



# Comprehensive Assessment of Demand-Side Resource Potentials (2010-2029): Appendices

## Volume II

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**FINAL REPORT**

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THE  
**CADMUS**  
GROUP, INC.

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# Appendix A: Data Collection

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## Appendix A.1: Residential End Use Survey

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### A.1.1 – Summary of Findings

One of the key tasks in helping PSE develop its 2010 IRP was cataloging the assumptions from previous IRPs and looking for opportunities to update the data. One such identified area was customer characteristics and energy consumption patterns in the residential sector. As PSE had not conducted a Residential Appliance Saturation Survey (RASS) since 2003, it was determined that an update would be a worthwhile endeavor. An updated RASS was planned for late 2008, but these results would not be available in time for inclusion in the 2010 IRP, so a smaller-scale Residential End Use Survey (REUS) was designed and implemented by The Cadmus Group (formerly Quantec, LLC).

The main tasks in the design, implementation, and analysis of this survey were:

- Designing the survey instrument
- Creating the sample
- Conducting surveys
- Analyzing survey responses

#### ***Designing the Survey Instrument***

To ensure that all necessary information was gathered, Cadmus worked closely with PSE staff on survey and question design. Questions were intended to gather information on:

- End uses present in homes
- Fuels used to run these end uses
- Building characteristics
- Energy efficiency measures already installed
- End use consumption estimates based on participant billing data

The final survey instrument is included in section A.1.2.

## Creating the Sample

The sample frame used is this survey, as shown in Table 1, was intended to reflect the composition of PSE’s residential sector, based on dwelling type (single family, multifamily, and manufactured homes) as well as on service type (electricity only, natural gas only, and combination customers).

**Table 1. Population Distribution Across Service and Dwelling Type**

| Service Type             | Single Family  |                 | Multifamily    |                 | Manufactured  |                 | Total            |                 |
|--------------------------|----------------|-----------------|----------------|-----------------|---------------|-----------------|------------------|-----------------|
|                          | Count          | % of Population | Count          | % of Population | Count         | % of Population | Count            | % of Population |
| Combo - Electric and Gas | 316,788        | 25%             | 20,853         | 2%              | 2,686         | 0%              | 340,327          | 27%             |
| Electric Only            | 308,338        | 25%             | 203,811        | 16%             | 65,881        | 5%              | 578,030          | 46%             |
| Gas Only                 | 305,024        | 24%             | 29,685         | 2%              | 673           | 0%              | 335,382          | 27%             |
| <b>Total</b>             | <b>930,150</b> | <b>74%</b>      | <b>254,349</b> | <b>20%</b>      | <b>69,240</b> | <b>6%</b>       | <b>1,253,739</b> | <b>100%</b>     |

To obtain enough data points in each segment to attain statistically representative results, it was determined that 600 surveys would be completed, spread across the segments proportionally based on PSE’s customer population. Some segments, such as manufactured combo homes, were over-sampled in an effort to obtain a large enough sample to be statistically significant. Table 2 presents the sample distribution used for the survey quotas.

**Table 2. Quota Distribution Across Service and Dwelling Type**

| Service Type             | Single Family | Multifamily | Manufactured | Total      |
|--------------------------|---------------|-------------|--------------|------------|
| Combo - Electric and Gas | 195           | 84          | 25           | 304        |
| Electric Only            | 105           | 30          | 25           | 160        |
| Gas Only                 | 124           | 12          | 0            | 136        |
| <b>Total</b>             | <b>424</b>    | <b>126</b>  | <b>50</b>    | <b>600</b> |

A sample of 13,000 records, shown in Table 3, was drawn by PSE and provided to the professional survey firm contracted to administer the survey.

**Table 3. Distribution of Survey Sample**

| Service Type             | Single Family | Multifamily  | Manufactured | Total         |
|--------------------------|---------------|--------------|--------------|---------------|
| Combo - Electric and Gas | 1,906         | 2,459        | 2,761        | 7,126         |
| Electric Only            | 1,104         | 298          | 196          | 1,598         |
| Gas Only                 | 2,604         | 1,670        | 2            | 4,276         |
| <b>Total</b>             | <b>5,614</b>  | <b>4,427</b> | <b>2,959</b> | <b>13,000</b> |



## Conducting the Survey

To administer the surveys, Cadmus contracted with Market Strategies. Of the 13,000 records provided, 3,171 were determined to be unusable prior to the fielding of the survey. This included: 2,741 cell phones, 285 “bad” numbers, 64 duplicates, and 81 records that were registered on the “do not call” list. Table 4 shows the sample attrition and final disposition for this study.

**Table 4. Final Sample Disposition**

|                      | Record Disposition          | Removed from Sample | Remaining     |
|----------------------|-----------------------------|---------------------|---------------|
|                      | Original Sample             | -                   | <b>13,000</b> |
| Pre-call screen      | Pre-Field Cleaning          | 3,171               | 9,829         |
|                      | Quota Full                  | 3,941               | 5,888         |
|                      | No Answer                   | 1,911               | 3,977         |
|                      | Out of Service/Wrong Number | 775                 | 3,202         |
| Unreachable          | Answering Mach/Voice Mail   | 645                 | 2,557         |
|                      | Busy                        | 201                 | 2,356         |
|                      | Business                    | 86                  | 2,270         |
|                      | Refusal                     | 1,604               | 666           |
| Survey Not Completed | Screened Out                | 75                  | 591           |
|                      | Language Issues             | 74                  | 517           |
|                      | Completed Interview         |                     | <b>517</b>    |

Table 5 shows the distribution of the 517 surveys by service and dwelling types. As demonstrated, the number of customers in manufactured homes with gas service was very low, but this was to be expected, based on the population distribution (Table 1).

**Table 5. Completed Survey Distribution Across Service and Dwelling Type**

| Service Type             | Single Family |                | Multifamily |                | Manufactured |                | Total      |                |
|--------------------------|---------------|----------------|-------------|----------------|--------------|----------------|------------|----------------|
|                          | Count         | % of Completes | Count       | % of Completes | Count        | % of Completes | Count      | % of Completes |
| Combo - Electric and Gas | 145           | 28%            | 10          | 2%             | 2            | 0%             | 157        | 30%            |
| Electric Only            | 99            | 19%            | 40          | 8%             | 38           | 7%             | 177        | 34%            |
| Gas Only                 | 169           | 33%            | 14          | 3%             | 0            | 0%             | 183        | 35%            |
| <b>Total</b>             | <b>413</b>    | <b>80%</b>     | <b>64</b>   | <b>12%</b>     | <b>40</b>    | <b>8%</b>      | <b>517</b> | <b>100%</b>    |

## ***Analyzing Survey Responses***

Upon survey completion, each question was analyzed for each segment and in aggregate. Frequency tables are provided in the appendices:

- A.1.3 – Survey Results by Service Type
- A.1.4 – Survey Results by Dwelling Type

## Appendix A.1.2: Residential End Use Survey

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February 2008  
 Closed-ended:  
 Other-Specified:

### QAX. MOVE IN FUEL FROM SAMPLE

- 1 Puget Sound Energy (PSE)

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### QAY. MOVE IN SERVTYPE FROM SAMPLE

- 1 Electricity
  - 2 Natural Gas
  - 3 Electricity and Natural Gas
- 

Hello, my name is \_\_\_\_\_, from Market Strategies and I'm calling on behalf of **Puget Sound Energy**. We are conducting a study about household energy use in Washington, and I'd like to ask you a few questions about the home at [address from sample]. I'm not selling anything, and your participation will help with future decisions regarding energy efficiency programs for consumers. [If necessary, refer customer to Bob Yetter, Market Research, at PSE. Dial 888-225-5773, select option 5, then dial ext. 81-3194.]

QA. First, can you verify that you are the person in your household who would be most likely to make decisions concerning your electric and gas utilities for the home at [Address from Sample]?

- 1 Yes {CONTINUE}
- 2 No {ASK TO SPEAK TO THIS PERSON; ARRANGE CALLBACK IF NECESSARY}
- DK {TERMINATE}
- REF {TERMINATE}

QB. Can you verify that PSE currently provides your [From Sample: Gas, Electricity, Gas AND Electricity] service?

- 1 Yes
- 2 No
  - a. If no, ask: What service is PSE providing to your home?

QC. Thank you. Do you own, rent, or lease this property?

- 1 Own
- 2 Rent
- 3 Lease
- 4 Other, Record
- 5 DK

QD. Which of the following best describes how the residence is occupied? [Prompt]

- 1 Year-round, full-time
- 2 Seasonal or part-time use – [Terminate]
- 3 Landlord of vacant unit– [Terminate]
- 4 Other [Specify]
- 5 Don't know – [Terminate]

---

**NOTE: Residence Description**

Q1. Which of the following best describes your home? (*READ CODES 1-4 AS NECESSARY*)

- 1 Single family **detached** house (on a separate lot) not connected to other living units
- 2 Single family **attached**, such as a duplex, **row- or townhouse** (*TECH NOTE: If necessary say: "It has adjacent walls to another residence with no units above or below."*)
- 3 A unit in a **condominium** or **apartment** building (*TECH NOTE: If necessary say: "The building has 4 or more attached units."*)
- 4 Manufactured home or house trailer, or
- 5 Something else [SPECIFY]
- DK {TERMINATE}
- REF {TERMINATE}

---

{ IF Q1=2 OR 3 ASK Q2, OTHERWISE GO TO Q3 }

Q2. How many living units or apartments are in the building where this residence is located? Please answer only for the building that contains this residence; do not consider other buildings that may exist in the complex.

[RECORD NUMBER 2-96]

- DK
  - REF
-

Q3. How many levels or stories are there in this residence? Please do not include an unfinished attic, unfinished basement, garage, or other floors that are never heated and are not used for living space. [Do not prompt] (*IF Q1=2 OR 3, DISPLAY: "Please answer only for the portion of the building where your unit is located."*)

- 1 One story
- 2 One and a half stories
- 3 Split level or two stories
- 4 Two and a half stories
- 5 Tri level or three stories
- 6 More than three stories
- 4 Other [SPECIFY]

DK  
REF

**NOTE: Home Characteristics/Weatherization / Efficient Equipment**

Q4. Is your home built on top of a foundation (a slab, with no basement), above a crawl space, above a unfinished basement, or above an finished basement? If different portions of your house have different configurations, please answer based on **the largest** portion of your home's footprint. (*READ CODES 1-4 AS NECESSARY*)

- 1 On a concrete slab or foundation
- 2 Above a crawl space
- 3 Above an unfinished basement
- 4 Above a finished basement

DK  
REF

Q5. Approximately what percentage of this residence's windows are **double or triple-pane**?

[RECORD NUMBER 0-100]%

DK  
REF

Q6. Approximately what percentage of your home's windows are equipped with **storm windows**? [Tech Note: If asked, A storm window is a secondary window, or perhaps a plastic sheet, that you place inside or outside your regular window to protect against the wind and cold. Storm windows are typically put on or pulled down before the winter, and removed or pulled up after the weather warms up each year.)

[RECORD NUMBER 0-100]%

DK  
REF

- Q7. What is the approximate square footage of **heated floor space** in this residence? [If necessary, prompt with “Make a guess if you can”] (*IF Q1=2 OR 3, DISPLAY: “Please indicate the number of square feet that pertains to your unit only.”*)

[RECORD NUMBER OF SQUARE FEET 0-6000]

3001 More than 6,000 square feet  
DK  
REF

{ IF Q7=DK ASK Q8, OTHERWISE GO TO Q9 }

- Q8. Although you aren’t sure about the actual **heated floor space**, can you estimate the square footage of your home using these categories? (*IF Q1=2 OR 3, DISPLAY: “Please indicate the category that pertains to your unit only.”*) (*READ CODES 1-7 AS NECESSARY*)

1 Less than 500 square feet  
2 501 to 1,000 square feet  
3 1,001 to 1,500 square feet  
4 1,501 to 2,000 square feet  
5 2,001 to 2,500 square feet  
6 2,501 to 3,000 square feet  
7 3,001 to 4,000 square feet  
8 4,001 to 5,000 square feet  
9 5,001 to 6,000 square feet  
More than 6,001 square feet  
DK  
REF

- Q9. How many heated rooms are in this residence? (Please include all heated areas. Do not include halls or foyers, bathrooms, closets, unheated porches, unheated garages, or unheated basement areas and rooms.)

[RECORD NUMBER]  
DK  
REF

- Q10. How many bathrooms are in this home? [If necessary: A full bath has a bathtub, toilet, and a sink; a  $\frac{3}{4}$  bathroom has a toilet, shower, and sink; a half bath has a toilet and a sink; a  $\frac{1}{4}$  bathroom has a toilet only.]?

1 None  
2 One  
3 1.25  
4 1.5  
5 1.75

|    |               |
|----|---------------|
| 6  | 2             |
| 7  | 2.25          |
| 8  | 2.5           |
| 9  | 2.75          |
| 10 | 3             |
| 11 | 3.25          |
| 12 | 3.5           |
| 13 | 3.75          |
| 14 | 4             |
| 15 | More than 4   |
| 16 | Other, record |
| 17 | DK            |
|    | REF           |

---

Q11. In what year was this residence built [If necessary, prompt with “Make a guess if you can”]  
(*IF Q1=2 OR 3, DISPLAY: “Answer only for the building in which you live.”*)

[RECORD NUMBER 1800 - 2008]

DK

REF

---

{IF Q11=DK ASK Q11A, OTHERWISE GO TO INTRO BEFORE Q12}

Q11A. Although you aren’t sure about the actual **year your home was built**, can you identify which from this list the closest general time frame? (*IF Q1=2 OR 3, DISPLAY: “Answer only for the building in which you live.”*) Was it.... (*READ CODES 1-3 AS NECESSARY*)

|    |              |
|----|--------------|
| 1  | Before 1940  |
| 2  | 1940 to 1959 |
| 3  | 1960 to 1979 |
| 4  | 1980 to 1985 |
| 5  | 1986 to 1990 |
| 6  | 1991 to 1995 |
| 7  | 1996 to 2000 |
| 8  | 2001 to 2002 |
| 9  | 2003 to 2004 |
| 10 | 2005         |
| 11 | 2006         |
| 12 | 2007         |
| 13 | 2008         |
|    | DK           |
|    | REF          |

---

**NOTE: Home Heating Systems**

In the next series of questions I'll be asking you about the **main heating system** in your home. Please answer the questions about the heating system that is used most.

{IF Q1=2 OR 3 ASK Q12, OTHERWISE GO TO FILTER BEFORE Q13}

- Q12. Does the main heating system serve only this residence or does it serve more than one residence?
- 1 Only this residence
  - 2 More than one residence
- DK  
REF

{IF Q1=1, 4, 5 OR Q12=1 ASK Q13, OTHERWISE GO TO INTRO BEFORE Q20}

- Q13. What is the type of system that is used to heat the majority of your home? (*ASK AS OPEN END; ACCEPT ONE MENTION*) (*PROBE FOR SPECIFICS: For example, there are 2 different types of heat pumps.*)
- 1 Natural gas central forced air furnace
  - 2 Natural gas hot water boiler (with radiators, baseboards or in the floor); also called natural gas hydronic heating
  - 3 Electric hot water boiler (with radiators, baseboards or in the floor); also called electric hydronic heating
  - 4 Natural gas steam boiler (with radiators)
  - 5 Natural gas radiant floor heating
  - 6 Natural gas fireplace or stove
  - 7 Electric Baseboard, wall heaters (without fans), ceiling cables, or floor cables
  - 8 Electric wall heaters with fans
  - 9 Electric central forced air furnace
  - 10 Air-source Heat pump (ELEC)
  - 11 Ground-source heat pump (ELEC)
  - 12 Portable heaters (ELEC)
  - 13 Oil central forced air furnace
  - 14 Oil hot water boiler (with radiators, baseboards, or in floor); also called oil hydronic heating
  - 15 Oil steam boiler (with radiators)
  - 16 Bottled gas central forced air (propane, butane, or kerosene)
  - 17 Bottled gas portable heaters (propane, butane, or kerosene)
  - 18 Wood or pellet stove – Skip to Q20
  - 19 Wood fireplace – Skip to Q20
  - 20 Solar
  - 21 Other System & Fuel [SPECIFY]
  - 22 None (No heating system) Skip to Q20
- DK  
REF



Q14. What type of temperature control is on the **main** heating system? (*TECH NOTE: If necessary say: "The one used most often."*) (*READ CODES 1-5 AS NECESSARY*)

- 1 Regular thermostat(s) with temperature settings
  - 2 Clock or programmable thermostat(s)
  - 3 Dial control **without** temperature settings
  - 4 Simple on/off switch or no temperature control, or
  - 5 Something else [SPECIFY]
  - DK
  - REF
- 

Q15. Which of the following statements best describes how the main **heating** system is used? [NOTE: Select all that apply] (*If necessary, READ CODES 1-4*)

- 1 The thermostat(s) is kept at a constant setting or temperature
  - 2 The thermostat is adjusted when occupants are sleeping
  - 3 The thermostat is adjusted when occupants leave the house
  - 4 The heater is turned on only when someone is cold
  - DK
  - REF
- 

{ IF Q15=1, 4, DK, REF ASK Q16, OTHERWISE GO TO FILTER BEFORE Q17 }

Q16. When you are **heating** your house, at what temperature do you normally keep your thermostat? (ASK AS OPEN END, ACCEPT ONE MENTION)

[RECORD NUMBER OF DEGREES FAHRENHEIT 0-96]

- 97 97 degrees F or more
  - DK
  - REF
- 

{ IF Q15=2 OR 3 ASK Q17-Q19, OTHERWISE GO TO Q20 }

When you are **heating** your house, at what **temperature** do you normally keep your thermostat set during these different periods of time?-

Q17. When one or more people in your household are at home and awake?

[RECORD NUMBER OF DEGREES FAHRENHEIT 0-96]

- 97 97 degrees F or more
  - DK
  - REF
-

Q18. When one or more people in your household are at home and everyone is sleeping?  
[RECORD NUMBER OF DEGREES FAHRENHEIT 0-96]

97 97 degrees F or more  
DK  
REF

Q19. When no one is at home?  
[RECORD NUMBER OF DEGREES FAHRENHEIT 0-96]

97 97 degrees F or more  
DK  
REF

**NOTE: Home Cooling Systems**

Now, moving on to your home's cooling system...

{ IF Q1=2 OR 3 ASK Q20, OTHERWISE GO TO FILTER BEFORE Q21 }

Q20. Does the main **cooling** system serve only this residence or does it serve more than one residence?

1 Only this residence  
2 More than one residence  
3 Residence has no cooling system [VOL] [Go to Q30]  
DK  
REF

{ IF Q1=1, 4, 5 OR Q20=1 ASK Q21-Q24, OTHERWISE GO TO FILTER BEFORE Q29 }

Q21. Which of the following is the type of cooling system that is used to cool the majority of home? (*READ CODES 1-9 AS NECESSARY-select all that apply*)

1 Central air conditioner  
2 Air-source heat pump  
3 Ground-source heat pump  
4 Room air conditioners  
5 Ductless mini-split air conditioner  
6 Evaporative cooler (Swamp cooler)  
7 Portable fans  
8 Whole-house fan, or  
9 Ceiling fans  
10 Something else [SPECIFY]  
DK  
REF

{ IF Q21=1-6, ASK Q22, OTHERWISE GO TO FILTER BEFORE Q29 }

Q22. What type of temperature control is on the main cooling system? (*TECH NOTE: If necessary say: "The one used most often."*) (*If necessary READ CODES 1-4*)

- 1 Regular thermostat(s) with temperature settings
- 2 Clock or programmable thermostat(s)
- 3 Dial control **without** temperature settings
- 4 Simple on/off switch or no temperature control
- 5 Other [SPECIFY]
- DK
- REF

Q23. Which of the following statements best describes how the main **cooling** system is used? [NOTE: Select all that apply] (*READ CODES 1-5*)

- 1 The thermostat(s) is kept at a constant setting or temperature
- 2 The thermostat is adjusted when occupants are sleeping
- 3 The thermostat is adjusted when occupants leave the house
- 4 The cooling system is turned on only when someone is warm
- 5 We rarely use this cooling system
- DK
- REF

{ IF Q23=1, 4, 5, DK, REF ASK Q24, OTHERWISE GO TO FILTER BEFORE Q25 }

Q24. When you are **cooling** your house, at what temperature do you normally keep your thermostat? (ASK AS OPEN END, ACCEPT ONE MENTION)

[RECORD NUMBER OF DEGREES FAHRENHEIT 0-96]

- 97 97 degrees F or more
- DK
- REF

{ IF Q23=2, 3 ASK Q25-Q28, OTHERWISE GO TO Q29 }

Q25. When you are **cooling** your house, at what **temperature** do you normally keep your thermostat set during these different periods of time? –

Q26. When one or more people in your household are at home and awake?

[RECORD NUMBER OF DEGREES FAHRENHEIT 0-96]

- 97 97 degrees F or more
- DK
- REF

---

Q27. When one or more people in your household are at home and everyone is sleeping?  
[RECORD NUMBER OF DEGREES FAHRENHEIT 0-96]

97 97 degrees F or more

DK

REF

Q28. When no one is at home?  
[RECORD NUMBER OF DEGREES FAHRENHEIT 0-96]

97 97 degrees F or more

DK

REF

---

**NOTE: Water Heating**

**I'd like to now ask you some questions about the water heater that you use to heat water for dish-washing, bathing, etc.**

{IF Q1=2 OR 3 ASK Q29, OTHERWISE GO TO FILTER BEFORE Q30}

Q29. Does the water heater, or the source of the hot water, serve only this residence or does it serve more than one residence?

1 Only this residence

2 Central water heating or tank for more than one residence

3 This residence has no hot water (Skip to Intro for Q38)

DK

REF

---

{IF Q1=1, 4, 5 OR Q29=1 ASK Q30, OTHERWISE GO TO INTRO BEFORE Q38}

Q30. How many water heaters are at this residence?

1 One

2 Two

3 Three or more

DK

REF

---

*(IF Q30=2 OR 3, RESTORE: "In the next series of questions I'll be asking you about the **primary** or **main** water heater for your house. Please answer these questions about the water heater that is used the most.")*

Q31. What type of water heater do you have? (*READ CODES 1-5 AS NECESSARY*)

- 1 Tank-type water heater. This is **the most common** type of water heater.
  - 2 Heat pump water heater
  - 3 Indirect water heater that uses the home's boiler as the heat source or an integrated water heater that is also used to heat the home.
  - 4 Solar water heater
  - 5 Tankless hotwater heater, also called Demand or instantaneous water heaters
- DK  
REF
- 

{IF Q3 1=4, ASK Q32-Q32A, OTHERWISE GO TO Q33}

Q32. What type of system is used in conjunction with your solar water heater? (*READ CODES 1-2*)

- 1 Tank-type water heater (this is the "standard" type, with a water storage tank)
  - 2 Tankless hotwater heater, also called Demand or Instantaneous water heaters
- DK  
REF
- 

Q32A. What is the secondary or back-up type of fuel you use to heat water at this residence? (*READ CODES 1-4 AS NECESSARY*)

- 1 Electricity
  - 2 Natural gas
  - 3 Propane or bottled gas (LP, propane, butane), or
  - 4 Something else [SPECIFY]
- DK  
REF
- 

{IF Q3 1=4, GO TO Q34}

Q33. What type of fuel or energy is used to heat the water used in this residence? (*READ CODES 1-4 AS NECESSARY*)

- 1 Electricity
  - 2 Natural gas
  - 3 Propane or bottled gas (LP, propane, butane), or
  - 4 Something else [SPECIFY]
- DK  
REF
-

Q34. At what **specific temperature** is your water heater thermostat set? (*ASK AS OPEN END, ACCEPT ONE MENTION*)

[RECORD NUMBER OF DEGREES FAHRENHEIT 0-200]

DK  
REF

{IF Q34=DK ASK Q34A, OTHERWISE GO TO INTRO BEFORE Q35}

Q34A. If not set at a specific temperature, then which of these statements best describes where your water heater thermostat is set? (*READ CODES 1-5 AS NECESSARY*)

- 1 On the “low” setting
- 2 Between the “low” and “medium” settings
- 3 On the “medium” setting
- 4 Between the “medium” and “high” settings
- 5 On the “high” setting

DK  
REF

Which of the following items do you have for your **main** water heater? Do you have ...

Q35. A water heater tank wrap

- 1 Yes
- 2 No

DK  
REF

Q36. Pipe insulation

- 1 Yes
- 2 No

DK  
REF

Q37. A water heater timer

- 1 Yes
- 2 No

DK  
REF

**NOTE: Appliances & Other Equipment**

In this section I will be asking about the appliances and other equipment you have in your home.

Now, about your refrigerator(s)...

Q38. How many refrigerators are in your home?

[RECORD NUMBER 0-10]

DK  
REF

---

{IF Q38 > 0, ASK Q39, OTHERWISE GO TO INTRO BEFORE Q40}

Q39. How many years old is your (*IF Q38 > 1 RESTORE: "primary"*) refrigerator? ? (*READ CODES 1-3*)

1 6 or less years old  
2 7 to 14 years old  
3 15 or more years old

DK  
REF

---

Now, about your freezer(s)...

Q40. How many stand-alone freezers are in your home?

[RECORD NUMBER 0-10]

DK  
REF

---

{IF Q40 > 0, ASK Q41, OTHERWISE GO TO Q42}

Q41. How many years old is your (*IF Q40 > 1 RESTORE: "primary"*) stand-alone freezer? (*READ CODES 1-3*)

1 6 or less years old  
2 7 to 14 years old  
3 15 or more years old

DK  
REF

---

Q42. How many dishwashers are in your home?

[RECORD NUMBER 0-10]

DK  
REF

---

Now, about your clothes washer...

Q43. Do you have a private clothes washer that is used just by the people in your household?

- 1 Yes
  - 2 No
  - DK
  - REF
- 

{ IF Q43=1 ASK Q44, OTHERWISE GO TO Q45 }

Q44 Which of the following best describes the type of clothes washer in your home? (*READ CODES 1-2*)

- 1 Front Load Washing Machine
  - 2 Top Load Washing Machine
  - 3 Other: Specify
  - DK
  - REF
- 

Q45. Do you have a clothes dryer that is used just by the people in your household?

- 1 Yes
  - 2 No
  - DK
  - REF
- 

{ IF Q45=1 ASK Q46, OTHERWISE GO TO Q47 }

Q46. What fuel or energy source do you use for your clothes dryer? (*READ CODES 1-4 AS NECESSARY*)

- 1 Electricity
  - 2 Natural gas
  - 3 Propane or bottled gas (LP, propane, butane)
  - 4 Something else [SPECIFY]
  - DK
  - REF
- 

Q47. Do you have your own swimming pool? (*If necessary, clarify: A private pool that only your household has access to.*)

- 1 Yes
  - 2 No
  - DK
  - REF
- 

{ IF Q47=1 ASK Q48-48B, OTHERWISE GO TO Q49 }



Q48. You probably use one fuel to “**run**” your pool and another to **heat** the water. What fuel or energy source do you use to **heat** your swimming pool? (*READ CODES 1-5 AS NECESSARY*)

- 1 Electricity
  - 2 Natural gas
  - 3 Solar
  - 4 Propane or bottled gas (LP, propane, butane)
  - 5 Not heated
  - 6 Something else [SPECIFY]
  - DK
  - REF
- 

Q48A. How often do you operate your pool pump and filtration system? (*READ CODES 1-2 AS NECESSARY*)

- 1 All day and all night?
  - 2 Turned off at night? or
  - 3 Something else [SPECIFY]
  - DK
  - REF
- 

Q48B. Do you own an insulating cover for your pool?

- 1 Yes
  - 2 No
  - DK
  - REF
- 

Q49. Do you have your own hot tub or spa? (*If necessary, clarify: A private hot tub or spa that only your household has access to.*)

- 1 Yes
  - 2 No
  - DK
  - REF
- 

{ IF Q49=1 ASK Q50, OTHERWISE GO TO Q51 }

Q50. What fuel or energy source do you use for your hot tub or spa? (*READ CODES 1-3 AS NECESSARY*)

- 1 Electricity
- 2 Natural gas
- 3 Propane or bottled gas (LP, propane, butane)
- 4 Something else [SPECIFY]
- DK
- REF

---

Q50A. Do you have your own sauna? *(If necessary, clarify: A private sauna that only your household has access to.)*

- 1 Yes
- 2 No
- DK
- REF

---

{IF Q50A=1 ASK Q50B, OTHERWISE GO TO Q51}

Q50B. What fuel or energy source do you use for sauna? *(READ CODES 1-4 AS NECESSARY)*

- 1 Electricity
- 2 Natural gas
- 3 Propane or bottled gas (LP, propane, butane)
- 4 Something else [SPECIFY]
- DK
- REF

---

Next, I'd like to ask about your cooking equipment. Some people have cook-tops that are separate from their ovens. Others have a range where the cook-top and oven are contained in one appliance. For the next few questions, please think of your cook-top and oven as two separate items

Q51. How many cook-top units do you have.

[RECORD NUMBER 0-2] {If more than two: "Note that you may have multiple burners in your cook-top, but only one unit" – recode as necessary }

- DK
- REF

---

{IF Q51>0 ASK Q52, OTHERWISE GO TO Q53}

Q52. What fuel or energy source do you use for your cook-top(s)? *(READ CODES 1-4 AS NECESSARY)*

- 1 Electricity
  - 2 Natural gas
  - 3 Propane or bottled gas (LP, propane, butane)
  - 4 Something else [SPECIFY]
  - DK
  - REF
-

Q53. How many ovens do you have?

[RECORD NUMBER 0-10]

DK  
REF

{ IF Q53>0 ASK Q54, OTHERWISE GO TO Q55 }

Q54. What fuel or energy source do you use for your oven(s)? (*READ CODES 1-4 AS NECESSARY*)

- 1 Electricity
- 2 Natural gas
- 3 Propane or bottled gas (LP, propane, butane)
- 4 Something else [SPECIFY]

DK  
REF

Q55. How many microwave ovens do you have?

[RECORD NUMBER 0-10]

DK  
REF

**NOTE: Audio Visual Equipment**

SCREEN DESIGN: RANDOMIZE QUESTIONS Q56–Q69

PROG. NOTE: BLOCK Q56-Q62, BLOCK Q56-Q57

PROG. NOTE: BLOCK Q64-Q69

Now, in order to get an idea of the way your home is using energy, I'd like to find out about your audio/video equipment and your home office equipment. For each piece of equipment I mention, please tell me how many of each you have in your home. What is the total number of ...

[RECORD NUMBER 0-96]

DK  
REF

Q56. Televisions, **of all types**, in your home?

{ IF Q56=1-96 ASK Q57, OTHERWISE CONTINUE }

PROG. NOTE: IF Q57>Q56 DISPLAY: "*You have reported having a greater number of Flat Screen tvs than the total number of televisions of all types in your home.*"

Q57. Large flat screen tvs (over 32 inches)?

Q58. Game console (Playstation, Wii, Nintendo, xbox, xCube, etc)

- Q59. VCRs or DVD players (not a combo unit)
- Q60. Combination VCR and DVD unit
- Q61. Stand-alone DVR (not TIVO)
- Q62. TIVO, Cable or satellite TV set-top boxes or receivers in your home ?
- Q63. Stereo systems in your home?
- Q64. Personal computers, including laptops, in your home?
- {IF Q64=1-96 ASK Q65, OTHERWISE GO TO Q66}
- Q65. Computer monitors in your home?
- Q66. Combination printer / fax / copiers in your home?
- Q67. Standalone Printers in your home?
- Q68. Standalone Fax machines in your home?
- Q69. Standalone Copiers in your home?
- {ASK Q70 LAST}
- Q70. Surge protector strips for any of the audio/video or home office equipment mentioned above?
- Q71. Which, if any, of the appliances in your home are ENERGYSTAR rated? [RECORD APPLIANCE AND VERIFY COUNT]

---

**NOTE: Occupancy Characteristics**

- Q72. Including yourself, how many people usually live in this residence at least six months of the year? Please include all members of your household whether or not they are related to you, but do not include anyone who is just visiting or children who may be away at college or in the military.

[RECORD NUMBER 1-96]

DK

REF

We'd like to ask a few more questions to get a feel for your energy usage patterns: [If the respondent hesitates to answer Q73 or Q74: Your answers to these questions are kept anonymous, and will be handled with strict confidentiality. If you have any concerns, Bob Yetter at PSE can be reached using a toll free number. {Refer contact if requested - Dial 888-225-5773, select option 5, then dial ext. 81-3194}]

---

Q73. On a typical weekday, for what average length of time is your home occupied by at least one person [Do not read. If necessary, prompt with randomized option from list]?

- 1 23-24 hrs/day
  - 2 21-22 hrs/day
  - 3 19-20 hrs/day
  - 4 17-18 hrs/day
  - 5 15-16 hrs/day
  - 6 13-14 hrs/day
  - 7 11-12 hrs/day
  - 8 9-10 hrs/day
  - 9 7-8 hrs/day
  - 10 5-6 hrs/day
  - 11 3-4 hrs/day
  - 12 1-2 hrs/day
- 

Q74. On a typical weekend, for what average length of time is your home occupied by at least one person [Do not read. If necessary, prompt with randomized option from list]?

- 1 23-24 hrs/day
  - 2 21-22 hrs/day
  - 3 19-20 hrs/day
  - 4 17-18 hrs/day
  - 5 15-16 hrs/day
  - 6 13-14 hrs/day
  - 7 11-12 hrs/day
  - 8 9-10 hrs/day
  - 9 7-8 hrs/day
  - 10 5-6 hrs/day
  - 11 3-4 hrs/day
  - 12 1-2 hrs/day
- 

*“Thank you very much for your cooperation and assistance!”*

## Appendix A.1.3 Survey Results by Service Type

The following tables present the results of the survey by service type. The actual number of responses in each customer segment have been extrapolated to the population to provide an estimate of the results across PSE’s entire service territory.

**Table B.1**

| Question ax. Service type from sample | Service Type             |               |          | Total   |
|---------------------------------------|--------------------------|---------------|----------|---------|
|                                       | Electric and Gas (combo) | Electric only | Gas only |         |
| Electric and Gas (combo)              | 341,000                  | 0             | 0        | 341,000 |
|                                       | 27.2%                    | 0             | 0        | 27.2%   |
| Electric only                         | 0                        | 578,030       | 0        | 578,030 |
|                                       | 0                        | 46.1%         | 0        | 46.1%   |
| Gas only                              | 0                        | 0             | 334,709  | 334,709 |
|                                       | 0                        | 0             | 26.7%    | 26.7%   |

**Table B.2**

| Question c. Do you own or rent or lease this property? | Service Type             |               |          | Total   |
|--|--------------------------|---------------|----------|---------|
|  | Electric and Gas (combo) | Electric only | Gas only |         |
| Own  | 307,625                  | 392,820       | 294,761  | 995,206 |
|  | 24.5%                    | 31.3%         | 23.5%    | 79.4%   |
| Rent   | 28,528                   | 160,794       | 38,164   | 227,486 |
|  | 2.3%                     | 12.8%         | 3.0%     | 18.1%   |
| Lease  | 4,847                    | 21,293        | 1,785    | 27,924  |
|  | 0.4%                     | 1.7%          | 0.1%     | 2.2%    |
| Refused  | 0                        | 3,123         | 0        | 3,123   |
|  | 0                        | 0.2%          | 0        | 0.2%    |

**Table B.3**

| Question d. Which of the following best describes how the residence is occupied? | Service Type             |               |          | Total     |
|--|--------------------------|---------------|----------|-----------|
|  | Electric and Gas (combo) | Electric only | Gas only |           |
| Year-round, full-time  | 341,000                  | 578,030       | 334,709  | 1,253,739 |
|  | 27.2%                    | 46.1%         | 26.7%    | 100.0%    |

**Table B.4**

| Question 1. Which of the following best describes your home? | Service Type             |               |          | Total   |
|--|--------------------------|---------------|----------|---------|
|  | Electric and Gas (combo) | Electric only | Gas only |         |
| Single family detached home                                  | 296,117                  | 320,013       | 287,179  | 903,308 |
|  | 23.6%                    | 25.5%         | 22.9%    | 72.0%   |
| Duplex, row- or townhouse                                    | 19,838                   | 33,694        | 21,309   | 74,841  |
|  | 1.6%                     | 2.7%          | 1.7%     | 6.0%    |
| Apartment or condo   | 21,687                   | 171,267       | 24,437   | 217,390 |
|  | 1.7%                     | 13.7%         | 1.9%     | 17.3%   |
| Manufactured home  | 3,359                    | 53,056        | 1,785    | 58,199  |
|  | 0.3%                     | 4.2%          | 0.1%     | 4.6%    |

**Table B.5**

| Question 1c. Which of the following best describes your home? | Service Type             |                  |                  | Total            |
|---|--------------------------|------------------|------------------|------------------|
|   | Electric and Gas (combo) | Electric only    | Gas only         |                  |
| Single family   | 296,117<br>23.6%         | 320,013<br>25.5% | 287,179<br>22.9% | 903,308<br>72.0% |
| Multi-family  | 41,524<br>3.3%           | 204,961<br>16.3% | 45,746<br>3.6%   | 292,232<br>23.3% |
| Manufactured home   | 3,359<br>0.3%            | 53,056<br>4.2%   | 1,785<br>0.1%    | 58,199<br>4.6%   |

**Table B.6**

| Question 2c. How many living units or apartments are in the building where this residence is located? | Service Type             |                  |                  | Total            |
|---|--------------------------|------------------|------------------|------------------|
|   | Electric and Gas (combo) | Electric only    | Gas only         |                  |
| 2 units   | 9,254<br>0.7%            | 5,095<br>0.4%    | 17,068<br>1.4%   | 31,417<br>2.5%   |
| 3 units   | 2,085<br>0.2%            | 10,191<br>0.8%   | 0<br>0           | 12,276<br>1.0%   |
| 4 units   | 13,267<br>1.1%           | 25,476<br>2.0%   | 4,241<br>0.3%    | 42,984<br>3.4%   |
| 5 or more units   | 12,670<br>1.0%           | 159,104<br>12.7% | 24,437<br>1.9%   | 196,210<br>15.7% |
| Don't know  | 4,249<br>0.3%            | 5,095<br>0.4%    | 0<br>0           | 9,345<br>0.7%    |
| Not applicable  | 299,476<br>23.9%         | 373,069<br>29.8% | 288,963<br>23.0% | 961,507<br>76.7% |



**Table B.7**

| Question 3. How many levels or stories are there in this residence? | Service Type             |                  |                  | Total            |
|---|--------------------------|------------------|------------------|------------------|
|   | Electric and Gas (combo) | Electric only    | Gas only         |                  |
| One story   | 106,787<br>8.5%          | 264,413<br>21.1% | 114,014<br>9.1%  | 485,213<br>38.7% |
| One and a half stories  | 8,657<br>0.7%            | 11,102<br>0.9%   | 5,354<br>0.4%    | 25,112<br>2.0%   |
| Split level or two stories  | 178,340<br>14.2%         | 199,625<br>15.9% | 155,763<br>12.4% | 533,727<br>42.6% |
| Two and a half stories  | 15,149<br>1.2%           | 34,023<br>2.7%   | 12,828<br>1.0%   | 62,000<br>4.9%   |
| Tri level or three stories  | 27,819<br>2.2%           | 55,554<br>4.4%   | 38,941<br>3.1%   | 122,314<br>9.8%  |
| More than three stories   | 4,249<br>0.3%            | 13,313<br>1.1%   | 7,810<br>0.6%    | 25,373<br>2.0%   |

**Table B.8**

| Question 4. On which of the following is your home built? | Service Type             |                  |                 | Total            |
|---|--------------------------|------------------|-----------------|------------------|
|   | Electric and Gas (combo) | Electric only    | Gas only        |                  |
| Concrete slab or foundation                               | 89,937<br>7.2%           | 254,691<br>20.3% | 101,310<br>8.1% | 445,938<br>35.6% |
| Above a crawl space                                       | 185,260<br>14.8%         | 174,979<br>14.0% | 122,479<br>9.8% | 482,718<br>38.5% |
| Above an unfinished basement                              | 16,343<br>1.3%           | 28,928<br>2.3%   | 51,555<br>4.1%  | 96,826<br>7.7%   |
| Above a finished basement                                 | 41,040<br>3.3%           | 57,033<br>4.5%   | 55,460<br>4.4%  | 153,533<br>12.2% |
| Don't know  | 6,335<br>0.5%            | 47,352<br>3.8%   | 3,905<br>0.3%   | 57,592<br>4.6%   |
| Refused   | 2,085<br>0.2%            | 15,047<br>1.2%   | 0<br>0          | 17,132<br>1.4%   |

**Table B.9**

| Question 5c. Approximately what percentage of this residence's windows are double or triple-pane? | Service Type             |               |          | Total   |
|---|--------------------------|---------------|----------|---------|
|   | Electric and Gas (combo) | Electric only | Gas only |         |
| 25% or less   | 34,175                   | 115,132       | 42,526   | 191,833 |
|   | 2.7%                     | 9.2%          | 3.4%     | 15.3%   |
| 26% - 50%   | 17,234                   | 20,709        | 16,061   | 54,005  |
|   | 1.4%                     | 1.7%          | 1.3%     | 4.3%    |
| 51% - 75%   | 4,328                    | 11,102        | 7,367    | 22,798  |
|   | 0.3%                     | 0.9%          | 0.6%     | 1.8%    |
| 76% - 100%  | 266,912                  | 407,821       | 250,238  | 924,971 |
|   | 21.3%                    | 32.5%         | 20.0%    | 73.8%   |
| Don't know  | 15,588                   | 23,265        | 18,517   | 57,371  |
|   | 1.2%                     | 1.9%          | 1.5%     | 4.6%    |
| Refused   | 2,761                    | 0             | 0        | 2,761   |
|   | 0.2%                     | 0             | 0        | 0.2%    |

**Table B.10**

| Question 6c. Approximately what percentage of your home's windows are equipped with storm windows? | Service Type             |               |          | Total   |
|--|--------------------------|---------------|----------|---------|
|  | Electric and Gas (combo) | Electric only | Gas only |         |
| 25% or less  | 279,366                  | 441,621       | 254,159  | 975,146 |
|  | 22.3%                    | 35.2%         | 20.3%    | 77.8%   |
| 26% - 50%  | 4,328                    | 13,313        | 18,075   | 35,716  |
|  | 0.3%                     | 1.1%          | 1.4%     | 2.8%    |
| 51% - 75%  | 3,844                    | 6,246         | 0        | 10,089  |
|  | 0.3%                     | 0.5%          | 0        | 0.8%    |
| 76% - 100%   | 29,735                   | 74,026        | 43,959   | 147,719 |
|  | 2.4%                     | 5.9%          | 3.5%     | 11.8%   |
| Don't know   | 23,727                   | 42,824        | 18,517   | 85,068  |
|  | 1.9%                     | 3.4%          | 1.5%     | 6.8%    |

**Table B.11**

| Question 7c. What is the approximate square footage of heated floor space in this residence? | Service Type             |               |          | Total   |
|--|--------------------------|---------------|----------|---------|
|  | Electric and Gas (combo) | Electric only | Gas only |         |
| Less than 500 square feet  | 0                        | 37,490        | 0        | 37,490  |
|  | 0                        | 3.0%          | 0        | 3.0%    |
| 501 to 1,000 square feet   | 26,849                   | 136,485       | 31,467   | 194,800 |
|  | 2.1%                     | 10.9%         | 2.5%     | 15.5%   |
| 1,001 to 1,500 square feet   | 40,589                   | 126,218       | 77,317   | 244,124 |
|  | 3.2%                     | 10.1%         | 6.2%     | 19.5%   |
| 1,501 to 2,000 square feet   | 110,732                  | 123,858       | 69,049   | 303,640 |
|  | 8.8%                     | 9.9%          | 5.5%     | 24.2%   |
| 2,001 to 2,500 square feet   | 51,940                   | 54,822        | 63,146   | 169,908 |
|  | 4.1%                     | 4.4%          | 5.0%     | 13.6%   |
| 2,501 to 3,000 square feet   | 46,044                   | 17,348        | 41,732   | 105,124 |
|  | 3.7%                     | 1.4%          | 3.3%     | 8.4%    |
| 3,001 to 4,000 square feet   | 47,611                   | 15,614        | 16,397   | 79,622  |
|  | 3.8%                     | 1.2%          | 1.3%     | 6.4%    |
| 4,001 to 5,000 square feet   | 4,328                    | 6,246         | 1,785    | 12,359  |
|  | 0.3%                     | 0.5%          | 0.1%     | 1.0%    |
| More than 6,000 square feet  | 2,164                    | 0             | 0        | 2,164   |
|  | 0.2%                     | 0             | 0        | 0.2%    |
| Don't know   | 10,742                   | 59,950        | 33,816   | 104,508 |
|  | 0.9%                     | 4.8%          | 2.7%     | 8.3%    |

**Table B.12**

| Question 8. Although you aren't sure about the actual heated floor space can you estimate the square footage of your home using these categories? | Service Type             |               |          | Total     |
|---|--------------------------|---------------|----------|-----------|
|   | Electric and Gas (combo) | Electric only | Gas only |           |
| Less than 500 square feet   | 0                        | 13,658        | 0        | 13,658    |
|   | 0                        | 1.1%          | 0        | 1.1%      |
| 501 to 1,000 square feet  | 2,085                    | 28,360        | 11,944   | 42,390    |
|   | 0.2%                     | 2.3%          | 1.0%     | 3.4%      |
| 1,001 to 1,500 square feet  | 2,164                    | 7,979         | 7,138    | 17,282    |
|   | 0.2%                     | 0.6%          | 0.6%     | 1.4%      |
| 1,501 to 2,000 square feet  | 2,164                    | 0             | 3,798    | 5,962     |
|   | 0.2%                     | 0             | 0.3%     | 0.5%      |
| 2,001 to 2,500 square feet  | 2,164                    | 0             | 0        | 2,164     |
|   | 0.2%                     | 0             | 0        | 0.2%      |
| Don't know  | 2,164                    | 9,952         | 9,152    | 21,268    |
|   | 0.2%                     | 0.8%          | 0.7%     | 1.7%      |
| Refused   | 0                        | 0             | 1,785    | 1,785     |
|   | 0                        | 0             | 0.1%     | 0.1%      |
| Not applicable  | 330,258                  | 518,080       | 300,893  | 1,149,231 |
|   | 26.3%                    | 41.3%         | 24.0%    | 91.7%     |

**Table B.13**

| Question 9. How many heated rooms are in this residence? | Service Type             |               |          | Total  |
|--|--------------------------|---------------|----------|--------|
|  | Electric and Gas (combo) | Electric only | Gas only |        |
| 1  | 0                        | 8,218         | 3,798    | 12,016 |
|  | 0                        | 0.7%          | 0.3%     | 1.0%   |

| Question 9. How many heated rooms are in this residence? | Service Type             |                  |                | Total            |
|--|--------------------------|------------------|----------------|------------------|
|  | Electric and Gas (combo) | Electric only    | Gas only       |                  |
| 2  | 2,164<br>0.2%            | 54,420<br>4.3%   | 3,905<br>0.3%  | 60,489<br>4.8%   |
| 3  | 8,420<br>0.7%            | 43,169<br>3.4%   | 15,955<br>1.3% | 67,544<br>5.4%   |
| 4  | 27,413<br>2.2%           | 125,472<br>10.0% | 36,592<br>2.9% | 189,476<br>15.1% |
| 5  | 27,603<br>2.2%           | 98,919<br>7.9%   | 47,864<br>3.8% | 174,386<br>13.9% |
| 6  | 65,443<br>5.2%           | 73,771<br>5.9%   | 58,235<br>4.6% | 197,449<br>15.7% |
| 7  | 43,801<br>3.5%           | 87,323<br>7.0%   | 56,237<br>4.5% | 187,361<br>14.9% |
| 8  | 60,112<br>4.8%           | 33,307<br>2.7%   | 47,085<br>3.8% | 140,504<br>11.2% |
| 9  | 45,447<br>3.6%           | 21,860<br>1.7%   | 20,195<br>1.6% | 87,502<br>7.0%   |
| 10   | 28,134<br>2.2%           | 11,102<br>0.9%   | 18,075<br>1.4% | 57,311<br>4.6%   |
| 11   | 8,657<br>0.7%            | 11,102<br>0.9%   | 8,923<br>0.7%  | 28,682<br>2.3%   |
| 12   | 8,657<br>0.7%            | 3,123<br>0.2%    | 7,138<br>0.6%  | 18,918<br>1.5%   |
| 13   | 2,164<br>0.2%            | 3,123<br>0.2%    | 5,354<br>0.4%  | 10,641<br>0.8%   |

| Question 9. How many heated rooms are in this residence? | Service Type             |               |          | Total |
|--|--------------------------|---------------|----------|-------|
|  | Electric and Gas (combo) | Electric only | Gas only |       |
| 14   | 6,492                    | 0             | 0        | 6,492 |
|  | 0.5%                     | 0             | 0        | 0.5%  |
| 15   | 2,164                    | 0             | 1,785    | 3,949 |
|  | 0.2%                     | 0             | 0.1%     | 0.3%  |
| 16   | 0                        | 3,123         | 1,785    | 4,907 |
|  | 0                        | 0.2%          | 0.1%     | 0.4%  |
| Don't know   | 4,328                    | 0             | 1,785    | 6,113 |
|  | 0.3%                     | 0             | 0.1%     | 0.5%  |



**Table B.14**

| Question 9c. How many heated rooms are in this residence? | Service Type             |               |          | Total   |
|---|--------------------------|---------------|----------|---------|
|   | Electric and Gas (combo) | Electric only | Gas only |         |
| 1   | 0                        | 8,218         | 3,798    | 12,016  |
|   | 0                        | 0.7%          | 0.3%     | 1.0%    |
| 2   | 2,164                    | 54,420        | 3,905    | 60,489  |
|   | 0.2%                     | 4.3%          | 0.3%     | 4.8%    |
| 3   | 8,420                    | 43,169        | 15,955   | 67,544  |
|   | 0.7%                     | 3.4%          | 1.3%     | 5.4%    |
| 4   | 27,413                   | 125,472       | 36,592   | 189,476 |
|   | 2.2%                     | 10.0%         | 2.9%     | 15.1%   |
| 5   | 27,603                   | 98,919        | 47,864   | 174,386 |
|   | 2.2%                     | 7.9%          | 3.8%     | 13.9%   |
| 6   | 65,443                   | 73,771        | 58,235   | 197,449 |
|   | 5.2%                     | 5.9%          | 4.6%     | 15.7%   |
| 7   | 43,801                   | 87,323        | 56,237   | 187,361 |
|   | 3.5%                     | 7.0%          | 4.5%     | 14.9%   |
| 8   | 60,112                   | 33,307        | 47,085   | 140,504 |
|   | 4.8%                     | 2.7%          | 3.8%     | 11.2%   |
| 9   | 45,447                   | 21,860        | 20,195   | 87,502  |
|   | 3.6%                     | 1.7%          | 1.6%     | 7.0%    |
| 10  | 28,134                   | 11,102        | 18,075   | 57,311  |
|   | 2.2%                     | 0.9%          | 1.4%     | 4.6%    |
| More than 10 rooms  | 28,134                   | 20,471        | 24,984   | 73,588  |
|   | 2.2%                     | 1.6%          | 2.0%     | 5.9%    |

| Question 9c. How many heated rooms are in this residence? | Service Type             |               |          | Total |
|---|--------------------------|---------------|----------|-------|
|   | Electric and Gas (combo) | Electric only | Gas only |       |
| Don't know  | 4,328                    | 0             | 1,785    | 6,113 |
|   | 0.3%                     | 0             | 0.1%     | 0.5%  |

**Table B.15**

| Question 10. How many bathrooms are in this home? | Service Type             |               |          | Total   |
|---|--------------------------|---------------|----------|---------|
|   | Electric and Gas (combo) | Electric only | Gas only |         |
| None  | 0                        | 13,313        | 5,354    | 18,667  |
|   | 0                        | 1.1%          | 0.4%     | 1.5%    |
| 1   | 38,266                   | 202,335       | 88,589   | 329,191 |
|   | 3.1%                     | 16.1%         | 7.1%     | 26.3%   |
| 1.25  | 4,328                    | 6,246         | 0        | 10,574  |
|   | 0.3%                     | 0.5%          | 0        | 0.8%    |
| 1.5   | 17,910                   | 32,395        | 18,533   | 68,838  |
|   | 1.4%                     | 2.6%          | 1.5%     | 5.5%    |
| 1.75  | 10,821                   | 19,082        | 9,488    | 39,390  |
|   | 0.9%                     | 1.5%          | 0.8%     | 3.1%    |
| 2   | 78,947                   | 196,166       | 85,461   | 360,574 |
|   | 6.3%                     | 15.6%         | 6.8%     | 28.8%   |
| 2.25  | 63,121                   | 42,569        | 58,571   | 164,261 |
|   | 5.0%                     | 3.4%          | 4.7%     | 13.1%   |
| 2.5   | 0                        | 3,123         | 7,138    | 10,261  |
|   | 0                        | 0.2%          | 0.6%     | 0.8%    |
| 2.75  | 108,129                  | 53,433        | 52,317   | 213,878 |
|   | 8.6%                     | 4.3%          | 4.2%     | 17.1%   |
| 3   | 2,164                    | 0             | 1,785    | 3,949   |
|   | 0.2%                     | 0             | 0.1%     | 0.3%    |
| 3.5   | 6,492                    | 3,123         | 2,120    | 11,736  |
|   | 0.5%                     | 0.2%          | 0.2%     | 0.9%    |

| Question 10. How many bathrooms are in this home? | Service Type             |               |          | Total  |
|---|--------------------------|---------------|----------|--------|
|   | Electric and Gas (combo) | Electric only | Gas only |        |
| 4   | 10,821                   | 6,246         | 5,354    | 22,420 |
|   | 0.9%                     | 0.5%          | 0.4%     | 1.8%   |

**Table B.16**

| Question 11c. In what year was this residence built? | Service Type             |               |          | Total   |
|--|--------------------------|---------------|----------|---------|
|  | Electric and Gas (combo) | Electric only | Gas only |         |
| Before 1940  | 6,492                    | 33,201        | 87,385   | 127,078 |
|  | 0.5%                     | 2.6%          | 7.0%     | 10.1%   |
| 1940 to 1959   | 33,059                   | 29,839        | 73,624   | 136,523 |
|  | 2.6%                     | 2.4%          | 5.9%     | 10.9%   |
| 1960 to 1979   | 132,081                  | 206,294       | 50,654   | 389,029 |
|  | 10.5%                    | 16.5%         | 4.0%     | 31.0%   |
| 1980 to 1985   | 23,806                   | 50,432        | 8,923    | 83,160  |
|  | 1.9%                     | 4.0%          | 0.7%     | 6.6%    |
| 1986 to 1990   | 32,383                   | 60,278        | 12,492   | 105,153 |
|  | 2.6%                     | 4.8%          | 1.0%     | 8.4%    |
| 1991 to 1995   | 28,055                   | 39,208        | 27,104   | 94,367  |
|  | 2.2%                     | 3.1%          | 2.2%     | 7.5%    |
| 1996 to 2000   | 34,548                   | 37,490        | 42,953   | 114,991 |
|  | 2.8%                     | 3.0%          | 3.4%     | 9.2%    |
| 2001 to 2002   | 15,746                   | 9,952         | 6,254    | 31,952  |
|  | 1.3%                     | 0.8%          | 0.5%     | 2.5%    |
| 2003 to 2004   | 17,077                   | 9,713         | 1,785    | 28,574  |
|  | 1.4%                     | 0.8%          | 0.1%     | 2.3%    |
| 2005   | 2,164                    | 5,095         | 3,569    | 10,829  |
|  | 0.2%                     | 0.4%          | 0.3%     | 0.9%    |
| 2006   | 2,164                    | 4,035         | 5,689    | 11,888  |
|  | 0.2%                     | 0.3%          | 0.5%     | 0.9%    |

| Question 11c. In what year was this residence built? | Service Type             |               |          | Total   |
|--|--------------------------|---------------|----------|---------|
|  | Electric and Gas (combo) | Electric only | Gas only |         |
| 2007   | 4,328                    | 0             | 3,569    | 7,897   |
|  | 0.3%                     | 0             | 0.3%     | 0.6%    |
| 2008   | 0                        | 3,467         | 0        | 3,467   |
|  | 0                        | 0.3%          | 0        | 0.3%    |
| Don't know   | 9,096                    | 89,026        | 10,707   | 108,830 |
|  | 0.7%                     | 7.1%          | 0.9%     | 8.7%    |

**Table B.17**

| Question 11a. Although you aren't sure about the actual year your home was built can you identify which from this list is the closest general time frame? | Service Type             |               |          | Total     |
|---|--------------------------|---------------|----------|-----------|
|   | Electric and Gas (combo) | Electric only | Gas only |           |
| Before 1940   | 2,761                    | 0             | 1,785    | 4,546     |
|   | 0.2%                     | 0             | 0.1%     | 0.4%      |
| 1940 to 1959  | 0                        | 3,123         | 1,785    | 4,907     |
|   | 0                        | 0.2%          | 0.1%     | 0.4%      |
| 1960 to 1979  | 2,085                    | 40,523        | 3,569    | 46,178    |
|   | 0.2%                     | 3.2%          | 0.3%     | 3.7%      |
| 1980 to 1985  | 0                        | 5,095         | 0        | 5,095     |
|   | 0                        | 0.4%          | 0        | 0.4%      |
| 1986 to 1990  | 0                        | 1,734         | 1,785    | 3,518     |
|   | 0                        | 0.1%          | 0.1%     | 0.3%      |
| 1991 to 1995  | 0                        | 1,734         | 1,785    | 3,518     |
|   | 0                        | 0.1%          | 0.1%     | 0.3%      |
| 1996 to 2000  | 2,085                    | 10,191        | 0        | 12,276    |
|   | 0.2%                     | 0.8%          | 0        | 1.0%      |
| Don't know  | 2,164                    | 26,627        | 0        | 28,791    |
|   | 0.2%                     | 2.1%          | 0        | 2.3%      |
| Not applicable  | 331,904                  | 489,004       | 324,002  | 1,144,909 |
|   | 26.5%                    | 39.0%         | 25.8%    | 91.3%     |

**Table B.18**

| Question 12. Does the main heating system serve only this residence or does it serve more than one residence? | Service Type             |                  |                  | Total            |
|---|--------------------------|------------------|------------------|------------------|
|   | Electric and Gas (combo) | Electric only    | Gas only         |                  |
| Only this residence   | 41,524<br>3.3%           | 186,553<br>14.9% | 35,480<br>2.8%   | 263,557<br>21.0% |
| More than one residence   | 0<br>0                   | 13,313<br>1.1%   | 8,146<br>0.6%    | 21,459<br>1.7%   |
| Don't know  | 0<br>0                   | 5,095<br>0.4%    | 2,120<br>0.2%    | 7,216<br>0.6%    |
| Not applicable  | 299,476<br>23.9%         | 373,069<br>29.8% | 288,963<br>23.0% | 961,507<br>76.7% |



**Table B.19**

| Question 13. What is the type of system that is used to heat the majority of your home? | Service Type             |                  |                  | Total            |
|---|--------------------------|------------------|------------------|------------------|
|   | Electric and Gas (combo) | Electric only    | Gas only         |                  |
| Natural Gas: Central forced air furnace   | 285,611<br>22.8%         | 98,647<br>7.9%   | 265,429<br>21.2% | 649,688<br>51.8% |
| Natural Gas: Hot water boiler   | 8,172<br>0.7%            | 1,734<br>0.1%    | 7,474<br>0.6%    | 17,380<br>1.4%   |
| Electric: Hot water boiler  | 0<br>0                   | 26,494<br>2.1%   | 0<br>0           | 26,494<br>2.1%   |
| Natural Gas: Steam boiler   | 0<br>0                   | 0<br>0           | 3,569<br>0.3%    | 3,569<br>0.3%    |
| Natural Gas: Radiant floor heating  | 0<br>0                   | 0<br>0           | 1,785<br>0.1%    | 1,785<br>0.1%    |
| Natural Gas: Fireplace or stove   | 4,249<br>0.3%            | 13,313<br>1.1%   | 14,841<br>1.2%   | 32,404<br>2.6%   |
| Electric: Baseboard, wall heaters, ceiling cables, or floor cables                      | 8,420<br>0.7%            | 172,941<br>13.8% | 11,043<br>0.9%   | 192,404<br>15.3% |
| Electric: Wall heaters with fans  | 2,085<br>0.2%            | 20,709<br>1.7%   | 1,785<br>0.1%    | 24,579<br>2.0%   |
| Electric: Central forced air furnace  | 8,657<br>0.7%            | 42,903<br>3.4%   | 2,120<br>0.2%    | 53,680<br>4.3%   |
| Electric: Air-source heat pump  | 4,328<br>0.3%            | 25,672<br>2.0%   | 0<br>0           | 30,000<br>2.4%   |
| Electric: Ground-source heat pump   | 2,164<br>0.2%            | 4,857<br>0.4%    | 0<br>0           | 7,021<br>0.6%    |

| Question 13. What is the type of system that is used to heat the majority of your home? | Service Type             |               |          | Total  |
|---|--------------------------|---------------|----------|--------|
|   | Electric and Gas (combo) | Electric only | Gas only |        |
| Electric: Portable heaters  | 0                        | 7,979         | 0        | 7,979  |
|   | 0                        | 0.6%          | 0        | 0.6%   |
| Oil: Central forced air furnace   | 0                        | 23,593        | 0        | 23,593 |
|   | 0                        | 1.9%          | 0        | 1.9%   |
| Oil: Hot water boiler (with radiators, baseboards, or in floor)                         | 0                        | 3,123         | 0        | 3,123  |
|   | 0                        | 0.2%          | 0        | 0.2%   |
| Bottled Gas: Central forced air (propane, butane, kerosene)                             | 0                        | 12,836        | 1,785    | 14,620 |
|   | 0                        | 1.0%          | 0.1%     | 1.2%   |
| Bottled Gas: Portable heaters (propane, butane, kerosene)                               | 0                        | 6,246         | 0        | 6,246  |
|   | 0                        | 0.5%          | 0        | 0.5%   |
| Wood: Wood stove or pellet stove  | 6,492                    | 22,443        | 1,785    | 30,720 |
|   | 0.5%                     | 1.8%          | 0.1%     | 2.5%   |
| Wood: Fireplace   | 2,164                    | 7,979         | 0        | 10,144 |
|   | 0.2%                     | 0.6%          | 0        | 0.8%   |
| Other system and fuel   | 2,164                    | 22,443        | 1,785    | 26,392 |
|   | 0.2%                     | 1.8%          | 0.1%     | 2.1%   |
| None (No heating system)  | 0                        | 0             | 1,785    | 1,785  |
|   | 0                        | 0             | 0.1%     | 0.1%   |
| Don't know  | 6,492                    | 42,585        | 9,259    | 58,336 |
|   | 0.5%                     | 3.4%          | 0.7%     | 4.7%   |
| Refused   | 0                        | 3,123         | 0        | 3,123  |
|   | 0                        | 0.2%          | 0        | 0.2%   |
| Not applicable  | 0                        | 18,409        | 10,266   | 28,675 |
|   | 0                        | 1.5%          | 0.8%     | 2.3%   |

**Table B.20**

| Question 14. What type of temperature control is on the main heating system? | Service Type             |                  |                  | Total            |
|--|--------------------------|------------------|------------------|------------------|
|  | Electric and Gas (combo) | Electric only    | Gas only         |                  |
| Regular thermostat(s) with temperature settings                              | 109,829<br>8.8%          | 291,932<br>23.3% | 98,625<br>7.9%   | 500,386<br>39.9% |
| Clock or programmable thermostat(s)  | 213,936<br>17.1%         | 136,572<br>10.9% | 194,809<br>15.5% | 545,317<br>43.5% |
| Dial control without temperature settings                                    | 2,085<br>0.2%            | 44,797<br>3.6%   | 14,276<br>1.1%   | 61,158<br>4.9%   |
| Simple on/off switch or no temperature control                               | 2,164<br>0.2%            | 10,191<br>0.8%   | 3,905<br>0.3%    | 16,260<br>1.3%   |
| No response  | 0<br>0                   | 33,800<br>2.7%   | 3,905<br>0.3%    | 37,705<br>3.0%   |
| Not applicable   | 12,985<br>1.0%           | 60,739<br>4.8%   | 19,189<br>1.5%   | 92,913<br>7.4%   |

**Table B.21**

| Question 15. Which of the following describes how the main heating system is used? | Service Type             |                  |                  | Total            |
|--|--------------------------|------------------|------------------|------------------|
|  | Electric and Gas (combo) | Electric only    | Gas only         |                  |
| The thermostat(s) is kept at a constant setting or temperature                     | 68,046<br>6.1%           | 128,997<br>11.6% | 87,017<br>7.8%   | 284,060<br>25.5% |
| The thermostat is adjusted when occupants are sleeping                             | 236,242<br>21.2%         | 248,836<br>22.4% | 167,034<br>15.0% | 652,111<br>58.6% |

|   |         |         |         |         |
|---|---------|---------|---------|---------|
| The thermostat is adjusted when occupants leave the house | 167,473 | 180,028 | 142,370 | 489,872 |
|   | 15.0%   | 16.2%   | 12.8%   | 44.0%   |
| The heater is turned on only when someone is cold         | 47,002  | 156,461 | 55,109  | 258,572 |
|   | 4.2%    | 14.1%   | 5.0%    | 23.2%   |

**Table B.22**

| Question 16. Home heating - at what temperature do you normally keep your thermostat? | Service Type             |               |          | Total  |
|---|--------------------------|---------------|----------|--------|
|   | Electric and Gas (combo) | Electric only | Gas only |        |
| 0   | 0                        | 5,095         | 0        | 5,095  |
|   | 0                        | 0.4%          | 0        | 0.4%   |
| 50  | 0                        | 8,218         | 0        | 8,218  |
|   | 0                        | 0.7%          | 0        | 0.7%   |
| 55  | 2,164                    | 6,829         | 1,785    | 10,778 |
|   | 0.2%                     | 0.5%          | 0.1%     | 0.9%   |
| 58  | 2,164                    | 5,095         | 3,569    | 10,829 |
|   | 0.2%                     | 0.4%          | 0.3%     | 0.9%   |
| 59  | 0                        | 0             | 1,785    | 1,785  |
|   | 0                        | 0             | 0.1%     | 0.1%   |
| 60  | 8,578                    | 26,388        | 3,569    | 38,535 |
|   | 0.7%                     | 2.1%          | 0.3%     | 3.1%   |
| 62  | 0                        | 0             | 5,354    | 5,354  |
|   | 0                        | 0             | 0.4%     | 0.4%   |
| 63  | 2,085                    | 6,246         | 1,785    | 10,115 |
|   | 0.2%                     | 0.5%          | 0.1%     | 0.8%   |
| 64  | 0                        | 8,547         | 1,785    | 10,331 |
|   | 0                        | 0.7%          | 0.1%     | 0.8%   |
| 65  | 10,742                   | 40,958        | 15,177   | 66,877 |
|   | 0.9%                     | 3.3%          | 1.2%     | 5.3%   |
| 66  | 2,164                    | 0             | 1,785    | 3,949  |
|   | 0.2%                     | 0             | 0.1%     | 0.3%   |

| Question 16. Home heating - at what temperature do you normally keep your thermostat? | Service Type             |               |          | Total   |
|---|--------------------------|---------------|----------|---------|
|   | Electric and Gas (combo) | Electric only | Gas only |         |
| 67  | 6,492                    | 8,218         | 12,492   | 27,202  |
|   | 0.5%                     | 0.7%          | 1.0%     | 2.2%    |
| 68  | 33,499                   | 37,835        | 36,927   | 108,261 |
|   | 2.7%                     | 3.0%          | 2.9%     | 8.6%    |
| 69  | 6,492                    | 6,246         | 7,138    | 19,876  |
|   | 0.5%                     | 0.5%          | 0.6%     | 1.6%    |
| 70  | 22,239                   | 54,032        | 32,580   | 108,851 |
|   | 1.8%                     | 4.3%          | 2.6%     | 8.7%    |
| 71  | 2,164                    | 5,095         | 5,354    | 12,613  |
|   | 0.2%                     | 0.4%          | 0.4%     | 1.0%    |
| 72  | 0                        | 24,416        | 3,569    | 27,985  |
|   | 0                        | 1.9%          | 0.3%     | 2.2%    |
| 73  | 0                        | 3,123         | 0        | 3,123   |
|   | 0                        | 0.2%          | 0        | 0.2%    |
| 75  | 2,761                    | 9,368         | 1,785    | 13,914  |
|   | 0.2%                     | 0.7%          | 0.1%     | 1.1%    |
| 76  | 2,164                    | 0             | 2,120    | 4,285   |
|   | 0.2%                     | 0             | 0.2%     | 0.3%    |
| Don't know  | 0                        | 10,191        | 0        | 10,191  |
|   | 0                        | 0.8%          | 0        | 0.8%    |
| Refused   | 2,164                    | 8,218         | 0        | 10,382  |
|   | 0.2%                     | 0.7%          | 0        | 0.8%    |
| Not applicable  | 235,127                  | 303,913       | 196,152  | 735,192 |
|   | 18.8%                    | 24.2%         | 15.6%    | 58.6%   |

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**Table B.23**

| Question 17. Home heating - at what temperature do you normally keep your thermostat set when one or more people in your household are at home and awake? | Service Type             |               |          | Total  |
|---|--------------------------|---------------|----------|--------|
|   | Electric and Gas (combo) | Electric only | Gas only |        |
| 0   | 0                        | 10,191        | 0        | 10,191 |
|   | 0                        | 0.8%          | 0        | 0.8%   |
| 54  | 0                        | 0             | 1,785    | 1,785  |
|   | 0                        | 0             | 0.1%     | 0.1%   |
| 55  | 0                        | 5,095         | 0        | 5,095  |
|   | 0                        | 0.4%          | 0        | 0.4%   |
| 59  | 0                        | 0             | 1,785    | 1,785  |
|   | 0                        | 0             | 0.1%     | 0.1%   |
| 60  | 4,249                    | 3,123         | 1,785    | 9,157  |
|   | 0.3%                     | 0.2%          | 0.1%     | 0.7%   |
| 62  | 0                        | 14,464        | 0        | 14,464 |
|   | 0                        | 1.2%          | 0        | 1.2%   |
| 63  | 0                        | 0             | 3,798    | 3,798  |
|   | 0                        | 0             | 0.3%     | 0.3%   |
| 64  | 8,657                    | 3,123         | 1,785    | 13,564 |
|   | 0.7%                     | 0.2%          | 0.1%     | 1.1%   |
| 65  | 21,484                   | 33,784        | 11,379   | 66,647 |
|   | 1.7%                     | 2.7%          | 0.9%     | 5.3%   |
| 66  | 10,336                   | 3,123         | 3,569    | 17,028 |
|   | 0.8%                     | 0.2%          | 0.3%     | 1.4%   |
| 67  | 21,642                   | 23,593        | 28,143   | 73,378 |
|   | 1.7%                     | 1.9%          | 2.2%     | 5.9%   |



| Question 17. Home heating - at what temperature do you normally keep your thermostat set when one or more people in your household are at home and awake? | Service Type             |                  |                  | Total            |
|---|--------------------------|------------------|------------------|------------------|
|   | Electric and Gas (combo) | Electric only    | Gas only         |                  |
| 68  | 81,110<br>6.5%           | 72,875<br>5.8%   | 61,133<br>4.9%   | 215,118<br>17.2% |
| 69  | 25,970<br>2.1%           | 9,368<br>0.7%    | 21,873<br>1.7%   | 57,211<br>4.6%   |
| 70  | 57,948<br>4.6%           | 55,766<br>4.4%   | 51,752<br>4.1%   | 165,465<br>13.2% |
| 71  | 13,424<br>1.1%           | 8,324<br>0.7%    | 3,569<br>0.3%    | 25,317<br>2.0%   |
| 72  | 8,657<br>0.7%            | 19,665<br>1.6%   | 3,905<br>0.3%    | 32,226<br>2.6%   |
| 73  | 2,164<br>0.2%            | 0<br>0           | 0<br>0           | 2,164<br>0.2%    |
| 75  | 0<br>0                   | 11,341<br>0.9%   | 2,120<br>0.2%    | 13,461<br>1.1%   |
| Don't know  | 0<br>0                   | 1,734<br>0.1%    | 3,569<br>0.3%    | 5,303<br>0.4%    |
| Not applicable  | 85,360<br>6.8%           | 302,461<br>24.1% | 132,762<br>10.6% | 520,583<br>41.5% |

**Table B.24**

| Question 18. Home heating - at what temperature do you normally keep your thermostat set when one or more people in your household are at home and everyone is sleeping? | Service Type             |                |                | Total          |
|--|--------------------------|----------------|----------------|----------------|
|  | Electric and Gas (combo) | Electric only  | Gas only       |                |
| 0  | 10,663<br>0.9%           | 23,265<br>1.9% | 5,354<br>0.4%  | 39,282<br>3.1% |
| 37   | 0<br>0                   | 0<br>0         | 1,785<br>0.1%  | 1,785<br>0.1%  |
| 40   | 0<br>0                   | 5,095<br>0.4%  | 0<br>0         | 5,095<br>0.4%  |
| 45   | 2,164<br>0.2%            | 5,095<br>0.4%  | 1,785<br>0.1%  | 9,044<br>0.7%  |
| 50   | 6,492<br>0.5%            | 9,368<br>0.7%  | 1,785<br>0.1%  | 17,645<br>1.4% |
| 52   | 2,164<br>0.2%            | 0<br>0         | 0<br>0         | 2,164<br>0.2%  |
| 53   | 2,164<br>0.2%            | 0<br>0         | 0<br>0         | 2,164<br>0.2%  |
| 55   | 21,078<br>1.7%           | 22,788<br>1.8% | 16,519<br>1.3% | 60,385<br>4.8% |
| 56   | 4,328<br>0.3%            | 0<br>0         | 1,785<br>0.1%  | 6,113<br>0.5%  |
| 57   | 2,164<br>0.2%            | 6,246<br>0.5%  | 0<br>0         | 8,410<br>0.7%  |
| 58   | 12,985<br>1.0%           | 9,952<br>0.8%  | 1,785<br>0.1%  | 24,721<br>2.0% |

| Question 18. Home heating - at what temperature do you normally keep your thermostat set when one or more people in your household are at home and everyone is sleeping? | Service Type             |               |          | Total   |
|--|--------------------------|---------------|----------|---------|
|  | Electric and Gas (combo) | Electric only | Gas only |         |
| 59   | 4,328                    | 6,246         | 0        | 10,574  |
|  | 0.3%                     | 0.5%          | 0        | 0.8%    |
| 60   | 43,722                   | 43,603        | 32,580   | 119,905 |
|  | 3.5%                     | 3.5%          | 2.6%     | 9.6%    |
| 61   | 4,328                    | 4,857         | 5,354    | 14,538  |
|  | 0.3%                     | 0.4%          | 0.4%     | 1.2%    |
| 62   | 23,806                   | 14,225        | 32,687   | 70,717  |
|  | 1.9%                     | 1.1%          | 2.6%     | 5.6%    |
| 63   | 15,149                   | 4,857         | 9,381    | 29,386  |
|  | 1.2%                     | 0.4%          | 0.7%     | 2.3%    |
| 64   | 10,336                   | 12,491        | 7,367    | 30,195  |
|  | 0.8%                     | 1.0%          | 0.6%     | 2.4%    |
| 65   | 42,313                   | 58,305        | 34,471   | 135,090 |
|  | 3.4%                     | 4.7%          | 2.7%     | 10.8%   |
| 66   | 15,070                   | 4,857         | 11,272   | 31,199  |
|  | 1.2%                     | 0.4%          | 0.9%     | 2.5%    |
| 67   | 10,821                   | 4,857         | 7,367    | 23,045  |
|  | 0.9%                     | 0.4%          | 0.6%     | 1.8%    |
| 68   | 17,234                   | 11,102        | 23,199   | 51,536  |
|  | 1.4%                     | 0.9%          | 1.9%     | 4.1%    |
| 69   | 2,164                    | 0             | 0        | 2,164   |
|  | 0.2%                     | 0             | 0        | 0.2%    |

| Question 18. Home heating - at what temperature do you normally keep your thermostat set when one or more people in your household are at home and everyone is sleeping? | Service Type             |                  |                  | Total            |
|--|--------------------------|------------------|------------------|------------------|
|  | Electric and Gas (combo) | Electric only    | Gas only         |                  |
| 70   | 2,164<br>0.2%            | 13,313<br>1.1%   | 5,689<br>0.5%    | 21,167<br>1.7%   |
| Don't know   | 0                        | 11,924<br>1.0%   | 1,785<br>0.1%    | 13,709<br>1.1%   |
| Refused  | 0                        | 3,123<br>0.2%    | 0                | 3,123<br>0.2%    |
| Not applicable   | 85,360<br>6.8%           | 302,461<br>24.1% | 132,762<br>10.6% | 520,583<br>41.5% |

**Table B.25**

| Question 19. Home heating - at what temperature do you normally keep your thermostat set when no one is at home? | Service Type             |               |          | Total  |
|--|--------------------------|---------------|----------|--------|
|  | Electric and Gas (combo) | Electric only | Gas only |        |
| 0  | 19,241                   | 41,435        | 16,061   | 76,737 |
|  | 1.5%                     | 3.3%          | 1.3%     | 6.1%   |
| 40   | 0                        | 1,734         | 0        | 1,734  |
|  | 0                        | 0.1%          | 0        | 0.1%   |
| 45   | 2,164                    | 8,218         | 1,785    | 12,167 |
|  | 0.2%                     | 0.7%          | 0.1%     | 1.0%   |
| 50   | 12,906                   | 14,225        | 3,569    | 30,700 |
|  | 1.0%                     | 1.1%          | 0.3%     | 2.4%   |
| 52   | 2,164                    | 0             | 1,785    | 3,949  |
|  | 0.2%                     | 0             | 0.1%     | 0.3%   |
| 53   | 0                        | 0             | 2,014    | 2,014  |
|  | 0                        | 0             | 0.2%     | 0.2%   |
| 54   | 0                        | 3,123         | 0        | 3,123  |
|  | 0                        | 0.2%          | 0        | 0.2%   |
| 55   | 25,485                   | 26,149        | 7,138    | 58,773 |
|  | 2.0%                     | 2.1%          | 0.6%     | 4.7%   |
| 56   | 4,328                    | 8,218         | 1,785    | 14,331 |
|  | 0.3%                     | 0.7%          | 0.1%     | 1.1%   |
| 57   | 2,164                    | 3,123         | 2,014    | 7,301  |
|  | 0.2%                     | 0.2%          | 0.2%     | 0.6%   |
| 58   | 11,418                   | 8,218         | 5,583    | 25,219 |
|  | 0.9%                     | 0.7%          | 0.4%     | 2.0%   |

| Question 19. Home heating - at what temperature do you normally keep your thermostat set when no one is at home? | Service Type             |               |          | Total   |
|--|--------------------------|---------------|----------|---------|
|  | Electric and Gas (combo) | Electric only | Gas only |         |
| 59   | 0                        | 3,123         | 0        | 3,123   |
|  | 0                        | 0.2%          | 0        | 0.2%    |
| 60   | 60,033                   | 49,265        | 42,068   | 151,366 |
|  | 4.8%                     | 3.9%          | 3.4%     | 12.1%   |
| 61   | 2,164                    | 0             | 0        | 2,164   |
|  | 0.2%                     | 0             | 0        | 0.2%    |
| 62   | 12,985                   | 9,713         | 29,118   | 51,816  |
|  | 1.0%                     | 0.8%          | 2.3%     | 4.1%    |
| 63   | 10,821                   | 6,829         | 7,367    | 25,017  |
|  | 0.9%                     | 0.5%          | 0.6%     | 2.0%    |
| 64   | 8,657                    | 3,123         | 12,721   | 24,500  |
|  | 0.7%                     | 0.2%          | 1.0%     | 2.0%    |
| 65   | 22,757                   | 42,108        | 26,768   | 91,633  |
|  | 1.8%                     | 3.4%          | 2.1%     | 7.3%    |
| 66   | 10,742                   | 4,857         | 11,272   | 26,871  |
|  | 0.9%                     | 0.4%          | 0.9%     | 2.1%    |
| 67   | 6,492                    | 4,857         | 0        | 11,349  |
|  | 0.5%                     | 0.4%          | 0        | 0.9%    |
| 68   | 21,642                   | 1,734         | 8,923    | 32,298  |
|  | 1.7%                     | 0.1%          | 0.7%     | 2.6%    |
| 69   | 2,164                    | 0             | 2,014    | 4,178   |
|  | 0.2%                     | 0             | 0.2%     | 0.3%    |
| 70   | 0                        | 0             | 8,923    | 8,923   |
|  | 0                        | 0             | 0.7%     | 0.7%    |

| Question 19. Home heating - at what temperature do you normally keep your thermostat set when no one is at home? | Service Type             |               |          | Total   |
|--|--------------------------|---------------|----------|---------|
|  | Electric and Gas (combo) | Electric only | Gas only |         |
| 71   | 4,328                    | 0             | 1,785    | 6,113   |
|  | 0.3%                     | 0             | 0.1%     | 0.5%    |
| 72   | 0                        | 3,123         | 0        | 3,123   |
|  | 0                        | 0.2%          | 0        | 0.2%    |
| Don't know   | 10,821                   | 24,416        | 7,474    | 42,710  |
|  | 0.9%                     | 1.9%          | 0.6%     | 3.4%    |
| Refused  | 2,164                    | 7,979         | 1,785    | 11,928  |
|  | 0.2%                     | 0.6%          | 0.1%     | 1.0%    |
| Not applicable   | 85,360                   | 302,461       | 132,762  | 520,583 |
|  | 6.8%                     | 24.1%         | 10.6%    | 41.5%   |

**Table B.26**

| Question 20. Does the main cooling system serve only this residence or does it serve more than one residence? | Service Type             |               |          | Total   |
|---|--------------------------|---------------|----------|---------|
|   | Electric and Gas (combo) | Electric only | Gas only |         |
| Only this residence   | 17,674                   | 10,191        | 11,715   | 39,579  |
|   | 1.4%                     | 0.8%          | 0.9%     | 3.2%    |
| More than one residence   | 0                        | 10,191        | 1,785    | 11,975  |
|   | 0                        | 0.8%          | 0.1%     | 1.0%    |
| Residence has more than one cooling system  | 21,765                   | 179,485       | 32,247   | 233,497 |
|   | 1.7%                     | 14.3%         | 2.6%     | 18.6%   |
| Don't know  | 2,085                    | 0             | 0        | 2,085   |
|   | 0.2%                     | 0             | 0        | 0.2%    |
| Refused   | 0                        | 5,095         | 0        | 5,095   |
|   | 0                        | 0.4%          | 0        | 0.4%    |
| Not applicable  | 299,476                  | 373,069       | 288,963  | 961,507 |
|   | 23.9%                    | 29.8%         | 23.0%    | 76.7%   |



**Table B.27**

| Question 21. Which of the following is the type of cooling system that is used to cool the majority of home? | Service Type             |                  |                  | Total            |
|--|--------------------------|------------------|------------------|------------------|
|  | Electric and Gas (combo) | Electric only    | Gas only         |                  |
| Central air conditioner  | 71,338<br>10.0%          | 26,955<br>3.8%   | 23,535<br>3.3%   | 121,828<br>17.0% |
| Air-source heat pump   | 6,492<br>0.9%            | 43,020<br>6.0%   | 7,138<br>1.0%    | 56,650<br>7.9%   |
| Ground-source heat pump  | 2,164<br>0.3%            | 14,570<br>2.0%   | 2,014<br>0.3%    | 18,747<br>2.6%   |
| Room air conditioners  | 19,399<br>2.7%           | 26,255<br>3.7%   | 21,873<br>3.1%   | 67,526<br>9.4%   |
| Ductless mini-split air conditioner  | 0<br>0%                  | 0<br>0%          | 0<br>0%          | 0<br>0%          |
| Evaporative cooler (swamp cooler)  | 0<br>0                   | 7,979<br>1.1%    | 1,785<br>0.2%    | 9,764<br>1.4%    |
| Portable fans  | 139,621<br>19.5%         | 114,834<br>16.1% | 111,255<br>15.6% | 365,710<br>51.1% |
| Whole-house fan  | 6,492<br>0.9%            | 20,815<br>2.9%   | 12,721<br>1.8%   | 40,029<br>5.6%   |
| Ceiling fans   | 74,178<br>10.4%          | 82,439<br>11.5%  | 65,389<br>9.1%   | 222,007<br>31.0% |
| Something else (specify)   | 2,164<br>0.3%            | 0<br>0           | 0<br>0           | 2,164<br>0.3%    |

**Table B.28**

| Question 22. What type of temperature control is on the main cooling system? | Service Type             |                  |                  | Total            |
|--|--------------------------|------------------|------------------|------------------|
|  | Electric and Gas (combo) | Electric only    | Gas only         |                  |
| Regular thermostat(s) with temperature settings                              | 19,477<br>1.6%           | 36,774<br>2.9%   | 17,845<br>1.4%   | 74,097<br>5.9%   |
| Clock or programmable thermostat(s)  | 73,424<br>5.9%           | 52,627<br>4.2%   | 20,195<br>1.6%   | 146,245<br>11.7% |
| Dial control without temperature settings                                    | 2,164<br>0.2%            | 19,665<br>1.6%   | 3,569<br>0.3%    | 25,398<br>2.0%   |
| Simple on/off switch or no temperature control                               | 4,328<br>0.3%            | 6,590<br>0.5%    | 9,381<br>0.7%    | 20,299<br>1.6%   |
| Don't know   | 0<br>0                   | 0<br>0           | 3,569<br>0.3%    | 3,569<br>0.3%    |
| Not applicable   | 241,606<br>19.3%         | 462,374<br>36.9% | 280,150<br>22.3% | 984,130<br>78.5% |

**Table B.29**

| Question 23. Which of the following statements best describes how the main cooling system is used? | Service Type             |                 |                 | Total             |
|--|--------------------------|-----------------|-----------------|-------------------|
|  | Electric and Gas (combo) | Electric only   | Gas only        |                   |
| The thermostat(s) is kept at a constant setting or temperature                                     | 10,742<br>4.0%           | 26,255<br>9.9%  | 3,569<br>1.3%   | 40,566<br>15.3%   |
| The thermostat is adjusted when occupants are sleeping   | 12,985<br>4.9%           | 19,665<br>7.4%  | 3,569<br>1.3%   | 36,219<br>13.6%   |
| The thermostat is adjusted when occupants leave the house  | 8,657<br>3.3%            | 11,686<br>4.4%  | 1,785<br>0.7%   | 22,127<br>8.3%    |
| The cooling system is turned on only when someone is warm  | 41,040<br>15.4%          | 37,357<br>14.1% | 30,673<br>11.5% | 109,071<br>41.0%  |
| We rarely use this cooling system  | 32,462<br>30.8%          | 52,733<br>50.1% | 20,088<br>19.1% | 105,283<br>100.0% |

**Table B.30**

| Question 24. Home cooling - at what temperature do you normally keep your thermostat? | Service Type             |               |          | Total  |
|---|--------------------------|---------------|----------|--------|
|   | Electric and Gas (combo) | Electric only | Gas only |        |
| 50  | 4,328                    | 0             | 0        | 4,328  |
|   | 0.3%                     | 0             | 0        | 0.3%   |
| 55  | 0                        | 3,123         | 0        | 3,123  |
|   | 0                        | 0.2%          | 0        | 0.2%   |
| 60  | 0                        | 6,829         | 5,354    | 12,183 |
|   | 0                        | 0.5%          | 0.4%     | 1.0%   |
| 62  | 2,164                    | 0             | 0        | 2,164  |
|   | 0.2%                     | 0             | 0        | 0.2%   |
| 64  | 2,164                    | 0             | 2,014    | 4,178  |
|   | 0.2%                     | 0             | 0.2%     | 0.3%   |
| 65  | 8,578                    | 0             | 1,785    | 10,362 |
|   | 0.7%                     | 0             | 0.1%     | 0.8%   |
| 67  | 4,328                    | 1,734         | 1,785    | 7,847  |
|   | 0.3%                     | 0.1%          | 0.1%     | 0.6%   |
| 68  | 2,164                    | 6,246         | 7,138    | 15,548 |
|   | 0.2%                     | 0.5%          | 0.6%     | 1.2%   |
| 69  | 2,164                    | 3,123         | 0        | 5,287  |
|   | 0.2%                     | 0.2%          | 0        | 0.4%   |
| 70  | 12,985                   | 17,931        | 8,923    | 39,839 |
|   | 1.0%                     | 1.4%          | 0.7%     | 3.2%   |
| 71  | 2,164                    | 1,734         | 0        | 3,898  |
|   | 0.2%                     | 0.1%          | 0        | 0.3%   |

| Question 24. Home cooling - at what temperature do you normally keep your thermostat? | Service Type             |                  |                  | Total              |
|---|--------------------------|------------------|------------------|--------------------|
|   | Electric and Gas (combo) | Electric only    | Gas only         |                    |
| 72  | 8,657<br>0.7%            | 12,491<br>1.0%   | 5,354<br>0.4%    | 26,502<br>2.1%     |
| 73  | 2,164<br>0.2%            | 0<br>0           | 1,785<br>0.1%    | 3,949<br>0.3%      |
| 74  | 10,821<br>0.9%           | 3,123<br>0.2%    | 1,785<br>0.1%    | 15,728<br>1.3%     |
| 75  | 8,578<br>0.7%            | 8,324<br>0.7%    | 3,569<br>0.3%    | 20,471<br>1.6%     |
| 78  | 2,164<br>0.2%            | 1,734<br>0.1%    | 3,905<br>0.3%    | 7,803<br>0.6%      |
| 80  | 0<br>0                   | 6,246<br>0.5%    | 0<br>0           | 6,246<br>0.5%      |
| 82  | 0<br>0                   | 3,123<br>0.2%    | 0<br>0           | 3,123<br>0.2%      |
| 85  | 0<br>0                   | 3,123<br>0.2%    | 0<br>0           | 3,123<br>0.2%      |
| 87  | 0<br>0                   | 3,123<br>0.2%    | 0<br>0           | 3,123<br>0.2%      |
| Don't know  | 10,821<br>0.9%           | 24,283<br>1.9%   | 7,596<br>0.6%    | 42,700<br>3.4%     |
| Refused   | 0<br>0                   | 3,123<br>0.2%    | 1,785<br>0.1%    | 4,907<br>0.4%      |
| Not applicable  | 256,756<br>20.5%         | 468,620<br>37.4% | 281,934<br>22.5% | 1,007,309<br>80.3% |

**Table B.31**

| Question 26. Home cooling - at what temperature do you normally keep your thermostat set when one or more people in your household are at home and awake? | Service Type             |               |          | Total  |
|---|--------------------------|---------------|----------|--------|
|   | Electric and Gas (combo) | Electric only | Gas only |        |
| 67  | 0                        | 0             | 1,785    | 1,785  |
|   | 0                        | 0             | 4.6%     | 4.6%   |
| 68  | 2,164                    | 0             | 0        | 2,164  |
|   | 5.6%                     | 0             | 0        | 5.6%   |
| 70  | 2,164                    | 14,808        | 1,785    | 18,757 |
|   | 5.6%                     | 38.6%         | 4.6%     | 48.9%  |
| 71  | 2,164                    | 0             | 0        | 2,164  |
|   | 5.6%                     | 0             | 0        | 5.6%   |
| 72  | 0                        | 3,123         | 0        | 3,123  |
|   | 0                        | 8.1%          | 0        | 8.1%   |
| 73  | 2,164                    | 0             | 0        | 2,164  |
|   | 5.6%                     | 0             | 0        | 5.6%   |
| 74  | 2,164                    | 0             | 0        | 2,164  |
|   | 5.6%                     | 0             | 0        | 5.6%   |
| 75  | 0                        | 1,734         | 0        | 1,734  |
|   | 0                        | 4.5%          | 0        | 4.5%   |
| 78  | 2,164                    | 0             | 0        | 2,164  |
|   | 5.6%                     | 0             | 0        | 5.6%   |
| Don't know  | 2,164                    | 0             | 0        | 2,164  |
|   | 5.6%                     | 0             | 0        | 5.6%   |

**Table B.32**

| Question 27. Home cooling - at what temperature do you normally keep your thermostat set when one or more people in your household are at home and everyone is sleeping? | Service Type             |               |          | Total     |
|--|--------------------------|---------------|----------|-----------|
|  | Electric and Gas (combo) | Electric only | Gas only |           |
| 0  | 4,328                    | 6,829         | 1,785    | 12,942    |
|  | 0.3%                     | 0.5%          | 0.1%     | 1.0%      |
| 60   | 0                        | 1,734         | 0        | 1,734     |
|  | 0                        | 0.1%          | 0        | 0.1%      |
| 65   | 2,164                    | 0             | 1,785    | 3,949     |
|  | 0.2%                     | 0             | 0.1%     | 0.3%      |
| 68   | 0                        | 3,123         | 0        | 3,123     |
|  | 0                        | 0.2%          | 0        | 0.2%      |
| 70   | 2,164                    | 3,123         | 0        | 5,287     |
|  | 0.2%                     | 0.2%          | 0        | 0.4%      |
| 72   | 0                        | 3,123         | 0        | 3,123     |
|  | 0                        | 0.2%          | 0        | 0.2%      |
| 73   | 2,164                    | 0             | 0        | 2,164     |
|  | 0.2%                     | 0             | 0        | 0.2%      |
| 75   | 2,164                    | 0             | 0        | 2,164     |
|  | 0.2%                     | 0             | 0        | 0.2%      |
| 82   | 2,164                    | 0             | 0        | 2,164     |
|  | 0.2%                     | 0             | 0        | 0.2%      |
| Refused  | 0                        | 1,734         | 0        | 1,734     |
|  | 0                        | 0.1%          | 0        | 0.1%      |
| Not applicable   | 325,851                  | 558,365       | 331,140  | 1,215,356 |
|  | 26.0%                    | 44.5%         | 26.4%    | 96.9%     |

**Table B.33**

| Question 28. Home cooling - at what temperature do you normally keep your thermostat set when no one is at home? | Service Type             |               |          | Total  |
|--|--------------------------|---------------|----------|--------|
|  | Electric and Gas (combo) | Electric only | Gas only |        |
| 0  | 4,328                    | 9,952         | 0        | 14,280 |
|  | 0.3%                     | 0.8%          | 0        | 1.1%   |
| 60   | 0                        | 1,734         | 0        | 1,734  |
|  | 0                        | 0.1%          | 0        | 0.1%   |
| 66   | 2,164                    | 0             | 0        | 2,164  |
|  | 0.2%                     | 0             | 0        | 0.2%   |
| 67   | 0                        | 0             | 1,785    | 1,785  |
|  | 0                        | 0             | 0.1%     | 0.1%   |
| 68   | 2,164                    | 0             | 0        | 2,164  |
|  | 0.2%                     | 0             | 0        | 0.2%   |
| 70   | 0                        | 0             | 1,785    | 1,785  |
|  | 0                        | 0             | 0.1%     | 0.1%   |
| 72   | 0                        | 3,123         | 0        | 3,123  |
|  | 0                        | 0.2%          | 0        | 0.2%   |
| 73   | 2,164                    | 0             | 0        | 2,164  |
|  | 0.2%                     | 0             | 0        | 0.2%   |
| 75   | 2,164                    | 3,123         | 0        | 5,287  |
|  | 0.2%                     | 0.2%          | 0        | 0.4%   |
| 78   | 2,164                    | 0             | 0        | 2,164  |
|  | 0.2%                     | 0             | 0        | 0.2%   |
| Refused  | 0                        | 1,734         | 0        | 1,734  |
|  | 0                        | 0.1%          | 0        | 0.1%   |



| Question 28. Home cooling - at what temperature do you normally keep your thermostat set when no one is at home? | Service Type             |               |          | Total     |
|--|--------------------------|---------------|----------|-----------|
|  | Electric and Gas (combo) | Electric only | Gas only |           |
| Not applicable   | 325,851                  | 558,365       | 331,140  | 1,215,356 |
|  | 26.0%                    | 44.5%         | 26.4%    | 96.9%     |

**Table B.34**

| Question 29. Does the water heater or the source of the hot water serve only this residence or does it serve more than one residence? | Service Type             |               |          | Total   |
|---|--------------------------|---------------|----------|---------|
|   | Electric and Gas (combo) | Electric only | Gas only |         |
| Only this residence   | 39,360                   | 186,553       | 35,480   | 261,393 |
|   | 3.1%                     | 14.9%         | 2.8%     | 20.8%   |
| Central water heating or tank for more than one residence   | 2,164                    | 13,313        | 8,481    | 23,959  |
|   | 0.2%                     | 1.1%          | 0.7%     | 1.9%    |
| This residence has no hot water   | 0                        | 5,095         | 0        | 5,095   |
|   | 0                        | 0.4%          | 0        | 0.4%    |
| Don't know  | 0                        | 0             | 1,785    | 1,785   |
|   | 0                        | 0             | 0.1%     | 0.1%    |
| Not applicable  | 299,476                  | 373,069       | 288,963  | 961,507 |
|   | 23.9%                    | 29.8%         | 23.0%    | 76.7%   |

**Table B.35**

| Question 30. How many water heaters are at this residence? | Service Type             |                  |                  | Total              |
|--|--------------------------|------------------|------------------|--------------------|
|  | Electric and Gas (combo) | Electric only    | Gas only         |                    |
| One  | 312,269<br>24.9%         | 525,837<br>41.9% | 311,615<br>24.9% | 1,149,722<br>91.7% |
| Two  | 22,239<br>1.8%           | 28,689<br>2.3%   | 11,043<br>0.9%   | 61,970<br>4.9%     |
| Three or more  | 2,164<br>0.2%            | 5,095<br>0.4%    | 0<br>0           | 7,259<br>0.6%      |
| Don't know   | 2,164<br>0.2%            | 0<br>0           | 1,785<br>0.1%    | 3,949<br>0.3%      |
| Not applicable   | 2,164<br>0.2%            | 18,409<br>1.5%   | 10,266<br>0.8%   | 30,839<br>2.5%     |

**Table B.36**

| Question 31. What type of water heater do you have?               | Service Type             |               |          | Total     |
|---|--------------------------|---------------|----------|-----------|
|   | Electric and Gas (combo) | Electric only | Gas only |           |
| Tank-type water heater  | 323,766                  | 520,159       | 306,598  | 1,150,522 |
|   | 25.8%                    | 41.5%         | 24.5%    | 91.8%     |
| Indirect water heater or integrated water heater                  | 2,085                    | 6,246         | 5,354    | 13,685    |
|   | 0.2%                     | 0.5%          | 0.4%     | 1.1%      |
| Tankless hotwater heater aka demand or instantaneous water heater | 10,821                   | 13,075        | 8,923    | 32,818    |
|   | 0.9%                     | 1.0%          | 0.7%     | 2.6%      |
| Don't know  | 2,164                    | 20,142        | 3,569    | 25,876    |
|   | 0.2%                     | 1.6%          | 0.3%     | 2.1%      |
| Not applicable  | 2,164                    | 18,409        | 10,266   | 30,839    |
|   | 0.2%                     | 1.5%          | 0.8%     | 2.5%      |

**Table B.37**

| Question 32. What type of system is used in conjunction with your solar water heater? | Service Type             |               |          | Total     |
|---|--------------------------|---------------|----------|-----------|
|   | Electric and Gas (combo) | Electric only | Gas only |           |
| Not applicable  | 341,000                  | 578,030       | 334,709  | 1,253,739 |
|   | 27.2%                    | 46.1%         | 26.7%    | 100.0%    |

**Table B.38**

| Question 32a. What is the secondary or back-up type of fuel you use to heat water at this residence? | Service Type             |               |          | Total     |
|--|--------------------------|---------------|----------|-----------|
|  | Electric and Gas (combo) | Electric only | Gas only |           |
| Not applicable   | 341,000                  | 578,030       | 334,709  | 1,253,739 |
|  | 27.2%                    | 46.1%         | 26.7%    | 100.0%    |

**Table B.39**

| Question 33. What type of fuel or energy is used to heat the water used in this residence? | Service Type             |               |          | Total   |
|--|--------------------------|---------------|----------|---------|
|  | Electric and Gas (combo) | Electric only | Gas only |         |
| Electricity  | 46,890                   | 426,023       | 50,883   | 523,797 |
|  | 3.7%                     | 34.0%         | 4.1%     | 41.8%   |
| Natural gas  | 285,532                  | 88,129        | 266,086  | 639,746 |
|  | 22.8%                    | 7.0%          | 21.2%    | 51.0%   |
| Propane or bottled gas (LP, propane, butane)   | 0                        | 25,327        | 0        | 25,327  |
|  | 0                        | 2.0%          | 0        | 2.0%    |
| Don't know   | 4,249                    | 0             | 3,905    | 8,154   |
|  | 0.3%                     | 0             | 0.3%     | 0.7%    |
| Not applicable   | 4,328                    | 38,551        | 13,835   | 56,714  |
|  | 0.3%                     | 3.1%          | 1.1%     | 4.5%    |

**Table B.40**

| Question 34. At what specific temperature is your water heater thermostat set? | Service Type             |               |          | Total  |
|--|--------------------------|---------------|----------|--------|
|  | Electric and Gas (combo) | Electric only | Gas only |        |
| 69   | 2,164                    | 0             | 0        | 2,164  |
|  | 0.2%                     | 0             | 0        | 0.2%   |
| 70   | 2,164                    | 0             | 1,785    | 3,949  |
|  | 0.2%                     | 0             | 0.1%     | 0.3%   |
| 72   | 0                        | 5,095         | 0        | 5,095  |
|  | 0                        | 0.4%          | 0        | 0.4%   |
| 75   | 0                        | 0             | 1,785    | 1,785  |
|  | 0                        | 0             | 0.1%     | 0.1%   |
| 80   | 0                        | 3,123         | 0        | 3,123  |
|  | 0                        | 0.2%          | 0        | 0.2%   |
| 85   | 0                        | 3,123         | 0        | 3,123  |
|  | 0                        | 0.2%          | 0        | 0.2%   |
| 90   | 4,328                    | 0             | 0        | 4,328  |
|  | 0.3%                     | 0             | 0        | 0.3%   |
| 98   | 0                        | 0             | 3,569    | 3,569  |
|  | 0                        | 0             | 0.3%     | 0.3%   |
| 100  | 8,657                    | 14,464        | 5,354    | 28,474 |
|  | 0.7%                     | 1.2%          | 0.4%     | 2.3%   |
| 102  | 4,328                    | 3,123         | 1,785    | 9,236  |
|  | 0.3%                     | 0.2%          | 0.1%     | 0.7%   |
| 105  | 0                        | 3,123         | 0        | 3,123  |
|  | 0                        | 0.2%          | 0        | 0.2%   |

| Question 34. At what specific temperature is your water heater thermostat set? | Service Type             |               |          | Total   |
|--|--------------------------|---------------|----------|---------|
|  | Electric and Gas (combo) | Electric only | Gas only |         |
| 109  | 0                        | 0             | 1,785    | 1,785   |
|  | 0                        | 0             | 0.1%     | 0.1%    |
| 110  | 8,657                    | 27,867        | 7,138    | 43,662  |
|  | 0.7%                     | 2.2%          | 0.6%     | 3.5%    |
| 114  | 0                        | 0             | 1,785    | 1,785   |
|  | 0                        | 0             | 0.1%     | 0.1%    |
| 115  | 10,742                   | 11,102        | 5,354    | 27,198  |
|  | 0.9%                     | 0.9%          | 0.4%     | 2.2%    |
| 118  | 0                        | 1,734         | 0        | 1,734   |
|  | 0                        | 0.1%          | 0        | 0.1%    |
| 120  | 43,317                   | 81,316        | 64,383   | 189,015 |
|  | 3.5%                     | 6.5%          | 5.1%     | 15.1%   |
| 125  | 10,821                   | 9,368         | 11,165   | 31,355  |
|  | 0.9%                     | 0.7%          | 0.9%     | 2.5%    |
| 130  | 10,742                   | 11,102        | 7,138    | 28,982  |
|  | 0.9%                     | 0.9%          | 0.6%     | 2.3%    |
| 135  | 0                        | 4,857         | 1,785    | 6,641   |
|  | 0                        | 0.4%          | 0.1%     | 0.5%    |
| 140  | 17,313                   | 27,061        | 3,798    | 48,172  |
|  | 1.4%                     | 2.2%          | 0.3%     | 3.8%    |
| 145  | 2,164                    | 0             | 0        | 2,164   |
|  | 0.2%                     | 0             | 0        | 0.2%    |

| Question 34. At what specific temperature is your water heater thermostat set? | Service Type             |               |          | Total   |
|--|--------------------------|---------------|----------|---------|
|  | Electric and Gas (combo) | Electric only | Gas only |         |
| 150  | 2,761                    | 0             | 1,785    | 4,546   |
|  | 0.2%                     | 0             | 0.1%     | 0.4%    |
| 155  | 0                        | 0             | 1,785    | 1,785   |
|  | 0                        | 0             | 0.1%     | 0.1%    |
| 160  | 2,164                    | 1,734         | 0        | 3,898   |
|  | 0.2%                     | 0.1%          | 0        | 0.3%    |
| 165  | 2,164                    | 6,246         | 0        | 8,410   |
|  | 0.2%                     | 0.5%          | 0        | 0.7%    |
| 170  | 0                        | 4,857         | 0        | 4,857   |
|  | 0                        | 0.4%          | 0        | 0.4%    |
| 180  | 2,164                    | 3,123         | 1,785    | 7,072   |
|  | 0.2%                     | 0.2%          | 0.1%     | 0.6%    |
| 185  | 0                        | 1,734         | 0        | 1,734   |
|  | 0                        | 0.1%          | 0        | 0.1%    |
| 190  | 2,085                    | 0             | 0        | 2,085   |
|  | 0.2%                     | 0             | 0        | 0.2%    |
| Don't know   | 202,100                  | 335,472       | 200,483  | 738,055 |
|  | 16.1%                    | 26.8%         | 16.0%    | 58.9%   |
| Not applicable   | 2,164                    | 18,409        | 10,266   | 30,839  |
|  | 0.2%                     | 1.5%          | 0.8%     | 2.5%    |

**Table B.41**

| Question 34a. If not set at a specific temperature then which of these statements best describes where your water heater thermostat is set? | Service Type             |               |          | Total   |
|---|--------------------------|---------------|----------|---------|
|   | Electric and Gas (combo) | Electric only | Gas only |         |
| On the 'low' setting  | 4,328                    | 21,876        | 9,610    | 35,814  |
|   | 0.3%                     | 1.7%          | 0.8%     | 2.9%    |
| Between the 'low' and 'medium' settings   | 12,500                   | 36,340        | 18,304   | 67,144  |
|   | 1.0%                     | 2.9%          | 1.5%     | 5.4%    |
| On the 'medium' setting   | 87,006                   | 122,767       | 83,661   | 293,434 |
|   | 6.9%                     | 9.8%          | 6.7%     | 23.4%   |
| Between the 'medium' and 'high' setting   | 58,714                   | 52,882        | 59,455   | 171,051 |
|   | 4.7%                     | 4.2%          | 4.7%     | 13.6%   |
| On the 'high' setting   | 15,746                   | 6,246         | 1,785    | 23,776  |
|   | 1.3%                     | 0.5%          | 0.1%     | 1.9%    |
| Don't know  | 23,806                   | 95,362        | 27,669   | 146,836 |
|   | 1.9%                     | 7.6%          | 2.2%     | 11.7%   |
| Not applicable  | 138,900                  | 242,558       | 134,226  | 515,684 |
|   | 11.1%                    | 19.3%         | 10.7%    | 41.1%   |



**Table B.42**

| Question 35. Which of the following items do you have for your main water heater? Do you have a water heater tank wrap? | Service Type             |               |          | Total   |
|---|--------------------------|---------------|----------|---------|
|   | Electric and Gas (combo) | Electric only | Gas only |         |
| Yes   | 127,234                  | 189,364       | 87,475   | 404,073 |
|   | 10.1%                    | 15.1%         | 7.0%     | 32.2%   |
| No  | 193,770                  | 329,628       | 209,742  | 733,140 |
|   | 15.5%                    | 26.3%         | 16.7%    | 58.5%   |
| Don't know  | 17,831                   | 40,629        | 27,226   | 85,687  |
|   | 1.4%                     | 3.2%          | 2.2%     | 6.8%    |
| Not applicable  | 2,164                    | 18,409        | 10,266   | 30,839  |
|   | 0.2%                     | 1.5%          | 0.8%     | 2.5%    |

**Table B.43**

| Question 36. Which of the following items do you have for your main water heater? Do you have pipe insulation? | Service Type             |               |          | Total   |
|--|--------------------------|---------------|----------|---------|
|  | Electric and Gas (combo) | Electric only | Gas only |         |
| Yes  | 207,038                  | 284,099       | 150,957  | 642,094 |
|  | 16.5%                    | 22.7%         | 12.0%    | 51.2%   |
| No   | 96,135                   | 211,522       | 138,572  | 446,229 |
|  | 7.7%                     | 16.9%         | 11.1%    | 35.6%   |
| Don't know   | 35,663                   | 64,000        | 34,914   | 134,577 |
|  | 2.8%                     | 5.1%          | 2.8%     | 10.7%   |
| Not applicable   | 2,164                    | 18,409        | 10,266   | 30,839  |
|  | 0.2%                     | 1.5%          | 0.8%     | 2.5%    |

**Table B.44**

| Question 37. Which of the following items do you have for your main water heater? Do you have a water heater timer? | Service Type             |               |          | Total   |
|---|--------------------------|---------------|----------|---------|
|   | Electric and Gas (combo) | Electric only | Gas only |         |
| Yes   | 34,548                   | 58,528        | 21,415   | 114,490 |
|   | 2.8%                     | 4.7%          | 1.7%     | 9.1%    |
| No  | 276,154                  | 408,166       | 250,605  | 934,925 |
|   | 22.0%                    | 32.6%         | 20.0%    | 74.6%   |
| Don't know  | 28,134                   | 92,928        | 52,423   | 173,485 |
|   | 2.2%                     | 7.4%          | 4.2%     | 13.8%   |
| Not applicable  | 2,164                    | 18,409        | 10,266   | 30,839  |
|   | 0.2%                     | 1.5%          | 0.8%     | 2.5%    |

**Table B.45**

| Question 38. How many refrigerators are in your home? | Service Type             |               |          | Total   |
|---|--------------------------|---------------|----------|---------|
|   | Electric and Gas (combo) | Electric only | Gas only |         |
| 1   | 229,513                  | 442,937       | 251,032  | 923,482 |
|   | 18.3%                    | 35.3%         | 20.0%    | 73.7%   |
| 2   | 104,995                  | 131,970       | 80,108   | 317,073 |
|   | 8.4%                     | 10.5%         | 6.4%     | 25.3%   |
| 3   | 4,328                    | 3,123         | 3,569    | 11,020  |
|   | 0.3%                     | 0.2%          | 0.3%     | 0.9%    |
| 4   | 2,164                    | 0             | 0        | 2,164   |
|   | 0.2%                     | 0             | 0        | 0.2%    |

**Table B.46**

| Question 39. How many years old is your primary refrigerator? | Service Type             |               |          | Total   |
|---|--------------------------|---------------|----------|---------|
|   | Electric and Gas (combo) | Electric only | Gas only |         |
| 6 or less years old   | 204,670                  | 310,530       | 175,729  | 690,929 |
|   | 16.3%                    | 24.8%         | 14.0%    | 55.1%   |
| 7 to 14 years old   | 106,032                  | 150,872       | 98,625   | 355,529 |
|   | 8.5%                     | 12.0%         | 7.9%     | 28.4%   |
| 15 or more years old  | 28,134                   | 72,875        | 56,786   | 157,796 |
|   | 2.2%                     | 5.8%          | 4.5%     | 12.6%   |
| Don't know  | 2,164                    | 43,752        | 3,569    | 49,485  |
|   | 0.2%                     | 3.5%          | 0.3%     | 3.9%    |

**Table B.47**

| Question 40. How many stand-alone freezers are in your home? | Service Type             |               |          | Total   |
|--|--------------------------|---------------|----------|---------|
|  | Electric and Gas (combo) | Electric only | Gas only |         |
| 0  | 174,699                  | 308,544       | 211,421  | 694,664 |
|  | 13.9%                    | 24.6%         | 16.9%    | 55.4%   |
| 1  | 152,719                  | 250,404       | 114,366  | 517,488 |
|  | 12.2%                    | 20.0%         | 9.1%     | 41.3%   |
| 2  | 13,582                   | 19,082        | 8,923    | 41,586  |
|  | 1.1%                     | 1.5%          | 0.7%     | 3.3%    |

**Table B.48**

| Question 41. How many years old is your 'primary' stand-alone freezer? | Service Type             |                  |                  | Total            |
|--|--------------------------|------------------|------------------|------------------|
|  | Electric and Gas (combo) | Electric only    | Gas only         |                  |
| 6 or less years old  | 49,697<br>4.0%           | 82,811<br>6.6%   | 39,718<br>3.2%   | 172,225<br>13.7% |
| 7 to 14 years old  | 41,716<br>3.3%           | 82,705<br>6.6%   | 34,471<br>2.7%   | 158,892<br>12.7% |
| 15 or more years old   | 72,724<br>5.8%           | 89,162<br>7.1%   | 49,099<br>3.9%   | 210,985<br>16.8% |
| Don't know   | 2,164<br>0.2%            | 14,808<br>1.2%   | 0<br>0           | 16,973<br>1.4%   |
| Not applicable   | 174,699<br>13.9%         | 308,544<br>24.6% | 211,421<br>16.9% | 694,664<br>55.4% |

**Table B.49**

| Question 42. How many dishwashers are in your home? | Service Type             |                  |                  | Total              |
|---|--------------------------|------------------|------------------|--------------------|
|   | Electric and Gas (combo) | Electric only    | Gas only         |                    |
| 0   | 19,996<br>1.6%           | 67,451<br>5.4%   | 46,415<br>3.7%   | 133,862<br>10.7%   |
| 1   | 321,004<br>25.6%         | 507,456<br>40.5% | 280,820<br>22.4% | 1,109,280<br>88.5% |
| 2   | 0<br>0                   | 3,123<br>0.2%    | 7,474<br>0.6%    | 10,597<br>0.8%     |

**Table B.50**

| Question 43. Do you have a private clothes washer that is used just by the people in your household? | Service Type             |               |          | Total     |
|--|--------------------------|---------------|----------|-----------|
|  | Electric and Gas (combo) | Electric only | Gas only |           |
| Yes  | 341,000                  | 498,611       | 320,874  | 1,160,485 |
|  | 27.2%                    | 39.8%         | 25.6%    | 92.6%     |
| No   | 0                        | 79,419        | 13,835   | 93,254    |
|  | 0                        | 6.3%          | 1.1%     | 7.4%      |

**Table B.51**

| Question 44. Which of the following best describes the type of clothes washer in your home? | Service Type             |               |          | Total   |
|---|--------------------------|---------------|----------|---------|
|   | Electric and Gas (combo) | Electric only | Gas only |         |
| Front load washing machine  | 120,956                  | 93,807        | 118,606  | 333,370 |
|   | 9.6%                     | 7.5%          | 9.5%     | 26.6%   |
| Top load washing machine  | 217,880                  | 404,804       | 200,483  | 823,166 |
|   | 17.4%                    | 32.3%         | 16.0%    | 65.7%   |
| Don't know  | 2,164                    | 0             | 1,785    | 3,949   |
|   | 0.2%                     | 0             | 0.1%     | 0.3%    |
| Not applicable  | 0                        | 79,419        | 13,835   | 93,254  |
|   | 0                        | 6.3%          | 1.1%     | 7.4%    |

**Table B.52**

| Question 45. Do you have a clothes dryer that is used just by the people in your household? | Service Type             |               |          | Total     |
|---|--------------------------|---------------|----------|-----------|
|   | Electric and Gas (combo) | Electric only | Gas only |           |
| Yes   | 336,075                  | 498,611       | 319,089  | 1,153,775 |
|   | 26.8%                    | 39.8%         | 25.5%    | 92.0%     |
| No  | 4,925                    | 79,419        | 15,620   | 99,964    |
|   | 0.4%                     | 6.3%          | 1.2%     | 8.0%      |

**Table B.53**

| Question 46. What fuel or energy source do you use for your clothes dryer? | Service Type             |               |          | Total   |
|--|--------------------------|---------------|----------|---------|
|  | Electric and Gas (combo) | Electric only | Gas only |         |
| Electricity  | 262,054                  | 444,595       | 254,052  | 960,701 |
|  | 22.7%                    | 38.5%         | 22.0%    | 83.3%   |
| Natural gas  | 71,935                   | 34,351        | 60,904   | 167,190 |
|  | 6.2%                     | 3.0%          | 5.3%     | 14.5%   |
| Propane or bottled gas (LP, propane, butane)                               | 0                        | 12,836        | 0        | 12,836  |
|  | 0                        | 1.1%          | 0        | 1.1%    |
| Something else (specify)   | 0                        | 1,734         | 0        | 1,734   |
|  | 0                        | 0.2%          | 0        | 0.2%    |
| Don't know   | 2,085                    | 5,095         | 4,134    | 11,315  |
|  | 0.2%                     | 0.4%          | 0.4%     | 1.0%    |

**Table B.54**

| Question 47. Do you have your own swimming pool? | Service Type             |               |          | Total     |
|--|--------------------------|---------------|----------|-----------|
|  | Electric and Gas (combo) | Electric only | Gas only |           |
| Yes  | 8,172                    | 11,102        | 9,152    | 28,426    |
|  | 0.7%                     | 0.9%          | 0.7%     | 2.3%      |
| No   | 332,828                  | 566,928       | 325,557  | 1,225,313 |
|  | 26.5%                    | 45.2%         | 26.0%    | 97.7%     |

**Table B.55**

| Question 48. What fuel or energy source do you use to heat your swimming pool? | Service Type             |               |          | Total     |
|--|--------------------------|---------------|----------|-----------|
|  | Electric and Gas (combo) | Electric only | Gas only |           |
| Electricity  | 0                        | 1,734         | 3,569    | 5,303     |
|  | 0                        | 0.1%          | 0.3%     | 0.4%      |
| Natural gas  | 6,492                    | 0             | 5,583    | 12,075    |
|  | 0.5%                     | 0             | 0.4%     | 1.0%      |
| Solar  | 0                        | 6,246         | 0        | 6,246     |
|  | 0                        | 0.5%          | 0        | 0.5%      |
| Not heated   | 0                        | 3,123         | 0        | 3,123     |
|  | 0                        | 0.2%          | 0        | 0.2%      |
| Don't know   | 1,680                    | 0             | 0        | 1,680     |
|  | 0.1%                     | 0             | 0        | 0.1%      |
| Not applicable   | 332,828                  | 566,928       | 325,557  | 1,225,313 |
|  | 26.5%                    | 45.2%         | 26.0%    | 97.7%     |

**Table B.56**

| Question 48a. How often do you operate your pool pump and filtration system? | Service Type             |               |          | Total     |
|--|--------------------------|---------------|----------|-----------|
|  | Electric and Gas (combo) | Electric only | Gas only |           |
| All day and all night  | 0                        | 0             | 1,785    | 1,785     |
|  | 0                        | 0             | 0.1%     | 0.1%      |
| Turned off at night  | 2,164                    | 0             | 5,583    | 7,747     |
|  | 0.2%                     | 0             | 0.4%     | 0.6%      |
| Something else (specify)   | 4,328                    | 7,979         | 1,785    | 14,092    |
|  | 0.3%                     | 0.6%          | 0.1%     | 1.1%      |
| Don't know   | 1,680                    | 3,123         | 0        | 4,802     |
|  | 0.1%                     | 0.2%          | 0        | 0.4%      |
| Not applicable   | 332,828                  | 566,928       | 325,557  | 1,225,313 |
|  | 26.5%                    | 45.2%         | 26.0%    | 97.7%     |

**Table B.57**

| Question 48b. Do you own an insulating cover for your pool? | Service Type             |               |          | Total     |
|---|--------------------------|---------------|----------|-----------|
|   | Electric and Gas (combo) | Electric only | Gas only |           |
| Yes   | 0                        | 7,979         | 5,583    | 13,562    |
|   | 0                        | 0.6%          | 0.4%     | 1.1%      |
| No  | 8,172                    | 3,123         | 3,569    | 14,864    |
|   | 0.7%                     | 0.2%          | 0.3%     | 1.2%      |
| Not applicable  | 332,828                  | 566,928       | 325,557  | 1,225,313 |
|   | 26.5%                    | 45.2%         | 26.0%    | 97.7%     |



**Table B.58**

| Question 49. Do you have your own hot tub or spa? | Service Type             |               |          | Total     |
|---|--------------------------|---------------|----------|-----------|
|   | Electric and Gas (combo) | Electric only | Gas only |           |
| Yes   | 38,955                   | 28,795        | 32,580   | 100,329   |
|   | 3.1%                     | 2.3%          | 2.6%     | 8.0%      |
| No  | 302,045                  | 549,235       | 302,129  | 1,153,410 |
|   | 24.1%                    | 43.8%         | 24.1%    | 92.0%     |

**Table B.59**

| Question 50. What fuel or energy source do you use for your hot tub or spa? | Service Type             |               |          | Total     |
|---|--------------------------|---------------|----------|-----------|
|   | Electric and Gas (combo) | Electric only | Gas only |           |
| Electricity   | 32,462                   | 25,672        | 25,213   | 83,347    |
|   | 2.6%                     | 2.0%          | 2.0%     | 6.6%      |
| Natural gas   | 6,492                    | 3,123         | 7,367    | 16,983    |
|   | 0.5%                     | 0.2%          | 0.6%     | 1.4%      |
| Not applicable  | 302,045                  | 549,235       | 302,129  | 1,153,410 |
|   | 24.1%                    | 43.8%         | 24.1%    | 92.0%     |

**Table B.60**

| Question 50a. Do you have your own sauna? | Service Type             |               |          | Total     |
|---|--------------------------|---------------|----------|-----------|
|   | Electric and Gas (combo) | Electric only | Gas only |           |
| Yes                                       | 4,328                    | 17,587        | 3,569    | 25,484    |
|   | 0.3%                     | 1.4%          | 0.3%     | 2.0%      |
| No  | 336,672                  | 558,710       | 331,140  | 1,226,521 |
|   | 26.9%                    | 44.6%         | 26.4%    | 97.8%     |
| Don't know                                | 0                        | 1,734         | 0        | 1,734     |
|   | 0                        | 0.1%          | 0        | 0.1%      |

**Table B.61**

| Question 50b. What fuel or energy source do you use for your sauna? | Service Type             |               |          | Total     |
|---|--------------------------|---------------|----------|-----------|
|   | Electric and Gas (combo) | Electric only | Gas only |           |
| Electricity   | 4,328                    | 17,587        | 3,569    | 25,484    |
|   | 0.3%                     | 1.4%          | 0.3%     | 2.0%      |
| Not applicable  | 336,672                  | 560,443       | 331,140  | 1,228,255 |
|   | 26.9%                    | 44.7%         | 26.4%    | 98.0%     |

**Table B.62**

| Question 51. How many cook-top units do you have? | Service Type             |                  |                  | Total              |
|---|--------------------------|------------------|------------------|--------------------|
|   | Electric and Gas (combo) | Electric only    | Gas only         |                    |
| 0   | 19,320<br>1.5%           | 42,585<br>3.4%   | 14,276<br>1.1%   | 76,182<br>6.1%     |
| 1   | 315,672<br>25.2%         | 501,077<br>40.0% | 306,156<br>24.4% | 1,122,906<br>89.6% |
| 2   | 6,008<br>0.5%            | 29,272<br>2.3%   | 14,276<br>1.1%   | 49,556<br>4.0%     |
| Don't know  | 0<br>0                   | 5,095<br>0.4%    | 0<br>0           | 5,095<br>0.4%      |

**Table B.63**

| Question 52. What fuel or energy source do you use for your cook-top(s)? | Service Type             |                  |                  | Total            |
|--|--------------------------|------------------|------------------|------------------|
|  | Electric and Gas (combo) | Electric only    | Gas only         |                  |
| Electricity  | 195,720<br>15.6%         | 436,781<br>34.8% | 180,975<br>14.4% | 813,476<br>64.9% |
| Natural gas  | 125,960<br>10.0%         | 64,774<br>5.2%   | 137,337<br>11.0% | 328,071<br>26.2% |
| Propane or bottled gas (LP, propane, butane)                             | 0<br>0                   | 28,795<br>2.3%   | 0<br>0           | 28,795<br>2.3%   |
| Don't know   | 0<br>0                   | 0<br>0           | 2,120<br>0.2%    | 2,120<br>0.2%    |
| No response  | 0<br>0                   | 5,095<br>0.4%    | 0<br>0           | 5,095<br>0.4%    |

|                |        |        |        |        |
|----------------|--------|--------|--------|--------|
| Not applicable | 19,320 | 42,585 | 14,276 | 76,182 |
|                | 1.5%   | 3.4%   | 1.1%   | 6.1%   |

**Table B.64**

| Question 53. How many ovens do you have? | Service Type             |               |          | Total     |
|--|--------------------------|---------------|----------|-----------|
|  | Electric and Gas (combo) | Electric only | Gas only |           |
| 0  | 0                        | 6,246         | 0        | 6,246     |
|  | 0                        | 0.5%          | 0        | 0.5%      |
| 1  | 273,990                  | 514,646       | 305,927  | 1,094,563 |
|  | 21.9%                    | 41.0%         | 24.4%    | 87.3%     |
| 2  | 67,010                   | 45,798        | 28,782   | 141,590   |
|  | 5.3%                     | 3.7%          | 2.3%     | 11.3%     |
| 3  | 0                        | 11,341        | 0        | 11,341    |
|  | 0                        | 0.9%          | 0        | 0.9%      |

**Table B.65**

| Question 54. What fuel or energy source do you use for your oven(s)? | Service Type             |               |          | Total     |
|--|--------------------------|---------------|----------|-----------|
|  | Electric and Gas (combo) | Electric only | Gas only |           |
| Electricity  | 282,050                  | 507,488       | 249,811  | 1,039,349 |
|  | 22.5%                    | 40.5%         | 19.9%    | 82.9%     |
| Natural gas  | 56,786                   | 48,338        | 82,778   | 187,901   |
|  | 4.5%                     | 3.9%          | 6.6%     | 15.0%     |
| Propane or bottled gas (LP, propane, butane)                         | 0                        | 15,959        | 0        | 15,959    |
|  | 0                        | 1.3%          | 0        | 1.3%      |
| Don't know   | 2,164                    | 0             | 2,120    | 4,285     |
|  | 0.2%                     | 0             | 0.2%     | 0.3%      |
| Not applicable   | 0                        | 6,246         | 0        | 6,246     |
|  | 0                        | 0.5%          | 0        | 0.5%      |

**Table B.66**

| Question 55. How many microwave ovens do you have? | Service Type             |                  |                  | Total              |
|--|--------------------------|------------------|------------------|--------------------|
|  | Electric and Gas (combo) | Electric only    | Gas only         |                    |
| 0  | 2,085<br>0.2%            | 23,265<br>1.9%   | 11,272<br>0.9%   | 36,623<br>2.9%     |
| 1  | 317,352<br>25.3%         | 532,560<br>42.5% | 305,591<br>24.4% | 1,155,504<br>92.2% |
| 2  | 21,563<br>1.7%           | 19,082<br>1.5%   | 17,845<br>1.4%   | 58,490<br>4.7%     |
| 3  | 0<br>0                   | 3,123<br>0.2%    | 0<br>0           | 3,123<br>0.2%      |

**Table B.67**

| Question 56. Number of televisions of all types in your home. | Service Type             |               |          | Total   |
|---|--------------------------|---------------|----------|---------|
|   | Electric and Gas (combo) | Electric only | Gas only |         |
| 0   | 4,328                    | 16,436        | 7,474    | 28,239  |
|   | 0.3%                     | 1.3%          | 0.6%     | 2.3%    |
| 1   | 47,408                   | 156,329       | 91,823   | 295,560 |
|   | 3.8%                     | 12.5%         | 7.3%     | 23.6%   |
| 2   | 108,005                  | 209,672       | 106,573  | 424,249 |
|   | 8.6%                     | 16.7%         | 8.5%     | 33.8%   |
| 3   | 82,080                   | 121,912       | 76,416   | 280,409 |
|   | 6.5%                     | 9.7%          | 6.1%     | 22.4%   |
| 4   | 56,268                   | 44,409        | 29,224   | 129,901 |
|   | 4.5%                     | 3.5%          | 2.3%     | 10.4%   |
| 5   | 25,000                   | 21,293        | 14,276   | 60,569  |
|   | 2.0%                     | 1.7%          | 1.1%     | 4.8%    |
| 6   | 4,328                    | 7,979         | 3,569    | 15,877  |
|   | 0.3%                     | 0.6%          | 0.3%     | 1.3%    |
| 7   | 2,761                    | 0             | 1,785    | 4,546   |
|   | 0.2%                     | 0             | 0.1%     | 0.4%    |
| 8   | 2,164                    | 0             | 1,785    | 3,949   |
|   | 0.2%                     | 0             | 0.1%     | 0.3%    |
| Refused   | 8,657                    | 0             | 1,785    | 10,441  |
|   | 0.7%                     | 0             | 0.1%     | 0.8%    |

**Table B.68**

| Question 57. Number of large flat-screen tvs (over 32 inches) in your home. | Service Type             |                  |                  | Total            |
|---|--------------------------|------------------|------------------|------------------|
|   | Electric and Gas (combo) | Electric only    | Gas only         |                  |
| 0   | 190,197<br>15.5%         | 420,106<br>34.3% | 192,812<br>15.7% | 803,116<br>65.5% |
| 1   | 109,684<br>9.0%          | 115,338<br>9.4%  | 116,577<br>9.5%  | 341,599<br>27.9% |
| 2   | 23,806<br>1.9%           | 17,931<br>1.5%   | 14,276<br>1.2%   | 56,013<br>4.6%   |
| 3   | 0<br>0                   | 3,123<br>0.3%    | 1,785<br>0.1%    | 4,907<br>0.4%    |
| 4   | 2,164<br>0.2%            | 0<br>0           | 0<br>0           | 2,164<br>0.2%    |
| 5   | 0<br>0                   | 5,095<br>0.4%    | 0<br>0           | 5,095<br>0.4%    |
| Refused   | 2,164<br>0.2%            | 0<br>0           | 0<br>0           | 2,164<br>0.2%    |
| Not applicable  | 8,657<br>0.7%            | 0<br>0           | 1,785<br>0.1%    | 10,441<br>0.9%   |



**Table B.69**

| Question 58. Number of game consoles<br>(Playstation Wii Nintendo xbox xCube etc) in<br>your home. | Service Type                |                  |                  | Total            |
|--|-----------------------------|------------------|------------------|------------------|
|  | Electric and<br>Gas (combo) | Electric<br>only | Gas only         |                  |
| 0  | 204,671<br>16.3%            | 443,938<br>35.4% | 206,844<br>16.5% | 855,453<br>68.2% |
| 1  | 75,215<br>6.0%              | 70,363<br>5.6%   | 80,108<br>6.4%   | 225,685<br>18.0% |
| 2  | 32,981<br>2.6%              | 36,430<br>2.9%   | 30,902<br>2.5%   | 100,312<br>8.0%  |
| 3  | 8,657<br>0.7%               | 11,102<br>0.9%   | 9,488<br>0.8%    | 29,246<br>2.3%   |
| 4  | 4,328<br>0.3%               | 8,218<br>0.7%    | 0<br>0           | 12,546<br>1.0%   |
| 5  | 0<br>0                      | 7,979<br>0.6%    | 3,569<br>0.3%    | 11,548<br>0.9%   |
| 6  | 4,328<br>0.3%               | 0<br>0           | 0<br>0           | 4,328<br>0.3%    |
| Don't know   | 2,164<br>0.2%               | 0<br>0           | 0<br>0           | 2,164<br>0.2%    |
| Refused  | 8,657<br>0.7%               | 0<br>0           | 3,798<br>0.3%    | 12,455<br>1.0%   |

**Table B.70**

| Question 59. Number of VCRs or DVD players<br>(not a combo unit) in your home. | Service Type                |                  |                  | Total            |
|--|-----------------------------|------------------|------------------|------------------|
|  | Electric and Gas<br>(combo) | Electric<br>only | Gas only         |                  |
| 0  | 70,808<br>5.6%              | 147,272<br>11.7% | 86,469<br>6.9%   | 304,549<br>24.3% |
| 1  | 124,236<br>9.9%             | 234,044<br>18.7% | 126,080<br>10.1% | 484,361<br>38.6% |
| 2  | 68,046<br>5.4%              | 133,419<br>10.6% | 89,244<br>7.1%   | 290,709<br>23.2% |
| 3  | 38,955<br>3.1%              | 43,736<br>3.5%   | 21,979<br>1.8%   | 104,670<br>8.3%  |
| 4  | 15,149<br>1.2%              | 13,313<br>1.1%   | 5,583<br>0.4%    | 34,045<br>2.7%   |
| 5  | 4,328<br>0.3%               | 3,123<br>0.2%    | 1,785<br>0.1%    | 9,236<br>0.7%    |
| 6  | 2,164<br>0.2%               | 0<br>0           | 0<br>0           | 2,164<br>0.2%    |
| 7  | 2,164<br>0.2%               | 0<br>0           | 0<br>0           | 2,164<br>0.2%    |
| 9  | 2,164<br>0.2%               | 0<br>0           | 0<br>0           | 2,164<br>0.2%    |
| Don't know   | 2,164<br>0.2%               | 3,123<br>0.2%    | 1,785<br>0.1%    | 7,072<br>0.6%    |
| Refused  | 10,821<br>0.9%              | 0<br>0           | 1,785<br>0.1%    | 12,605<br>1.0%   |

**Table B.71**

| Question 60. Number of combination VCR and DVD units in your home. | Service Type             |                  |                  | Total            |
|--|--------------------------|------------------|------------------|------------------|
|  | Electric and Gas (combo) | Electric only    | Gas only         |                  |
| 0  | 181,574<br>14.5%         | 309,979<br>24.7% | 170,268<br>13.6% | 661,821<br>52.8% |
| 1  | 107,487<br>8.6%          | 191,936<br>15.3% | 117,249<br>9.4%  | 416,671<br>33.2% |
| 2  | 38,955<br>3.1%           | 52,283<br>4.2%   | 30,902<br>2.5%   | 122,139<br>9.7%  |
| 3  | 6,492<br>0.5%            | 20,709<br>1.7%   | 9,152<br>0.7%    | 36,354<br>2.9%   |
| 4  | 0                        | 0                | 1,785            | 1,785            |
|  | 0                        | 0                | 0.1%             | 0.1%             |
| 5  | 0                        | 0                | 1,785            | 1,785            |
|  | 0                        | 0                | 0.1%             | 0.1%             |
| 23   | 0                        | 3,123            | 0                | 3,123            |
|  | 0                        | 0.2%             | 0                | 0.2%             |
| Don't know   | 0                        | 0                | 1,785            | 1,785            |
|  | 0                        | 0                | 0.1%             | 0.1%             |
| Refused  | 6,492                    | 0                | 1,785            | 8,277            |
|  | 0.5%                     | 0                | 0.1%             | 0.7%             |

**Table B.72**

| Question 61. Number of stand-alone DVR units (not TIVO) in your home. | Service Type             |                  |                  | Total            |
|---|--------------------------|------------------|------------------|------------------|
|   | Electric and Gas (combo) | Electric only    | Gas only         |                  |
| 0   | 247,063<br>19.7%         | 421,028<br>33.6% | 239,317<br>19.1% | 907,408<br>72.4% |
| 1   | 61,036<br>4.9%           | 109,798<br>8.8%  | 71,857<br>5.7%   | 242,691<br>19.4% |
| 2   | 15,746<br>1.3%           | 39,224<br>3.1%   | 12,828<br>1.0%   | 67,798<br>5.4%   |
| 3   | 2,085<br>0.2%            | 1,734<br>0.1%    | 5,354<br>0.4%    | 9,173<br>0.7%    |
| Don't know  | 6,414<br>0.5%            | 6,246<br>0.5%    | 3,569<br>0.3%    | 16,228<br>1.3%   |
| Refused   | 8,657<br>0.7%            | 0<br>0           | 1,785<br>0.1%    | 10,441<br>0.8%   |

**Table B.73**

| Question 62. Number of TIVO or cable or satellite TV set-top boxes or receivers in your home. | Service Type             |                  |                 | Total            |
|---|--------------------------|------------------|-----------------|------------------|
|   | Electric and Gas (combo) | Electric only    | Gas only        |                  |
| 0   | 121,745<br>9.7%          | 243,201<br>19.4% | 121,169<br>9.7% | 486,115<br>38.8% |
| 1   | 117,698<br>9.4%          | 193,803<br>15.5% | 121,398<br>9.7% | 432,899<br>34.5% |
| 2   | 43,204<br>3.4%           | 89,311<br>7.1%   | 58,235<br>4.6%  | 190,751<br>15.2% |
| 3   | 36,712<br>2.9%           | 33,545<br>2.7%   | 24,984<br>2.0%  | 95,241<br>7.6%   |
| 4   | 4,328<br>0.3%            | 18,170<br>1.4%   | 5,354<br>0.4%   | 27,852<br>2.2%   |
| 5   | 4,328<br>0.3%            | 0<br>0           | 1,785<br>0.1%   | 6,113<br>0.5%    |
| Don't know  | 4,328<br>0.3%            | 0<br>0           | 1,785<br>0.1%   | 6,113<br>0.5%    |
| Refused   | 8,657<br>0.7%            | 0<br>0           | 0<br>0          | 8,657<br>0.7%    |

**Table B.74**

| Question 63. Number of stereo systems in your home. | Service Type             |                  |                | Total            |
|---|--------------------------|------------------|----------------|------------------|
|   | Electric and Gas (combo) | Electric only    | Gas only       |                  |
| 0   | 68,238<br>5.4%           | 190,219<br>15.2% | 99,877<br>8.0% | 358,333<br>28.6% |

| Question 63. Number of stereo systems in your home. | Service Type             |               |          | Total   |
|---|--------------------------|---------------|----------|---------|
|   | Electric and Gas (combo) | Electric only | Gas only |         |
| 1   | 188,360                  | 324,066       | 182,515  | 694,942 |
|   | 15.0%                    | 25.8%         | 14.6%    | 55.4%   |
| 2   | 47,611                   | 46,859        | 35,920   | 130,390 |
|   | 3.8%                     | 3.7%          | 2.9%     | 10.4%   |
| 3   | 19,477                   | 11,686        | 10,707   | 41,870  |
|   | 1.6%                     | 0.9%          | 0.9%     | 3.3%    |
| 4   | 4,328                    | 3,467         | 1,785    | 9,580   |
|   | 0.3%                     | 0.3%          | 0.1%     | 0.8%    |
| 6   | 0                        | 1,734         | 0        | 1,734   |
|   | 0                        | 0.1%          | 0        | 0.1%    |
| 13  | 0                        | 0             | 2,120    | 2,120   |
|   | 0                        | 0             | 0.2%     | 0.2%    |
| Refused   | 12,985                   | 0             | 1,785    | 14,769  |
|   | 1.0%                     | 0             | 0.1%     | 1.2%    |

Table B.75

| Question 64. Number of personal computers - including laptops - in your home. | Service Type             |               |          | Total   |
|---|--------------------------|---------------|----------|---------|
|   | Electric and Gas (combo) | Electric only | Gas only |         |
| 0   | 28,010                   | 96,501        | 29,011   | 153,522 |
|   | 2.2%                     | 7.7%          | 2.3%     | 12.2%   |
| 1   | 128,000                  | 283,247       | 147,939  | 559,186 |
|   | 10.2%                    | 22.6%         | 11.8%    | 44.6%   |

| Question 64. Number of personal computers - including laptops - in your home. | Service Type             |                 |                | Total            |
|---|--------------------------|-----------------|----------------|------------------|
|   | Electric and Gas (combo) | Electric only   | Gas only       |                  |
| 2   | 97,905<br>7.8%           | 108,287<br>8.6% | 82,350<br>6.6% | 288,543<br>23.0% |
| 3   | 45,965<br>3.7%           | 63,862<br>5.1%  | 46,856<br>3.7% | 156,684<br>12.5% |
| 4   | 17,313<br>1.4%           | 14,792<br>1.2%  | 17,845<br>1.4% | 49,951<br>4.0%   |
| 5   | 6,492<br>0.5%            | 6,246<br>0.5%   | 7,138<br>0.6%  | 19,876<br>1.6%   |
| 7   | 2,164<br>0.2%            | 0<br>0          | 0<br>0         | 2,164<br>0.2%    |
| 8   | 2,164<br>0.2%            | 0<br>0          | 1,785<br>0.1%  | 3,949<br>0.3%    |
| Don't know  | 0<br>0                   | 5,095<br>0.4%   | 0<br>0         | 5,095<br>0.4%    |
| Refused   | 12,985<br>1.0%           | 0<br>0          | 1,785<br>0.1%  | 14,769<br>1.2%   |

Table B.76

| Question 65. Number of computer monitors in your home. | Service Type             |                |                | Total            |
|--|--------------------------|----------------|----------------|------------------|
|  | Electric and Gas (combo) | Electric only  | Gas only       |                  |
| 0  | 23,727<br>2.2%           | 59,605<br>5.4% | 42,510<br>3.9% | 125,842<br>11.4% |

| Question 65. Number of computer monitors in your home. | Service Type             |                  |                  | Total            |
|--|--------------------------|------------------|------------------|------------------|
|  | Electric and Gas (combo) | Electric only    | Gas only         |                  |
| 1  | 176,209<br>16.0%         | 313,325<br>28.5% | 183,981<br>16.7% | 673,514<br>61.2% |
| 2  | 69,174<br>6.3%           | 69,391<br>6.3%   | 45,301<br>4.1%   | 183,866<br>16.7% |
| 3  | 22,239<br>2.0%           | 27,867<br>2.5%   | 24,984<br>2.3%   | 75,089<br>6.8%   |
| 4  | 4,328<br>0.4%            | 6,246<br>0.6%    | 5,354<br>0.5%    | 15,928<br>1.4%   |
| 5  | 2,164<br>0.2%            | 0<br>0           | 0<br>0           | 2,164<br>0.2%    |
| 6  | 0<br>0                   | 0<br>0           | 1,785<br>0.2%    | 1,785<br>0.2%    |
| Don't know   | 2,164<br>0.2%            | 0<br>0           | 0<br>0           | 2,164<br>0.2%    |
| Not applicable   | 12,985<br>1.2%           | 5,095<br>0.5%    | 1,785<br>0.2%    | 19,865<br>1.8%   |

**Table B.77**

| Question 66. Number of combination printer / fax / copiers in your home. | Service Type             |                  |                  | Total            |
|--|--------------------------|------------------|------------------|------------------|
|  | Electric and Gas (combo) | Electric only    | Gas only         |                  |
| 0  | 133,523<br>10.6%         | 309,863<br>24.7% | 172,266<br>13.7% | 615,652<br>49.1% |



|            |         |         |         |         |
|------------|---------|---------|---------|---------|
| 1          | 181,507 | 226,642 | 142,813 | 550,962 |
|            | 14.5%   | 18.1%   | 11.4%   | 43.9%   |
| 2          | 15,149  | 31,573  | 16,061  | 62,783  |
|            | 1.2%    | 2.5%    | 1.3%    | 5.0%    |
| 3          | 2,164   | 3,123   | 1,785   | 7,072   |
|            | 0.2%    | 0.2%    | 0.1%    | 0.6%    |
| Don't know | 0       | 6,829   | 0       | 6,829   |
|            | 0       | 0.5%    | 0       | 0.5%    |
| Refused    | 8,657   | 0       | 1,785   | 10,441  |
|            | 0.7%    | 0       | 0.1%    | 0.8%    |

**Table B.78**

| Question 67.<br>Number of stand-<br>alone printers in<br>your home. | Service Type                |                  |                  | Total            |
|---|-----------------------------|------------------|------------------|------------------|
|   | Electric and<br>Gas (combo) | Electric<br>only | Gas only         |                  |
| 0   | 138,855<br>11.1%            | 293,199<br>23.4% | 142,265<br>11.3% | 574,318<br>45.8% |
| 1   | 153,937<br>12.3%            | 246,429<br>19.7% | 158,309<br>12.6% | 558,675<br>44.6% |
| 2   | 37,388<br>3.0%              | 36,668<br>2.9%   | 26,997<br>2.2%   | 101,053<br>8.1%  |
| 3   | 0                           | 1,734<br>0.1%    | 1,785<br>0.1%    | 3,518<br>0.3%    |
| 4   | 0                           | 0                | 1,785<br>0.1%    | 1,785<br>0.1%    |
| 10  | 0                           | 0                | 1,785<br>0.1%    | 1,785<br>0.1%    |
| Don't know  | 2,164<br>0.2%               | 0                | 0                | 2,164<br>0.2%    |
| Refused   | 8,657<br>0.7%               | 0                | 1,785<br>0.1%    | 10,441<br>0.8%   |

**Table B.79**

| Question 68. Number of stand-alone fax machines in your home. | Service Type             |                  |                  | Total              |
|---|--------------------------|------------------|------------------|--------------------|
|   | Electric and Gas (combo) | Electric only    | Gas only         |                    |
| 0   | 282,568<br>22.5%         | 502,483<br>40.1% | 293,329<br>23.4% | 1,078,379<br>86.0% |
| 1   | 47,611<br>3.8%           | 67,329<br>5.4%   | 36,027<br>2.9%   | 150,968<br>12.0%   |
| 2   | 2,164<br>0.2%            | 8,218<br>0.7%    | 3,569<br>0.3%    | 13,951<br>1.1%     |
| Refused   | 8,657<br>0.7%            | 0<br>0           | 1,785<br>0.1%    | 10,441<br>0.8%     |

**Table B.80**

| Question 69. Number of stand-alone copiers in your home. | Service Type             |               |          | Total     |
|--|--------------------------|---------------|----------|-----------|
|  | Electric and Gas (combo) | Electric only | Gas only |           |
| 0  | 264,894                  | 458,985       | 283,841  | 1,007,721 |
|  | 21.1%                    | 36.6%         | 22.6%    | 80.4%     |
| 1  | 62,524                   | 94,629        | 45,514   | 202,667   |
|  | 5.0%                     | 7.5%          | 3.6%     | 16.2%     |
| 2  | 7,090                    | 19,559        | 1,785    | 28,433    |
|  | 0.6%                     | 1.6%          | 0.1%     | 2.3%      |
| 11   | 0                        | 0             | 1,785    | 1,785     |
|  | 0                        | 0             | 0.1%     | 0.1%      |
| Don't know   | 0                        | 4,857         | 0        | 4,857     |
|  | 0                        | 0.4%          | 0        | 0.4%      |
| Refused  | 6,492                    | 0             | 1,785    | 8,277     |
|  | 0.5%                     | 0             | 0.1%     | 0.7%      |

**Table B.81**

| Question 70. Number of surge protector strips in your home for any of the audio/video or home office mentioned above. | Service Type             |                  |                | Total            |
|---|--------------------------|------------------|----------------|------------------|
|   | Electric and Gas (combo) | Electric only    | Gas only       |                  |
| 0   | 32,823<br>2.6%           | 81,454<br>6.5%   | 42,403<br>3.4% | 156,680<br>12.5% |
| 1   | 64,879<br>5.2%           | 125,201<br>10.0% | 73,748<br>5.9% | 263,828<br>21.0% |
| 2   | 65,882<br>5.3%           | 145,104<br>11.6% | 80,673<br>6.4% | 291,659<br>23.3% |
| 3   | 81,596<br>6.5%           | 75,547<br>6.0%   | 65,816<br>5.2% | 222,959<br>17.8% |
| 4   | 21,642<br>1.7%           | 65,612<br>5.2%   | 32,351<br>2.6% | 119,604<br>9.5%  |
| 5   | 21,642<br>1.7%           | 34,113<br>2.7%   | 14,505<br>1.2% | 70,260<br>5.6%   |
| 6   | 20,074<br>1.6%           | 30,184<br>2.4%   | 7,367<br>0.6%  | 57,625<br>4.6%   |
| 7   | 10,821<br>0.9%           | 3,123<br>0.2%    | 3,569<br>0.3%  | 17,513<br>1.4%   |
| 8   | 4,328<br>0.3%            | 7,979<br>0.6%    | 0<br>0         | 12,308<br>1.0%   |
| 9   | 2,164<br>0.2%            | 1,734<br>0.1%    | 1,785<br>0.1%  | 5,682<br>0.5%    |
| 10  | 4,328<br>0.3%            | 3,123<br>0.2%    | 3,569<br>0.3%  | 11,020<br>0.9%   |

| Question 70. Number of surge protector strips in your home for any of the audio/video or home office mentioned above. | Service Type             |               |          | Total  |
|---|--------------------------|---------------|----------|--------|
|   | Electric and Gas (combo) | Electric only | Gas only |        |
| 12  | 0                        | 0             | 1,785    | 1,785  |
|   | 0                        | 0             | 0.1%     | 0.1%   |
| 20  | 2,164                    | 0             | 0        | 2,164  |
|   | 0.2%                     | 0             | 0        | 0.2%   |
| Don't know  | 2,164                    | 3,123         | 5,354    | 10,641 |
|   | 0.2%                     | 0.2%          | 0.4%     | 0.8%   |
| Refused   | 6,492                    | 1,734         | 1,785    | 10,011 |
|   | 0.5%                     | 0.1%          | 0.1%     | 0.8%   |

**Table B.82**

| Question 71. Which, if any, of the appliances in your home are Energy Star rated? | Service Type             |                  |                  | Total            |
|---|--------------------------|------------------|------------------|------------------|
|   | Electric and Gas (combo) | Electric only    | Gas only         |                  |
| all of them/everything  | 10,821<br>1.5%           | 30,078<br>4.1%   | 8,923<br>1.2%    | 49,821<br>6.8%   |
| air conditioning  | 0<br>0                   | 0<br>0           | 5,354<br>0.7%    | 5,354<br>0.7%    |
| computer monitor  | 6,414<br>0.9%            | 0<br>0           | 7,138<br>1.0%    | 13,552<br>1.9%   |
| computer  | 12,985<br>1.8%           | 36,579<br>5.0%   | 10,707<br>1.5%   | 60,271<br>8.3%   |
| dishwasher  | 83,872<br>11.5%          | 85,006<br>11.6%  | 68,746<br>9.4%   | 237,624<br>32.6% |
| dryer   | 104,916<br>14.4%         | 79,343<br>10.9%  | 94,310<br>12.9%  | 278,569<br>38.2% |
| freezer   | 34,627<br>4.7%           | 17,931<br>2.5%   | 12,492<br>1.7%   | 65,050<br>8.9%   |
| furnace   | 6,492<br>0.9%            | 3,123<br>0.4%    | 12,721<br>1.7%   | 22,336<br>3.1%   |
| microwave   | 21,157<br>2.9%           | 30,422<br>4.2%   | 12,828<br>1.8%   | 64,407<br>8.8%   |
| oven  | 25,485<br>3.5%           | 14,225<br>1.9%   | 9,381<br>1.3%    | 49,091<br>6.7%   |
| refrigerator  | 144,953<br>19.9%         | 181,623<br>24.9% | 121,398<br>16.6% | 447,975<br>61.4% |

| Question 71. Which, if any, of the appliances in your home are Energy Star rated? | Service Type             |                  |                  | Total              |
|---|--------------------------|------------------|------------------|--------------------|
|   | Electric and Gas (combo) | Electric only    | Gas only         |                    |
| stove   | 47,533<br>6.5%           | 69,063<br>9.5%   | 35,036<br>4.8%   | 151,632<br>20.8%   |
| television  | 19,477<br>2.7%           | 30,094<br>4.1%   | 18,075<br>2.5%   | 67,646<br>9.3%     |
| washing machine   | 122,150<br>16.7%         | 93,568<br>12.8%  | 105,017<br>14.4% | 320,736<br>44.0%   |
| water heater  | 19,477<br>2.7%           | 75,892<br>10.4%  | 47,986<br>6.6%   | 143,355<br>19.6%   |
| asked/answered  | 293,546<br>23.4%         | 468,905<br>37.4% | 276,474<br>22.1% | 1,038,925<br>82.9% |
| Don't know  | 47,454<br>3.8%           | 109,125<br>8.7%  | 56,451<br>4.5%   | 213,030<br>17.0%   |
| Refused   | 0<br>0                   | 0<br>0           | 1,785<br>0.1%    | 1,785<br>0.1%      |



**Table B.83**

| Question 72. How many people - including yourself - usually live in this residence at least six months of the year? | Service Type             |                  |                 | Total            |
|---|--------------------------|------------------|-----------------|------------------|
|   | Electric and Gas (combo) | Electric only    | Gas only        |                  |
| 1   | 45,244<br>3.6%           | 185,644<br>14.8% | 57,353<br>4.6%  | 288,241<br>23.0% |
| 2   | 123,233<br>9.8%          | 235,867<br>18.8% | 112,001<br>8.9% | 471,101<br>37.6% |
| 3   | 67,528<br>5.4%           | 65,357<br>5.2%   | 76,890<br>6.1%  | 209,775<br>16.7% |
| 4   | 51,861<br>4.1%           | 55,988<br>4.5%   | 57,899<br>4.6%  | 165,749<br>13.2% |
| 5   | 27,164<br>2.2%           | 32,050<br>2.6%   | 18,075<br>1.4%  | 77,289<br>6.2%   |
| 6   | 8,657<br>0.7%            | 0<br>0           | 8,923<br>0.7%   | 17,579<br>1.4%   |
| 7   | 2,164<br>0.2%            | 0<br>0           | 1,785<br>0.1%   | 3,949<br>0.3%    |
| 8   | 4,328<br>0.3%            | 3,123<br>0.2%    | 0<br>0          | 7,451<br>0.6%    |
| Refused   | 10,821<br>0.9%           | 0<br>0           | 1,785<br>0.1%   | 12,605<br>1.0%   |

**Table B.84**

| Question 73. For what average length of time is your home occupied by at least one person on a typical weekday ? | Service Type             |               |          | Total   |
|--|--------------------------|---------------|----------|---------|
|  | Electric and Gas (combo) | Electric only | Gas only |         |
| 23-24 hrs/day  | 137,412                  | 243,831       | 116,928  | 498,171 |
|  | 11.0%                    | 19.4%         | 9.3%     | 39.7%   |
| 21-22 hrs/day  | 15,746                   | 42,930        | 21,750   | 80,427  |
|  | 1.3%                     | 3.4%          | 1.7%     | 6.4%    |
| 19-20 hrs/day  | 39,394                   | 40,613        | 26,768   | 106,775 |
|  | 3.1%                     | 3.2%          | 2.1%     | 8.5%    |
| 17-18 hrs/day  | 30,298                   | 42,824        | 40,512   | 113,634 |
|  | 2.4%                     | 3.4%          | 3.2%     | 9.1%    |
| 15-16 hrs/day  | 28,055                   | 70,363        | 38,605   | 137,023 |
|  | 2.2%                     | 5.6%          | 3.1%     | 10.9%   |
| 13-14 hrs/day  | 32,305                   | 26,255        | 28,005   | 86,564  |
|  | 2.6%                     | 2.1%          | 2.2%     | 6.9%    |
| 11-12 hrs/day  | 30,219                   | 60,650        | 24,100   | 114,969 |
|  | 2.4%                     | 4.8%          | 1.9%     | 9.2%    |
| 9-10 hrs/day   | 4,249                    | 4,857         | 5,354    | 14,460  |
|  | 0.3%                     | 0.4%          | 0.4%     | 1.2%    |
| 7-8 hrs/day  | 2,164                    | 27,777        | 13,057   | 42,998  |
|  | 0.2%                     | 2.2%          | 1.0%     | 3.4%    |
| 5-6 hrs/day  | 4,328                    | 1,734         | 7,138    | 13,200  |
|  | 0.3%                     | 0.1%          | 0.6%     | 1.1%    |
| 3-4 hrs/day  | 2,164                    | 3,123         | 0        | 5,287   |
|  | 0.2%                     | 0.2%          | 0        | 0.4%    |

| Question 73. For what average length of time is your home occupied by at least one person on a typical weekday ? | Service Type             |               |          | Total  |
|--|--------------------------|---------------|----------|--------|
|  | Electric and Gas (combo) | Electric only | Gas only |        |
| 1-2 hrs/day  | 0                        | 0             | 3,569    | 3,569  |
|  | 0                        | 0             | 0.3%     | 0.3%   |
| Don't know   | 3,844                    | 4,857         | 3,569    | 12,269 |
|  | 0.3%                     | 0.4%          | 0.3%     | 1.0%   |
| Refused  | 10,821                   | 8,218         | 5,354    | 24,393 |
|  | 0.9%                     | 0.7%          | 0.4%     | 1.9%   |

**Table B.85**

| Question 74. For what average length of time is your home occupied by at least one person on a typical weekend? | Service Type             |               |          | Total   |
|---|--------------------------|---------------|----------|---------|
|   | Electric and Gas (combo) | Electric only | Gas only |         |
| 23-24 hrs/day   | 182,780                  | 303,674       | 162,565  | 649,020 |
|   | 14.6%                    | 24.2%         | 13.0%    | 51.8%   |
| 21-22 hrs/day   | 17,910                   | 39,807        | 9,152    | 66,869  |
|   | 1.4%                     | 3.2%          | 0.7%     | 5.3%    |
| 19-20 hrs/day   | 54,137                   | 68,496        | 52,882   | 175,515 |
|   | 4.3%                     | 5.5%          | 4.2%     | 14.0%   |
| 17-18 hrs/day   | 27,897                   | 39,701        | 25,319   | 92,918  |
|   | 2.2%                     | 3.2%          | 2.0%     | 7.4%    |
| 15-16 hrs/day   | 12,985                   | 41,435        | 31,467   | 85,887  |
|   | 1.0%                     | 3.3%          | 2.5%     | 6.9%    |
| 13-14 hrs/day   | 10,742                   | 15,047        | 11,272   | 37,061  |
|   | 0.9%                     | 1.2%          | 0.9%     | 3.0%    |
| 11-12 hrs/day   | 8,657                    | 25,805        | 16,733   | 51,194  |
|   | 0.7%                     | 2.1%          | 1.3%     | 4.1%    |
| 9-10 hrs/day  | 4,328                    | 20,471        | 7,138    | 31,937  |
|   | 0.3%                     | 1.6%          | 0.6%     | 2.5%    |
| 7-8 hrs/day   | 0                        | 9,368         | 7,474    | 16,842  |
|   | 0                        | 0.7%          | 0.6%     | 1.3%    |
| 5-6 hrs/day   | 6,492                    | 0             | 3,569    | 10,062  |
|   | 0.5%                     | 0             | 0.3%     | 0.8%    |
| 3-4 hrs/day   | 2,085                    | 0             | 0        | 2,085   |
|   | 0.2%                     | 0             | 0        | 0.2%    |

| Question 74. For what average length of time is your home occupied by at least one person on a typical weekend? | Service Type             |               |          | Total  |
|---|--------------------------|---------------|----------|--------|
|   | Electric and Gas (combo) | Electric only | Gas only |        |
| 1-2 hrs/day   | 0                        | 0             | 1,785    | 1,785  |
|   | 0                        | 0             | 0.1%     | 0.1%   |
| Don't know  | 8,657                    | 11,102        | 1,785    | 21,543 |
|   | 0.7%                     | 0.9%          | 0.1%     | 1.7%   |
| Refused   | 4,328                    | 3,123         | 3,569    | 11,020 |
|   | 0.3%                     | 0.2%          | 0.3%     | 0.9%   |

## Appendix A.1.4 Survey Results by Dwelling Type

The following tables present the results of the survey by dwelling type. The actual number of responses in each customer segment have been extrapolated to the population to provide an estimate of the results across PSE’s entire service territory.

**Table C.1**

| Question ax. Service type from sample | Dwelling Type               |                           |                    |                   | Total   |
|---------------------------------------|-----------------------------|---------------------------|--------------------|-------------------|---------|
|                                       | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |         |
| Electric and Gas (combo)              | 296,117                     | 19,838                    | 21,687             | 3,359             | 341,000 |
|                                       | 23.6%                       | 1.6%                      | 1.7%               | 0.3%              | 27.2%   |
| Electric only                         | 320,013                     | 33,694                    | 171,267            | 53,056            | 578,030 |
|                                       | 25.5%                       | 2.7%                      | 13.7%              | 4.2%              | 46.1%   |
| Gas only                              | 287,179                     | 21,309                    | 24,437             | 1,785             | 334,709 |
|                                       | 22.9%                       | 1.7%                      | 1.9%               | 0.1%              | 26.7%   |

**Table C.2**

| Question c. Do you own or rent or lease this property? | Dwelling Type               |                           |                    |                   | Total   |
|--|-----------------------------|---------------------------|--------------------|-------------------|---------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |         |
| Own  | 832,148                     | 49,387                    | 67,553             | 46,118            | 995,206 |
|  | 66.4%                       | 3.9%                      | 5.4%               | 3.7%              | 79.4%   |
| Rent   | 56,884                      | 22,693                    | 137,561            | 10,348            | 227,486 |
|  | 4.5%                        | 1.8%                      | 11.0%              | 0.8%              | 18.1%   |
| Lease  | 11,153                      | 2,761                     | 12,276             | 1,734             | 27,924  |
|  | 0.9%                        | 0.2%                      | 1.0%               | 0.1%              | 2.2%    |
| Refused  | 3,123                       | 0                         | 0                  | 0                 | 3,123   |
|  | 0.2%                        | 0                         | 0                  | 0                 | 0.2%    |

**Table C.3**

| Question d. Which of the following best describes how the residence is occupied? | Dwelling Type               |                           |                    |                   | Total     |
|--|-----------------------------|---------------------------|--------------------|-------------------|-----------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |           |
| Year-round, full-time  | 903,308                     | 74,841                    | 217,390            | 58,199            | 1,253,739 |
|  | 72.0%                       | 6.0%                      | 17.3%              | 4.6%              | 100.0%    |

**Table C.4**

| Question 1. Which of the following best describes your home? | Dwelling Type               |                           |                    |                   | Total   |
|--|-----------------------------|---------------------------|--------------------|-------------------|---------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |         |
| Single family detached home                                  | 903,308                     | 0                         | 0                  | 0                 | 903,308 |
|  | 72.0%                       | 0                         | 0                  | 0                 | 72.0%   |
| Duplex, row- or townhouse                                    | 0                           | 74,841                    | 0                  | 0                 | 74,841  |
|  | 0                           | 6.0%                      | 0                  | 0                 | 6.0%    |
| Apartment or condo   | 0                           | 0                         | 217,390            | 0                 | 217,390 |
|  | 0                           | 0                         | 17.3%              | 0                 | 17.3%   |
| Manufactured home  | 0                           | 0                         | 0                  | 58,199            | 58,199  |
|  | 0                           | 0                         | 0                  | 4.6%              | 4.6%    |

**Table C.5**

| Question1c. Which of the following best describes your home? | Dwelling Type               |                           |                    |                   | Total   |
|--|-----------------------------|---------------------------|--------------------|-------------------|---------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |         |
| Single family  | 903,308                     | 0                         | 0                  | 0                 | 903,308 |
|  | 72.0%                       | 0                         | 0                  | 0                 | 72.0%   |
| Multi-family   | 0                           | 74,841                    | 217,390            | 0                 | 292,232 |
|  | 0                           | 6.0%                      | 17.3%              | 0                 | 23.3%   |
| Manufactured home  | 0                           | 0                         | 0                  | 58,199            | 58,199  |
|  | 0                           | 0                         | 0                  | 4.6%              | 4.6%    |

**Table C.6**

| Question 2c. How many living units or apartments are in the building where this residence is located? | Dwelling Type               |                           |                    |                   | Total   |
|---|-----------------------------|---------------------------|--------------------|-------------------|---------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |         |
| 2 units   | 0                           | 31,417                    | 0                  | 0                 | 31,417  |
|   | 0                           | 2.5%                      | 0                  | 0                 | 2.5%    |
| 3 units   | 0                           | 2,085                     | 10,191             | 0                 | 12,276  |
|   | 0                           | 0.2%                      | 0.8%               | 0                 | 1.0%    |
| 4 units   | 0                           | 11,465                    | 31,519             | 0                 | 42,984  |
|   | 0                           | 0.9%                      | 2.5%               | 0                 | 3.4%    |
| 5 or more units   | 0                           | 27,710                    | 168,501            | 0                 | 196,210 |
|   | 0                           | 2.2%                      | 13.4%              | 0                 | 15.7%   |
| Don't know  | 0                           | 2,164                     | 7,181              | 0                 | 9,345   |
|   | 0                           | 0.2%                      | 0.6%               | 0                 | 0.7%    |
| Not applicable  | 903,308                     | 0                         | 0                  | 58,199            | 961,507 |
|   | 72.0%                       | 0                         | 0                  | 4.6%              | 76.7%   |



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**Table C.7**

| Question 3. How many levels or stories are there in this residence? | Dwelling Type               |                           |                    |                   | Total            |
|---|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| One story   | 345,487<br>27.6%            | 15,754<br>1.3%            | 65,773<br>5.2%     | 58,199<br>4.6%    | 485,213<br>38.7% |
| One and a half stories  | 22,948<br>1.8%              | 0<br>0                    | 2,164<br>0.2%      | 0<br>0            | 25,112<br>2.0%   |
| Split level or two stories  | 409,291<br>32.6%            | 44,691<br>3.6%            | 79,745<br>6.4%     | 0<br>0            | 533,727<br>42.6% |
| Two and a half stories  | 44,593<br>3.6%              | 5,095<br>0.4%             | 12,311<br>1.0%     | 0<br>0            | 62,000<br>4.9%   |
| Tri level or three stories  | 77,040<br>6.1%              | 7,216<br>0.6%             | 38,058<br>3.0%     | 0<br>0            | 122,314<br>9.8%  |
| More than three stories   | 3,949<br>0.3%               | 2,085<br>0.2%             | 19,339<br>1.5%     | 0<br>0            | 25,373<br>2.0%   |

**Table C.8**

| Question 4. On which of the following is your home built? | Dwelling Type               |                           |                    |                   | Total            |
|---|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| Concrete slab or foundation                               | 272,838<br>21.8%            | 48,966<br>3.9%            | 100,210<br>8.0%    | 23,924<br>1.9%    | 445,938<br>35.6% |
| Above a crawl space                                       | 404,961<br>32.3%            | 23,755<br>1.9%            | 24,927<br>2.0%     | 29,074<br>2.3%    | 482,718<br>38.5% |
| Above an unfinished basement                              | 82,395<br>6.6%              | 0<br>0                    | 14,431<br>1.2%     | 0<br>0            | 96,826<br>7.7%   |
| Above a finished basement                                 | 132,920<br>10.6%            | 0<br>0                    | 20,613<br>1.6%     | 0<br>0            | 153,533<br>12.2% |
| Don't know  | 7,072<br>0.6%               | 2,120<br>0.2%             | 44,933<br>3.6%     | 3,467<br>0.3%     | 57,592<br>4.6%   |
| Refused   | 3,123<br>0.2%               | 0<br>0                    | 12,276<br>1.0%     | 1,734<br>0.1%     | 17,132<br>1.4%   |

**Table C.9**

| Question 5c. Approximately what percentage of this residence's windows are double or triple-pane? | Dwelling Type               |                           |                    |                   | Total   |
|---|-----------------------------|---------------------------|--------------------|-------------------|---------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |         |
| 25% or less   | 108,856                     | 17,450                    | 46,564             | 18,962            | 191,833 |
|   | 8.7%                        | 1.4%                      | 3.7%               | 1.5%              | 15.3%   |
| 26% - 50%   | 42,496                      | 6,414                     | 5,095              | 0                 | 54,005  |
|   | 3.4%                        | 0.5%                      | 0.4%               | 0                 | 4.3%    |
| 51% - 75%   | 21,064                      | 0                         | 0                  | 1,734             | 22,798  |
|   | 1.7%                        | 0                         | 0                  | 0.1%              | 1.8%    |
| 76% - 100%  | 707,877                     | 42,148                    | 139,228            | 35,719            | 924,971 |
|   | 56.5%                       | 3.4%                      | 11.1%              | 2.8%              | 73.8%   |
| Don't know  | 23,015                      | 8,830                     | 23,741             | 1,785             | 57,371  |
|   | 1.8%                        | 0.7%                      | 1.9%               | 0.1%              | 4.6%    |
| Refused   | 0                           | 0                         | 2,761              | 0                 | 2,761   |
|   | 0                           | 0                         | 0.2%               | 0                 | 0.2%    |

**Table C.10**

| Question 6c. Approximately what percentage of your home’s windows are equipped with storm windows? | Dwelling Type               |                           |                    |                   | Total   |
|--|-----------------------------|---------------------------|--------------------|-------------------|---------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |         |
| 25% or less  | 719,551                     | 45,712                    | 170,302            | 39,582            | 975,146 |
|  | 57.4%                       | 3.6%                      | 13.6%              | 3.2%              | 77.8%   |
| 26% - 50%  | 25,526                      | 0                         | 10,191             | 0                 | 35,716  |
|  | 2.0%                        | 0                         | 0.8%               | 0                 | 2.8%    |
| 51% - 75%  | 8,410                       | 0                         | 0                  | 1,680             | 10,089  |
|  | 0.7%                        | 0                         | 0                  | 0.1%              | 0.8%    |
| 76% - 100%   | 102,238                     | 15,880                    | 14,396             | 15,205            | 147,719 |
|  | 8.2%                        | 1.3%                      | 1.1%               | 1.2%              | 11.8%   |
| Don't know   | 47,583                      | 13,250                    | 22,501             | 1,734             | 85,068  |
|  | 3.8%                        | 1.1%                      | 1.8%               | 0.1%              | 6.8%    |

**Table C.11**

| Question 7c. What is the approximate square footage of heated floor space in this residence? | Dwelling Type               |                           |                    |                   | Total            |
|--|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| Less than 500 square feet  | 15,614<br>1.2%              | 0<br>0                    | 18,409<br>1.5%     | 3,467<br>0.3%     | 37,490<br>3.0%   |
| 501 to 1,000 square feet   | 56,170<br>4.5%              | 23,290<br>1.9%            | 104,938<br>8.4%    | 10,402<br>0.8%    | 194,800<br>15.5% |
| 1,001 to 1,500 square feet   | 161,437<br>12.9%            | 13,285<br>1.1%            | 49,001<br>3.9%     | 20,402<br>1.6%    | 244,124<br>19.5% |
| 1,501 to 2,000 square feet   | 248,045<br>19.8%            | 31,387<br>2.5%            | 7,216<br>0.6%      | 16,993<br>1.4%    | 303,640<br>24.2% |
| 2,001 to 2,500 square feet   | 169,908<br>13.6%            | 0<br>0                    | 0<br>0             | 0<br>0            | 169,908<br>13.6% |
| 2,501 to 3,000 square feet   | 105,124<br>8.4%             | 0<br>0                    | 0<br>0             | 0<br>0            | 105,124<br>8.4%  |
| 3,001 to 4,000 square feet   | 77,502<br>6.2%              | 0<br>0                    | 2,120<br>0.2%      | 0<br>0            | 79,622<br>6.4%   |
| 4,001 to 5,000 square feet   | 12,359<br>1.0%              | 0<br>0                    | 0<br>0             | 0<br>0            | 12,359<br>1.0%   |
| More than 6,000 square feet  | 2,164<br>0.2%               | 0<br>0                    | 0<br>0             | 0<br>0            | 2,164<br>0.2%    |
| Don't know   | 54,986<br>4.4%              | 6,880<br>0.5%             | 35,707<br>2.8%     | 6,935<br>0.6%     | 104,508<br>8.3%  |

**Table C.12**

| Question 8. Although you aren't sure about the actual heated floor space can you estimate the square footage of your home using these categories? | Dwelling Type               |                           |                    |                   | Total     |
|---|-----------------------------|---------------------------|--------------------|-------------------|-----------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |           |
| Less than 500 square feet   | 0                           | 0                         | 10,191             | 3,467             | 13,658    |
|   | 0                           | 0                         | 0.8%               | 0.3%              | 1.1%      |
| 501 to 1,000 square feet  | 10,044                      | 5,095                     | 25,517             | 1,734             | 42,390    |
|   | 0.8%                        | 0.4%                      | 2.0%               | 0.1%              | 3.4%      |
| 1,001 to 1,500 square feet  | 17,282                      | 0                         | 0                  | 0                 | 17,282    |
|   | 1.4%                        | 0                         | 0                  | 0                 | 1.4%      |
| 1,501 to 2,000 square feet  | 5,962                       | 0                         | 0                  | 0                 | 5,962     |
|   | 0.5%                        | 0                         | 0                  | 0                 | 0.5%      |
| 2,001 to 2,500 square feet  | 2,164                       | 0                         | 0                  | 0                 | 2,164     |
|   | 0.2%                        | 0                         | 0                  | 0                 | 0.2%      |
| Don't know  | 17,749                      | 1,785                     | 0                  | 1,734             | 21,268    |
|   | 1.4%                        | 0.1%                      | 0                  | 0.1%              | 1.7%      |
| Refused   | 1,785                       | 0                         | 0                  | 0                 | 1,785     |
|   | 0.1%                        | 0                         | 0                  | 0                 | 0.1%      |
| Not applicable  | 848,322                     | 67,962                    | 181,683            | 51,265            | 1,149,231 |
|   | 67.7%                       | 5.4%                      | 14.5%              | 4.1%              | 91.7%     |

**Table C.13**

| Question 9. How many heated rooms are in this residence? | Dwelling Type               |                           |                    |                   | Total  |
|--|-----------------------------|---------------------------|--------------------|-------------------|--------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |        |
| 1  | 5,136                       | 0                         | 6,880              | 0                 | 12,016 |
|  | 0.4%                        | 0                         | 0.5%               | 0                 | 1.0%   |

| Question 9. How many heated rooms are in this residence? | Dwelling Type               |                           |                    |                   | Total            |
|--|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| 2  | 9,044<br>0.7%               | 5,095<br>0.4%             | 42,883<br>3.4%     | 3,467<br>0.3%     | 60,489<br>4.8%   |
| 3  | 19,958<br>1.6%              | 3,905<br>0.3%             | 40,214<br>3.2%     | 3,467<br>0.3%     | 67,544<br>5.4%   |
| 4  | 66,186<br>5.3%              | 20,573<br>1.6%            | 88,902<br>7.1%     | 13,815<br>1.1%    | 189,476<br>15.1% |
| 5  | 104,897<br>8.4%             | 26,796<br>2.1%            | 29,512<br>2.4%     | 13,180<br>1.1%    | 174,386<br>13.9% |
| 6  | 174,177<br>13.9%            | 14,603<br>1.2%            | 0<br>0             | 8,669<br>0.7%     | 197,449<br>15.7% |
| 7  | 169,676<br>13.5%            | 2,085<br>0.2%             | 6,880<br>0.5%      | 8,719<br>0.7%     | 187,361<br>14.9% |
| 8  | 133,572<br>10.7%            | 1,785<br>0.1%             | 0<br>0             | 5,147<br>0.4%     | 140,504<br>11.2% |
| 9  | 85,382<br>6.8%              | 0<br>0                    | 2,120<br>0.2%      | 0<br>0            | 87,502<br>7.0%   |
| 10   | 55,577<br>4.4%              | 0<br>0                    | 0<br>0             | 1,734<br>0.1%     | 57,311<br>4.6%   |
| 11   | 28,682<br>2.3%              | 0<br>0                    | 0<br>0             | 0<br>0            | 28,682<br>2.3%   |
| 12   | 18,918<br>1.5%              | 0<br>0                    | 0<br>0             | 0<br>0            | 18,918<br>1.5%   |
| 13   | 10,641<br>0.8%              | 0<br>0                    | 0<br>0             | 0<br>0            | 10,641<br>0.8%   |



| Question 9. How many heated rooms are in this residence? | Dwelling Type               |                           |                    |                   | Total |
|--|-----------------------------|---------------------------|--------------------|-------------------|-------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |       |
| 14   | 6,492                       | 0                         | 0                  | 0                 | 6,492 |
|  | 0.5%                        | 0                         | 0                  | 0                 | 0.5%  |
| 15   | 3,949                       | 0                         | 0                  | 0                 | 3,949 |
|  | 0.3%                        | 0                         | 0                  | 0                 | 0.3%  |
| 16   | 4,907                       | 0                         | 0                  | 0                 | 4,907 |
|  | 0.4%                        | 0                         | 0                  | 0                 | 0.4%  |
| Don't know   | 6,113                       | 0                         | 0                  | 0                 | 6,113 |
|  | 0.5%                        | 0                         | 0                  | 0                 | 0.5%  |

**Table C.14**

| Question 9c. How many heated rooms are in this residence? | Dwelling Type               |                           |                    |                   | Total            |
|---|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| 1   | 5,136<br>0.4%               | 0<br>0                    | 6,880<br>0.5%      | 0<br>0            | 12,016<br>1.0%   |
| 2   | 9,044<br>0.7%               | 5,095<br>0.4%             | 42,883<br>3.4%     | 3,467<br>0.3%     | 60,489<br>4.8%   |
| 3   | 19,958<br>1.6%              | 3,905<br>0.3%             | 40,214<br>3.2%     | 3,467<br>0.3%     | 67,544<br>5.4%   |
| 4   | 66,186<br>5.3%              | 20,573<br>1.6%            | 88,902<br>7.1%     | 13,815<br>1.1%    | 189,476<br>15.1% |
| 5   | 104,897<br>8.4%             | 26,796<br>2.1%            | 29,512<br>2.4%     | 13,180<br>1.1%    | 174,386<br>13.9% |
| 6   | 174,177<br>13.9%            | 14,603<br>1.2%            | 0<br>0             | 8,669<br>0.7%     | 197,449<br>15.7% |
| 7   | 169,676<br>13.5%            | 2,085<br>0.2%             | 6,880<br>0.5%      | 8,719<br>0.7%     | 187,361<br>14.9% |
| 8   | 133,572<br>10.7%            | 1,785<br>0.1%             | 0<br>0             | 5,147<br>0.4%     | 140,504<br>11.2% |
| 9   | 85,382<br>6.8%              | 0<br>0                    | 2,120<br>0.2%      | 0<br>0            | 87,502<br>7.0%   |
| 10  | 55,577<br>4.4%              | 0<br>0                    | 0<br>0             | 1,734<br>0.1%     | 57,311<br>4.6%   |
| More than 10 rooms  | 73,588<br>5.9%              | 0<br>0                    | 0<br>0             | 0<br>0            | 73,588<br>5.9%   |

| Question 9c. How many heated rooms are in this residence? | Dwelling Type               |                           |                    |                   | Total |
|---|-----------------------------|---------------------------|--------------------|-------------------|-------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |       |
| Don't know  | 6,113                       | 0                         | 0                  | 0                 | 6,113 |
|   | 0.5%                        | 0                         | 0                  | 0                 | 0.5%  |

**Table C.15**

| Question 10. How many bathrooms are in this home? | Dwelling Type               |                           |                    |                   | Total   |
|---|-----------------------------|---------------------------|--------------------|-------------------|---------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |         |
| None  | 6,692                       | 6,880                     | 5,095              | 0                 | 18,667  |
|   | 0.5%                        | 0.5%                      | 0.4%               | 0                 | 1.5%    |
| 1   | 136,885                     | 10,191                    | 162,994            | 19,122            | 329,191 |
|   | 10.9%                       | 0.8%                      | 13.0%              | 1.5%              | 26.3%   |
| 1.25  | 10,574                      | 0                         | 0                  | 0                 | 10,574  |
|   | 0.8%                        | 0                         | 0                  | 0                 | 0.8%    |
| 1.5   | 54,152                      | 7,856                     | 5,095              | 1,734             | 68,838  |
|   | 4.3%                        | 0.6%                      | 0.4%               | 0.1%              | 5.5%    |
| 1.75  | 33,802                      | 2,120                     | 0                  | 3,467             | 39,390  |
|   | 2.7%                        | 0.2%                      | 0                  | 0.3%              | 3.1%    |
| 2   | 268,038                     | 18,659                    | 40,001             | 33,877            | 360,574 |
|   | 21.4%                       | 1.5%                      | 3.2%               | 2.7%              | 28.8%   |
| 2.25  | 140,816                     | 21,360                    | 2,085              | 0                 | 164,261 |
|   | 11.2%                       | 1.7%                      | 0.2%               | 0                 | 13.1%   |
| 2.5   | 10,261                      | 0                         | 0                  | 0                 | 10,261  |
|   | 0.8%                        | 0                         | 0                  | 0                 | 0.8%    |
| 2.75  | 206,104                     | 7,775                     | 0                  | 0                 | 213,878 |
|   | 16.4%                       | 0.6%                      | 0                  | 0                 | 17.1%   |
| 3   | 3,949                       | 0                         | 0                  | 0                 | 3,949   |
|   | 0.3%                        | 0                         | 0                  | 0                 | 0.3%    |
| 3.5   | 9,615                       | 0                         | 2,120              | 0                 | 11,736  |
|   | 0.8%                        | 0                         | 0.2%               | 0                 | 0.9%    |

| Question 10. How many bathrooms are in this home? | Dwelling Type               |                           |                    |                   | Total  |
|---|-----------------------------|---------------------------|--------------------|-------------------|--------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |        |
| 4   | 22,420                      | 0                         | 0                  | 0                 | 22,420 |
|   | 1.8%                        | 0                         | 0                  | 0                 | 1.8%   |

**Table C.16**

| Question 11c. In what year was this residence built? | Dwelling Type               |                           |                    |                   | Total   |
|--|-----------------------------|---------------------------|--------------------|-------------------|---------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |         |
| Before 1940  | 106,474                     | 0                         | 20,604             | 0                 | 127,078 |
|  | 8.5%                        | 0                         | 1.6%               | 0                 | 10.1%   |
| 1940 to 1959   | 126,295                     | 2,164                     | 4,546              | 3,518             | 136,523 |
|  | 10.1%                       | 0.2%                      | 0.4%               | 0.3%              | 10.9%   |
| 1960 to 1979   | 285,927                     | 29,368                    | 53,038             | 20,696            | 389,029 |
|  | 22.8%                       | 2.3%                      | 4.2%               | 1.7%              | 31.0%   |
| 1980 to 1985   | 64,301                      | 0                         | 10,191             | 8,669             | 83,160  |
|  | 5.1%                        | 0                         | 0.8%               | 0.7%              | 6.6%    |
| 1986 to 1990   | 70,414                      | 3,949                     | 22,466             | 8,324             | 105,153 |
|  | 5.6%                        | 0.3%                      | 1.8%               | 0.7%              | 8.4%    |
| 1991 to 1995   | 84,874                      | 4,206                     | 2,164              | 3,123             | 94,367  |
|  | 6.8%                        | 0.3%                      | 0.2%               | 0.2%              | 7.5%    |
| 1996 to 2000   | 79,551                      | 9,974                     | 23,732             | 1,734             | 114,991 |
|  | 6.3%                        | 0.8%                      | 1.9%               | 0.1%              | 9.2%    |
| 2001 to 2002   | 20,883                      | 2,120                     | 7,216              | 1,734             | 31,952  |
|  | 1.7%                        | 0.2%                      | 0.6%               | 0.1%              | 2.5%    |
| 2003 to 2004   | 16,687                      | 2,085                     | 6,335              | 3,467             | 28,574  |
|  | 1.3%                        | 0.2%                      | 0.5%               | 0.3%              | 2.3%    |

| Question 11c. In what year was this residence built? | Dwelling Type               |                           |                    |                   | Total           |
|--|-----------------------------|---------------------------|--------------------|-------------------|-----------------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                 |
| 2005   | 5,733<br>0.5%               | 0<br>0                    | 5,095<br>0.4%      | 0<br>0            | 10,829<br>0.9%  |
| 2006   | 7,983<br>0.6%               | 3,905<br>0.3%             | 0<br>0             | 0<br>0            | 11,888<br>0.9%  |
| 2007   | 6,113<br>0.5%               | 1,785<br>0.1%             | 0<br>0             | 0<br>0            | 7,897<br>0.6%   |
| 2008   | 1,734<br>0.1%               | 0<br>0                    | 0<br>0             | 1,734<br>0.1%     | 3,467<br>0.3%   |
| Don't know   | 26,339<br>2.1%              | 15,286<br>1.2%            | 62,003<br>4.9%     | 5,201<br>0.4%     | 108,830<br>8.7% |

**Table C.17**

| Question 11a. Although you aren't sure about the actual year your home was built can you identify which from this list is the closest general time frame? | Dwelling Type               |                           |                    |                   | Total              |
|---|-----------------------------|---------------------------|--------------------|-------------------|--------------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                    |
| Before 1940   | 4,546<br>0.4%               | 0<br>0                    | 0<br>0             | 0<br>0            | 4,546<br>0.4%      |
| 1940 to 1959  | 4,907<br>0.4%               | 0<br>0                    | 0<br>0             | 0<br>0            | 4,907<br>0.4%      |
| 1960 to 1979  | 6,692<br>0.5%               | 10,191<br>0.8%            | 27,562<br>2.2%     | 1,734<br>0.1%     | 46,178<br>3.7%     |
| 1980 to 1985  | 0<br>0                      | 0<br>0                    | 5,095<br>0.4%      | 0<br>0            | 5,095<br>0.4%      |
| 1986 to 1990  | 0<br>0                      | 0<br>0                    | 1,785<br>0.1%      | 1,734<br>0.1%     | 3,518<br>0.3%      |
| 1991 to 1995  | 1,785<br>0.1%               | 0<br>0                    | 0<br>0             | 1,734<br>0.1%     | 3,518<br>0.3%      |
| 1996 to 2000  | 0<br>0                      | 0<br>0                    | 12,276<br>1.0%     | 0<br>0            | 12,276<br>1.0%     |
| Don't know  | 8,410<br>0.7%               | 5,095<br>0.4%             | 15,286<br>1.2%     | 0<br>0            | 28,791<br>2.3%     |
| Not applicable  | 876,968<br>69.9%            | 59,556<br>4.8%            | 155,387<br>12.4%   | 52,998<br>4.2%    | 1,144,909<br>91.3% |

**Table C.18**

| Question 12. Does the main heating system serve only this residence or does it serve more than one residence? | Dwelling Type               |                           |                    |                   | Total   |
|---|-----------------------------|---------------------------|--------------------|-------------------|---------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |         |
| Only this residence   | 0                           | 74,841                    | 188,716            | 0                 | 263,557 |
|   | 0                           | 6.0%                      | 15.1%              | 0                 | 21.0%   |
| More than one residence   | 0                           | 0                         | 21,459             | 0                 | 21,459  |
|   | 0                           | 0                         | 1.7%               | 0                 | 1.7%    |
| Don't know  | 0                           | 0                         | 7,216              | 0                 | 7,216   |
|   | 0                           | 0                         | 0.6%               | 0                 | 0.6%    |
| Not applicable  | 903,308                     | 0                         | 0                  | 58,199            | 961,507 |
|   | 72.0%                       | 0                         | 0                  | 4.6%              | 76.7%   |

**Table C.19**

| Question 13. What is the type of system that is used to heat the majority of your home? | Dwelling Type               |                           |                    |                   | Total   |
|---|-----------------------------|---------------------------|--------------------|-------------------|---------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |         |
| Natural Gas: Central forced air furnace   | 587,469                     | 29,167                    | 24,387             | 8,665             | 649,688 |
|   | 46.9%                       | 2.3%                      | 1.9%               | 0.7%              | 51.8%   |
| Natural Gas: Hot water boiler   | 11,846                      | 0                         | 2,120              | 3,413             | 17,380  |
|   | 0.9%                        | 0                         | 0.2%               | 0.3%              | 1.4%    |
| Electric: Hot water boiler  | 12,836                      | 0                         | 10,191             | 3,467             | 26,494  |
|   | 1.0%                        | 0                         | 0.8%               | 0.3%              | 2.1%    |
| Natural Gas: Steam boiler   | 3,569                       | 0                         | 0                  | 0                 | 3,569   |
|   | 0.3%                        | 0                         | 0                  | 0                 | 0.3%    |
| Natural Gas: Radiant floor heating  | 1,785                       | 0                         | 0                  | 0                 | 1,785   |
|   | 0.1%                        | 0                         | 0                  | 0                 | 0.1%    |



| Question 13. What is the type of system that is used to heat the majority of your home? | Dwelling Type               |                           |                    |                   | Total            |
|---|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| Natural Gas: Fireplace or stove   | 18,008<br>1.4%              | 0<br>0                    | 14,396<br>1.1%     | 0<br>0            | 32,404<br>2.6%   |
| Electric: Baseboard, wall heaters, ceiling cables, or floor cables                      | 51,046<br>4.1%              | 22,278<br>1.8%            | 112,145<br>8.9%    | 6,935<br>0.6%     | 192,404<br>15.3% |
| Electric: Wall heaters with fans  | 17,399<br>1.4%              | 2,085<br>0.2%             | 5,095<br>0.4%      | 0<br>0            | 24,579<br>2.0%   |
| Electric: Central forced air furnace  | 29,127<br>2.3%              | 7,216<br>0.6%             | 0<br>0             | 17,337<br>1.4%    | 53,680<br>4.3%   |
| Electric: Air-source heat pump  | 21,676<br>1.7%              | 0<br>0                    | 0<br>0             | 8,324<br>0.7%     | 30,000<br>2.4%   |
| Electric: Ground-source heat pump   | 7,021<br>0.6%               | 0<br>0                    | 0<br>0             | 0<br>0            | 7,021<br>0.6%    |
| Electric: Portable heaters  | 6,246<br>0.5%               | 0<br>0                    | 0<br>0             | 1,734<br>0.1%     | 7,979<br>0.6%    |
| Oil: Central forced air furnace   | 23,593<br>1.9%              | 0<br>0                    | 0<br>0             | 0<br>0            | 23,593<br>1.9%   |
| Oil: Hot water boiler (with radiators, baseboards, or in floor)                         | 3,123<br>0.2%               | 0<br>0                    | 0<br>0             | 0<br>0            | 3,123<br>0.2%    |
| Bottled Gas: Central forced air (propane, butane, kerosene)                             | 14,620<br>1.2%              | 0<br>0                    | 0<br>0             | 0<br>0            | 14,620<br>1.2%   |
| Bottled Gas: Portable heaters (propane, butane, kerosene)                               | 6,246<br>0.5%               | 0<br>0                    | 0<br>0             | 0<br>0            | 6,246<br>0.5%    |
| Wood: Wood stove or pellet stove  | 22,502<br>1.8%              | 5,095<br>0.4%             | 0<br>0             | 3,123<br>0.2%     | 30,720<br>2.5%   |

| Question 13. What is the type of system that is used to heat the majority of your home? | Dwelling Type               |                           |                    |                   | Total          |
|---|-----------------------------|---------------------------|--------------------|-------------------|----------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                |
| Wood: Fireplace   | 8,410<br>0.7%               | 0<br>0                    | 0<br>0             | 1,734<br>0.1%     | 10,144<br>0.8% |
| Other system and fuel   | 21,297<br>1.7%              | 0<br>0                    | 5,095<br>0.4%      | 0<br>0            | 26,392<br>2.1% |
| None (No heating system)  | 1,785<br>0.1%               | 0<br>0                    | 0<br>0             | 0<br>0            | 1,785<br>0.1%  |
| Don't know  | 30,583<br>2.4%              | 9,000<br>0.7%             | 15,286<br>1.2%     | 3,467<br>0.3%     | 58,336<br>4.7% |
| Refused   | 3,123<br>0.2%               | 0<br>0                    | 0<br>0             | 0<br>0            | 3,123<br>0.2%  |
| Not applicable  | 0<br>0                      | 0<br>0                    | 28,675<br>2.3%     | 0<br>0            | 28,675<br>2.3% |

**Table C.20**

| Question 14. What type of temperature control is on the main heating system? | Dwelling Type               |                           |                    |                   | Total            |
|--|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| Regular thermostat(s) with temperature settings                              | 305,281<br>24.3%            | 37,178<br>3.0%            | 123,361<br>9.8%    | 34,566<br>2.8%    | 500,386<br>39.9% |
| Clock or programmable thermostat(s)  | 503,072<br>40.1%            | 18,473<br>1.5%            | 10,196<br>0.8%     | 13,576<br>1.1%    | 545,317<br>43.5% |
| Dial control without temperature settings                                    | 26,768<br>2.1%              | 5,095<br>0.4%             | 27,562<br>2.2%     | 1,734<br>0.1%     | 61,158<br>4.9%   |
| Simple on/off switch or no temperature control                               | 3,949<br>0.3%               | 0<br>0                    | 12,311<br>1.0%     | 0<br>0            | 16,260<br>1.3%   |
| No response  | 0<br>0                      | 14,095<br>1.1%            | 15,286<br>1.2%     | 8,324<br>0.7%     | 37,705<br>3.0%   |
| Not applicable   | 64,238<br>5.1%              | 0<br>0                    | 28,675<br>2.3%     | 0<br>0            | 92,913<br>7.4%   |

| Question 15. Which of the following describes how the main heating system is used? | Dwelling Type               |                           |                    |                   | Total            |
|--|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| The thermostat(s) is kept at a constant setting or temperature                     | 209,189<br>18.8%            | 22,847<br>2.1%            | 39,838<br>3.6%     | 12,187<br>1.1%    | 284,060<br>25.5% |
| The thermostat is adjusted when occupants are sleeping                             | 536,186<br>48.2%            | 28,328<br>2.5%            | 60,312<br>5.4%     | 27,286<br>2.5%    | 652,111<br>58.6% |
| The thermostat is adjusted when occupants leave the house                          | 367,194<br>33.0%            | 29,130<br>2.6%            | 64,473<br>5.8%     | 29,074<br>2.6%    | 489,872<br>44.0% |
| The heater is turned on only when someone is cold                                  | 145,437<br>13.1%            | 11,578<br>1.0%            | 89,421<br>8.0%     | 12,136<br>1.1%    | 258,572<br>23.2% |

**Table C.21**

| Question 16. Home heating - at what temperature do you normally keep your thermostat? | Dwelling Type               |                           |                    |                   | Total  |
|---|-----------------------------|---------------------------|--------------------|-------------------|--------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |        |
| 0   | 0                           | 0                         | 5,095              | 0                 | 5,095  |
|   | 0                           | 0                         | 0.4%               | 0                 | 0.4%   |
| 50  | 3,123                       | 0                         | 5,095              | 0                 | 8,218  |
|   | 0.2%                        | 0                         | 0.4%               | 0                 | 0.7%   |
| 55  | 3,949                       | 0                         | 5,095              | 1,734             | 10,778 |
|   | 0.3%                        | 0                         | 0.4%               | 0.1%              | 0.9%   |
| 58  | 5,733                       | 0                         | 5,095              | 0                 | 10,829 |
|   | 0.5%                        | 0                         | 0.4%               | 0                 | 0.9%   |
| 59  | 1,785                       | 0                         | 0                  | 0                 | 1,785  |
|   | 0.1%                        | 0                         | 0                  | 0                 | 0.1%   |
| 60  | 17,645                      | 0                         | 19,156             | 1,734             | 38,535 |
|   | 1.4%                        | 0                         | 1.5%               | 0.1%              | 3.1%   |
| 62  | 5,354                       | 0                         | 0                  | 0                 | 5,354  |
|   | 0.4%                        | 0                         | 0                  | 0                 | 0.4%   |
| 63  | 8,030                       | 2,085                     | 0                  | 0                 | 10,115 |
|   | 0.6%                        | 0.2%                      | 0                  | 0                 | 0.8%   |
| 64  | 10,331                      | 0                         | 0                  | 0                 | 10,331 |
|   | 0.8%                        | 0                         | 0                  | 0                 | 0.8%   |
| 65  | 38,279                      | 11,085                    | 12,311             | 5,201             | 66,877 |
|   | 3.1%                        | 0.9%                      | 1.0%               | 0.4%              | 5.3%   |
| 66  | 3,949                       | 0                         | 0                  | 0                 | 3,949  |
|   | 0.3%                        | 0                         | 0                  | 0                 | 0.3%   |

| Question 16. Home heating - at what temperature do you normally keep your thermostat? | Dwelling Type               |                           |                    |                   | Total            |
|---|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| 67  | 22,107<br>1.8%              | 0<br>0                    | 5,095<br>0.4%      | 0<br>0            | 27,202<br>2.2%   |
| 68  | 76,812<br>6.1%              | 6,405<br>0.5%             | 21,577<br>1.7%     | 3,467<br>0.3%     | 108,261<br>8.6%  |
| 69  | 19,876<br>1.6%              | 0<br>0                    | 0<br>0             | 0<br>0            | 19,876<br>1.6%   |
| 70  | 78,566<br>6.3%              | 6,880<br>0.5%             | 12,952<br>1.0%     | 10,453<br>0.8%    | 108,851<br>8.7%  |
| 71  | 5,354<br>0.4%               | 2,164<br>0.2%             | 5,095<br>0.4%      | 0<br>0            | 12,613<br>1.0%   |
| 72  | 16,060<br>1.3%              | 0<br>0                    | 10,191<br>0.8%     | 1,734<br>0.1%     | 27,985<br>2.2%   |
| 73  | 3,123<br>0.2%               | 0<br>0                    | 0<br>0             | 0<br>0            | 3,123<br>0.2%    |
| 75  | 8,030<br>0.6%               | 5,884<br>0.5%             | 0<br>0             | 0<br>0            | 13,914<br>1.1%   |
| 76  | 2,164<br>0.2%               | 0<br>0                    | 2,120<br>0.2%      | 0<br>0            | 4,285<br>0.3%    |
| Don't know  | 0<br>0                      | 0<br>0                    | 10,191<br>0.8%     | 0<br>0            | 10,191<br>0.8%   |
| Refused   | 5,287<br>0.4%               | 0<br>0                    | 5,095<br>0.4%      | 0<br>0            | 10,382<br>0.8%   |
| Not applicable  | 567,751<br>45.3%            | 40,338<br>3.2%            | 93,227<br>7.4%     | 33,877<br>2.7%    | 735,192<br>58.6% |

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**Table C.22**

| Question 17. Home heating -<br>at what temperature do you<br>normally keep your thermostat<br>set when one or more people<br>in your household are at home<br>and awake? | Dwelling Type                        |                                 |                       |                      | Total  |
|--|--------------------------------------|---------------------------------|-----------------------|----------------------|--------|
|  | Single<br>family<br>detached<br>home | Duplex,<br>row- or<br>townhouse | Apartment<br>or condo | Manufactured<br>home |        |
| 0  | 0                                    | 0                               | 10,191                | 0                    | 10,191 |
|  | 0                                    | 0                               | 0.8%                  | 0                    | 0.8%   |
| 54   | 1,785                                | 0                               | 0                     | 0                    | 1,785  |
|  | 0.1%                                 | 0                               | 0                     | 0                    | 0.1%   |
| 55   | 0                                    | 0                               | 5,095                 | 0                    | 5,095  |
|  | 0                                    | 0                               | 0.4%                  | 0                    | 0.4%   |
| 59   | 1,785                                | 0                               | 0                     | 0                    | 1,785  |
|  | 0.1%                                 | 0                               | 0                     | 0                    | 0.1%   |
| 60   | 7,072                                | 0                               | 2,085                 | 0                    | 9,157  |
|  | 0.6%                                 | 0                               | 0.2%                  | 0                    | 0.7%   |
| 62   | 9,368                                | 5,095                           | 0                     | 0                    | 14,464 |
|  | 0.7%                                 | 0.4%                            | 0                     | 0                    | 1.2%   |
| 63   | 3,798                                | 0                               | 0                     | 0                    | 3,798  |
|  | 0.3%                                 | 0                               | 0                     | 0                    | 0.3%   |
| 64   | 13,564                               | 0                               | 0                     | 0                    | 13,564 |
|  | 1.1%                                 | 0                               | 0                     | 0                    | 1.1%   |
| 65   | 46,311                               | 16,517                          | 2,085                 | 1,734                | 66,647 |
|  | 3.7%                                 | 1.3%                            | 0.2%                  | 0.1%                 | 5.3%   |
| 66   | 13,184                               | 2,164                           | 0                     | 1,680                | 17,028 |
|  | 1.1%                                 | 0.2%                            | 0                     | 0.1%                 | 1.4%   |



| Question 17. Home heating -<br>at what temperature do you<br>normally keep your thermostat<br>set when one or more people<br>in your household are at home<br>and awake? | Dwelling Type               |                           |                    |                   | Total            |
|--|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| 67   | 71,593<br>5.7%              | 1,785<br>0.1%             | 0<br>0             | 0<br>0            | 73,378<br>5.9%   |
| 68   | 183,475<br>14.6%            | 1,785<br>0.1%             | 19,456<br>1.6%     | 10,402<br>0.8%    | 215,118<br>17.2% |
| 69   | 53,262<br>4.2%              | 3,949<br>0.3%             | 0<br>0             | 0<br>0            | 57,211<br>4.6%   |
| 70   | 133,288<br>10.6%            | 2,164<br>0.2%             | 21,399<br>1.7%     | 8,614<br>0.7%     | 165,465<br>13.2% |
| 71   | 19,413<br>1.5%              | 2,085<br>0.2%             | 2,085<br>0.2%      | 1,734<br>0.1%     | 25,317<br>2.0%   |
| 72   | 18,421<br>1.5%              | 0<br>0                    | 7,216<br>0.6%      | 6,590<br>0.5%     | 32,226<br>2.6%   |
| 73   | 2,164<br>0.2%               | 0<br>0                    | 0<br>0             | 0<br>0            | 2,164<br>0.2%    |
| 75   | 6,246<br>0.5%               | 0<br>0                    | 7,216<br>0.6%      | 0<br>0            | 13,461<br>1.1%   |
| Don't know   | 3,569<br>0.3%               | 0<br>0                    | 0<br>0             | 1,734<br>0.1%     | 5,303<br>0.4%    |
| Not applicable   | 315,010<br>25.1%            | 39,298<br>3.1%            | 140,562<br>11.2%   | 25,712<br>2.1%    | 520,583<br>41.5% |

**Table C.23**

| Question 18. Home heating -<br>at what temperature do you<br>normally keep your thermostat<br>set when one or more people<br>in your household are at home<br>and everyone is sleeping? | Dwelling Type                        |                                 |                       |                      | Total          |
|---|--------------------------------------|---------------------------------|-----------------------|----------------------|----------------|
|   | Single<br>family<br>detached<br>home | Duplex,<br>row- or<br>townhouse | Apartment<br>or condo | Manufactured<br>home |                |
| 0   | 18,092<br>1.4%                       | 5,095<br>0.4%                   | 14,361<br>1.1%        | 1,734<br>0.1%        | 39,282<br>3.1% |
| 37  | 1,785<br>0.1%                        | 0<br>0                          | 0<br>0                | 0<br>0               | 1,785<br>0.1%  |
| 40  | 5,095<br>0.4%                        | 0<br>0                          | 0<br>0                | 0<br>0               | 5,095<br>0.4%  |
| 45  | 1,785<br>0.1%                        | 2,164<br>0.2%                   | 5,095<br>0.4%         | 0<br>0               | 9,044<br>0.7%  |
| 50  | 17,645<br>1.4%                       | 0<br>0                          | 0<br>0                | 0<br>0               | 17,645<br>1.4% |
| 52  | 2,164<br>0.2%                        | 0<br>0                          | 0<br>0                | 0<br>0               | 2,164<br>0.2%  |
| 53  | 2,164<br>0.2%                        | 0<br>0                          | 0<br>0                | 0<br>0               | 2,164<br>0.2%  |
| 55  | 48,057<br>3.8%                       | 0<br>0                          | 7,181<br>0.6%         | 5,147<br>0.4%        | 60,385<br>4.8% |
| 56  | 6,113<br>0.5%                        | 0<br>0                          | 0<br>0                | 0<br>0               | 6,113<br>0.5%  |
| 57  | 8,410<br>0.7%                        | 0<br>0                          | 0<br>0                | 0<br>0               | 8,410<br>0.7%  |

| Question 18. Home heating -<br>at what temperature do you<br>normally keep your thermostat<br>set when one or more people<br>in your household are at home<br>and everyone is sleeping? | Dwelling Type               |                           |                    |                   | Total            |
|---|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| 58  | 17,892<br>1.4%              | 5,095<br>0.4%             | 0<br>0             | 1,734<br>0.1%     | 24,721<br>2.0%   |
| 59  | 10,574<br>0.8%              | 0<br>0                    | 0<br>0             | 0<br>0            | 10,574<br>0.8%   |
| 60  | 100,136<br>8.0%             | 8,965<br>0.7%             | 3,870<br>0.3%      | 6,935<br>0.6%     | 119,905<br>9.6%  |
| 61  | 12,805<br>1.0%              | 0<br>0                    | 0<br>0             | 1,734<br>0.1%     | 14,538<br>1.2%   |
| 62  | 66,863<br>5.3%              | 2,120<br>0.2%             | 0<br>0             | 1,734<br>0.1%     | 70,717<br>5.6%   |
| 63  | 27,653<br>2.2%              | 0<br>0                    | 0<br>0             | 1,734<br>0.1%     | 29,386<br>2.3%   |
| 64  | 28,515<br>2.3%              | 0<br>0                    | 0<br>0             | 1,680<br>0.1%     | 30,195<br>2.4%   |
| 65  | 107,145<br>8.5%             | 6,069<br>0.5%             | 15,286<br>1.2%     | 6,590<br>0.5%     | 135,090<br>10.8% |
| 66  | 20,931<br>1.7%              | 4,249<br>0.3%             | 4,285<br>0.3%      | 1,734<br>0.1%     | 31,199<br>2.5%   |
| 67  | 23,045<br>1.8%              | 0<br>0                    | 0<br>0             | 0<br>0            | 23,045<br>1.8%   |
| 68  | 45,932<br>3.7%              | 1,785<br>0.1%             | 2,085<br>0.2%      | 1,734<br>0.1%     | 51,536<br>4.1%   |

| Question 18. Home heating -<br>at what temperature do you<br>normally keep your thermostat<br>set when one or more people<br>in your household are at home<br>and everyone is sleeping? | Dwelling Type               |                           |                    |                   | Total   |
|---|-----------------------------|---------------------------|--------------------|-------------------|---------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |         |
| 69  | 2,164                       | 0                         | 0                  | 0                 | 2,164   |
|   | 0.2%                        | 0                         | 0                  | 0                 | 0.2%    |
| 70  | 6,692                       | 0                         | 14,475             | 0                 | 21,167  |
|   | 0.5%                        | 0                         | 1.2%               | 0                 | 1.7%    |
| Don't know  | 3,518                       | 0                         | 10,191             | 0                 | 13,709  |
|   | 0.3%                        | 0                         | 0.8%               | 0                 | 1.1%    |
| Refused   | 3,123                       | 0                         | 0                  | 0                 | 3,123   |
|   | 0.2%                        | 0                         | 0                  | 0                 | 0.2%    |
| Not applicable  | 315,010                     | 39,298                    | 140,562            | 25,712            | 520,583 |
|   | 25.1%                       | 3.1%                      | 11.2%              | 2.1%              | 41.5%   |

**Table C.24**

| Question 19. Home heating -<br>at what temperature do you<br>normally keep your thermostat<br>set when no one is at home? | Dwelling Type               |                           |                    |                   | Total  |
|---|-----------------------------|---------------------------|--------------------|-------------------|--------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |        |
| 0   | 44,468                      | 5,095                     | 23,706             | 3,467             | 76,737 |
|   | 3.5%                        | 0.4%                      | 1.9%               | 0.3%              | 6.1%   |
| 40  | 1,734                       | 0                         | 0                  | 0                 | 1,734  |
|   | 0.1%                        | 0                         | 0                  | 0                 | 0.1%   |
| 45  | 4,907                       | 2,164                     | 5,095              | 0                 | 12,167 |
|   | 0.4%                        | 0.2%                      | 0.4%               | 0                 | 1.0%   |

| Question 19. Home heating -<br>at what temperature do you<br>normally keep your thermostat<br>set when no one is at home? | Dwelling Type               |                           |                    |                   | Total   |
|---|-----------------------------|---------------------------|--------------------|-------------------|---------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |         |
| 50  | 26,881                      | 0                         | 2,085              | 1,734             | 30,700  |
|   | 2.1%                        | 0                         | 0.2%               | 0.1%              | 2.4%    |
| 52  | 3,949                       | 0                         | 0                  | 0                 | 3,949   |
|   | 0.3%                        | 0                         | 0                  | 0                 | 0.3%    |
| 53  | 2,014                       | 0                         | 0                  | 0                 | 2,014   |
|   | 0.2%                        | 0                         | 0                  | 0                 | 0.2%    |
| 54  | 3,123                       | 0                         | 0                  | 0                 | 3,123   |
|   | 0.2%                        | 0                         | 0                  | 0                 | 0.2%    |
| 55  | 43,435                      | 0                         | 10,191             | 5,147             | 58,773  |
|   | 3.5%                        | 0                         | 0.8%               | 0.4%              | 4.7%    |
| 56  | 9,236                       | 5,095                     | 0                  | 0                 | 14,331  |
|   | 0.7%                        | 0.4%                      | 0                  | 0                 | 1.1%    |
| 57  | 7,301                       | 0                         | 0                  | 0                 | 7,301   |
|   | 0.6%                        | 0                         | 0                  | 0                 | 0.6%    |
| 58  | 20,123                      | 5,095                     | 0                  | 0                 | 25,219  |
|   | 1.6%                        | 0.4%                      | 0                  | 0                 | 2.0%    |
| 59  | 3,123                       | 0                         | 0                  | 0                 | 3,123   |
|   | 0.2%                        | 0                         | 0                  | 0                 | 0.2%    |
| 60  | 132,382                     | 3,949                     | 8,154              | 6,881             | 151,366 |
|   | 10.6%                       | 0.3%                      | 0.7%               | 0.5%              | 12.1%   |
| 61  | 2,164                       | 0                         | 0                  | 0                 | 2,164   |
|   | 0.2%                        | 0                         | 0                  | 0                 | 0.2%    |

| Question 19. Home heating -<br>at what temperature do you<br>normally keep your thermostat<br>set when no one is at home? | Dwelling Type               |                           |                    |                   | Total  |
|---|-----------------------------|---------------------------|--------------------|-------------------|--------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |        |
| 62  | 47,962                      | 2,120                     | 0                  | 1,734             | 51,816 |
|   | 3.8%                        | 0.2%                      | 0                  | 0.1%              | 4.1%   |
| 63  | 18,188                      | 0                         | 5,095              | 1,734             | 25,017 |
|   | 1.5%                        | 0                         | 0.4%               | 0.1%              | 2.0%   |
| 64  | 24,500                      | 0                         | 0                  | 0                 | 24,500 |
|   | 2.0%                        | 0                         | 0                  | 0                 | 2.0%   |
| 65  | 70,982                      | 3,870                     | 10,191             | 6,590             | 91,633 |
|   | 5.7%                        | 0.3%                      | 0.8%               | 0.5%              | 7.3%   |
| 66  | 18,767                      | 4,249                     | 2,120              | 1,734             | 26,871 |
|   | 1.5%                        | 0.3%                      | 0.2%               | 0.1%              | 2.1%   |
| 67  | 9,615                       | 0                         | 0                  | 1,734             | 11,349 |
|   | 0.8%                        | 0                         | 0                  | 0.1%              | 0.9%   |
| 68  | 30,513                      | 1,785                     | 0                  | 0                 | 32,298 |
|   | 2.4%                        | 0.1%                      | 0                  | 0                 | 2.6%   |
| 69  | 4,178                       | 0                         | 0                  | 0                 | 4,178  |
|   | 0.3%                        | 0                         | 0                  | 0                 | 0.3%   |
| 70  | 8,923                       | 0                         | 0                  | 0                 | 8,923  |
|   | 0.7%                        | 0                         | 0                  | 0                 | 0.7%   |
| 71  | 6,113                       | 0                         | 0                  | 0                 | 6,113  |
|   | 0.5%                        | 0                         | 0                  | 0                 | 0.5%   |
| 72  | 3,123                       | 0                         | 0                  | 0                 | 3,123  |
|   | 0.2%                        | 0                         | 0                  | 0                 | 0.2%   |

| Question 19. Home heating -<br>at what temperature do you<br>normally keep your thermostat<br>set when no one is at home? | Dwelling Type               |                           |                    |                   | Total            |
|---|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| Don't know  | 30,399<br>2.4%              | 2,120<br>0.2%             | 10,191<br>0.8%     | 0<br>0            | 42,710<br>3.4%   |
| Refused   | 10,194<br>0.8%              | 0<br>0                    | 0<br>0             | 1,734<br>0.1%     | 11,928<br>1.0%   |
| Not applicable  | 315,010<br>25.1%            | 39,298<br>3.1%            | 140,562<br>11.2%   | 25,712<br>2.1%    | 520,583<br>41.5% |

**Table C.25**

| Question 20. Does the main cooling system serve only this residence or does it serve more than one residence? | Dwelling Type               |                           |                    |                   | Total            |
|---|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| Only this residence   | 0<br>0                      | 28,114<br>2.2%            | 11,465<br>0.9%     | 0<br>0            | 39,579<br>3.2%   |
| More than one residence   | 0<br>0                      | 0<br>0                    | 11,975<br>1.0%     | 0<br>0            | 11,975<br>1.0%   |
| Residence has more than one cooling system  | 0<br>0                      | 46,728<br>3.7%            | 186,770<br>14.9%   | 0<br>0            | 233,497<br>18.6% |
| Don't know  | 0<br>0                      | 0<br>0                    | 2,085<br>0.2%      | 0<br>0            | 2,085<br>0.2%    |
| Refused   | 0<br>0                      | 0<br>0                    | 5,095<br>0.4%      | 0<br>0            | 5,095<br>0.4%    |

|                |         |   |   |        |         |
|----------------|---------|---|---|--------|---------|
| Not applicable | 903,308 | 0 | 0 | 58,199 | 961,507 |
|                | 72.0%   | 0 | 0 | 4.6%   | 76.7%   |



**Table C.26**

| Question 21. Which of the following is the type of cooling system that is used to cool the majority of home? | Dwelling Type               |                           |                    |                   | Total            |
|--|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| Central air conditioner  | 102,466<br>14.3%            | 12,147<br>1.7%            | 7,216<br>1.0%      | 0<br>0            | 121,828<br>17.0% |
| Air-source heat pump   | 46,593<br>6.5%              | 0<br>0                    | 0<br>0             | 10,058<br>1.4%    | 56,650<br>7.9%   |
| Ground-source heat pump  | 17,014<br>2.4%              | 0<br>0                    | 0<br>0             | 1,734<br>0.2%     | 18,747<br>2.6%   |
| Room air conditioners  | 51,626<br>7.2%              | 7,181<br>1.0%             | 0<br>0             | 8,719<br>1.2%     | 67,526<br>9.4%   |
| Ductless mini-split air conditioner  | 0<br>0                      | 0<br>0                    | 0<br>0             | 0<br>0            | 0<br>0           |
| Evaporative cooler (swamp cooler)  | 4,907<br>0.7%               | 0<br>0                    | 0<br>0             | 4,857<br>0.7%     | 9,764<br>1.4%    |
| Portable fans  | 336,802<br>47.1%            | 4,206<br>0.6%             | 2,164<br>0.3%      | 22,538<br>3.2%    | 365,710<br>51.1% |
| Whole-house fan  | 34,827<br>4.9%              | 0<br>0                    | 0<br>0             | 5,201<br>0.7%     | 40,029<br>5.6%   |
| Ceiling fans   | 204,619<br>28.6%            | 1,785<br>0.2%             | 0<br>0             | 15,603<br>2.2%    | 222,007<br>31.0% |
| Something else (specify)   | 2,164<br>0.3%               | 0<br>0                    | 0<br>0             | 0<br>0            | 2,164<br>0.3%    |

**Table C.27**

| Question 22. What type of temperature control is on the main cooling system? | Dwelling Type               |                           |                    |                   | Total            |
|--|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| Regular thermostat(s) with temperature settings                              | 62,783<br>5.0%              | 6,113<br>0.5%             | 0<br>0             | 5,201<br>0.4%     | 74,097<br>5.9%   |
| Clock or programmable thermostat(s)  | 122,586<br>9.8%             | 8,119<br>0.6%             | 7,216<br>0.6%      | 8,324<br>0.7%     | 146,245<br>11.7% |
| Dial control without temperature settings                                    | 15,102<br>1.2%              | 5,095<br>0.4%             | 0<br>0             | 5,201<br>0.4%     | 25,398<br>2.0%   |
| Simple on/off switch or no temperature control                               | 15,443<br>1.2%              | 0<br>0                    | 0<br>0             | 4,857<br>0.4%     | 20,299<br>1.6%   |
| Don't know   | 1,785<br>0.1%               | 0<br>0                    | 0<br>0             | 1,785<br>0.1%     | 3,569<br>0.3%    |
| Not applicable   | 685,609<br>54.7%            | 55,514<br>4.4%            | 210,175<br>16.8%   | 32,832<br>2.6%    | 984,130<br>78.5% |

**Table C.28**

| Question 23. Which of the following statements best describes how the main cooling system is used? | Dwelling Type               |                           |                    |                   | Total             |
|--|-----------------------------|---------------------------|--------------------|-------------------|-------------------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                   |
| The thermostat(s) is kept at a constant setting or temperature                                     | 28,184<br>10.6%             | 7,181<br>2.7%             | 0<br>0             | 5,201<br>2.0%     | 40,566<br>15.3%   |
| The thermostat is adjusted when occupants are sleeping   | 24,138<br>9.1%              | 0<br>0                    | 5,095<br>1.9%      | 6,986<br>2.6%     | 36,219<br>13.6%   |
| The thermostat is adjusted when occupants leave the house  | 11,400<br>4.3%              | 2,164<br>0.8%             | 5,095<br>1.9%      | 3,467<br>1.3%     | 22,127<br>8.3%    |
| The cooling system is turned on only when someone is warm  | 87,927<br>33.1%             | 3,870<br>1.5%             | 7,216<br>2.7%      | 10,058<br>3.8%    | 109,071<br>41.0%  |
| We rarely use this cooling system  | 87,379<br>83.0%             | 6,113<br>5.8%             | 0<br>0             | 11,791<br>11.2%   | 105,283<br>100.0% |

**Table C.29**

| Question 24. Home cooling - at what temperature do you normally keep your thermostat? | Dwelling Type               |                           |                    |                   | Total  |
|---|-----------------------------|---------------------------|--------------------|-------------------|--------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |        |
| 50  | 4,328                       | 0                         | 0                  | 0                 | 4,328  |
|   | 0.3%                        | 0                         | 0                  | 0                 | 0.3%   |
| 55  | 3,123                       | 0                         | 0                  | 0                 | 3,123  |
|   | 0.2%                        | 0                         | 0                  | 0                 | 0.2%   |
| 60  | 5,354                       | 5,095                     | 0                  | 1,734             | 12,183 |
|   | 0.4%                        | 0.4%                      | 0                  | 0.1%              | 1.0%   |
| 62  | 2,164                       | 0                         | 0                  | 0                 | 2,164  |
|   | 0.2%                        | 0                         | 0                  | 0                 | 0.2%   |
| 64  | 4,178                       | 0                         | 0                  | 0                 | 4,178  |
|   | 0.3%                        | 0                         | 0                  | 0                 | 0.3%   |
| 65  | 6,492                       | 3,870                     | 0                  | 0                 | 10,362 |
|   | 0.5%                        | 0.3%                      | 0                  | 0                 | 0.8%   |
| 67  | 5,682                       | 2,164                     | 0                  | 0                 | 7,847  |
|   | 0.5%                        | 0.2%                      | 0                  | 0                 | 0.6%   |
| 68  | 15,548                      | 0                         | 0                  | 0                 | 15,548 |
|   | 1.2%                        | 0                         | 0                  | 0                 | 1.2%   |
| 69  | 5,287                       | 0                         | 0                  | 0                 | 5,287  |
|   | 0.4%                        | 0                         | 0                  | 0                 | 0.4%   |
| 70  | 31,276                      | 0                         | 5,095              | 3,467             | 39,839 |
|   | 2.5%                        | 0                         | 0.4%               | 0.3%              | 3.2%   |
| 71  | 3,898                       | 0                         | 0                  | 0                 | 3,898  |
|   | 0.3%                        | 0                         | 0                  | 0                 | 0.3%   |

| Question 24. Home cooling - at what temperature do you normally keep your thermostat? | Dwelling Type               |                           |                    |                   | Total              |
|---|-----------------------------|---------------------------|--------------------|-------------------|--------------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                    |
| 72  | 26,502<br>2.1%              | 0<br>0                    | 0<br>0             | 0<br>0            | 26,502<br>2.1%     |
| 73  | 3,949<br>0.3%               | 0<br>0                    | 0<br>0             | 0<br>0            | 3,949<br>0.3%      |
| 74  | 13,564<br>1.1%              | 2,164<br>0.2%             | 0<br>0             | 0<br>0            | 15,728<br>1.3%     |
| 75  | 13,184<br>1.1%              | 2,085<br>0.2%             | 0<br>0             | 5,201<br>0.4%     | 20,471<br>1.6%     |
| 78  | 3,949<br>0.3%               | 0<br>0                    | 2,120<br>0.2%      | 1,734<br>0.1%     | 7,803<br>0.6%      |
| 80  | 6,246<br>0.5%               | 0<br>0                    | 0<br>0             | 0<br>0            | 6,246<br>0.5%      |
| 82  | 3,123<br>0.2%               | 0<br>0                    | 0<br>0             | 0<br>0            | 3,123<br>0.2%      |
| 85  | 0<br>0                      | 0<br>0                    | 0<br>0             | 3,123<br>0.2%     | 3,123<br>0.2%      |
| 87  | 3,123<br>0.2%               | 0<br>0                    | 0<br>0             | 0<br>0            | 3,123<br>0.2%      |
| Don't know  | 32,591<br>2.6%              | 1,785<br>0.1%             | 0<br>0             | 8,324<br>0.7%     | 42,700<br>3.4%     |
| Refused   | 4,907<br>0.4%               | 0<br>0                    | 0<br>0             | 0<br>0            | 4,907<br>0.4%      |
| Not applicable  | 704,840<br>56.2%            | 57,678<br>4.6%            | 210,175<br>16.8%   | 34,617<br>2.8%    | 1,007,309<br>80.3% |

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**Table C.30**

| Question 26. Home cooling - at what temperature do you normally keep your thermostat set when one or more people in your household are at home and awake? | Dwelling Type               |                           |                    |                   | Total  |
|---|-----------------------------|---------------------------|--------------------|-------------------|--------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |        |
| 67  | 1,785                       | 0                         | 0                  | 0                 | 1,785  |
|   | 4.6%                        | 0                         | 0                  | 0                 | 4.6%   |
| 68  | 2,164                       | 0                         | 0                  | 0                 | 2,164  |
|   | 5.6%                        | 0                         | 0                  | 0                 | 5.6%   |
| 70  | 6,246                       | 2,164                     | 5,095              | 5,252             | 18,757 |
|   | 16.3%                       | 5.6%                      | 13.3%              | 13.7%             | 48.9%  |
| 71  | 2,164                       | 0                         | 0                  | 0                 | 2,164  |
|   | 5.6%                        | 0                         | 0                  | 0                 | 5.6%   |
| 72  | 3,123                       | 0                         | 0                  | 0                 | 3,123  |
|   | 8.1%                        | 0                         | 0                  | 0                 | 8.1%   |
| 73  | 2,164                       | 0                         | 0                  | 0                 | 2,164  |
|   | 5.6%                        | 0                         | 0                  | 0                 | 5.6%   |
| 74  | 2,164                       | 0                         | 0                  | 0                 | 2,164  |
|   | 5.6%                        | 0                         | 0                  | 0                 | 5.6%   |
| 75  | 0                           | 0                         | 0                  | 1,734             | 1,734  |
|   | 0                           | 0                         | 0                  | 4.5%              | 4.5%   |
| 78  | 2,164                       | 0                         | 0                  | 0                 | 2,164  |
|   | 5.6%                        | 0                         | 0                  | 0                 | 5.6%   |
| Don't know  | 2,164                       | 0                         | 0                  | 0                 | 2,164  |
|   | 5.6%                        | 0                         | 0                  | 0                 | 5.6%   |

**Table C.31**

| Question 27. Home cooling - at what temperature do you normally keep your thermostat set when one or more people in your household are at home and everyone is sleeping? | Dwelling Type               |                           |                    |                   | Total              |
|--|-----------------------------|---------------------------|--------------------|-------------------|--------------------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                    |
| 0  | 6,113<br>0.5%               | 0<br>0                    | 5,095<br>0.4%      | 1,734<br>0.1%     | 12,942<br>1.0%     |
| 60   | 0<br>0                      | 0<br>0                    | 0<br>0             | 1,734<br>0.1%     | 1,734<br>0.1%      |
| 65   | 2,164<br>0.2%               | 0<br>0                    | 0<br>0             | 1,785<br>0.1%     | 3,949<br>0.3%      |
| 68   | 3,123<br>0.2%               | 0<br>0                    | 0<br>0             | 0<br>0            | 3,123<br>0.2%      |
| 70   | 3,123<br>0.2%               | 2,164<br>0.2%             | 0<br>0             | 0<br>0            | 5,287<br>0.4%      |
| 72   | 3,123<br>0.2%               | 0<br>0                    | 0<br>0             | 0<br>0            | 3,123<br>0.2%      |
| 73   | 2,164<br>0.2%               | 0<br>0                    | 0<br>0             | 0<br>0            | 2,164<br>0.2%      |
| 75   | 2,164<br>0.2%               | 0<br>0                    | 0<br>0             | 0<br>0            | 2,164<br>0.2%      |
| 82   | 2,164<br>0.2%               | 0<br>0                    | 0<br>0             | 0<br>0            | 2,164<br>0.2%      |
| Refused  | 0<br>0                      | 0<br>0                    | 0<br>0             | 1,734<br>0.1%     | 1,734<br>0.1%      |
| Not applicable   | 879,170<br>70.1%            | 72,677<br>5.8%            | 212,295<br>16.9%   | 51,214<br>4.1%    | 1,215,356<br>96.9% |



**Table C.32**

| Question 28. Home cooling - at what temperature do you normally keep your thermostat set when no one is at home? | Dwelling Type               |                           |                    |                   | Total          |
|--|-----------------------------|---------------------------|--------------------|-------------------|----------------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                |
| 0  | 7,451<br>0.6%               | 0<br>0                    | 5,095<br>0.4%      | 1,734<br>0.1%     | 14,280<br>1.1% |
| 60   | 0<br>0                      | 0<br>0                    | 0<br>0             | 1,734<br>0.1%     | 1,734<br>0.1%  |
| 66   | 0<br>0                      | 2,164<br>0.2%             | 0<br>0             | 0<br>0            | 2,164<br>0.2%  |
| 67   | 1,785<br>0.1%               | 0<br>0                    | 0<br>0             | 0<br>0            | 1,785<br>0.1%  |
| 68   | 2,164<br>0.2%               | 0<br>0                    | 0<br>0             | 0<br>0            | 2,164<br>0.2%  |
| 70   | 0<br>0                      | 0<br>0                    | 0<br>0             | 1,785<br>0.1%     | 1,785<br>0.1%  |
| 72   | 3,123<br>0.2%               | 0<br>0                    | 0<br>0             | 0<br>0            | 3,123<br>0.2%  |
| 73   | 2,164<br>0.2%               | 0<br>0                    | 0<br>0             | 0<br>0            | 2,164<br>0.2%  |
| 75   | 5,287<br>0.4%               | 0<br>0                    | 0<br>0             | 0<br>0            | 5,287<br>0.4%  |
| 78   | 2,164<br>0.2%               | 0<br>0                    | 0<br>0             | 0<br>0            | 2,164<br>0.2%  |
| Refused  | 0<br>0                      | 0<br>0                    | 0<br>0             | 1,734<br>0.1%     | 1,734<br>0.1%  |

| Question 28. Home cooling - at what temperature do you normally keep your thermostat set when no one is at home? | Dwelling Type               |                           |                    |                   | Total     |
|--|-----------------------------|---------------------------|--------------------|-------------------|-----------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |           |
| Not applicable   | 879,170                     | 72,677                    | 212,295            | 51,214            | 1,215,356 |
|  | 70.1%                       | 5.8%                      | 16.9%              | 4.1%              | 96.9%     |

**Table C.33**

| Question29. Does the water heater or the source of the hot water serve only this residence or does it serve more than one residence? | Dwelling Type               |                           |                    |                   | Total   |
|--|-----------------------------|---------------------------|--------------------|-------------------|---------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |         |
| Only this residence  | 0                           | 74,841                    | 186,552            | 0                 | 261,393 |
|  | 0                           | 6.0%                      | 14.9%              | 0                 | 20.8%   |
| Central water heating or tank for more than one residence  | 0                           | 0                         | 23,959             | 0                 | 23,959  |
|  | 0                           | 0                         | 1.9%               | 0                 | 1.9%    |
| This residence has no hot water  | 0                           | 0                         | 5,095              | 0                 | 5,095   |
|  | 0                           | 0                         | 0.4%               | 0                 | 0.4%    |
| Don't know   | 0                           | 0                         | 1,785              | 0                 | 1,785   |
|  | 0                           | 0                         | 0.1%               | 0                 | 0.1%    |
| Not applicable   | 903,308                     | 0                         | 0                  | 58,199            | 961,507 |
|  | 72.0%                       | 0                         | 0                  | 4.6%              | 76.7%   |

**Table C.34**

| Question30. How many water heaters are at this residence? | Dwelling Type               |                           |                    |                   | Total     |
|---|-----------------------------|---------------------------|--------------------|-------------------|-----------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |           |
| One   | 837,345                     | 74,841                    | 179,336            | 58,199            | 1,149,722 |
|   | 66.8%                       | 6.0%                      | 14.3%              | 4.6%              | 91.7%     |
| Two   | 59,850                      | 0                         | 2,120              | 0                 | 61,970    |
|   | 4.8%                        | 0                         | 0.2%               | 0                 | 4.9%      |
| Three or more   | 2,164                       | 0                         | 5,095              | 0                 | 7,259     |
|   | 0.2%                        | 0                         | 0.4%               | 0                 | 0.6%      |
| Don't know  | 3,949                       | 0                         | 0                  | 0                 | 3,949     |
|   | 0.3%                        | 0                         | 0                  | 0                 | 0.3%      |
| Not applicable  | 0                           | 0                         | 30,839             | 0                 | 30,839    |
|   | 0                           | 0                         | 2.5%               | 0                 | 2.5%      |

**Table C.35**

| Question 31. What type of water heater do you have?               | Dwelling Type               |                           |                    |                   | Total              |
|---|-----------------------------|---------------------------|--------------------|-------------------|--------------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                    |
| Tank-type water heater  | 858,648<br>68.5%            | 67,962<br>5.4%            | 169,180<br>13.5%   | 54,732<br>4.4%    | 1,150,522<br>91.8% |
| Indirect water heater or integrated water heater                  | 11,599<br>0.9%              | 0<br>0                    | 2,085<br>0.2%      | 0<br>0            | 13,685<br>1.1%     |
| Tankless hotwater heater aka demand or instantaneous water heater | 25,989<br>2.1%              | 0<br>0                    | 5,095<br>0.4%      | 1,734<br>0.1%     | 32,818<br>2.6%     |
| Don't know  | 7,072<br>0.6%               | 6,880<br>0.5%             | 10,191<br>0.8%     | 1,734<br>0.1%     | 25,876<br>2.1%     |
| Not applicable  | 0<br>0                      | 0<br>0                    | 30,839<br>2.5%     | 0<br>0            | 30,839<br>2.5%     |

**Table C.36**

| Question 32. What type of system is used in conjunction with your solar water heater? | Dwelling Type               |                           |                    |                   | Total               |
|---|-----------------------------|---------------------------|--------------------|-------------------|---------------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                     |
| Not applicable  | 903,308<br>72.0%            | 74,841<br>6.0%            | 217,390<br>17.3%   | 58,199<br>4.6%    | 1,253,739<br>100.0% |

**Table C.37**

| Question 32a. What is the secondary or back-up type of fuel you use to heat water at this residence? | Dwelling Type               |                           |                    |                   | Total     |
|--|-----------------------------|---------------------------|--------------------|-------------------|-----------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |           |
| Not applicable   | 903,308                     | 74,841                    | 217,390            | 58,199            | 1,253,739 |
|  | 72.0%                       | 6.0%                      | 17.3%              | 4.6%              | 100.0%    |

**Table C.38**

| Question 33. What type of fuel or energy is used to heat the water used in this residence? | Dwelling Type               |                           |                    |                   | Total   |
|--|-----------------------------|---------------------------|--------------------|-------------------|---------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |         |
| Electricity  | 304,336                     | 30,763                    | 140,897            | 47,800            | 523,797 |
|  | 24.3%                       | 2.5%                      | 11.2%              | 3.8%              | 41.8%   |
| Natural gas  | 564,409                     | 35,113                    | 31,559             | 8,665             | 639,746 |
|  | 45.0%                       | 2.8%                      | 2.5%               | 0.7%              | 51.0%   |
| Propane or bottled gas (LP, propane, butane)   | 25,327                      | 0                         | 0                  | 0                 | 25,327  |
|  | 2.0%                        | 0                         | 0                  | 0                 | 2.0%    |
| Don't know   | 2,164                       | 2,085                     | 3,905              | 0                 | 8,154   |
|  | 0.2%                        | 0.2%                      | 0.3%               | 0                 | 0.7%    |
| Not applicable   | 7,072                       | 6,880                     | 41,029             | 1,734             | 56,714  |
|  | 0.6%                        | 0.5%                      | 3.3%               | 0.1%              | 4.5%    |

**Table C.39**

| Question 34. At what specific temperature is your water heater thermostat set? | Dwelling Type               |                           |                    |                   | Total  |
|--|-----------------------------|---------------------------|--------------------|-------------------|--------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |        |
| 69   | 0                           | 2,164                     | 0                  | 0                 | 2,164  |
|  | 0                           | 0.2%                      | 0                  | 0                 | 0.2%   |
| 70   | 3,949                       | 0                         | 0                  | 0                 | 3,949  |
|  | 0.3%                        | 0                         | 0                  | 0                 | 0.3%   |
| 72   | 0                           | 0                         | 5,095              | 0                 | 5,095  |
|  | 0                           | 0                         | 0.4%               | 0                 | 0.4%   |
| 75   | 1,785                       | 0                         | 0                  | 0                 | 1,785  |
|  | 0.1%                        | 0                         | 0                  | 0                 | 0.1%   |
| 80   | 3,123                       | 0                         | 0                  | 0                 | 3,123  |
|  | 0.2%                        | 0                         | 0                  | 0                 | 0.2%   |
| 85   | 3,123                       | 0                         | 0                  | 0                 | 3,123  |
|  | 0.2%                        | 0                         | 0                  | 0                 | 0.2%   |
| 90   | 4,328                       | 0                         | 0                  | 0                 | 4,328  |
|  | 0.3%                        | 0                         | 0                  | 0                 | 0.3%   |
| 98   | 3,569                       | 0                         | 0                  | 0                 | 3,569  |
|  | 0.3%                        | 0                         | 0                  | 0                 | 0.3%   |
| 100  | 20,256                      | 0                         | 5,095              | 3,123             | 28,474 |
|  | 1.6%                        | 0                         | 0.4%               | 0.2%              | 2.3%   |
| 102  | 9,236                       | 0                         | 0                  | 0                 | 9,236  |
|  | 0.7%                        | 0                         | 0                  | 0                 | 0.7%   |

| Question 34. At what specific temperature is your water heater thermostat set? | Dwelling Type               |                           |                    |                   | Total   |
|--|-----------------------------|---------------------------|--------------------|-------------------|---------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |         |
| 105  | 3,123                       | 0                         | 0                  | 0                 | 3,123   |
|  | 0.2%                        | 0                         | 0                  | 0                 | 0.2%    |
| 109  | 1,785                       | 0                         | 0                  | 0                 | 1,785   |
|  | 0.1%                        | 0                         | 0                  | 0                 | 0.1%    |
| 110  | 38,566                      | 0                         | 5,095              | 0                 | 43,662  |
|  | 3.1%                        | 0                         | 0.4%               | 0                 | 3.5%    |
| 114  | 1,785                       | 0                         | 0                  | 0                 | 1,785   |
|  | 0.1%                        | 0                         | 0                  | 0                 | 0.1%    |
| 115  | 25,112                      | 2,085                     | 0                  | 0                 | 27,198  |
|  | 2.0%                        | 0.2%                      | 0                  | 0                 | 2.2%    |
| 118  | 0                           | 0                         | 0                  | 1,734             | 1,734   |
|  | 0                           | 0                         | 0                  | 0.1%              | 0.1%    |
| 120  | 158,641                     | 11,569                    | 10,191             | 8,614             | 189,015 |
|  | 12.7%                       | 0.9%                      | 0.8%               | 0.7%              | 15.1%   |
| 125  | 29,190                      | 2,164                     | 0                  | 0                 | 31,355  |
|  | 2.3%                        | 0.2%                      | 0                  | 0                 | 2.5%    |
| 130  | 25,163                      | 0                         | 2,085              | 1,734             | 28,982  |
|  | 2.0%                        | 0                         | 0.2%               | 0.1%              | 2.3%    |
| 135  | 4,907                       | 0                         | 0                  | 1,734             | 6,641   |
|  | 0.4%                        | 0                         | 0                  | 0.1%              | 0.5%    |
| 140  | 43,316                      | 0                         | 0                  | 4,857             | 48,172  |
|  | 3.5%                        | 0                         | 0                  | 0.4%              | 3.8%    |

| Question 34. At what specific temperature is your water heater thermostat set? | Dwelling Type               |                           |                    |                   | Total   |
|--|-----------------------------|---------------------------|--------------------|-------------------|---------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |         |
| 145  | 2,164                       | 0                         | 0                  | 0                 | 2,164   |
|  | 0.2%                        | 0                         | 0                  | 0                 | 0.2%    |
| 150  | 4,546                       | 0                         | 0                  | 0                 | 4,546   |
|  | 0.4%                        | 0                         | 0                  | 0                 | 0.4%    |
| 155  | 1,785                       | 0                         | 0                  | 0                 | 1,785   |
|  | 0.1%                        | 0                         | 0                  | 0                 | 0.1%    |
| 160  | 2,164                       | 0                         | 0                  | 1,734             | 3,898   |
|  | 0.2%                        | 0                         | 0                  | 0.1%              | 0.3%    |
| 165  | 8,410                       | 0                         | 0                  | 0                 | 8,410   |
|  | 0.7%                        | 0                         | 0                  | 0                 | 0.7%    |
| 170  | 3,123                       | 0                         | 0                  | 1,734             | 4,857   |
|  | 0.2%                        | 0                         | 0                  | 0.1%              | 0.4%    |
| 180  | 7,072                       | 0                         | 0                  | 0                 | 7,072   |
|  | 0.6%                        | 0                         | 0                  | 0                 | 0.6%    |
| 185  | 0                           | 0                         | 0                  | 1,734             | 1,734   |
|  | 0                           | 0                         | 0                  | 0.1%              | 0.1%    |
| 190  | 0                           | 0                         | 2,085              | 0                 | 2,085   |
|  | 0                           | 0                         | 0.2%               | 0                 | 0.2%    |
| Don't know   | 493,088                     | 56,859                    | 156,905            | 31,203            | 738,055 |
|  | 39.3%                       | 4.5%                      | 12.5%              | 2.5%              | 58.9%   |
| Not applicable   | 0                           | 0                         | 30,839             | 0                 | 30,839  |
|  | 0                           | 0                         | 2.5%               | 0                 | 2.5%    |



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**Table C.40**

| Question 34a. If not set at a specific temperature then which of these statements best describes where your water heater thermostat is set? | Dwelling Type               |                           |                    |                   | Total            |
|---|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| On the 'low' setting  | 15,276<br>1.2%              | 1,785<br>0.1%             | 15,286<br>1.2%     | 3,467<br>0.3%     | 35,814<br>2.9%   |
| Between the 'low' and 'medium' settings   | 41,565<br>3.3%              | 15,286<br>1.2%            | 6,880<br>0.5%      | 3,413<br>0.3%     | 67,144<br>5.4%   |
| On the 'medium' setting   | 211,363<br>16.9%            | 7,216<br>0.6%             | 60,935<br>4.9%     | 13,921<br>1.1%    | 293,434<br>23.4% |
| Between the 'medium' and 'high' setting   | 116,661<br>9.3%             | 13,172<br>1.1%            | 36,017<br>2.9%     | 5,201<br>0.4%     | 171,051<br>13.6% |
| On the 'high' setting   | 18,851<br>1.5%              | 4,925<br>0.4%             | 0<br>0             | 0<br>0            | 23,776<br>1.9%   |
| Don't know  | 89,373<br>7.1%              | 14,475<br>1.2%            | 37,787<br>3.0%     | 5,201<br>0.4%     | 146,836<br>11.7% |
| Not applicable  | 410,219<br>32.7%            | 17,983<br>1.4%            | 60,486<br>4.8%     | 26,996<br>2.2%    | 515,684<br>41.1% |

**Table C.41**

| Question 35. Which of the following items do you have for your main water heater? Do you have a water heater tank wrap? | Dwelling Type               |                           |                    |                   | Total   |
|---|-----------------------------|---------------------------|--------------------|-------------------|---------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |         |
| Yes   | 325,856                     | 14,139                    | 41,993             | 22,085            | 404,073 |
|   | 26.0%                       | 1.1%                      | 3.3%               | 1.8%              | 32.2%   |
| No  | 537,090                     | 51,737                    | 115,134            | 29,179            | 733,140 |
|   | 42.8%                       | 4.1%                      | 9.2%               | 2.3%              | 58.5%   |
| Don't know  | 40,362                      | 8,965                     | 29,425             | 6,935             | 85,687  |
|   | 3.2%                        | 0.7%                      | 2.3%               | 0.6%              | 6.8%    |
| Not applicable  | 0                           | 0                         | 30,839             | 0                 | 30,839  |
|   | 0                           | 0                         | 2.5%               | 0                 | 2.5%    |

**Table C.42**

| Question 36. Which of the following items do you have for your main water heater? Do you have pipe insulation? | Dwelling Type               |                           |                    |                   | Total   |
|--|-----------------------------|---------------------------|--------------------|-------------------|---------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |         |
| Yes  | 526,110                     | 31,294                    | 52,148             | 32,542            | 642,094 |
|  | 42.0%                       | 2.5%                      | 4.2%               | 2.6%              | 51.2%   |
| No   | 313,408                     | 29,701                    | 87,864             | 15,255            | 446,229 |
|  | 25.0%                       | 2.4%                      | 7.0%               | 1.2%              | 35.6%   |
| Don't know   | 63,789                      | 13,847                    | 46,539             | 10,402            | 134,577 |
|  | 5.1%                        | 1.1%                      | 3.7%               | 0.8%              | 10.7%   |
| Not applicable   | 0                           | 0                         | 30,839             | 0                 | 30,839  |
|  | 0                           | 0                         | 2.5%               | 0                 | 2.5%    |

**Table C.43**

| Question 37. Which of the following items do you have for your main water heater? Do you have a water heater timer? | Dwelling Type               |                           |                    |                   | Total            |
|---|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| Yes   | 101,248<br>8.1%             | 4,328<br>0.3%             | 7,181<br>0.6%      | 1,734<br>0.1%     | 114,490<br>9.1%  |
| No  | 701,360<br>55.9%            | 54,633<br>4.4%            | 132,919<br>10.6%   | 46,013<br>3.7%    | 934,925<br>74.6% |
| Don't know  | 100,701<br>8.0%             | 15,880<br>1.3%            | 46,452<br>3.7%     | 10,453<br>0.8%    | 173,485<br>13.8% |
| Not applicable  | 0<br>0                      | 0<br>0                    | 30,839<br>2.5%     | 0<br>0            | 30,839<br>2.5%   |

**Table C.44**

| Question 38. How many refrigerators are in your home? | Dwelling Type               |                           |                    |                   | Total            |
|---|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| 1   | 604,450<br>48.2%            | 57,643<br>4.6%            | 208,390<br>16.6%   | 52,998<br>4.2%    | 923,482<br>73.7% |
| 2   | 285,673<br>22.8%            | 17,198<br>1.4%            | 9,000<br>0.7%      | 5,201<br>0.4%     | 317,073<br>25.3% |
| 3   | 11,020<br>0.9%              | 0<br>0                    | 0<br>0             | 0<br>0            | 11,020<br>0.9%   |
| 4   | 2,164<br>0.2%               | 0<br>0                    | 0<br>0             | 0<br>0            | 2,164<br>0.2%    |

**Table C.45**

| Question 39. How many years old is your primary refrigerator? | Dwelling Type               |                           |                    |                   | Total            |
|---|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| 6 or less years old   | 515,265<br>41.1%            | 42,357<br>3.4%            | 112,451<br>9.0%    | 20,855<br>1.7%    | 690,929<br>55.1% |
| 7 to 14 years old   | 260,132<br>20.7%            | 20,509<br>1.6%            | 58,004<br>4.6%     | 16,884<br>1.3%    | 355,529<br>28.4% |
| 15 or more years old  | 119,054<br>9.5%             | 6,880<br>0.5%             | 21,459<br>1.7%     | 10,402<br>0.8%    | 157,796<br>12.6% |
| Don't know  | 8,856<br>0.7%               | 5,095<br>0.4%             | 25,476<br>2.0%     | 10,058<br>0.8%    | 49,485<br>3.9%   |

**Table C.46**

| Question 40. How many stand-alone freezers are in your home? | Dwelling Type               |                           |                    |                   | Total            |
|--|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| 0  | 403,027<br>32.1%            | 58,831<br>4.7%            | 207,200<br>16.5%   | 25,607<br>2.0%    | 694,664<br>55.4% |
| 1  | 460,428<br>36.7%            | 16,011<br>1.3%            | 10,191<br>0.8%     | 30,859<br>2.5%    | 517,488<br>41.3% |
| 2  | 39,853<br>3.2%              | 0<br>0                    | 0<br>0             | 1,734<br>0.1%     | 41,586<br>3.3%   |

**Table C.47**

| Question 41. How many years old is your 'primary' stand-alone freezer? | Dwelling Type               |                           |                    |                   | Total            |
|--|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| 6 or less years old  | 152,428<br>12.2%            | 9,345<br>0.7%             | 0<br>0             | 10,453<br>0.8%    | 172,225<br>13.7% |
| 7 to 14 years old  | 140,196<br>11.2%            | 6,666<br>0.5%             | 5,095<br>0.4%      | 6,935<br>0.6%     | 158,892<br>12.7% |
| 15 or more years old   | 197,514<br>15.8%            | 0<br>0                    | 0<br>0             | 13,471<br>1.1%    | 210,985<br>16.8% |
| Don't know   | 10,144<br>0.8%              | 0<br>0                    | 5,095<br>0.4%      | 1,734<br>0.1%     | 16,973<br>1.4%   |
| Not applicable   | 403,027<br>32.1%            | 58,831<br>4.7%            | 207,200<br>16.5%   | 25,607<br>2.0%    | 694,664<br>55.4% |

**Table C.48**

| Question 42. How many dishwashers are in your home? | Dwelling Type               |                           |                    |                   | Total              |
|---|-----------------------------|---------------------------|--------------------|-------------------|--------------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                    |
| 0   | 74,117<br>5.9%              | 2,164<br>0.2%             | 43,712<br>3.5%     | 13,870<br>1.1%    | 133,862<br>10.7%   |
| 1   | 820,715<br>65.5%            | 72,677<br>5.8%            | 171,558<br>13.7%   | 44,330<br>3.5%    | 1,109,280<br>88.5% |
| 2   | 8,476<br>0.7%               | 0<br>0                    | 2,120<br>0.2%      | 0<br>0            | 10,597<br>0.8%     |

**Table C.49**

| Question 43. Do you have a private clothes washer that is used just by the people in your household? | Dwelling Type               |                           |                    |                   | Total              |
|--|-----------------------------|---------------------------|--------------------|-------------------|--------------------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                    |
| Yes  | 901,523<br>71.9%            | 71,719<br>5.7%            | 135,978<br>10.8%   | 51,265<br>4.1%    | 1,160,485<br>92.6% |
| No   | 1,785<br>0.1%               | 3,123<br>0.2%             | 81,412<br>6.5%     | 6,935<br>0.6%     | 93,254<br>7.4%     |

**Table C.50**

| Question 44. Which of the following best describes the type of clothes washer in your home? | Dwelling Type               |                           |                    |                   | Total            |
|---|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| Front load washing machine  | 289,782<br>23.1%            | 12,024<br>1.0%            | 26,707<br>2.1%     | 4,857<br>0.4%     | 333,370<br>26.6% |
| Top load washing machine  | 607,793<br>48.5%            | 59,694<br>4.8%            | 109,271<br>8.7%    | 46,408<br>3.7%    | 823,166<br>65.7% |
| Don't know  | 3,949<br>0.3%               | 0<br>0                    | 0<br>0             | 0<br>0            | 3,949<br>0.3%    |
| Not applicable  | 1,785<br>0.1%               | 3,123<br>0.2%             | 81,412<br>6.5%     | 6,935<br>0.6%     | 93,254<br>7.4%   |

**Table C.51**

| Question 45. Do you have a clothes dryer that is used just by the people in your household? | Dwelling Type               |                           |                    |                   | Total              |
|---|-----------------------------|---------------------------|--------------------|-------------------|--------------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                    |
| Yes   | 897,575<br>71.6%            | 68,957<br>5.5%            | 135,978<br>10.8%   | 51,265<br>4.1%    | 1,153,775<br>92.0% |
| No  | 5,733<br>0.5%               | 5,884<br>0.5%             | 81,412<br>6.5%     | 6,935<br>0.6%     | 99,964<br>8.0%     |

**Table C.52**

| Question 46. What fuel or energy source do you use for your clothes dryer? | Dwelling Type               |                           |                    |                   | Total            |
|--|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| Electricity  | 721,949<br>62.6%            | 57,413<br>5.0%            | 131,808<br>11.4%   | 49,531<br>4.3%    | 960,701<br>83.3% |
| Natural gas  | 160,776<br>13.9%            | 4,328<br>0.4%             | 2,085<br>0.2%      | 0<br>0            | 167,190<br>14.5% |
| Propane or bottled gas (LP, propane, butane)                               | 11,102<br>1.0%              | 0<br>0                    | 0<br>0             | 1,734<br>0.2%     | 12,836<br>1.1%   |
| Something else (specify)   | 1,734<br>0.2%               | 0<br>0                    | 0<br>0             | 0<br>0            | 1,734<br>0.2%    |
| Don't know   | 2,014<br>0.2%               | 7,216<br>0.6%             | 2,085<br>0.2%      | 0<br>0            | 11,315<br>1.0%   |



**Table C.53**

| Question 47. Do you have your own swimming pool? | Dwelling Type               |                           |                    |                   | Total     |
|--|-----------------------------|---------------------------|--------------------|-------------------|-----------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |           |
| Yes  | 26,746                      | 0                         | 0                  | 1,680             | 28,426    |
|  | 2.1%                        | 0                         | 0                  | 0.1%              | 2.3%      |
| No   | 876,561                     | 74,841                    | 217,390            | 56,520            | 1,225,313 |
|  | 69.9%                       | 6.0%                      | 17.3%              | 4.5%              | 97.7%     |

**Table C.54**

| Question 48. What fuel or energy source do you use to heat your swimming pool? | Dwelling Type               |                           |                    |                   | Total     |
|--|-----------------------------|---------------------------|--------------------|-------------------|-----------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |           |
| Electricity  | 5,303                       | 0                         | 0                  | 0                 | 5,303     |
|  | 0.4%                        | 0                         | 0                  | 0                 | 0.4%      |
| Natural gas  | 12,075                      | 0                         | 0                  | 0                 | 12,075    |
|  | 1.0%                        | 0                         | 0                  | 0                 | 1.0%      |
| Solar  | 6,246                       | 0                         | 0                  | 0                 | 6,246     |
|  | 0.5%                        | 0                         | 0                  | 0                 | 0.5%      |
| Not heated   | 3,123                       | 0                         | 0                  | 0                 | 3,123     |
|  | 0.2%                        | 0                         | 0                  | 0                 | 0.2%      |
| Don't know   | 0                           | 0                         | 0                  | 1,680             | 1,680     |
|  | 0                           | 0                         | 0                  | 0.1%              | 0.1%      |
| Not applicable   | 876,561                     | 74,841                    | 217,390            | 56,520            | 1,225,313 |
|  | 69.9%                       | 6.0%                      | 17.3%              | 4.5%              | 97.7%     |

**Table C.55**

| Question 48a. How often do you operate your pool pump and filtration system? | Dwelling Type               |                           |                    |                   | Total     |
|--|-----------------------------|---------------------------|--------------------|-------------------|-----------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |           |
| All day and all night  | 1,785                       | 0                         | 0                  | 0                 | 1,785     |
|  | 0.1%                        | 0                         | 0                  | 0                 | 0.1%      |
| Turned off at night  | 7,747                       | 0                         | 0                  | 0                 | 7,747     |
|  | 0.6%                        | 0                         | 0                  | 0                 | 0.6%      |
| Something else (specify)   | 14,092                      | 0                         | 0                  | 0                 | 14,092    |
|  | 1.1%                        | 0                         | 0                  | 0                 | 1.1%      |
| Don't know   | 3,123                       | 0                         | 0                  | 1,680             | 4,802     |
|  | 0.2%                        | 0                         | 0                  | 0.1%              | 0.4%      |
| Not applicable   | 876,561                     | 74,841                    | 217,390            | 56,520            | 1,225,313 |
|  | 69.9%                       | 6.0%                      | 17.3%              | 4.5%              | 97.7%     |

**Table C.56**

| Question 48b. Do you own an insulating cover for your pool? | Dwelling Type               |                           |                    |                   | Total     |
|---|-----------------------------|---------------------------|--------------------|-------------------|-----------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |           |
| Yes   | 13,562                      | 0                         | 0                  | 0                 | 13,562    |
|   | 1.1%                        | 0                         | 0                  | 0                 | 1.1%      |
| No  | 13,184                      | 0                         | 0                  | 1,680             | 14,864    |
|   | 1.1%                        | 0                         | 0                  | 0.1%              | 1.2%      |
| Not applicable  | 876,561                     | 74,841                    | 217,390            | 56,520            | 1,225,313 |
|   | 69.9%                       | 6.0%                      | 17.3%              | 4.5%              | 97.7%     |

**Table C.57**

| Question<br>49. Do you<br>have your<br>own hot tub<br>or spa? | Dwelling Type                        |                                 |                       |                      | Total     |
|---|--------------------------------------|---------------------------------|-----------------------|----------------------|-----------|
|   | Single<br>family<br>detached<br>home | Duplex,<br>row- or<br>townhouse | Apartment<br>or condo | Manufactured<br>home |           |
| Yes   | 94,698                               | 2,164                           | 0                     | 3,467                | 100,329   |
|   | 7.6%                                 | 0.2%                            | 0                     | 0.3%                 | 8.0%      |
| No  | 808,610                              | 72,677                          | 217,390               | 54,732               | 1,153,410 |
|   | 64.5%                                | 5.8%                            | 17.3%                 | 4.4%                 | 92.0%     |

**Table C.58**

| Question 50. What fuel or<br>energy source do you<br>use for your hot tub or<br>spa? | Dwelling Type                        |                                 |                       |                      | Total     |
|--|--------------------------------------|---------------------------------|-----------------------|----------------------|-----------|
|  | Single<br>family<br>detached<br>home | Duplex,<br>row- or<br>townhouse | Apartment<br>or condo | Manufactured<br>home |           |
| Electricity  | 77,715                               | 2,164                           | 0                     | 3,467                | 83,347    |
|  | 6.2%                                 | 0.2%                            | 0                     | 0.3%                 | 6.6%      |
| Natural gas  | 16,983                               | 0                               | 0                     | 0                    | 16,983    |
|  | 1.4%                                 | 0                               | 0                     | 0                    | 1.4%      |
| Not applicable   | 808,610                              | 72,677                          | 217,390               | 54,732               | 1,153,410 |
|  | 64.5%                                | 5.8%                            | 17.3%                 | 4.4%                 | 92.0%     |

**Table C.59**

| Question 50a. Do you have your own sauna? | Dwelling Type               |                           |                    |                   | Total              |
|---|-----------------------------|---------------------------|--------------------|-------------------|--------------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                    |
| Yes                                       | 20,389<br>1.6%              | 0<br>0                    | 5,095<br>0.4%      | 0<br>0            | 25,484<br>2.0%     |
| No  | 882,919<br>70.4%            | 74,841<br>6.0%            | 212,295<br>16.9%   | 56,466<br>4.5%    | 1,226,521<br>97.8% |
| Don't know                                | 0<br>0                      | 0<br>0                    | 0<br>0             | 1,734<br>0.1%     | 1,734<br>0.1%      |

**Table C.60**

| Question 50b. What fuel or energy source do you use for your sauna? | Dwelling Type               |                           |                    |                   | Total              |
|---|-----------------------------|---------------------------|--------------------|-------------------|--------------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                    |
| Electricity   | 20,389<br>1.6%              | 0<br>0                    | 5,095<br>0.4%      | 0<br>0            | 25,484<br>2.0%     |
| Not applicable  | 882,919<br>70.4%            | 74,841<br>6.0%            | 212,295<br>16.9%   | 58,199<br>4.6%    | 1,228,255<br>98.0% |

**Table C.61**

| Question 51. How many cook-top units do you have? | Dwelling Type               |                           |                    |                   | Total              |
|---|-----------------------------|---------------------------|--------------------|-------------------|--------------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                    |
| 0   | 48,162<br>3.8%              | 5,095<br>0.4%             | 19,456<br>1.6%     | 3,467<br>0.3%     | 76,182<br>6.1%     |
| 1   | 817,616<br>65.2%            | 69,746<br>5.6%            | 187,743<br>15.0%   | 47,800<br>3.8%    | 1,122,906<br>89.6% |
| 2   | 32,434<br>2.6%              | 0<br>0                    | 10,191<br>0.8%     | 6,931<br>0.6%     | 49,556<br>4.0%     |
| Don't know  | 5,095<br>0.4%               | 0<br>0                    | 0<br>0             | 0<br>0            | 5,095<br>0.4%      |

**Table C.62**

| Question 52. What fuel or energy source do you use for your cook-top(s)? | Dwelling Type               |                           |                    |                   | Total            |
|--|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| Electricity  | 536,684<br>42.8%            | 59,136<br>4.7%            | 166,392<br>13.3%   | 51,265<br>4.1%    | 813,476<br>64.9% |
| Natural gas  | 286,305<br>22.8%            | 8,490<br>0.7%             | 31,542<br>2.5%     | 1,734<br>0.1%     | 328,071<br>26.2% |
| Propane or bottled gas (LP, propane, butane)                             | 27,061<br>2.2%              | 0<br>0                    | 0<br>0             | 1,734<br>0.1%     | 28,795<br>2.3%   |
| Don't know   | 0<br>0                      | 2,120<br>0.2%             | 0<br>0             | 0<br>0            | 2,120<br>0.2%    |
| No response  | 5,095<br>0.4%               | 0<br>0                    | 0<br>0             | 0<br>0            | 5,095<br>0.4%    |

|                |        |       |        |       |        |
|----------------|--------|-------|--------|-------|--------|
| Not applicable | 48,162 | 5,095 | 19,456 | 3,467 | 76,182 |
|                | 3.8%   | 0.4%  | 1.6%   | 0.3%  | 6.1%   |

**Table C.63**

| Question 53. How many ovens do you have? | Dwelling Type               |                           |                    |                   | Total     |
|--|-----------------------------|---------------------------|--------------------|-------------------|-----------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |           |
| 0  | 6,246                       | 0                         | 0                  | 0                 | 6,246     |
|  | 0.5%                        | 0                         | 0                  | 0                 | 0.5%      |
| 1  | 756,995                     | 72,677                    | 210,210            | 54,681            | 1,094,563 |
|  | 60.4%                       | 5.8%                      | 16.8%              | 4.4%              | 87.3%     |
| 2  | 133,822                     | 2,164                     | 2,085              | 3,518             | 141,590   |
|  | 10.7%                       | 0.2%                      | 0.2%               | 0.3%              | 11.3%     |
| 3  | 6,246                       | 0                         | 5,095              | 0                 | 11,341    |
|  | 0.5%                        | 0                         | 0.4%               | 0                 | 0.9%      |

**Table C.64**

| Question 54. What fuel or energy source do you use for your oven(s)? | Dwelling Type               |                           |                    |                   | Total              |
|--|-----------------------------|---------------------------|--------------------|-------------------|--------------------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                    |
| Electricity  | 716,243<br>57.1%            | 68,480<br>5.5%            | 198,159<br>15.8%   | 56,466<br>4.5%    | 1,039,349<br>82.9% |
| Natural gas  | 162,696<br>13.0%            | 4,241<br>0.3%             | 19,231<br>1.5%     | 1,734<br>0.1%     | 187,901<br>15.0%   |
| Propane or bottled gas (LP, propane, butane)                         | 15,959<br>1.3%              | 0<br>0                    | 0<br>0             | 0<br>0            | 15,959<br>1.3%     |
| Don't know   | 2,164<br>0.2%               | 2,120<br>0.2%             | 0<br>0             | 0<br>0            | 4,285<br>0.3%      |
| Not applicable   | 6,246<br>0.5%               | 0<br>0                    | 0<br>0             | 0<br>0            | 6,246<br>0.5%      |

**Table C.65**

| Question 55. How many microwave ovens do you have? | Dwelling Type               |                           |                    |                   | Total              |
|--|-----------------------------|---------------------------|--------------------|-------------------|--------------------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                    |
| 0  | 17,131<br>1.4%              | 0<br>0                    | 19,491<br>1.6%     | 0<br>0            | 36,623<br>2.9%     |
| 1  | 830,547<br>66.2%            | 70,592<br>5.6%            | 197,899<br>15.8%   | 56,466<br>4.5%    | 1,155,504<br>92.2% |
| 2  | 52,507<br>4.2%              | 4,249<br>0.3%             | 0<br>0             | 1,734<br>0.1%     | 58,490<br>4.7%     |
| 3  | 3,123<br>0.2%               | 0<br>0                    | 0<br>0             | 0<br>0            | 3,123<br>0.2%      |

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**Table C.66**

| Question 56.<br>Number of<br>televisions of all<br>types in your home. | Dwelling Type                        |                                 |                       |                      | Total            |
|--|--------------------------------------|---------------------------------|-----------------------|----------------------|------------------|
|  | Single<br>family<br>detached<br>home | Duplex,<br>row- or<br>townhouse | Apartment<br>or condo | Manufactured<br>home |                  |
| 0  | 15,928<br>1.3%                       | 0<br>0                          | 12,311<br>1.0%        | 0<br>0               | 28,239<br>2.3%   |
| 1  | 172,072<br>13.7%                     | 10,829<br>0.9%                  | 89,130<br>7.1%        | 23,529<br>1.9%       | 295,560<br>23.6% |
| 2  | 287,041<br>22.9%                     | 35,899<br>2.9%                  | 78,825<br>6.3%        | 22,484<br>1.8%       | 424,249<br>33.8% |
| 3  | 243,947<br>19.5%                     | 10,240<br>0.8%                  | 17,554<br>1.4%        | 8,669<br>0.7%        | 280,409<br>22.4% |
| 4  | 105,788<br>8.4%                      | 10,018<br>0.8%                  | 12,311<br>1.0%        | 1,785<br>0.1%        | 129,901<br>10.4% |
| 5  | 45,883<br>3.7%                       | 7,856<br>0.6%                   | 5,095<br>0.4%         | 1,734<br>0.1%        | 60,569<br>4.8%   |
| 6  | 15,877<br>1.3%                       | 0<br>0                          | 0<br>0                | 0<br>0               | 15,877<br>1.3%   |
| 7  | 4,546<br>0.4%                        | 0<br>0                          | 0<br>0                | 0<br>0               | 4,546<br>0.4%    |
| 8  | 3,949<br>0.3%                        | 0<br>0                          | 0<br>0                | 0<br>0               | 3,949<br>0.3%    |
| Refused  | 8,277<br>0.7%                        | 0<br>0                          | 2,164<br>0.2%         | 0<br>0               | 10,441<br>0.8%   |

**Table C.67**

| Question 57. Number of large flat-screen tvs (over 32 inches) in your home. | Dwelling Type               |                           |                    |                   | Total   |
|---|-----------------------------|---------------------------|--------------------|-------------------|---------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |         |
| 0   | 550,928                     | 39,970                    | 169,328            | 42,890            | 803,116 |
|   | 45.0%                       | 3.3%                      | 13.8%              | 3.5%              | 65.5%   |
| 1   | 273,704                     | 32,707                    | 23,396             | 11,791            | 341,599 |
|   | 22.3%                       | 2.7%                      | 1.9%               | 1.0%              | 27.9%   |
| 2   | 45,236                      | 2,164                     | 5,095              | 3,518             | 56,013  |
|   | 3.7%                        | 0.2%                      | 0.4%               | 0.3%              | 4.6%    |
| 3   | 4,907                       | 0                         | 0                  | 0                 | 4,907   |
|   | 0.4%                        | 0                         | 0                  | 0                 | 0.4%    |
| 4   | 2,164                       | 0                         | 0                  | 0                 | 2,164   |
|   | 0.2%                        | 0                         | 0                  | 0                 | 0.2%    |
| 5   | 0                           | 0                         | 5,095              | 0                 | 5,095   |
|   | 0                           | 0                         | 0.4%               | 0                 | 0.4%    |
| Refused   | 2,164                       | 0                         | 0                  | 0                 | 2,164   |
|   | 0.2%                        | 0                         | 0                  | 0                 | 0.2%    |
| Not applicable  | 8,277                       | 0                         | 2,164              | 0                 | 10,441  |
|   | 0.7%                        | 0                         | 0.2%               | 0                 | 0.9%    |

**Table C.68**

| Question 58. Number of game consoles (Playstation Wii Nintendo xbox xCube etc) in your home. | Dwelling Type               |                           |                    |                   | Total            |
|--|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| 0  | 592,634<br>47.3%            | 44,312<br>3.5%            | 167,243<br>13.3%   | 51,265<br>4.1%    | 855,453<br>68.2% |
| 1  | 173,760<br>13.9%            | 21,699<br>1.7%            | 28,492<br>2.3%     | 1,734<br>0.1%     | 225,685<br>18.0% |
| 2  | 77,903<br>6.2%              | 6,666<br>0.5%             | 12,276<br>1.0%     | 3,467<br>0.3%     | 100,312<br>8.0%  |
| 3  | 25,392<br>2.0%              | 0<br>0                    | 2,120<br>0.2%      | 1,734<br>0.1%     | 29,246<br>2.3%   |
| 4  | 5,287<br>0.4%               | 2,164<br>0.2%             | 5,095<br>0.4%      | 0<br>0            | 12,546<br>1.0%   |
| 5  | 11,548<br>0.9%              | 0<br>0                    | 0<br>0             | 0<br>0            | 11,548<br>0.9%   |
| 6  | 4,328<br>0.3%               | 0<br>0                    | 0<br>0             | 0<br>0            | 4,328<br>0.3%    |
| Don't know   | 2,164<br>0.2%               | 0<br>0                    | 0<br>0             | 0<br>0            | 2,164<br>0.2%    |
| Refused  | 10,291<br>0.8%              | 0<br>0                    | 2,164<br>0.2%      | 0<br>0            | 12,455<br>1.0%   |

**Table C.69**

| Question 59. Number of VCRs or DVD players (not a combo unit) in your home. | Dwelling Type               |                           |                    |                   | Total            |
|---|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| 0   | 211,631<br>16.9%            | 14,579<br>1.2%            | 62,684<br>5.0%     | 15,654<br>1.2%    | 304,549<br>24.3% |
| 1   | 343,973<br>27.4%            | 27,181<br>2.2%            | 80,719<br>6.4%     | 32,487<br>2.6%    | 484,361<br>38.6% |
| 2   | 210,365<br>16.8%            | 20,726<br>1.7%            | 51,294<br>4.1%     | 8,324<br>0.7%     | 290,709<br>23.2% |
| 3   | 83,366<br>6.6%              | 12,355<br>1.0%            | 7,216<br>0.6%      | 1,734<br>0.1%     | 104,670<br>8.3%  |
| 4   | 20,732<br>1.7%              | 0<br>0                    | 13,313<br>1.1%     | 0<br>0            | 34,045<br>2.7%   |
| 5   | 9,236<br>0.7%               | 0<br>0                    | 0<br>0             | 0<br>0            | 9,236<br>0.7%    |
| 6   | 2,164<br>0.2%               | 0<br>0                    | 0<br>0             | 0<br>0            | 2,164<br>0.2%    |
| 7   | 2,164<br>0.2%               | 0<br>0                    | 0<br>0             | 0<br>0            | 2,164<br>0.2%    |
| 9   | 2,164<br>0.2%               | 0<br>0                    | 0<br>0             | 0<br>0            | 2,164<br>0.2%    |
| Don't know  | 7,072<br>0.6%               | 0<br>0                    | 0<br>0             | 0<br>0            | 7,072<br>0.6%    |
| Refused   | 10,441<br>0.8%              | 0<br>0                    | 2,164<br>0.2%      | 0<br>0            | 12,605<br>1.0%   |

**Table C.70**

| Question 60. Number of combination VCR and DVD units in your home. | Dwelling Type               |                           |                    |                   | Total   |
|--|-----------------------------|---------------------------|--------------------|-------------------|---------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |         |
| 0  | 467,314                     | 46,375                    | 117,669            | 30,463            | 661,821 |
|  | 37.3%                       | 3.7%                      | 9.4%               | 2.4%              | 52.8%   |
| 1  | 296,002                     | 17,302                    | 79,149             | 24,218            | 416,671 |
|  | 23.6%                       | 1.4%                      | 6.3%               | 1.9%              | 33.2%   |
| 2  | 95,102                      | 6,069                     | 17,450             | 3,518             | 122,139 |
|  | 7.6%                        | 0.5%                      | 1.4%               | 0.3%              | 9.7%    |
| 3  | 28,136                      | 5,095                     | 3,123              | 0                 | 36,354  |
|  | 2.2%                        | 0.4%                      | 0.2%               | 0                 | 2.9%    |
| 4  | 1,785                       | 0                         | 0                  | 0                 | 1,785   |
|  | 0.1%                        | 0                         | 0                  | 0                 | 0.1%    |
| 5  | 1,785                       | 0                         | 0                  | 0                 | 1,785   |
|  | 0.1%                        | 0                         | 0                  | 0                 | 0.1%    |
| 23   | 3,123                       | 0                         | 0                  | 0                 | 3,123   |
|  | 0.2%                        | 0                         | 0                  | 0                 | 0.2%    |
| Don't know   | 1,785                       | 0                         | 0                  | 0                 | 1,785   |
|  | 0.1%                        | 0                         | 0                  | 0                 | 0.1%    |
| Refused  | 8,277                       | 0                         | 0                  | 0                 | 8,277   |
|  | 0.7%                        | 0                         | 0                  | 0                 | 0.7%    |

**Table C.71**

| Question 61. Number of stand-alone DVR units (not TIVO) in your home. | Dwelling Type               |                           |                    |                   | Total   |
|---|-----------------------------|---------------------------|--------------------|-------------------|---------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |         |
| 0   | 663,946                     | 37,824                    | 163,043            | 42,596            | 907,408 |
|   | 53.0%                       | 3.0%                      | 13.0%              | 3.4%              | 72.4%   |
| 1   | 166,500                     | 29,278                    | 34,777             | 12,136            | 242,691 |
|   | 13.3%                       | 2.3%                      | 2.8%               | 1.0%              | 19.4%   |
| 2   | 46,873                      | 1,785                     | 17,406             | 1,734             | 67,798  |
|   | 3.7%                        | 0.1%                      | 1.4%               | 0.1%              | 5.4%    |
| 3   | 5,354                       | 2,085                     | 0                  | 1,734             | 9,173   |
|   | 0.4%                        | 0.2%                      | 0                  | 0.1%              | 0.7%    |
| Don't know  | 12,359                      | 3,870                     | 0                  | 0                 | 16,228  |
|   | 1.0%                        | 0.3%                      | 0                  | 0                 | 1.3%    |
| Refused   | 8,277                       | 0                         | 2,164              | 0                 | 10,441  |
|   | 0.7%                        | 0                         | 0.2%               | 0                 | 0.8%    |

**Table C.72**

| Question 62. Number of TIVO or cable or satellite TV set-top boxes or receivers in your home. | Dwelling Type               |                           |                    |                   | Total            |
|---|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| 0   | 342,204<br>27.3%            | 16,595<br>1.3%            | 100,319<br>8.0%    | 26,996<br>2.2%    | 486,115<br>38.8% |
| 1   | 299,964<br>23.9%            | 24,823<br>2.0%            | 87,311<br>7.0%     | 20,801<br>1.7%    | 432,899<br>34.5% |
| 2   | 144,496<br>11.5%            | 19,750<br>1.6%            | 19,570<br>1.6%     | 6,935<br>0.6%     | 190,751<br>15.2% |
| 3   | 79,834<br>6.4%              | 8,578<br>0.7%             | 5,095<br>0.4%      | 1,734<br>0.1%     | 95,241<br>7.6%   |
| 4   | 15,928<br>1.3%              | 5,095<br>0.4%             | 5,095<br>0.4%      | 1,734<br>0.1%     | 27,852<br>2.2%   |
| 5   | 6,113<br>0.5%               | 0<br>0                    | 0<br>0             | 0<br>0            | 6,113<br>0.5%    |
| Don't know  | 6,113<br>0.5%               | 0<br>0                    | 0<br>0             | 0<br>0            | 6,113<br>0.5%    |
| Refused   | 8,657<br>0.7%               | 0<br>0                    | 0<br>0             | 0<br>0            | 8,657<br>0.7%    |

**Table C.73**

| Question 63.<br>Number of stereo<br>systems in your<br>home. | Dwelling Type                        |                                 |                       |                      | Total            |
|--|--------------------------------------|---------------------------------|-----------------------|----------------------|------------------|
|  | Single<br>family<br>detached<br>home | Duplex,<br>row- or<br>townhouse | Apartment<br>or condo | Manufactured<br>home |                  |
| 0  | 219,457<br>17.5%                     | 20,374<br>1.6%                  | 94,629<br>7.5%        | 23,873<br>1.9%       | 358,333<br>28.6% |
| 1  | 514,988<br>41.1%                     | 42,156<br>3.4%                  | 110,406<br>8.8%       | 27,391<br>2.2%       | 694,942<br>55.4% |
| 2  | 113,371<br>9.0%                      | 10,191<br>0.8%                  | 5,095<br>0.4%         | 1,734<br>0.1%        | 130,390<br>10.4% |
| 3  | 35,041<br>2.8%                       | 0<br>0                          | 5,095<br>0.4%         | 1,734<br>0.1%        | 41,870<br>3.3%   |
| 4  | 7,847<br>0.6%                        | 0<br>0                          | 0<br>0                | 1,734<br>0.1%        | 9,580<br>0.8%    |
| 6  | 0<br>0                               | 0<br>0                          | 0<br>0                | 1,734<br>0.1%        | 1,734<br>0.1%    |
| 13   | 0<br>0                               | 2,120<br>0.2%                   | 0<br>0                | 0<br>0               | 2,120<br>0.2%    |
| Refused  | 12,605<br>1.0%                       | 0<br>0                          | 2,164<br>0.2%         | 0<br>0               | 14,769<br>1.2%   |



**Table C.74**

| Question 64. Number of personal computers - including laptops - in your home. | Dwelling Type               |                           |                    |                   | Total   |
|---|-----------------------------|---------------------------|--------------------|-------------------|---------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |         |
| 0   | 68,990                      | 6,034                     | 57,697             | 20,801            | 153,522 |
|   | 5.5%                        | 0.5%                      | 4.6%               | 1.7%              | 12.2%   |
| 1   | 374,073                     | 48,678                    | 112,562            | 23,873            | 559,186 |
|   | 29.8%                       | 3.9%                      | 9.0%               | 1.9%              | 44.6%   |
| 2   | 235,905                     | 18,345                    | 22,501             | 11,791            | 288,543 |
|   | 18.8%                       | 1.5%                      | 1.8%               | 0.9%              | 23.0%   |
| 3   | 135,794                     | 1,785                     | 17,371             | 1,734             | 156,684 |
|   | 10.8%                       | 0.1%                      | 1.4%               | 0.1%              | 12.5%   |
| 4   | 49,951                      | 0                         | 0                  | 0                 | 49,951  |
|   | 4.0%                        | 0                         | 0                  | 0                 | 4.0%    |
| 5   | 19,876                      | 0                         | 0                  | 0                 | 19,876  |
|   | 1.6%                        | 0                         | 0                  | 0                 | 1.6%    |
| 7   | 2,164                       | 0                         | 0                  | 0                 | 2,164   |
|   | 0.2%                        | 0                         | 0                  | 0                 | 0.2%    |
| 8   | 3,949                       | 0                         | 0                  | 0                 | 3,949   |
|   | 0.3%                        | 0                         | 0                  | 0                 | 0.3%    |
| Don't know  | 0                           | 0                         | 5,095              | 0                 | 5,095   |
|   | 0                           | 0                         | 0.4%               | 0                 | 0.4%    |
| Refused   | 12,605                      | 0                         | 2,164              | 0                 | 14,769  |
|   | 1.0%                        | 0                         | 0.2%               | 0                 | 1.2%    |

**Table C.75**

| Question 65.<br>Number of<br>computer monitors<br>in your home. | Dwelling Type                     |                              |                       |                      | Total            |
|---|-----------------------------------|------------------------------|-----------------------|----------------------|------------------|
|   | Single family<br>detached<br>home | Duplex, row-<br>or townhouse | Apartment<br>or condo | Manufactured<br>home |                  |
| 0   | 71,620<br>6.5%                    | 14,579<br>1.3%               | 34,441<br>3.1%        | 5,201<br>0.5%        | 125,842<br>11.4% |
| 1   | 486,765<br>44.2%                  | 52,064<br>4.7%               | 110,812<br>10.1%      | 23,873<br>2.2%       | 673,514<br>61.2% |
| 2   | 173,027<br>15.7%                  | 2,164<br>0.2%                | 2,085<br>0.2%         | 6,590<br>0.6%        | 183,866<br>16.7% |
| 3   | 68,260<br>6.2%                    | 0<br>0                       | 5,095<br>0.5%         | 1,734<br>0.2%        | 75,089<br>6.8%   |
| 4   | 15,928<br>1.4%                    | 0<br>0                       | 0<br>0                | 0<br>0               | 15,928<br>1.4%   |
| 5   | 2,164<br>0.2%                     | 0<br>0                       | 0<br>0                | 0<br>0               | 2,164<br>0.2%    |
| 6   | 1,785<br>0.2%                     | 0<br>0                       | 0<br>0                | 0<br>0               | 1,785<br>0.2%    |
| Don't know  | 2,164<br>0.2%                     | 0<br>0                       | 0<br>0                | 0<br>0               | 2,164<br>0.2%    |
| Not applicable  | 12,605<br>1.1%                    | 0<br>0                       | 7,259<br>0.7%         | 0<br>0               | 19,865<br>1.8%   |

**Table C.76**

| Question 66. Number of combination printer / fax / copiers in your home. | Dwelling Type               |                           |                    |                   | Total            |
|--|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| 0  | 399,793<br>31.9%            | 31,460<br>2.5%            | 146,605<br>11.7%   | 37,794<br>3.0%    | 615,652<br>49.1% |
| 1  | 435,143<br>34.7%            | 33,191<br>2.6%            | 65,690<br>5.2%     | 16,938<br>1.4%    | 550,962<br>43.9% |
| 2  | 50,859<br>4.1%              | 5,095<br>0.4%             | 5,095<br>0.4%      | 1,734<br>0.1%     | 62,783<br>5.0%   |
| 3  | 7,072<br>0.6%               | 0<br>0                    | 0<br>0             | 0<br>0            | 7,072<br>0.6%    |
| Don't know   | 0<br>0                      | 5,095<br>0.4%             | 0<br>0             | 1,734<br>0.1%     | 6,829<br>0.5%    |
| Refused  | 10,441<br>0.8%              | 0<br>0                    | 0<br>0             | 0<br>0            | 10,441<br>0.8%   |

**Table C.77**

| Question 67. Number of stand-alone printers in your home. | Dwelling Type               |                           |                    |                   | Total            |
|---|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| 0   | 369,469<br>29.5%            | 29,408<br>2.3%            | 149,492<br>11.9%   | 25,948<br>2.1%    | 574,318<br>45.8% |
| 1   | 425,553<br>33.9%            | 40,338<br>3.2%            | 65,734<br>5.2%     | 27,050<br>2.2%    | 558,675<br>44.6% |
| 2   | 92,490<br>7.4%              | 5,095<br>0.4%             | 0<br>0             | 3,467<br>0.3%     | 101,053<br>8.1%  |
| 3   | 1,785<br>0.1%               | 0<br>0                    | 0<br>0             | 1,734<br>0.1%     | 3,518<br>0.3%    |
| 4   | 1,785<br>0.1%               | 0<br>0                    | 0<br>0             | 0<br>0            | 1,785<br>0.1%    |
| 10  | 1,785<br>0.1%               | 0<br>0                    | 0<br>0             | 0<br>0            | 1,785<br>0.1%    |
| Don't know  | 2,164<br>0.2%               | 0<br>0                    | 0<br>0             | 0<br>0            | 2,164<br>0.2%    |
| Refused   | 8,277<br>0.7%               | 0<br>0                    | 2,164<br>0.2%      | 0<br>0            | 10,441<br>0.8%   |

**Table C.78**

| Question 68. Number of stand-alone fax machines in your home. | Dwelling Type               |                           |                    |                   | Total              |
|---|-----------------------------|---------------------------|--------------------|-------------------|--------------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                    |
| 0   | 758,057<br>60.5%            | 63,633<br>5.1%            | 205,079<br>16.4%   | 51,609<br>4.1%    | 1,078,379<br>86.0% |
| 1   | 128,118<br>10.2%            | 9,044<br>0.7%             | 7,216<br>0.6%      | 6,590<br>0.5%     | 150,968<br>12.0%   |
| 2   | 6,692<br>0.5%               | 2,164<br>0.2%             | 5,095<br>0.4%      | 0<br>0            | 13,951<br>1.1%     |
| Refused   | 10,441<br>0.8%              | 0<br>0                    | 0<br>0             | 0<br>0            | 10,441<br>0.8%     |

**Table C.79**

| Question 69. Number of stand-alone copiers in your home. | Dwelling Type               |                           |                    |                   | Total              |
|--|-----------------------------|---------------------------|--------------------|-------------------|--------------------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                    |
| 0  | 711,934<br>56.8%            | 58,360<br>4.7%            | 191,019<br>15.2%   | 46,408<br>3.7%    | 1,007,721<br>80.4% |
| 1  | 159,947<br>12.8%            | 11,386<br>0.9%            | 21,276<br>1.7%     | 10,058<br>0.8%    | 202,667<br>16.2%   |
| 2  | 18,243<br>1.5%              | 5,095<br>0.4%             | 5,095<br>0.4%      | 0<br>0            | 28,433<br>2.3%     |
| 11   | 1,785<br>0.1%               | 0<br>0                    | 0<br>0             | 0<br>0            | 1,785<br>0.1%      |
| Don't know   | 3,123<br>0.2%               | 0<br>0                    | 0<br>0             | 1,734<br>0.1%     | 4,857<br>0.4%      |
| Refused  | 8,277<br>0.7%               | 0<br>0                    | 0<br>0             | 0<br>0            | 8,277<br>0.7%      |

**Table C.80**

| Question 70. Number of surge protector strips in your home for any of the audio/video or home office mentioned above. | Dwelling Type               |                           |                    |                   | Total            |
|---|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| 0   | 82,470<br>6.6%              | 10,283<br>0.8%            | 46,539<br>3.7%     | 17,388<br>1.4%    | 156,680<br>12.5% |
| 1   | 184,462<br>14.7%            | 10,571<br>0.8%            | 63,649<br>5.1%     | 5,147<br>0.4%     | 263,828<br>21.0% |
| 2   | 193,972<br>15.5%            | 35,598<br>2.8%            | 43,707<br>3.5%     | 18,382<br>1.5%    | 291,659<br>23.3% |
| 3   | 182,564<br>14.6%            | 4,249<br>0.3%             | 32,732<br>2.6%     | 3,413<br>0.3%     | 222,959<br>17.8% |
| 4   | 85,565<br>6.8%              | 10,191<br>0.8%            | 20,381<br>1.6%     | 3,467<br>0.3%     | 119,604<br>9.5%  |
| 5   | 61,266<br>4.9%              | 2,164<br>0.2%             | 5,095<br>0.4%      | 1,734<br>0.1%     | 70,260<br>5.6%   |
| 6   | 47,137<br>3.8%              | 0<br>0                    | 5,287<br>0.4%      | 5,201<br>0.4%     | 57,625<br>4.6%   |
| 7   | 17,513<br>1.4%              | 0<br>0                    | 0<br>0             | 0<br>0            | 17,513<br>1.4%   |
| 8   | 10,574<br>0.8%              | 0<br>0                    | 0<br>0             | 1,734<br>0.1%     | 12,308<br>1.0%   |
| 9   | 5,682<br>0.5%               | 0<br>0                    | 0<br>0             | 0<br>0            | 5,682<br>0.5%    |
| 10  | 11,020<br>0.9%              | 0<br>0                    | 0<br>0             | 0<br>0            | 11,020<br>0.9%   |

| Question 70. Number of surge protector strips in your home for any of the audio/video or home office mentioned above. | Dwelling Type               |                           |                    |                   | Total          |
|---|-----------------------------|---------------------------|--------------------|-------------------|----------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                |
| 12  | 1,785<br>0.1%               | 0<br>0                    | 0<br>0             | 0<br>0            | 1,785<br>0.1%  |
| 20  | 2,164<br>0.2%               | 0<br>0                    | 0<br>0             | 0<br>0            | 2,164<br>0.2%  |
| Don't know  | 8,856<br>0.7%               | 1,785<br>0.1%             | 0<br>0             | 0<br>0            | 10,641<br>0.8% |
| Refused   | 8,277<br>0.7%               | 0<br>0                    | 0<br>0             | 1,734<br>0.1%     | 10,011<br>0.8% |



**Table C.81**

| Question 71. Energy Star equipment | Dwelling Type               |                           |                    |                   | Total            |
|------------------------------------|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|                                    | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| all of them/everything             | 39,819<br>5.5%              | 1,785<br>0.2%             | 5,095<br>0.7%      | 3,123<br>0.4%     | 49,821<br>6.8%   |
| air conditioning                   | 5,354<br>0.7%               | 0<br>0                    | 0<br>0             | 0<br>0            | 5,354<br>0.7%    |
| computer monitor                   | 11,466<br>1.6%              | 0<br>0                    | 2,085<br>0.3%      | 0<br>0            | 13,552<br>1.9%   |
| computer                           | 34,794<br>4.8%              | 0<br>0                    | 25,476<br>3.5%     | 0<br>0            | 60,271<br>8.3%   |
| dishwasher                         | 201,893<br>27.7%            | 19,990<br>2.7%            | 7,181<br>1.0%      | 8,560<br>1.2%     | 237,624<br>32.6% |
| dryer                              | 250,651<br>34.3%            | 17,621<br>2.4%            | 5,095<br>0.7%      | 5,201<br>0.7%     | 278,569<br>38.2% |
| freezer                            | 56,436<br>7.7%              | 5,095<br>0.7%             | 0<br>0             | 3,518<br>0.5%     | 65,050<br>8.9%   |
| furnace                            | 22,336<br>3.1%              | 0<br>0                    | 0<br>0             | 0<br>0            | 22,336<br>3.1%   |
| microwave                          | 51,614<br>7.1%              | 4,285<br>0.6%             | 5,095<br>0.7%      | 3,413<br>0.5%     | 64,407<br>8.8%   |
| oven                               | 47,412<br>6.5%              | 0<br>0                    | 0<br>0             | 1,680<br>0.2%     | 49,091<br>6.7%   |
| refrigerator                       | 355,294<br>48.7%            | 35,088<br>4.8%            | 41,993<br>5.8%     | 15,600<br>2.1%    | 447,975<br>61.4% |

| Question 71. Energy Star equipment | Dwelling Type               |                           |                    |                   | Total     |
|------------------------------------|-----------------------------|---------------------------|--------------------|-------------------|-----------|
|                                    | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |           |
| stove                              | 117,368                     | 14,667                    | 14,396             | 5,201             | 151,632   |
|                                    | 16.1%                       | 2.0%                      | 2.0%               | 0.7%              | 20.8%     |
| television                         | 41,583                      | 9,044                     | 15,286             | 1,734             | 67,646    |
|                                    | 5.7%                        | 1.2%                      | 2.1%               | 0.2%              | 9.3%      |
| washing machine                    | 290,682                     | 19,406                    | 7,181              | 3,467             | 320,736   |
|                                    | 39.8%                       | 2.7%                      | 1.0%               | 0.5%              | 44.0%     |
| water heater                       | 106,841                     | 19,003                    | 12,311             | 5,201             | 143,355   |
|                                    | 14.6%                       | 2.6%                      | 1.7%               | 0.7%              | 19.6%     |
| asked/answered                     | 776,935                     | 63,633                    | 152,293            | 46,063            | 1,038,925 |
|                                    | 62.0%                       | 5.1%                      | 12.1%              | 3.7%              | 82.9%     |
| Don't know                         | 124,588                     | 11,208                    | 65,097             | 12,136            | 213,030   |
|                                    | 9.9%                        | 0.9%                      | 5.2%               | 1.0%              | 17.0%     |
| Refused                            | 1,785                       | 0                         | 0                  | 0                 | 1,785     |
|                                    | 0.1%                        | 0                         | 0                  | 0                 | 0.1%      |

**Table C.82**

| Question 72. How many people - including yourself - usually live in this residence at least six months of the year? | Dwelling Type               |                           |                    |                   | Total            |
|---|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| 1   | 109,701<br>8.7%             | 28,018<br>2.2%            | 136,706<br>10.9%   | 13,815<br>1.1%    | 288,241<br>23.0% |
| 2   | 366,864<br>29.3%            | 29,839<br>2.4%            | 38,682<br>3.1%     | 35,715<br>2.8%    | 471,101<br>37.6% |
| 3   | 181,213<br>14.5%            | 5,990<br>0.5%             | 17,371<br>1.4%     | 5,201<br>0.4%     | 209,775<br>16.7% |
| 4   | 143,936<br>11.5%            | 6,069<br>0.5%             | 12,276<br>1.0%     | 3,467<br>0.3%     | 165,749<br>13.2% |
| 5   | 62,173<br>5.0%              | 4,925<br>0.4%             | 10,191<br>0.8%     | 0<br>0            | 77,289<br>6.2%   |
| 6   | 17,579<br>1.4%              | 0<br>0                    | 0<br>0             | 0<br>0            | 17,579<br>1.4%   |
| 7   | 3,949<br>0.3%               | 0<br>0                    | 0<br>0             | 0<br>0            | 3,949<br>0.3%    |
| 8   | 7,451<br>0.6%               | 0<br>0                    | 0<br>0             | 0<br>0            | 7,451<br>0.6%    |
| Refused   | 10,441<br>0.8%              | 0<br>0                    | 2,164<br>0.2%      | 0<br>0            | 12,605<br>1.0%   |

**Table C.83**

| Question 73. For what average length of time is your home occupied by at least one person on a typical weekday ? | Dwelling Type               |                           |                    |                   | Total            |
|--|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| 23-24 hrs/day  | 400,195<br>31.9%            | 23,928<br>1.9%            | 43,189<br>3.4%     | 30,859<br>2.5%    | 498,171<br>39.7% |
| 21-22 hrs/day  | 44,676<br>3.6%              | 5,095<br>0.4%             | 25,454<br>2.0%     | 5,201<br>0.4%     | 80,427<br>6.4%   |
| 19-20 hrs/day  | 76,400<br>6.1%              | 4,249<br>0.3%             | 19,535<br>1.6%     | 6,590<br>0.5%     | 106,775<br>8.5%  |
| 17-18 hrs/day  | 78,950<br>6.3%              | 9,000<br>0.7%             | 23,950<br>1.9%     | 1,734<br>0.1%     | 113,634<br>9.1%  |
| 15-16 hrs/day  | 91,512<br>7.3%              | 1,785<br>0.1%             | 41,993<br>3.3%     | 1,734<br>0.1%     | 137,023<br>10.9% |
| 13-14 hrs/day  | 59,674<br>4.8%              | 10,654<br>0.8%            | 9,301<br>0.7%      | 6,935<br>0.6%     | 86,564<br>6.9%   |
| 11-12 hrs/day  | 71,191<br>5.7%              | 11,085<br>0.9%            | 32,692<br>2.6%     | 0<br>0            | 114,969<br>9.2%  |
| 9-10 hrs/day   | 10,641<br>0.8%              | 0<br>0                    | 2,085<br>0.2%      | 1,734<br>0.1%     | 14,460<br>1.2%   |
| 7-8 hrs/day  | 23,807<br>1.9%              | 5,095<br>0.4%             | 14,095<br>1.1%     | 0<br>0            | 42,998<br>3.4%   |
| 5-6 hrs/day  | 9,302<br>0.7%               | 2,164<br>0.2%             | 0<br>0             | 1,734<br>0.1%     | 13,200<br>1.1%   |
| 3-4 hrs/day  | 5,287<br>0.4%               | 0<br>0                    | 0<br>0             | 0<br>0            | 5,287<br>0.4%    |

| Question 73. For what average length of time is your home occupied by at least one person on a typical weekday ? | Dwelling Type               |                           |                    |                   | Total          |
|--|-----------------------------|---------------------------|--------------------|-------------------|----------------|
|  | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                |
| 1-2 hrs/day  | 1,785<br>0.1%               | 1,785<br>0.1%             | 0<br>0             | 0<br>0            | 3,569<br>0.3%  |
| Don't know   | 10,590<br>0.8%              | 0<br>0                    | 0<br>0             | 1,680<br>0.1%     | 12,269<br>1.0% |
| Refused  | 19,297<br>1.5%              | 0<br>0                    | 5,095<br>0.4%      | 0<br>0            | 24,393<br>1.9% |

**Table C.84**

| Question 74. For what average length of time is your home occupied by at least one person on a typical weekend? | Dwelling Type               |                           |                    |                   | Total            |
|---|-----------------------------|---------------------------|--------------------|-------------------|------------------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |                  |
| 23-24 hrs/day   | 497,885<br>39.7%            | 34,945<br>2.8%            | 80,130<br>6.4%     | 36,060<br>2.9%    | 649,020<br>51.8% |
| 21-22 hrs/day   | 40,260<br>3.2%              | 0<br>0                    | 23,142<br>1.8%     | 3,467<br>0.3%     | 66,869<br>5.3%   |
| 19-20 hrs/day   | 126,688<br>10.1%            | 9,449<br>0.8%             | 27,641<br>2.2%     | 11,737<br>0.9%    | 175,515<br>14.0% |
| 17-18 hrs/day   | 50,260<br>4.0%              | 8,455<br>0.7%             | 32,469<br>2.6%     | 1,734<br>0.1%     | 92,918<br>7.4%   |
| 15-16 hrs/day   | 48,703<br>3.9%              | 10,829<br>0.9%            | 24,622<br>2.0%     | 1,734<br>0.1%     | 85,887<br>6.9%   |
| 13-14 hrs/day   | 20,931<br>1.7%              | 5,095<br>0.4%             | 9,301<br>0.7%      | 1,734<br>0.1%     | 37,061<br>3.0%   |
| 11-12 hrs/day   | 34,978<br>2.8%              | 2,120<br>0.2%             | 14,095<br>1.1%     | 0<br>0            | 51,194<br>4.1%   |
| 9-10 hrs/day  | 30,203<br>2.4%              | 0<br>0                    | 0<br>0             | 1,734<br>0.1%     | 31,937<br>2.5%   |
| 7-8 hrs/day   | 14,722<br>1.2%              | 0<br>0                    | 2,120<br>0.2%      | 0<br>0            | 16,842<br>1.3%   |
| 5-6 hrs/day   | 6,113<br>0.5%               | 2,164<br>0.2%             | 1,785<br>0.1%      | 0<br>0            | 10,062<br>0.8%   |
| 3-4 hrs/day   | 0<br>0                      | 0<br>0                    | 2,085<br>0.2%      | 0<br>0            | 2,085<br>0.2%    |

| Question 74. For what average length of time is your home occupied by at least one person on a typical weekend? | Dwelling Type               |                           |                    |                   | Total  |
|---|-----------------------------|---------------------------|--------------------|-------------------|--------|
|   | Single family detached home | Duplex, row- or townhouse | Apartment or condo | Manufactured home |        |
| 1-2 hrs/day   | 0                           | 1,785                     | 0                  | 0                 | 1,785  |
|   | 0                           | 0.1%                      | 0                  | 0                 | 0.1%   |
| Don't know  | 21,543                      | 0                         | 0                  | 0                 | 21,543 |
|   | 1.7%                        | 0                         | 0                  | 0                 | 1.7%   |
| Refused   | 11,020                      | 0                         | 0                  | 0                 | 11,020 |
|   | 0.9%                        | 0                         | 0                  | 0                 | 0.9%   |

# Appendix A.2 – Commercial Building Stock Assessment

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## Background and Objectives

This report characterizes the 2008 commercial building stock in Puget Sound Energy's (PSE) service territory. The study is intended to:

1. Augment and update the results of 2003 Commercial Building Stock Assessment (CBSA) conducted for the Pacific Northwest, and
2. Develop energy-use intensity (EUI) values, fuel shares, and penetration of energy-efficient technologies and practices for use in the Comprehensive Assessment of Demand-Side Resource Potentials (2010-2029).

The results of this study are expected to serve as a basis for current planning, forecasting, and program development initiatives by PSE. Site information from the 2003 CBSA was updated during Winter 2009 and is currently being processed; these results will be incorporated into the database during May/June 2009.

## Study Approach

### Sample Development

This study augments commercial building data collected during the 2003 CBSA study. Because auxiliary data collection activities such as the new construction study and supplemental site visits for the 1998-2000 cohort provided adequate data for newer buildings, only buildings constructed before 1995 were included in this study. PSE provided a database of all current commercial accounts. To build a sample frame, Cadmus classified accounts into building type categories (see Table 1) by NAICS code, and screened for vintage (pre-1995). The building type sample distribution was determined according to the building type percentage kWh usage for PSE. Offices make up the largest part of the commercial electricity load and thus, had the highest site visit target. Within each building type, buildings were sorted into quartiles based on the annual electricity (kWh) consumption, and site visit targets were evenly distributed across the quartiles, shown in Table 1. Buildings were randomly selected from the screened customer database for each quartile.



**Table 1. Initial Sample Frame, Oversample**

| <b>Building Type</b> | <b>Q1<br/>sample</b> | <b>Q2<br/>Sample</b> | <b>Q3<br/>Sample</b> | <b>Q4<br/>Sample</b> | <b>Desired<br/>Sample</b> |
|----------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|
| Dry Goods Retail     | 5                    | 5                    | 6                    | 6                    | 22                        |
| Grocery              | 1                    | 2                    | 2                    | 2                    | 7                         |
| Office               | 10                   | 10                   | 11                   | 11                   | 42                        |
| Restaurant           | 1                    | 2                    | 3                    | 3                    | 9                         |
| Warehouse            | -                    | -                    | -                    | 1                    | 1                         |
| Health               | 1                    | 1                    | 2                    | 2                    | 6                         |
| Hotel/Motel          | -                    | 1                    | 1                    | 1                    | 3                         |
| Schools              | 2                    | 2                    | 3                    | 3                    | 10                        |
| <b>Total</b>         | <b>20</b>            | <b>23</b>            | <b>28</b>            | <b>29</b>            | <b>100</b>                |

To preemptively address sample attrition during the recruitment and auditing process, the initial sample frame targeted 100 buildings, with the goal of completing a minimum of 80 audits at the conclusion of field work. The actual sample of site visits conducted by building segmentation is shown in Table 2. Buildings classified as “Health” were harder to recruit due to privacy and timing issues.

**Table 2. Actual Building Sample**

| <b>Building Type</b> | <b>Q1</b> | <b>Q2</b> | <b>Q3</b> | <b>Q4</b> | <b>Total</b> |
|----------------------|-----------|-----------|-----------|-----------|--------------|
| Dry Goods Retail     | 5         | 4         | 5         | 6         | 20           |
| Grocery              | 1         | -         | 3         | 5         | 9            |
| Office               | 1         | 6         | 11        | 10        | 28           |
| Restaurant           | 1         | 3         | 4         | 4         | 12           |
| Warehouse            | -         | -         | -         | 1         | 1            |
| Health               | 1         | 1         | -         | -         | 2            |
| Hotel/Motel          | 1         | 1         | -         | 1         | 3            |
| Schools              | 1         | 1         | 3         | 3         | 8            |
| <b>Total</b>         | <b>11</b> | <b>16</b> | <b>26</b> | <b>30</b> | <b>83</b>    |

## Sample Recruitment and Data Collection

Given the dated and often incorrect contact information in the sample frame, it was necessary to design recruitment and scheduling procedures which would result in reaching as many sites as possible. Project staff called contacts at the commercial buildings listed in the sample frame to recruit buildings for in-person audits. In cases where contact information was wrong or unavailable, staff performed Internet research to determine the correct information. Once the targeted number of site visits for a given quartile and building type were recruited, the callers moved forward with recruitment of other quartiles or building types.

After a building had committed to participate, an auditor followed up and scheduled an on-site audit. During the walk-through, the auditor collected information on square footage, building use

and general characteristics, HVAC systems, lighting, envelope, and refrigeration (if applicable). The site visit data collection instrument is located in Appendix A.2.2.

Recruited contacts were uploaded into a Web interface designed for organizing and tracking data collection from site visits. The web database mirrored the field data collection instrument and auditors could access the database in the field and input information. Recruitment began in May 2008 and concluded in July 2008. Auditors conducted site visits from June 2008 through August 2008.

## Data Analysis

Case weights for the PSE sample were defined as the PSE population floor space divided by the sample floor space. The weighting was performed at the following levels: building type, four cohorts (pre 1988, 1988-1994, 1995-2001, 2002-2007), and three building size bins (<20,000, 20,000-100,000, >100,000). Population floor space totals were obtained from PNNRES for pre-1988 cohorts and Dodge for post-1988 cohorts.

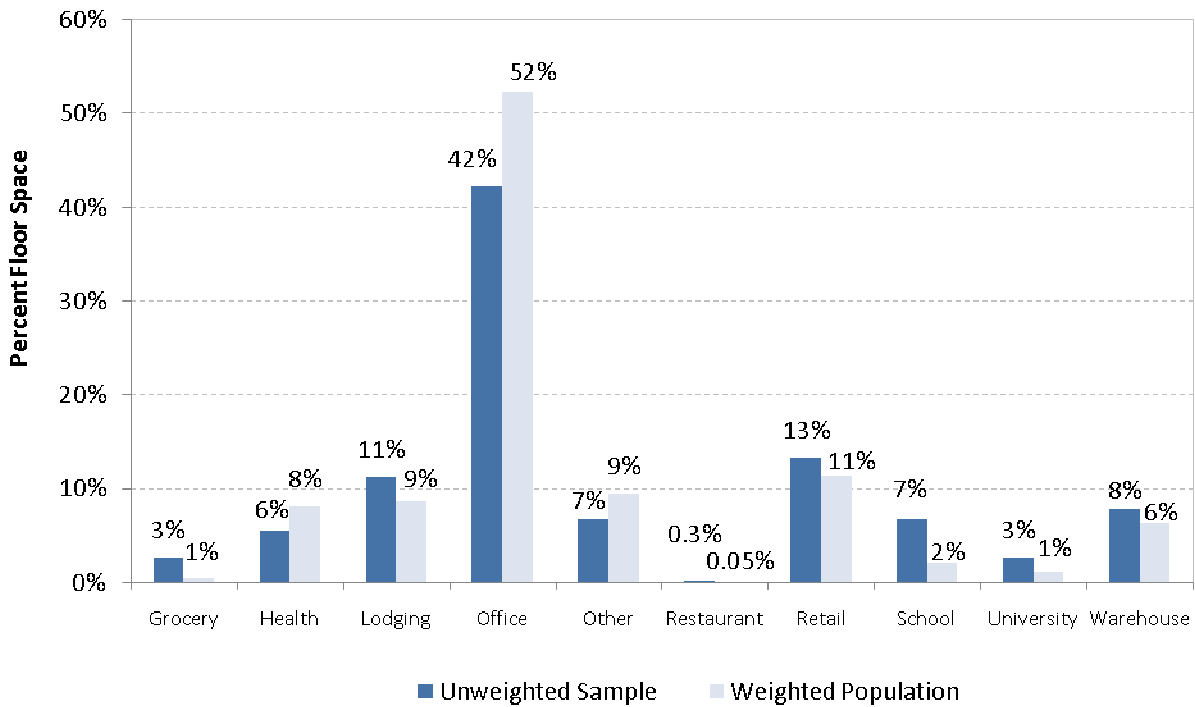
Information on how this data was used in the potential study is included in Appendix C. A summary of basic characteristics is provided in the next section. The potential study data inputs and summarization may differ from the general summary of data, as the inputs took into account the differences among gas only, electricity only, and dual fuel customers.

# Appendix A.2.2 – CBSA Key Findings

## Building Type

Floor space by building type is shown in Figure 1. The un-weighted totals show the actual floor space distribution based on the sample. The weighted totals show the floor space in the population weighted by each building type’s usage distribution.

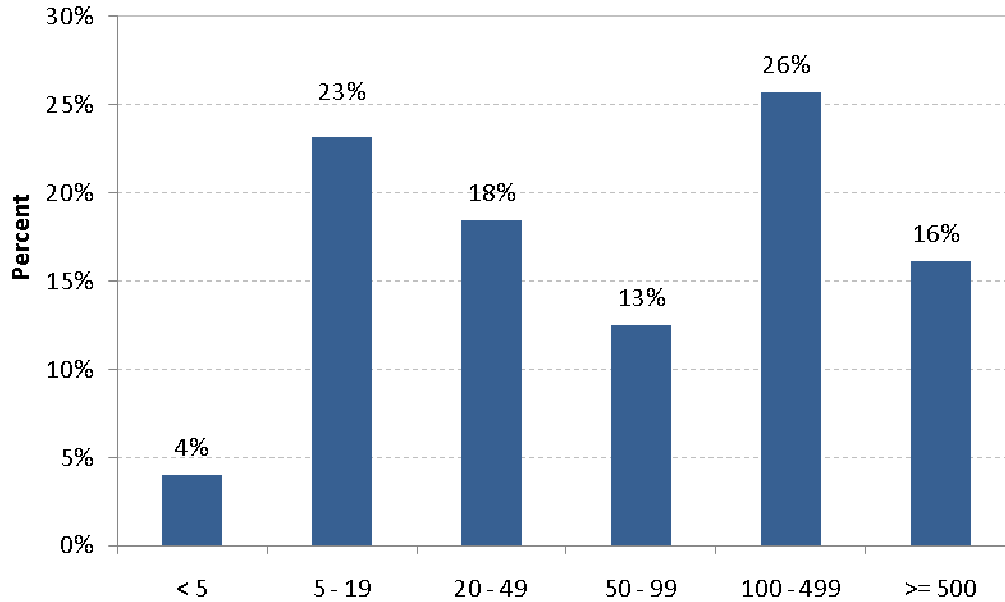
**Figure 1. Building Type by Percentage Floor Space**



## Building Size

Commercial building size is split fairly evenly at 50,000 square feet; approximately half of the buildings are larger than 50,000 (55%) and half are smaller than 50,000 square feet. Most buildings fall under the 100,000-499,000 square feet category (26%) or the 5,000-19,000 square feet category (23%). buildings smaller than 5,000 square feet make up only 4% of the commercial floor space.

**Figure 2. Building Size Distribution (1000 sq.ft.)**

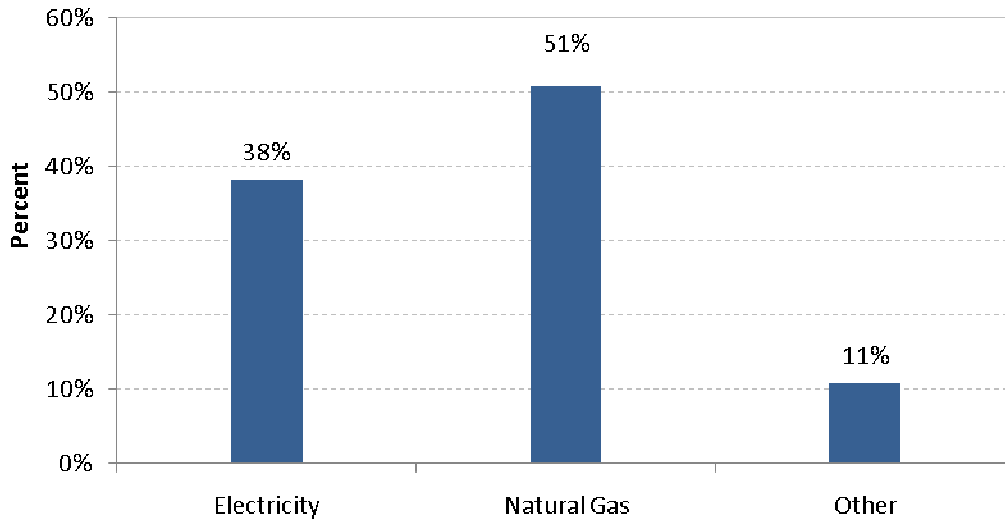


### ***Heating and Cooling***

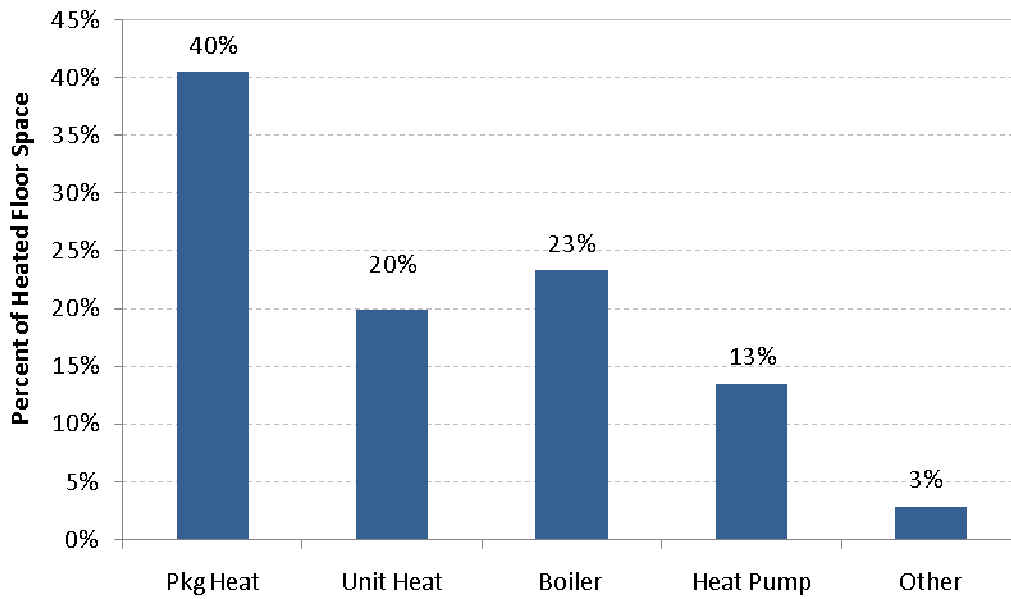
Natural gas is the primary heating fuel for about 51% of commercial building floor space; electricity is the primary heating source for about 38% of building floor, as shown in Figure 3. Other commercial building heating sources are wood stoves and waste oil burners.

Figure 4 and Figure 5 show the distribution of primary heating and cooling system types; the data indicate that the majority of buildings are served by packaged (rooftop) HVAC units. Boilers and chillers serve approximately a quarter of the heated/cooled commercial floor space while heat pumps serve 13% of the building population.

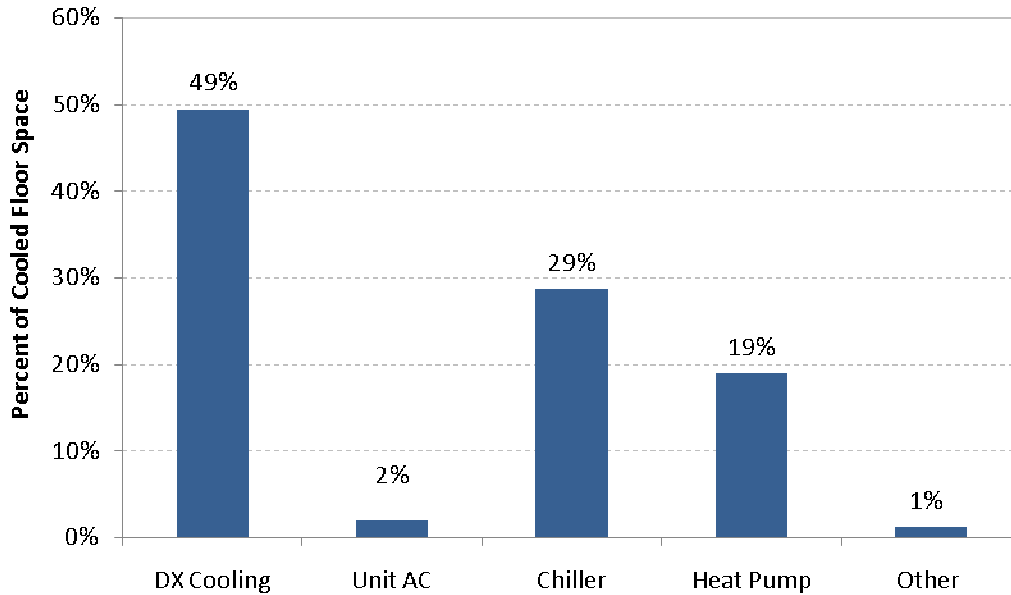
**Figure 3. Predominant Fuel Type**



**Figure 4. Primary Heating Equipment**



**Figure 5. Primary Cooling Equipment**

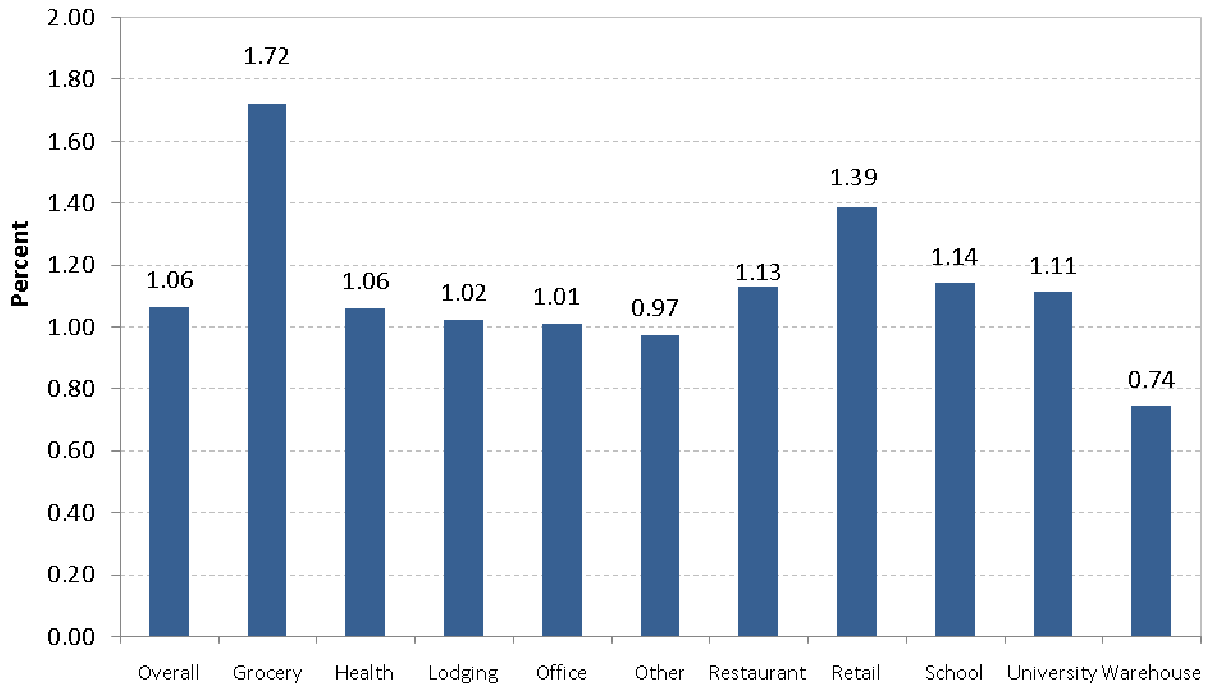


### ***Lighting***

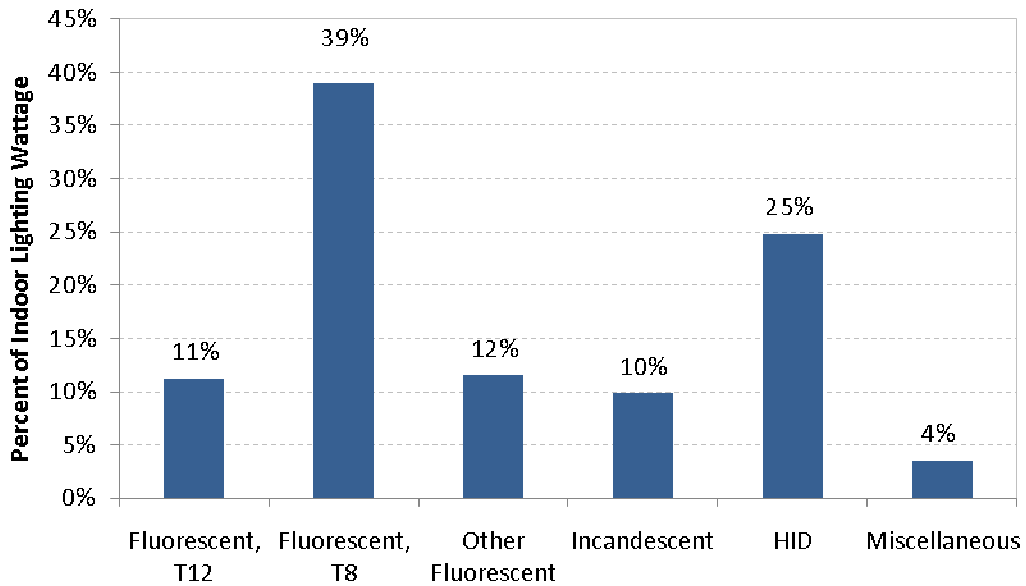
The overall indoor lighting power density (LPD) for all commercial floor space is 1.06 W/sf. Figure 6 shows the LPD for each building type as well as the overall commercial building LPD.

The majority of commercial lighting wattage is in fluorescent lamps (62%). The fluorescent category includes T-12, T-8, T-5, and compact fluorescent lamps. As shown in Figure 7, T-8 fluorescent lamps account for nearly 40% of the installed lighting wattage, and T-12 lamps account for about 11%. HID lights make up 25% of the indoor lighting wattages.

**Figure 6. Interior Lighting Power Density**



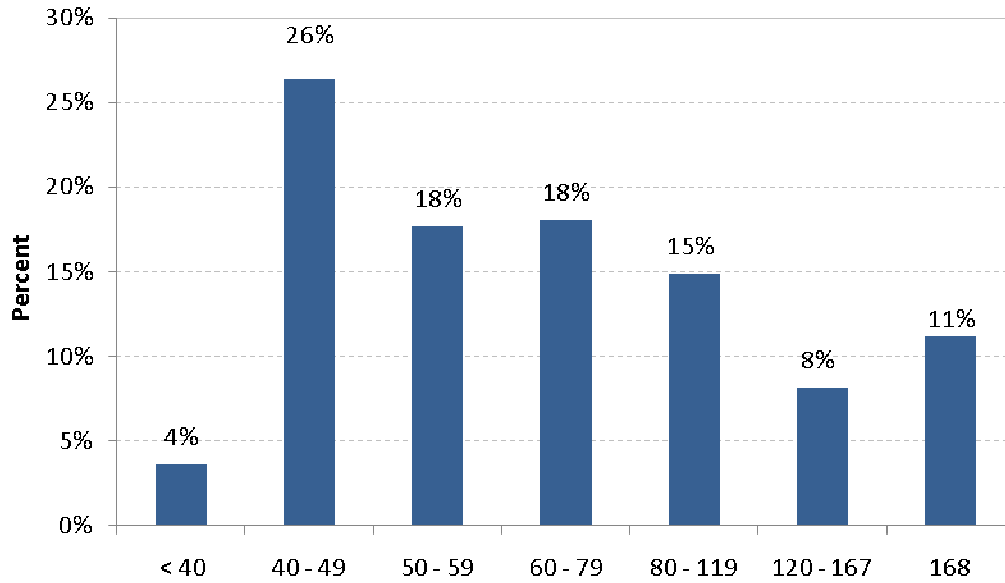
**Figure 7. Percent Wattage by Indoor Lamp Type**



## Operating Hours

Most commercial buildings (62%) operate between 40 to 80 hours per week, shown in Figure 8. Approximately 11% of commercial buildings are on a continuous operation schedule and only 4% operate less than 40 hours a week.

**Figure 8. Building Hours of Operation**





## **Appendix A.2.3 – Data Collection Instrument**

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Site Visit Data Collection Instrument



## Building Occupancy & Management

|   |   |                           |                |        |            |
|---|---|---------------------------|----------------|--------|------------|
| What percentage of the building/complex is occupied by the Owner and/or Tenants?    |   |                           |                | %owner | %tenant    |
| Original Construction   |   | Original Total Floor Area |                |        |            |
| Is a renovation/upgrade planned in the next 2 years?                                |   |                           |                |        |            |
| If yes, which systems? <b>Lighting, HVAC, HVAC Controls, Refrigeration, Windows</b> |   |                           |                | L      | H C R W Ro |
| Is a staff person whose duties include energy conservation and/or management?       |   |                           |                |        |            |
| Is maintenance/repair work done <b>In-house</b> , or by an <b>Outside party</b> ?   |   |                           |                |        |            |
| General O&M   | I | O                         | HVAC Controls  | I      | O          |
| Lighting  | I | O                         | HVAC Equipment | I      | O          |
|   |   |                           | Refrigeration  | I      | O          |

## General Space Information

|                              | Primary Space | Secondary Space | Tertiary Space | Common Space | Indoor Parking |
|------------------------------|---------------|-----------------|----------------|--------------|----------------|
|                              | Space ID: 1   | Space ID: 2     | Space ID: 3    | Space ID: C  | Space ID: P    |
| Functional Use (table below) |               |                 |                |              |                |
| % Of Total Building SQFT     |               |                 |                |              |                |
| Space Cooled?                | Y N           | Y N             | Y N            | Y N          |                |
| After Hours Shutoff/Setup?   | Y N           | Y N             | Y N            | Y N          | Y N            |
| Space Heated?                | Y N           | Y N             | Y N            | Y N          |                |
| After Hours Shutoff/Setback? | Y N           | Y N             | Y N            | Y N          | Y N            |

| Functional Use Codes (Space Type) |                         |
|-----------------------------------|-------------------------|
| 1 Assembly / Recreation           | 7 Office                |
| 2 Classroom                       | 8 Sales                 |
| 3 Dining                          | 9 Storage - Low bay     |
| 4 Guest room                      | 10 Vacant               |
| 5 Kitchen                         | 11 Warehouse - High bay |
| 6 Laundry / Housekeeping          |                         |

## Utility Information

|                               |     |           |           |           |
|-------------------------------|-----|-----------|-----------|-----------|
| <b>Electric Accounts</b>      | ID: | <b>E1</b> | <b>E2</b> | <b>E3</b> |
| <b>Electric Utility Name:</b> |     |           |           |           |
| Meter #                       |     |           |           |           |

|                          |     |           |           |           |
|--------------------------|-----|-----------|-----------|-----------|
| <b>Gas Accounts</b>      | ID: | <b>G1</b> | <b>G2</b> | <b>G3</b> |
| <b>Gas Utility Name:</b> |     |           |           |           |
| Meter #                  |     |           |           |           |

## 2a. Business Schedules

### Primary Schedule For Space ID 1

| Day Type | Business Hours (1-24) | Closed All Day?          | Open 24 Hours?           |
|----------|-----------------------|--------------------------|--------------------------|
| Weekday  | from _____ To _____   | <input type="checkbox"/> | <input type="checkbox"/> |
| Saturday | from _____ To _____   | <input type="checkbox"/> | <input type="checkbox"/> |
| Sunday   | from _____ To _____   | <input type="checkbox"/> | <input type="checkbox"/> |

### Primary Schedule For Space ID 2

| Day Type | Business Hours (1-24) | Closed All Day?          | Open 24 Hours?           |
|----------|-----------------------|--------------------------|--------------------------|
| Weekday  | from _____ To _____   | <input type="checkbox"/> | <input type="checkbox"/> |
| Saturday | from _____ To _____   | <input type="checkbox"/> | <input type="checkbox"/> |
| Sunday   | from _____ To _____   | <input type="checkbox"/> | <input type="checkbox"/> |

### Primary Schedule For Space ID 3

| Day Type | Business Hours (1-24) | Closed All Day?          | Open 24 Hours?           |
|----------|-----------------------|--------------------------|--------------------------|
| Weekday  | from _____ To _____   | <input type="checkbox"/> | <input type="checkbox"/> |
| Saturday | from _____ To _____   | <input type="checkbox"/> | <input type="checkbox"/> |
| Sunday   | from _____ To _____   | <input type="checkbox"/> | <input type="checkbox"/> |

### Primary Schedule For Space ID **Common**

| Day Type | Business Hours (1-24) | Closed All Day?          | Open 24 Hours?           |
|----------|-----------------------|--------------------------|--------------------------|
| Weekday  | from _____ To _____   | <input type="checkbox"/> | <input type="checkbox"/> |
| Saturday | from _____ To _____   | <input type="checkbox"/> | <input type="checkbox"/> |
| Sunday   | from _____ To _____   | <input type="checkbox"/> | <input type="checkbox"/> |

### Primary Schedule For Space ID **Indoor Parking**

| Day Type | Business Hours (1-24) | Closed All Day?          | Open 24 Hours?           |
|----------|-----------------------|--------------------------|--------------------------|
| Weekday  | from _____ To _____   | <input type="checkbox"/> | <input type="checkbox"/> |
| Saturday | from _____ To _____   | <input type="checkbox"/> | <input type="checkbox"/> |
| Sunday   | from _____ To _____   | <input type="checkbox"/> | <input type="checkbox"/> |

### 3. Building Envelope

| WALLS  | Space 1                | Space 2                | Space 3                | Space C                |
|--|------------------------|------------------------|------------------------|------------------------|
| <b>Surface Type:</b><br><b>B</b> = Brick<br><b>C</b> = Concrete<br><b>CB</b> = Concrete Block<br><b>F</b> = Wood<br><b>M</b> = Metal | B<br>C<br>CB<br>F<br>M | B<br>C<br>CB<br>F<br>M | B<br>C<br>CB<br>F<br>M | B<br>C<br>CB<br>F<br>M |
| <b>Framing Type:</b><br><b>M</b> = Metal<br><b>W</b> = Wood  | M W                    | M W                    | M W                    | M W                    |

| WINDOWS   | Space 1 | Space 2 | Space 3 | Space C |
|---|---------|---------|---------|---------|
| <b>% of Wall Area</b>   |         |         |         |         |
| <b>Layers of Glazing</b>  | 1 2 3   | 1 2 3   | 1 2 3   | 1 2 3   |
| <b>Glazing Material:</b><br><b>C</b> = Clear<br><b>O</b> = Opaque<br><b>R</b> = Reflective<br><b>T</b> = Tinted | C O R T | C O R T | C O R T | C O R T |
| <b>Frame Type:</b><br><b>M</b> = Metal<br><b>V</b> = Vinyl<br><b>W</b> = Wood                                   | M V W   | M V W   | M V W   | M V W   |
| <b>Window Type:</b><br><b>F</b> = Fixed<br><b>O</b> = Operable  | F O     | F O     | F O     | F O     |

| ROOFS  | Space 1      | Space 2      | Space 3      | Space C      |
|--|--------------|--------------|--------------|--------------|
| <b>Roof Type:</b><br><b>F</b> = Flat<br><b>P</b> = Pitched   | F P          | F P          | F P          | F P          |
| <b>Surface Material:</b><br><b>B</b> = Built-up<br><b>C</b> = Cool Roof<br><b>E</b> = Membrane<br><b>M</b> = Metal<br><b>S</b> = Shingles/Felt | B C E<br>M S | B C E<br>M S | B C E<br>M S | B C E<br>M S |
| <b>Deck Material:</b><br><b>C</b> = Concrete<br><b>M</b> = Metal<br><b>W</b> = Wood  | C M W        | C M W        | C M W        | C M W        |
| <b>Roof Area (SF): [Flat Roof Only]</b>  |              |              |              |              |

| FLOORS   | Space 1    | Space 2    | Space 3    | Space C    |
|--|------------|------------|------------|------------|
| <b>Floor Type:</b><br><b>B</b> = Basement<br><b>C</b> = Crawl<br><b>S</b> = Slab<br><b>U</b> = Unconditioned | B C<br>S U | B C<br>S U | B C<br>S U | B C<br>S U |

| SKYLIGHTS                        | Space 1 | Space 2 | Space 3 | Space C |
|----------------------------------|---------|---------|---------|---------|
| <b>Skylights?</b>                | Y N     | Y N     | Y N     | Y N     |
| <b>Skylight Area (SF):</b>       |         |         |         |         |
| <b>Lighting Dimming Control?</b> | Y N     | Y N     | Y N     | Y N     |

## 4. Unitary HVAC System

Packaged System ID:                      **PS1**                                      **PS2**                                      **PS3**

|   |                 |                 |                 |
|---|-----------------|-----------------|-----------------|
| <b>Space ID (s) Served</b>  | C<br>1 2 3      | C<br>1 2 3      | C<br>1 2 3      |
| <b>Packaged HVAC System Type</b> (Table below)  |                 |                 |                 |
| <b>Number of Identical Units</b>  |                 |                 |                 |
| <b>Age of Units</b> (Years)   |                 |                 |                 |
| <b>Manufacturer</b>   |                 |                 |                 |
| <b>Model Name/Number</b>  |                 |                 |                 |
| <b>Rated Cooling Capacity</b> (Tons)  |                 |                 |                 |
| <b>Performance Rating</b> (Circle one)  | <i>EER SEER</i> | <i>EER SEER</i> | <i>EER SEER</i> |
| <b>Performance Rating Value</b>   |                 |                 |                 |
| <b>Temperature Control Type</b> (Table below)   |                 |                 |                 |
| <b>Supply Fans: Volume Control:</b> [VAV systems only]<br>Discharge Damper    Inlet Vane    VFD | D I V           | D I V           | D I V           |
| <b>Return Fans?</b>   | Y N             | Y N             | Y N             |
| <b>Economizer:</b> Air    Water    None   | A W N           | A W N           | A W N           |
| <b>Primary Heat: Fuel Type</b> (Table below)  |                 |                 |                 |
| <b>Heating Type</b> (Table below)   |                 |                 |                 |
| <i>Rated Efficiency (%) (may be &gt; 100)</i>   |                 |                 |                 |
| <b>Supp. Heat Fuel Type</b> (Table below)   |                 |                 |                 |
| <b>Heating Type</b> (Table below)   |                 |                 |                 |
| <i>Rated Efficiency (%) (may be &gt; 100)</i>   |                 |                 |                 |

| Packaged HVAC System Type Codes      |                            |
|--------------------------------------|----------------------------|
| 0 Packaged Single Zone - HEAT only   | 7 Heat Pump, ground source |
| 1 Packaged Single Zone - A/C only    | 8 Heat pump, water source  |
| 2 Packaged Single Zone - A/C w/ heat | 9 Split System             |
| 3 Packaged Multi Zone                | 10 Unit Heater             |
| 4 Packaged VAV                       | 11 Unit Ventilator         |
| 5 Evaporative Cooler                 | 12 Window / Wall A/C unit  |
| 6 Heat Pump, air source              | 13 Window / Wall Heat Pump |

| Temperature Control Type Codes |                           |
|--------------------------------|---------------------------|
| 1                              | Thermostat - Programmable |
| 2                              | Thermostat - Manual       |
| 3                              | EMS                       |
| 4                              | Always On                 |
| 5                              | Manual on/off             |
| 6                              | Time clock                |

| Fuel Type Codes | Heating Type Codes   |
|-----------------|----------------------|
| 1 Electricity   | 1 Forced Air Furnace |
| 2 Natural Gas   | 2 Resistance         |
| 3 Fuel Oil      | 3 Central Boiler     |
| 4 Propane       | 4 Other              |
| 5 Other         |                      |

## 5a. Central HVAC System - Boiler

| Boiler ID:                  |                      | B1     | B2     | B3     |
|-----------------------------|----------------------|--------|--------|--------|
| Boiler Service:             | Steam      Hot Water | S    H | S    H | S    H |
| Fuel Type                   | (Table below)        |        |        |        |
| Number of Identical Boilers |                      |        |        |        |
| Number of Units on Standby  |                      |        |        |        |
| Age of Boiler(s)            | (years)              |        |        |        |
| Manufacturer                |                      |        |        |        |
| Model Name/Number           |                      |        |        |        |
| Input Capacity              | (kBtu/hr)            |        |        |        |
| Efficiency                  | (Nominal %)          |        |        |        |
| EMS Control?                |                      | Y    N | Y    N | Y    N |

### HOT WATER PUMPS

|                   |                              |             |             |
|-------------------|------------------------------|-------------|-------------|
| Quantity          |                              |             |             |
| Motor HP          |                              |             |             |
| Motor Efficiency  | (% or S, H, P)               |             |             |
| Capacity Control: | 1 speed   2 speed   Variable | 1    2    V | 1    2    V |
| EMS Control?      |                              | Y    N      | Y    N      |

| Fuel Type Codes |             |
|-----------------|-------------|
| 1               | Electricity |
| 2               | Natural Gas |
| 3               | Fuel Oil    |
| 4               | Propane     |
| 5               | Other       |

### 5b. Central HVAC System - Chiller

| Chiller ID:                     | C1  | C2  | C3  |
|---------------------------------|-----|-----|-----|
| Chiller Type (Table below)      |     |     |     |
| Number of Identical Chillers    |     |     |     |
| Age of Chiller(s) (Years)       |     |     |     |
| Manufacturer                    |     |     |     |
| Model Name/Number               |     |     |     |
| Rated Cooling Capacity (Tons)   |     |     |     |
| Compressor: Design Full Load kW |     |     |     |
| EMS Control?                    | Y N | Y N | Y N |

#### HEAT REJECTION SYSTEM

|   |                   |                   |                   |
|---|-------------------|-------------------|-------------------|
| Condenser Type (Table below)  |                   |                   |                   |
| <b>Fan Control:</b><br>CO nstant P ony motor V ariable Speed<br>CY cle T wo-Speed | CO P<br>CY T<br>V | CO P<br>CY T<br>V | CO P<br>CY T<br>V |
| Condenser Fans: Quantity  |                   |                   |                   |
| HP  |                   |                   |                   |
| EMS Control?  | Y N               | Y N               | Y N               |

#### CHILLED WATER PUMPS

|  |       |       |       |
|--|-------|-------|-------|
| Pump Use: Primary Secondary                | P S   | P S   | P S   |
| Quantity                                   |       |       |       |
| Motor HP                                   |       |       |       |
| Motor Efficiency (% or S, H, P)            |       |       |       |
| Capacity Control: 1 speed 2 speed Variable | 1 2 V | 1 2 V | 1 2 V |
| EMS Control?                               | Y N   | Y N   | Y N   |

#### CONDENSER WATER PUMPS

|  |       |       |       |
|--|-------|-------|-------|
| Quantity                                   |       |       |       |
| Motor HP                                   |       |       |       |
| Motor Efficiency (% or S, H, P)            |       |       |       |
| Capacity Control: 1 speed 2 speed Variable | 1 2 V | 1 2 V | 1 2 V |
| EMS Control?                               | Y N   | Y N   | Y N   |

| Chiller Type Codes |                           | Condenser Type Codes   |  |
|--------------------|---------------------------|------------------------|--|
| 1 Centrifugal      | 4 Absorption, hot water   | 1 Air Cooled Condenser |  |
| 2 Reciprocating    | 5 Absorption, natural gas | 2 Cooling Tower        |  |
| 3 Rotary           | 6 Absorption, steam       | 3 Evaporative Cooler   |  |
|                    |                           | 4 Other                |  |



## 5c. Central HVAC System – Air Handler

|  | Air Handler ID: | AH1     | AH2     | AH3     |
|--|-----------------|---------|---------|---------|
| <b>Air Distribution System Type</b> (Table below)                                |                 |         |         |         |
| <b>Temperature Control Type</b> (Table below)                                    |                 |         |         |         |
| <b>Age of Air Handler</b> (Years)  |                 |         |         |         |
| <b>Supply Fans: Volume Control:</b> None<br>Inlet Vane<br>VFD                    |                 | N I V   | N I V   | N I V   |
| <b>Motor HP</b>  |                 |         |         |         |
| <b>Motor Efficiency</b> (% or S, H, P)   |                 |         |         |         |
| <b>Return Fans?</b>  |                 | Y N     | Y N     | Y N     |
| <b>Motor HP</b>  |                 |         |         |         |
| <b>Motor Efficiency</b> (% or S, H, P)   |                 | / /     | / /     | / /     |
| <b>Economizer?</b>   |                 | Y N     | Y N     | Y N     |
| <b>Terminal Reheat:</b> <b>Electric</b> <b>Water</b><br><b>Steam</b> <b>None</b> |                 | E S W N | E S W N | E S W N |

| Air Distribution System Type Codes |                         |
|------------------------------------|-------------------------|
| 1 CV - Single Zone                 | 8 VAV – Terminal Reheat |
| 2 CV - Multi Zone                  | 9 VAV – Dual Duct       |
| 3 CV - Dual Duct                   | 10 Fan Coil             |
| 4 CV - Terminal Reheat             | 11 Baseboard            |
| 5 FPS – Fan Powered VAV - Series   | 12 Heat & Vent          |
| 6 FPP – Fan Powered VAV - Parallel | 13 Hydronic Heat Pump   |
| 7 VAV – Cooling Only               | 14 Induction            |

| Temperature Control Type Codes |  |
|--------------------------------|--|
| 1 Thermostat – Programmable    |  |
| 2 Thermostat - Manual          |  |
| 3 EMS                          |  |
| 4 Always On                    |  |
| 5 Manual on/off                |  |
| 6 Time clock                   |  |

## 6. Domestic Water Heating

| Water Heater ID:                       | WH1 | WH2 | WH3 | WH4 |
|--|-----|-----|-----|-----|
| <b>Water Heater Type</b> (Table below) |     |     |     |     |
| <b>Fuel Type</b> (Table below)         |     |     |     |     |
| <b>Number of Identical Units</b>       |     |     |     |     |
| <b>Age Of Water Heater</b> (years)     |     |     |     |     |
| <b>Tank Capacity</b> (Gallons)         |     |     |     |     |
| <b>Input Capacity</b> (kW or kBtu/hr)  |     |     |     |     |
| <b>Tank Wrap?</b>                      | Y N | Y N | Y N | Y N |
| <b>Recirculation Pump?</b>             | Y N | Y N | Y N | Y N |

| <b>Water Heater Type Codes</b> |                               |
|--------------------------------|-------------------------------|
| 1                              | Heat Pump                     |
| 2                              | Heat Recovery                 |
| 3                              | Instantaneous (tankless)      |
| 4                              | Self-Contained                |
| 5                              | Storage Tank (Central Boiler) |
| 6                              | Other                         |

| <b>Fuel Type Codes</b> |             |
|------------------------|-------------|
| 1                      | Electricity |
| 2                      | Natural Gas |
| 3                      | Fuel Oil    |
| 4                      | Propane     |
| 5                      | Other       |

## 8a. Indoor Lighting

|  |          |          |          |          |          |          |
|--|----------|----------|----------|----------|----------|----------|
| <b>Lighting Group ID#</b> (multiple pages OK)  | IL-_____ | IL-_____ | IL-_____ | IL-_____ | IL-_____ | IL-_____ |
| <b>Usage:</b> General Area Retail Display Task | G R T    | G R T    | G R T    | G R T    | G R T    | G R T    |

### FLUORESCENT

|                                     |     |     |     |     |     |     |
|-------------------------------------|-----|-----|-----|-----|-----|-----|
| <b>F</b> = Standard Tube            | F   | F   | F   | F   | F   | F   |
| <b>U</b> = U-tube                   | U   | U   | U   | U   | U   | U   |
| <b>Length</b> (1.5' 2' 3' 4' 6' 8') |     |     |     |     |     |     |
| <b>Diameter</b> (T5 T8 T10 T12)     |     |     |     |     |     |     |
| <b>CF</b> = Compact Fluorescent     | CF  | CF  | CF  | CF  | CF  | CF  |
| <b>CIR</b> = Circline Fluorescent   | CIR | CIR | CIR | CIR | CIR | CIR |

### HID

|                                 |    |    |    |    |    |    |
|---------------------------------|----|----|----|----|----|----|
| <b>MH</b> = Metal Halide        | MH | MH | MH | MH | MH | MH |
| <b>H</b> = High Pressure Sodium | H  | H  | H  | H  | H  | H  |

### MISC.

|                               |     |     |     |     |     |     |
|-------------------------------|-----|-----|-----|-----|-----|-----|
| <b>I</b> = Incandescent       | I   | I   | I   | I   | I   | I   |
| <b>Q</b> = Quartz/Halogen     | Q   | Q   | Q   | Q   | Q   | Q   |
| <b>XI</b> = Exit Incandescent | XI  | XI  | XI  | XI  | XI  | XI  |
| <b>XCF</b> = Exit CF          | XCF | XCF | XCF | XCF | XCF | XCF |
| <b>LED</b> = Exit LED         | LED | LED | LED | LED | LED | LED |

|  |     |     |     |     |     |     |
|--|-----|-----|-----|-----|-----|-----|
| <b>Watts per lamp:</b>                   |     |     |     |     |     |     |
| <b>Number of lamps per fixture:</b>      |     |     |     |     |     |     |
| <b>Total number of fixtures:</b>         |     |     |     |     |     |     |
| <b>Ballast Type:</b> ES = ES Magnetic    | ES  | ES  | ES  | ES  | ES  | ES  |
| E = Electronic                           | E   | E   | E   | E   | E   | E   |
| <b>Control Type:</b> E = EMS             | E   | E   | E   | E   | E   | E   |
| DC = Daylighting - Continuous dimming    | DC  | DC  | DC  | DC  | DC  | DC  |
| DS = Daylighting - Step dimming          | DS  | DS  | DS  | DS  | DS  | DS  |
| MB = Manual - circuit breaker            | MB  | MB  | MB  | MB  | MB  | MB  |
| MS = Manual - wall switch                | MS  | MS  | MS  | MS  | MS  | MS  |
| OS = Occupancy sensor                    | OS  | OS  | OS  | OS  | OS  | OS  |
| P = Photocell                            | P   | P   | P   | P   | P   | P   |
| T = Timeclock                            | T   | T   | T   | T   | T   | T   |
| N = None (continuous)                    | N   | N   | N   | N   | N   | N   |
| <b>% of Lighting load controlled:</b>    |     |     |     |     |     |     |
| <b>Are controls functional and used?</b> | Y N | Y N | Y N | Y N | Y N | Y N |

## 8b. Indoor Lighting – Overview

| Lighting Group ID<br>(unique entries) | Description | Space ID<br>(select one) | Area Surveyed (SF) | Total Area<br>Represented (SF) |
|---------------------------------------|-------------|--------------------------|--------------------|--------------------------------|
| IL-_____                              |             | C P<br>1 2 3             |                    |                                |
| IL-_____                              |             | C P<br>1 2 3             |                    |                                |
| IL-_____                              |             | C P<br>1 2 3             |                    |                                |
| IL-_____                              |             | C P<br>1 2 3             |                    |                                |
| IL-_____                              |             | C P<br>1 2 3             |                    |                                |
| IL-_____                              |             | C P<br>1 2 3             |                    |                                |
| IL-_____                              |             | C P<br>1 2 3             |                    |                                |
| IL-_____                              |             | C P<br>1 2 3             |                    |                                |
| IL-_____                              |             | C P<br>1 2 3             |                    |                                |
| IL-_____                              |             | C P<br>1 2 3             |                    |                                |
| IL-_____                              |             | C P<br>1 2 3             |                    |                                |
| IL-_____                              |             | C P<br>1 2 3             |                    |                                |
| IL-_____                              |             | C P<br>1 2 3             |                    |                                |
| IL-_____                              |             | C P<br>1 2 3             |                    |                                |
| IL-_____                              |             | C P<br>1 2 3             |                    |                                |
| IL-_____                              |             | C P<br>1 2 3             |                    |                                |
| IL-_____                              |             | C P<br>1 2 3             |                    |                                |
| IL-_____                              |             | C P<br>1 2 3             |                    |                                |
| IL-_____                              |             | C P<br>1 2 3             |                    |                                |
| IL-_____                              |             | C P<br>1 2 3             |                    |                                |
| IL-_____                              |             | C P<br>1 2 3             |                    |                                |
| IL-_____                              |             | C P<br>1 2 3             |                    |                                |
| <b>Total</b>                          |             |                          |                    |                                |

## 9. Outdoor Lighting

| Outdoor Lighting ID#                                 | OL-_____                                  | OL-_____          | OL-_____          | OL-_____          | OL-_____          | OL-_____          |                   |
|--|---|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| <b>Use type:</b> Advertising<br>Bldg Façade<br>Other | Parking Lot<br>Display<br>Safety/Security | A P<br>F D<br>G S | A P<br>F D<br>G S | A P<br>F D<br>G S | A P<br>F D<br>G S | A P<br>F D<br>G S | A P<br>F D<br>G S |

### FLUORESCENT

|                                     |     |     |     |     |     |     |
|-------------------------------------|-----|-----|-----|-----|-----|-----|
| <b>F</b> = Standard Tube            | F   | F   | F   | F   | F   | F   |
| <b>U</b> = U-tube                   | U   | U   | U   | U   | U   | U   |
| <b>Length</b> (1.5' 2' 3' 4' 6' 8') |     |     |     |     |     |     |
| <b>Diameter</b> (T5 T8 T10 T12)     |     |     |     |     |     |     |
| <b>CF</b> = Compact Fluorescent     | CF  | CF  | CF  | CF  | CF  | CF  |
| <b>CIR</b> = Circline Fluorescent   | CIR | CIR | CIR | CIR | CIR | CIR |

### HID

|                                 |    |    |    |    |    |    |
|---------------------------------|----|----|----|----|----|----|
| <b>MH</b> = Metal Halide        | MH | MH | MH | MH | MH | MH |
| <b>H</b> = High Pressure Sodium | H  | H  | H  | H  | H  | H  |
| <b>N</b> = Neon                 | N  | N  | N  | N  | N  | N  |

### MISC.

|                           |   |   |   |   |   |   |
|---------------------------|---|---|---|---|---|---|
| <b>Q</b> = Quartz/Halogen | Q | Q | Q | Q | Q | Q |
| <b>I</b> = Incandescent   | I | I | I | I | I | I |

|   |                          |                          |                          |                          |                          |                          |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <b>Watts per lamp</b> (Enter 10 if Neon)                  |                          |                          |                          |                          |                          |                          |
| -- Check if lamp watts were estimated?                    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b>Number of lamps per fixture</b><br>(Enter 1 if Neon)   |                          |                          |                          |                          |                          |                          |
| <b>Total number of fixtures</b><br>(Total length if Neon) |                          |                          |                          |                          |                          |                          |
| <b>Ballast Type:</b> ES = ES Magnetic                     | ES                       | ES                       | ES                       | ES                       | ES                       | ES                       |
| E = Electronic  | E                        | E                        | E                        | E                        | E                        | E                        |
| <b>Control Type:</b> E = EMS                              | E                        | E                        | E                        | E                        | E                        | E                        |
| MB = Manual - circuit breaker                             | MB                       | MB                       | MB                       | MB                       | MB                       | MB                       |
| MS = Manual on/off switch                                 | MS                       | MS                       | MS                       | MS                       | MS                       | MS                       |
| OS = Occupancy sensor                                     | OS                       | OS                       | OS                       | OS                       | OS                       | OS                       |
| P = Photocell   | P                        | P                        | P                        | P                        | P                        | P                        |
| PT = Photocell/Timeclock                                  | PT                       | PT                       | PT                       | PT                       | PT                       | PT                       |
| T = Timeclock   | T                        | T                        | T                        | T                        | T                        | T                        |
| N = None (continuous)                                     | N                        | N                        | N                        | N                        | N                        | N                        |
| <b>Are controls functional and used?</b>                  | Y N                      | Y N                      | Y N                      | Y N                      | Y N                      | Y N                      |

## 10. Miscellaneous Equipment

| Economic Use Type | Equipment                      |               |
|-------------------|--------------------------------|---------------|
| Grocery           | Point-of-use terminals         | (#)           |
|                   | Food Prep – Meat Dept.         | (1=Yes, 0=No) |
|                   | Food Prep – Deli               | (1=Yes, 0=No) |
| Hotel/Motel       | Rooms                          | (#)           |
|                   | Annual Average occupancy       | (%)           |
|                   | Kitchen – Full Service (below) | (1=Yes, 0=No) |
|                   | Kitchen – Warming              | (1=Yes, 0=No) |
|                   | Laundry Facility (see below)   | (1=Yes, 0=No) |
| Office            | PCs                            | (#)           |
| Other Health      | Beds                           | (#)           |
|                   | Laundry Facility (see below)   | (1=Yes, 0=No) |
| Restaurant        | Meals per day                  | (#)           |
|                   | Kitchen – Full Service (below) | (1=Yes, 0=No) |
|                   | Kitchen – Warming              | (1=Yes, 0=No) |
| Retail            | Point-of-use terminals         | (#)           |
| School            | Classrooms                     | (#)           |
|                   | Kitchen – Full Service (below) | (1=Yes, 0=No) |
|                   | Kitchen – Warming              | (1=Yes, 0=No) |
|                   | Laundry Facility (see below)   | (1=Yes, 0=No) |
| Warehouse         | Forklifts (electric only)      | (#)           |

| Food Service Equipment  |                             | Electric / Gas |
|-------------------------|-----------------------------|----------------|
| If Kitchen–Full Service | Broilers / Fryers           | E G            |
|                         | Griddle / Grill             | E G            |
|                         | Oven                        | E G            |
|                         | Range                       | E G            |
| If Laundry              | Dishwasher Booster          | E G            |
|                         | Clothes Dryer – Commercial  | E G            |
|                         | Clothes Dryer – Residential | E G            |

| Packaged Refrigeration Equipment | Count |
|----------------------------------|-------|
| Vending Machines                 |       |
| Beverage Merchandizers           |       |
| Ice Machines                     |       |
| Refrigerators                    |       |
| Freezers                         |       |

## 11. Refrigeration Equipment

|                                      |  |   | Space ID:       |                 |                 |                 |                 |
|--------------------------------------|--|---|-----------------|-----------------|-----------------|-----------------|-----------------|
|                                      |  |   | C<br>1 2 3      | C<br>1 2 3      | C<br>1 2 3      | C<br>1 2 3      | C<br>1 2 3      |
| <b>Compressors</b>                   |  |   | ID #:           |                 |                 |                 |                 |
|                                      |  |   | Cp-1            | Cp-2            | Cp-3            | Cp-4            | Cp-5            |
| <b>Type:</b>                         | Reciprocating<br>Two-stage multiplex<br>Other          | Screw<br>Multiplex                              | R S<br>T M<br>O | R S<br>T M<br>O | R S<br>T M<br>O | R S<br>T M<br>O | R S<br>T M<br>O |
| <b>Temp:</b>                         | Low<br>Medium<br>High                                  | (0 to -10 °F)<br>(30 to 40 °F)<br>(50 to 55 °F) | L M H           | L M H           | L M H           | L M H           | L M H           |
| <b>Total HP:</b>                     |  |   |                 |                 |                 |                 |                 |
| <b>Quantity:</b>                     |  |   |                 |                 |                 |                 |                 |
| <b>Unloaders or VSD compressors?</b> |  |   | U V NA          | U V NA          | U V NA          | U V NA          | U V NA          |
| <b>Heat Recovery Type:</b>           | None<br>Space Heating/Reheat<br>Water heating<br>Other |   | N S<br>W O      | N S<br>W O      | N S<br>W O      | N S<br>W O      | N S<br>W O      |

|  |  |  | ID #:           |                 |                 |                 |                 |
|--|--|--|-----------------|-----------------|-----------------|-----------------|-----------------|
|  |  |  | Cn-1            | Cn-2            | Cn-3            | Cn-4            | Cn-5            |
| <b>Type:</b>                                   | Air-cooled<br>Close-approach<br>Water-cooled | Air-cooled w/Pre-cooler<br>Evap-cooled | A P<br>C E<br>W | A P<br>C E<br>W | A P<br>C E<br>W | A P<br>C E<br>W | A P<br>C E<br>W |
| <b>Total Fan HP:</b> (all types)               |  |  |                 |                 |                 |                 |                 |
| <b>Fan VSD?</b>                                |  |  | Y N             | Y N             | Y N             | Y N             | Y N             |
| <b>Pump Motor HP</b> (water-cooled units only) |  |  |                 |                 |                 |                 |                 |
| <b>Pump VSD?</b>                               |  |  | Y N             | Y N             | Y N             | Y N             | Y N             |

|                                   |      | ID #:            |                  |                  |                  |                  |
|-----------------------------------|------|------------------|------------------|------------------|------------------|------------------|
|                                   |      | DC-1             | DC-2             | DC-3             | DC-4             | DC-5             |
| <b>Display Cases</b>              |      |                  |                  |                  |                  |                  |
| <b>Case Length:</b>               | (LF) |                  |                  |                  |                  |                  |
| <b>Do the cases have doors?</b>   |      | Y N              | Y N              | Y N              | Y N              | Y N              |
| <b>Anti-sweat heater control?</b> |      | Y N              | Y N              | Y N              | Y N              | Y N              |
| <b>Lighting Type:</b>             |      | T12 T8<br>T5 LED | T12 T8<br>T5 LED | T12 T8<br>T5 LED | T12 T8<br>T5 LED | T12 T8<br>T5 LED |
| <b>Watts per lamp:</b>            |      |                  |                  |                  |                  |                  |
| <b>Total number of lamps:</b>     |      |                  |                  |                  |                  |                  |

## 12. Server Rooms

| <b>Number of Hardware in Use:</b> | <b>Less than 3 years old</b> | <b>4-10 years old</b> | <b>11-15 years old</b> |
|-----------------------------------|------------------------------|-----------------------|------------------------|
| <b>Servers</b>                    |                              |                       |                        |
| <b>Storage Devices</b>            |                              |                       |                        |
| <b>Backup Devices</b>             |                              |                       |                        |
| <b>Routers, switches</b>          |                              |                       |                        |

|  |             |
|--|-------------|
| <b>Total Floor Area:</b>   |             |
| <b>Separate electric meter:</b>                                  | [Y] [N] [?] |
| <b>Total electrical load: (kW)</b>                               |             |
| <b>Number of servers with power management system installed:</b> |             |
| <b>Is power management system activated:</b>                     | [Y] [N] [?] |
| <b>Does space have it's own conditioning:</b>                    | [Y] [N] [?] |
| <b>Cooling capacity: (tons)</b>                                  |             |
| <b>Lighting power density: (W/sf)</b>                            |             |
| <b>UPS Electrical capacity:</b>                                  |             |
| <b>UPS Current load:</b>   |             |
| <b>Size of Backup generator on site: (MW)</b>                    |             |



## Appendix A.3: Fuel Conversion Survey

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### Appendix A.3-1 Summary of Results

Fuel conversion, from electricity to natural gas, is a potential option for managing energy demand within Puget Sound Energy's service territory. To examine the viability of this management strategy, The Cadmus Group conducted a survey among PSE's residential customers to determine how receptive households are to converting from electric to gas home heating at different incentive levels. Other information collected in the survey included: home size, perceptions of natural gas, likelihood of switching to a gas water heater, and a battery of segmentation questions which touched on environmental values, energy product purchasing decisions, utility service expectations, and energy use. A copy of the survey instrument is located in Appendix A.3-2.

Consumer Contact administered the survey via telephone on June 20 through July 7, 2008. The sample frame consisted of PSE residential customers that receive electricity service only. Some PSE electricity customers overlap with Cascade Natural or other natural gas provider territory, and those respondents were screened out at the beginning of the survey. A total of 1,932 households were successfully contacted and 317 responded to the full survey, yielding a response rate of 16.4 percent. Of the 1,932 contacted households, 421 (21.8 percent) were ineligible for the survey because they receive natural gas from an alternate provider. A summary of responses for each question is located in Appendix A.3-3. Basic analysis on fuel conversion potential is presented in this memo; however, the analysis can be expanded to other items as needed.

#### Fuel Conversion Market Potential Assessment

Before responding to questions about fuel conversion, each respondent was informed that it will cost the average homeowner \$6000 to convert their heating system from electricity to gas and that it will save them approximately \$600 annually on their energy bill. Respondents then answered the following question:

“Given the cost of converting, how likely would you be to convert to [a gas heating system] for your home in the next five years?”

Response categories were based on a 5-point Likert scale, including “very likely” (5), “somewhat likely” (4), “neutral” (3), “somewhat unlikely” (2), and “very unlikely” (1). Respondents who answered 1, 2, 3, or 4, were also asked how likely they would be to switch if they were offered an incentive of \$1500, \$3000, \$4500, or \$6000 (equivalents of 25, 50, 75, and 100 percent of total conversion cost, respectively). Each respondent answered for one randomly drawn incentive level. If a respondent indicated that s/he was “highly likely” to switch without an incentive, it was assumed s/he would also switch at any incentive level.

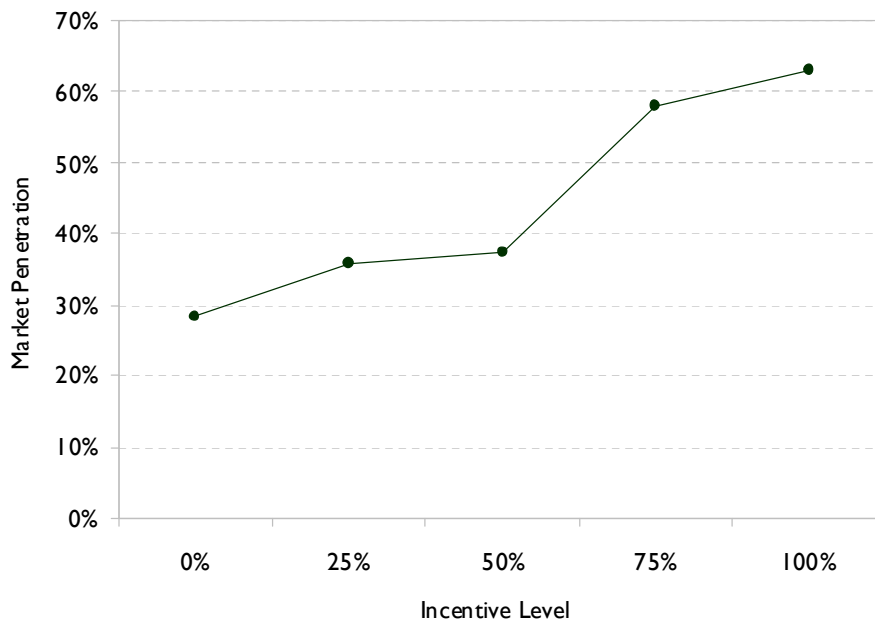
Data for the fuel conversion questions are shown in Table 1. In order to calculate the market penetration for fuel conversion, each point on the 5-point scale was assigned a probability of switching, see row 2, Table 1.

**Table 1. Fuel Switching Responses At Different Incentive Levels**

| Incentive Level | 5-Point Scale<br>(Probability of Switching) |             |             |             |            | Total Responses | Market Penetration |
|-----------------|---|-------------|-------------|-------------|------------|-----------------|--------------------|
|                 | 1<br>(0.0)                                  | 2<br>(0.25) | 3<br>(0.50) | 4<br>(0.75) | 5<br>(1.0) |                 |                    |
| None            | 133   | 47          | 42          | 25          | 26         | 273             | 28%                |
| 25%             | 23  | 6           | 11          | 12          | 4          | 56              | 36%                |
| 50%             | 26  | 12          | 7           | 14          | 8          | 67              | 37%                |
| 75%             | 13  | 6           | 15          | 16          | 19         | 69              | 58%                |
| 100%            | 10  | 7           | 4           | 11          | 22         | 54              | 63%                |

We calculated market potential by taking the weighted average of the conversion probability at each incentive level. The probability of switching is markedly higher at the 100 percent subsidy (63%) compared to no subsidy (28%). Figure 1 displays the market penetration at each incentive level.

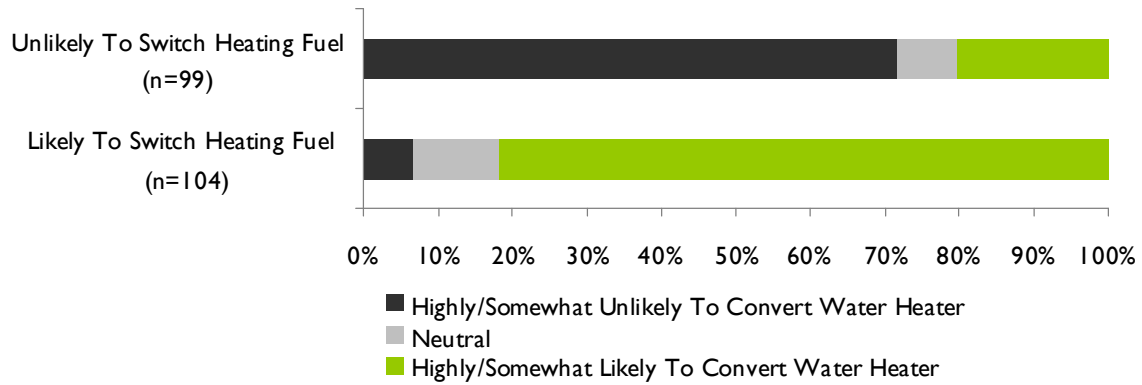
**Figure 1. Market Penetration of Fuel Conversion At Different Incentive Levels**



### ***Water Heater Replacement***

Homeowners who said they were highly or somewhat likely to convert their heating system indicated they would also be likely to change their hot water heater at the same time. The majority of respondents that said they were highly or somewhat unlikely to convert their heating system also indicated they would be unlikely to change their hot water heater at the same time. Figure 2 shows the likelihood of switching a gas water heat at the same time as a heating system.

**Figure 2. Likeliness To Convert Water Heater At Same Time As Heating Source**



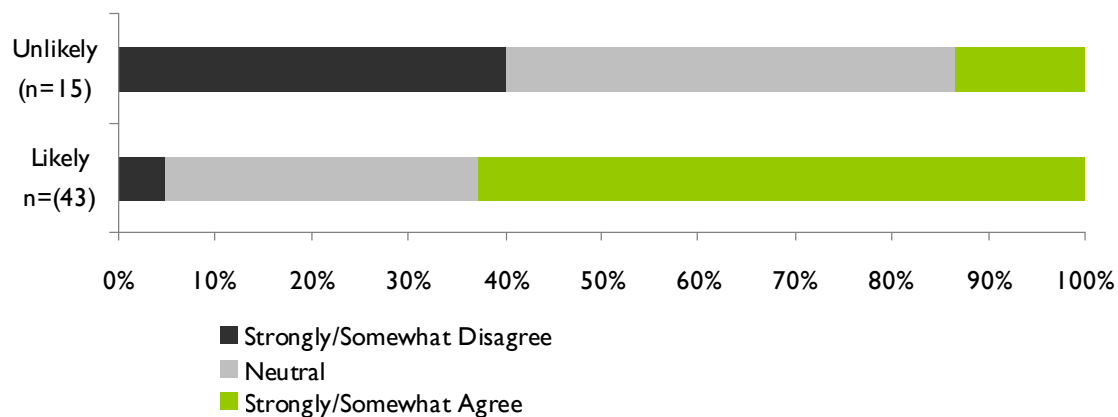
***Perceptions Regarding Natural Gas***

In order to examine the motivating reasons for willingness to convert fuel sources, we compared two types of respondents: those that were somewhat likely or highly likely to switch without an incentive (“Likely” group) and those that were highly unlikely or somewhat unlikely to switch with a 100 percent incentive (“Unlikely” group).

In particular, we compared the two groups’ natural gas awareness. Survey respondents were asked to rate their level of agreement with seven statements about natural gas, and the responses between the “Likely” and “Unlikely” groups were significantly different for all seven statements, as indicated by  $\chi^2$ , a statistical measure of correspondence between the two groups’ responses.<sup>1</sup> One of the most notable differences between the two groups’ perception of natural gas was whether or not they thought it was a more economical energy source. As shown in Figure 3, the “Likely” group generally agreed that natural gas is more economical, while the “Unlikely” group disagreed or indicated neutrality.

<sup>1</sup> The chi-squared value and probability (p-value) is given for each statement. A p-value <0.05 is significant at the 95% confidence level. Q12\_1 ( $\chi^2 = 21.41, p=0.0003$ ); Q12\_2 ( $\chi^2 = 26.59, p<0.0001$ ); Q12\_3 ( $\chi^2 = 18.27, p=0.0011$ ); Q12\_4 ( $\chi^2 = 17.59, p=0.0015$ ); Q12\_5 ( $\chi^2 = 23.34, p=0.001$ ); Q12\_6 ( $\chi^2 = 16.68, p=0.0022$ ); Q12\_7 ( $\chi^2 = 15.65, p=0.0035$ )

**Figure 3. Agreement With the Statement “Natural Gas is more economical than other fuel sources.”**



Note: Unlikely “n” is smaller because only a quarter of the respondents were asked if they would switch with a 100 percent incentive; every respondent was asked if they would be willing to switch without an incentive.

## Appendix A.3-2 Survey Instrument

Puget Sound Energy Residential Fuel Conversion Survey  
June 18, 2008 FINAL

Introduction/Screening  
**com:[REVISED 06/18/08]**

My name is \_\_\_\_\_, and I am from Consumer Contact, calling on behalf of Puget (PEW-JIT) Sound Energy, your electricity provider. We are conducting a study to better understand whether our customers would consider switching to gas appliances when appropriate. This survey is for research purposes only and is not a marketing call. All survey results will be aggregated and only used by your utility in their planning efforts.

(Q1.) First of all, do you own your home?  
(DO NOT READ LIST) **com:[SINGLE MENTION]**

- 1 YES
- 2 NO

**com:[IF Q1=1 CONTINUE,OTHERWISE TERMINATE]**

~

(Q2.) Which of the following best describes your home?  
(READ LIST IF NECESSARY) **com:[SINGLE MENTION]**

- 1 Single family detached (on a separate lot) not connected to other living units
- 2 Duplex or Triplex with 2 or 3 total living units (IF NECESSARY SAY "It has one adjacent wall to another residence with no units above or below")
- 3 Unit in Condominium or Apartment building with 4 or more attached units
- 4 Manufactured or mobile home

**com:[IF Q2=3,4,? OR ! TERMINATE, OTHERWISE CONTINUE]**

~

(Q3.) Can you verify that you are the person in your household who would be most likely to make decisions concerning appliance purchases for the home at **com:[ADDRESS FROM SAMPLE]**? (IF RESPONDENT NEEDS CLARIFICATION: "For example, if your water heater were to break down today, would you be the person who decides how to replace it?")

- 1 YES
- 2 NO (ASK TO SPEAK TO THIS PERSON OR ARRANGE CALLBACK IF NECESSARY)

**com:[IF Q3=? OR ! TERMINATE, OTHERWISE CONTINUE]**

~

(Q4.) Who provides your electricity service?  
(DO NOT READ LIST) **com:[SINGLE MENTION]**

(INTERVIEWER NOTE: IF RESPONDENT IS UNSURE, OFFER SUGGESTIONS SUCH AS:  
SNOHOMISH PUD, SEATTLE CITY LIGHT, TACOMA POWER. IF  
ANSWER IS GIVEN RECORD UNDER 'OTHER PLEASE SPECIFY')

- 1 PUGET SOUND ENERGY (PSE OR PUGET POWER)
- 2 OTHER (PLEASE SPECIFY): \_\_\_\_\_

**com:[IF Q4=! TERMINATE, OTHERWISE CONTINUE]**

~

**com:[REVISED 06/18/08]**

(Q5.) What is your primary source of heating fuel?  
(DO NOT READ LIST) **com:[SINGLE MENTION]**

(INTERVIEWER NOTE: READ IF NECESSARY "What fuel is used most to heat your home?")

- 1 NATURAL GAS
- 2 ELECTRIC
- 3 PROPANE
- 4 OIL
- 91 OTHER (PLEASE SPECIFY): \_\_\_\_\_

**com:[IF Q5=1 CONTINUE, OTHERWISE SKIP TO Q7]**

~

**com:[REVISED 06/18/08]**

(Q6.) Who provides your natural gas service?  
(DO NOT READ LIST) **com:[SINGLE MENTION]**

- 1 PUGET SOUND ENERGY/WASHINGTON NATURAL GAS
- 2 CASCADE NATURAL GAS
- 3 AMERIGAS
- 4 FERRELLGAS
- 5 NORTH WEST PROPANE
- 6 PERMAGAS
- 7 SUBURBAN PROPANE
- 91 OTHER (PLEASE SPECIFY): \_\_\_\_\_

**com:[IF Q6=1 OR 2 OR 91 TERMINATE, OTHERWISE CONTINUE TO Q6A]**

~

**com:[REVISED 06/18/08]**

(Q6a.) It is to my understanding that **com:[INSERT ANSWER FROM Q6]** is a propane company. Do you buy or fill a tank for fuel?

- 1 YES
- 2 NO

**com:[IF YES AUTO RECODE Q5 WITH CODE 3 AND CONTINUE WITH SURVEY, OTHERWISE TERMINATE]**

~

This call may be monitored or recorded for quality control purposes.

**com:[REVISED 06/18/08]**

(Q7.) What type of heating system does your home have?  
(READ LIST) **com:[SINGLE MENTION]**

- 1 Central forced air heating [IF RESPONDENT IS UNSURE  
ASK: "Do you have a central heating unit that  
circulates hot air through a duct system?]  
**com:[INSERT HEATING TYPE "A GAS FURNACE" IN Q16-Q18]**
- 2 Resistance heating, such as baseboard, ceiling,  
floor, zone, or wall heaters **com:[INSERT HEATING TYPE  
"GAS WALL HEATERS" IN Q16]**
- 3 Portable heaters **com:[INSERT HEATING TYPE "GAS WALL  
HEATERS" IN Q16-Q18]**
- 4 Heat pump
- ? DON'T KNOW **com:[INSERT HEATING TYPE "A GAS HEATING  
SYSTEM" IN Q16-Q18]**
- ! REFUSED **com:[INSERT HEATING TYPE "A GAS HEATING  
SYSTEM" IN Q16-Q18]**

**com:[IF Q7=4 SKIP TO Q19, OTHERWISE CONTINUE]**

~

(Q8.) Do any of your close neighbors have gas heating and/or  
appliances?  
(DO NOT READ LIST) **com:[SINGLE MENTION]**

- 1 YES
- 2 NO

~

**com:[REVISED 06/18/08]**

(Q9.) What is the square footage of your home?  
(DO NOT READ LIST) **com:[SINGLE MENTION]**

\_\_\_\_\_ (RECORD SQUARE FOOTAGE)

**com:[IF ? OR ! CONTINUE, OTHERWISE SKIP TO Q11]**

**com:[INSERT CHECK RANGE OF MIN 300 AND MAX 8000 SQUARE FOOTAGE; ALLOW SPECIAL  
INPUT]**

~

(Q10.) Which of the following categories do you feel best describes the  
square footage of your home? Your best guess is fine.  
(READ LIST) **com:[SINGLE MENTION]**

- 1 1000 or less
- 2 1001-1500
- 3 1501-2000

- 4 2001-2500
- 5 More than 2500

~

(Q11.) How many bedrooms are there in your home?  
 (DO NOT READ LIST) **com: [SINGLE MENTION]**

- 1 ONE
- 2 TWO
- 3 THREE
- 4 FOUR
- 5 FIVE OR MORE

~

NG AWARENESS QUESTIONS

(Q12.) Please rate your level of agreement with the following statements about natural gas using a 5-point scale where "1" is strongly disagree and "5" is strongly agree?  
 (READ LIST) **com: [SINGLE MENTION FOR EACH STATEMENT]**

- |           |   |   |   |          |       |
|-----------|---|---|---|----------|-------|
| 1         | 2 | 3 | 4 | 5        | ?     |
| STRONGLY  |   |   |   | STRONGLY | DON'T |
| DIASAGREE |   |   |   | AGREE    | KNOW  |

**com: [RANDOMIZE]**

- 1 Natural gas is more economical than other energy sources.
- 2 Natural gas heats your residence more comfortably than other heat sources.
- 3 Natural gas has remained more stable in price than other sources of energy over the last 3 years.
- 4 Natural gas is cleaner for the environment than other energy sources.
- 5 Natural gas improves the value of your residence.
- 6 Natural gas is a safe product to use for heating your residence.
- 7 Natural gas will be a plentiful energy source for years to come.

~

(Q13.) Have you ever considered converting your home to natural gas heating?  
 (DO NOT READ LIST) **com: [SINGLE MENTION]**

- 1 YES
- 2 NO

**com: [IF Q13=1 CONTINUE, OTHERWISE SKIP TO Q15]**

~



(Q14.) In deciding whether or not to switch to natural gas on a scale from 1 to 5 where 1 is "not important at all" and 5 is "extremely important", how important are the following considerations.  
**com: [SINGLE MENTION FOR EACH CONSIDERATION]**

(INTERVIEWER NOTE: IF NEEDED, REREAD "Please give me a number between 1 and 5 where 1 is not important at all and 5 is extremely important,")

| Not important at all |   |   |   |   | Extremely Important | Don't Know |
|----------------------|---|---|---|---|---------------------|------------|
| 1                    | 2 | 3 | 4 | 5 |                     | ?          |

**com: [RANDOMIZE]**

- 1 Effect on the value of your home
- 2 Environmental friendliness
- 3 Effect on monthly energy bill
- 4 Investment to purchase new gas equipment/appliances
- 5 Level of comfort

~

(Q15.) What are some of the reasons that would prevent you from converting to natural gas?  
 (DO NOT READ) **com: [MULTIPLE MENTIONS]**

- 01 COST TO PURCHASE NEW GAS EQUIPMENT/APPLIANCES
- 02 EXPENSE OF SETTING UP NATURAL GAS SERVICE (GETTING GAS TO YOUR RESIDENCE)
- 03 MONTHLY ENERGY EXPENSE
- 04 SATISFIED WITH MY CURRENT HEAT SOURCE
- 05 SAFETY CONCERNS ABOUT NATURAL GAS
- 06 LIMITATIONS OF BUILDING STRUCTURE
- 07 PLAN TO MOVE SOON
- 91 OTHER (PLEASE SPECIFY): \_\_\_\_\_

~

FUEL SWITCH QUESTIONS`

Assuming that it will cost the average homeowner \$6000 to convert their heating system from electricity to gas and that it will save them approximately **com: [REVISED 06/19]** \$600 annually on their energy bill, we would like to learn about your willingness to convert to **com: [INSERT HEATING TYPE FROM Q7]** even while your current heating system is fully operational.

(Q16.) Given the cost of converting, how likely would you be to convert to **com: [INSERT HEATING TYPE FROM Q7]** for your home in the next

five years? Please give a number between 1 to 5, where 1 is very unlikely and 5 is highly likely.

(DO NOT READ LIST) com:[SINGLE MENTION]

- 5 HIGHLY LIKELY
- 4 SOMEWHAT LIKELY
- 3 LIKELY
- 2 SOMEWHAT UNLIKELY
- 1 VERY UNLIKELY

com:[IF Q16=5 SKIP TO Q18, OTHERWISE CONTINUE]

~

com:[REVISED 06/18/08]

(Q17.) If your utility paid com:[RANDOM BID VALUE] of the \$6,000 cost to switch to com:[INSERT HEATING TYPE FROM Q7] for your home, how likely would you be to convert in the next five years? Please give a number between 1 to 5, where 1 is very unlikely and 5 is highly likely.

(DO NOT READ LIST) com:[SINGLE MENTION]

- 5 HIGHLY LIKELY
- 4 SOMEWHAT LIKELY
- 3 LIKELY
- 2 SOMEWHAT UNLIKELY
- 1 VERY UNLIKELY

com: [INSERT RANDOM BID VALUES OF \$1500, \$3000, \$4500, \$6000]

~

com:[FOR THESE INSERTS REMOVE "A" FROM HEATING TYPE]

(Q18.) How likely would you be to convert to a gas water heater at the same time as your com:[INSERT HEATING TYPE FROM Q7]? Please give a number between 1 to 5, where 1 is very unlikely and 5 is highly likely.

(DO NOT READ LIST) com:[SINGLE MENTION]

- 5 HIGHLY LIKELY
- 4 SOMEWHAT LIKELY
- 3 LIKELY
- 2 SOMEWHAT UNLIKELY
- 1 VERY UNLIKELY
- 0 ALREADY HAVE A GAS WATER HEATER

~

#### SEGMENTATION QUESTIONS

Finally, we would like to ask you some general questions that will help us in overall policy decisions. All questions need to be answered on a 10-point scale. This data will be used to compare with results we have from other surveys.

(Q19.) Now we'd like to understand how you think about using energy at your home. Using a 10-point scale where '1' means you strongly disagree, and '10' means you strongly agree, please indicate how much you agree or disagree with each of the following statements.

How much do you agree that.....(READ LIST)

(INTERVIEWER: REPEAT THE SCALE AS NECESSARY.)

(INTERVIEWER: IT IS VERY IMPORTANT THAT EACH RESPONDENT PROVIDE A 1-10 RATING FOR EVERY ITEM. IF THE RESPONDENT SAYS "DON'T KNOW", PROMPT AGAIN FOR A 1-10 RATING, REPEATING SCALE AND/OR ITEM AS NECESSARY.)

**com: [SINGLE MENTION FOR EACH STATEMENT]**

|          |   |   |   |   |   |   |   |   |          |    |
|----------|---|---|---|---|---|---|---|---|----------|----|
| 1        | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10       | ?  |
| STRONGLY |   |   |   |   |   |   |   |   | STRONGLY | DK |
| DISAGREE |   |   |   |   |   |   |   |   | AGREE    |    |

**com: [RANDOMIZE]**

- 1 It is very important for you to find ways to control your energy costs.
- 2 You believe it is socially responsible to limit your use of electricity.
- 3 You are very concerned about the environmental effects of electricity generating plants.
- 4 You regularly review your home's energy usage, and constantly look for ways to save on energy costs.
- 5 It is just as important to conserve natural gas as it is to conserve electricity.
- 6 Of all the things you could do to help protect the environment, energy conservation is definitely the most important.
- 7 You pay a lot of attention to energy-related issues because they affect both your home and the country as a whole
- 8 The long-term threat from global warming and climate change is real, and potentially catastrophic

~

(Q20.) Now, I'd like to ask you how important some different factors are when you shop for energy-related products and services for your home.

Please use a scale of 1 to 10, where '1' means that factor is not at all important and '10' means that factor is extremely important when you are selecting which appliance, electronic device, or other energy-related product or service to purchase for your home.

How important.....(READ LIST)

(INTERVIEWER: REPEAT THE SCALE AS NECESSARY)

(INTERVIEWER: IT IS VERY IMPORTANT THAT EACH RESPONDENT PROVIDE A 1-10 RATING FOR EVERY ITEM. IF THE RESPONDENT SAYS "DON'T KNOW", PROMPT AGAIN FOR A 1-10 RATING, REPEATING SCALE AND/OR ITEM AS NECESSARY.)

**com: [SINGLE MENTION FOR EACH FACTOR]**

|            |   |   |   |   |   |   |   |   |           |    |
|------------|---|---|---|---|---|---|---|---|-----------|----|
| 1          | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10        | ?  |
| NOT AT ALL |   |   |   |   |   |   |   |   | EXTREMELY | DK |
| IMPORTANT  |   |   |   |   |   |   |   |   | IMPORTANT |    |

**com: [RANDOMIZE]**

- 1 are any cost savings you might get from reduced electricity usage?
- 2 are any positive effects on the environment that might result from reduced energy usage?
- 3 are any purchase discounts that might be offered for purchasing energy efficient devices?

~

(Q21.) I'm going to read a list of different actions that people can take. Using a 10 point scale, where '1' means that action makes no contribution toward protecting the environment at all and '10' means that action makes a major contribution toward protecting the environment please tell me how much impact you think each action has.

How much of a contribution does (INSERT ITEM) make toward protecting the environment?

(INTERVIEWER: REPEAT THE SCALE AS NECESSARY.)

(INTERVIEWER: IT IS VERY IMPORTANT THAT EACH RESPONDENT PROVIDE A 1-10 RATING FOR EVERY ITEM. IF THE RESPONDENT SAYS "DON'T KNOW", PROMPT AGAIN FOR A 1-10 RATING, REPEATING SCALE AND/OR ITEM AS NECESSARY.)

(READ LIST) **com: [SINGLE MENTION FOR EACH ACTION]**

|              |   |   |   |   |   |   |   |   |              |    |
|--------------|---|---|---|---|---|---|---|---|--------------|----|
| 1            | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10           | ?  |
| MAKES NO     |   |   |   |   |   |   |   |   | MAJOR        | DK |
| CONTRIBUTION |   |   |   |   |   |   |   |   | CONTRIBUTION |    |

**com: [RANDOMIZE]**

- 1 Using mass transit instead of driving
- 2 Recycling paper, cans, bottles and plastics
- 3 Setting heating or cooling thermostats to use less energy
- 4 Driving an electric or hybrid gas-electric vehicle

- 5 Participating in a Green Power rates program to buy renewable energy
- 6 Replacing major appliances with more energy efficient ones
- 7 Replacing regular light bulbs and fixtures with energy efficient ones
- 8 Installing additional or upgraded insulation or windows

~

Finally, let's turn to the question of what you want from an energy utility company.

(Q22.) Using a 10-point scale, where '1' means not at all important, and '10' means extremely important, please indicate how important it is to you that your energy utility company do the following things, even if that meant that you had to pay a little more in order for the company to pursue these types of initiatives?

(INTERVIEWER: REPEAT THE SCALE AS NECESSARY.)

(INTERVIEWER: IT IS VERY IMPORTANT THAT EACH RESPONDENT PROVIDE A 1-10 RATING FOR EVERY ITEM. IF THE RESPONDENT SAYS "DON'T KNOW", PROMPT AGAIN FOR A 1-10 RATING, REPEATING SCALE AND/OR ITEM AS NECESSARY.)

(READ LIST) **com: [SINGLE MENTION FOR EACH ACTION]**

|            |   |   |   |   |   |   |   |   |           |    |
|------------|---|---|---|---|---|---|---|---|-----------|----|
| 1          | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10        | ?  |
| NOT AT ALL |   |   |   |   |   |   |   |   | EXTREMELY | DK |
| IMPORTANT  |   |   |   |   |   |   |   |   | IMPORTANT |    |

**com: [RANDOMIZE]**

- 1 Actively encourage its customers to participate in energy and cost saving programs.
- 2 Do everything possible to supply renewable, clean energy
- 3 Operate its business in a completely environmentally friendly manner.

~

**com: [INSERT STANDARD TERMINATION PAGE]**

## Appendix A.3-3 Summary of Survey Responses

*Table 1 - First of all, do you own your home?*

| Q1  | Frequency | Percent |
|-----|-----------|---------|
| Yes | 318       | 100.00  |

*Table 2 - Which of the following best describes your home?*

| Q2   | Frequency | Percent |
|--|-----------|---------|
| Single family detached (on a separate lot) not connected to other living units | 311       | 97.80   |
| Duplex or Triplex with 2 or 3 total living units                               | 7         | 2.20    |

*Table 3 - Can you verify that you are the person in your household who would be most likely to make decisions concerning appliance purchases for the home*

| Q3  | Frequency | Percent |
|-----|-----------|---------|
| Yes | 318       | 100.00  |

*Table 4 - Who provides your electricity service?*

| Q4                 | Frequency | Percent |
|--------------------|-----------|---------|
| Puget Sound Energy | 315       | 99.06   |
| Other              | 3         | 0.94    |

*Table 5 - What is your primary source of heating fuel?*

| Q5       | Frequency | Percent |
|----------|-----------|---------|
| Electric | 203       | 27.47   |
| Propane  | 10        | 1.35    |

|                               |     |       |
|-------------------------------|-----|-------|
| <b>Oil</b>                    | 78  | 10.55 |
| <b>Natural Gas</b>            | 421 | 56.97 |
| <b>Other (Please specify)</b> | 27  | 3.65  |

*If already have Natural Gas:*

| <b>If Q5 = Natural Gas</b>                       | <b>Frequency</b> | <b>Percent</b> |
|--|------------------|----------------|
| <b>Puget Sound Energy/Washington Natural Gas</b> | 47               | 11.06          |
| <b>Cascade Natural Gas</b>                       | 355              | 83.53          |
| <b>Amerigas</b>                                  | 0                | 0.00           |
| <b>Ferrellgas</b>                                | 1                | 0.24           |
| <b>North West Propane</b>                        | 0                | 0.00           |
| <b>Permagas</b>                                  | 0                | 0.00           |
| <b>Suburban Propane</b>                          | 0                | 0.00           |
| <b>Other</b>                                     | 5                | 1.18           |
| <b>Don't Know</b>                                | 17               | 4.00           |

*Table 6 - What type of heating system does your home have?*

| <b>Q7</b>   | <b>Frequency</b> | <b>Percent</b> |
|---|------------------|----------------|
| <b>Central forced air heating</b>   | 138              | 43.40          |
| <b>Resistance heating, such as baseboard, ceiling, floor, zone, or wall heaters</b> | 121              | 38.05          |
| <b>Portable heaters</b>   | 3                | 0.94           |
| <b>Heat pump</b>  | 42               | 13.21          |
| <b>Refused</b>  | 1                | 0.31           |
| <b>Don't Know</b>   | 13               | 4.09           |

*Table 7 - Do any of your close neighbors have gas heating and/or appliances?*

| Q8         | Frequency | Percent |
|------------|-----------|---------|
| Yes        | 147       | 53.26   |
| No/None    | 69        | 25.00   |
| Refused    | 2         | 0.72    |
| Don't Know | 58        | 21.01   |

*Table 8 - What is the square footage of your home?*

| Q9             | Frequency | Percent |
|----------------|-----------|---------|
| Don't Know     | 42        | 13.21   |
| 1000 or less   | 30        | 9.43    |
| 1001-1500      | 78        | 24.53   |
| 1501-2000      | 64        | 20.13   |
| 2001-2500      | 32        | 10.06   |
| More than 2500 | 72        | 22.64   |

*Table 9 – (If previous question “Don't Know) Which of the following categories do you feel best describes the square footage of your home? Your best guess is fine.*

| Q10            | Frequency | Percent |
|----------------|-----------|---------|
| 1000 or less   | 3         | 10.00   |
| 1001-1500      | 8         | 26.67   |
| 1501-2000      | 5         | 16.67   |
| 2001-2500      | 6         | 20.00   |
| More than 2500 | 2         | 6.67    |
| Don't Know     | 6         | 20.00   |

*Table 10 - How many bedrooms are there in your home?*



| Q11          | Frequency | Percent |
|--------------|-----------|---------|
| One          | 6         | 2.17    |
| Two          | 33        | 11.96   |
| Three        | 156       | 56.52   |
| Four         | 61        | 22.10   |
| Five or More | 20        | 7.25    |

*Table 11 - Rate the following statements about natural gas using a 5-point scale where 1 is strongly disagree and 5 is strongly agree: Natural gas is more economical than other energy sources.*

| Q12_1                 | Frequency | Percent |
|-----------------------|-----------|---------|
| One-Strongly Disagree | 29        | 10.51   |
| Two                   | 27        | 9.78    |
| Three                 | 70        | 25.36   |
| Four                  | 51        | 18.48   |
| Five-Strongly Agree   | 39        | 14.13   |
| Refused               | 2         | 0.72    |
| Don't Know            | 58        | 21.01   |

*Table 12 - Rate the following statements about natural gas using a 5-point scale where 1 is strongly disagree and 5 is strongly agree: Natural gas heats your residence more comfortably than other heat sources.*

| Q12_2                 | Frequency | Percent |
|-----------------------|-----------|---------|
| One-Strongly Disagree | 33        | 11.96   |
| Two                   | 17        | 6.16    |
| Three                 | 72        | 26.09   |
| Four                  | 43        | 15.58   |
| Five-Strongly Agree   | 37        | 13.41   |
| Refused               | 5         | 1.81    |
| Don't Know            | 69        | 25.00   |

*Table 13 - Rate the following statements about natural gas using a 5-point scale where 1 is strongly disagree and 5 is strongly agree: Natural gas has remained more stable in price than other sources of energy over the last 3 years.*

| Q12_3                 | Frequency | Percent |
|-----------------------|-----------|---------|
| One-Strongly Disagree | 32        | 11.59   |
| Two                   | 25        | 9.06    |
| Three                 | 65        | 23.55   |
| Four                  | 33        | 11.96   |
| Five-Strongly Agree   | 30        | 10.87   |
| Refused               | 3         | 1.09    |
| Don't Know            | 88        | 31.88   |

*Table 14 - Rate the following statements about natural gas using a 5-point scale where 1 is strongly disagree and 5 is strongly agree: Natural gas is cleaner for the environment than other energy sources.*

| Q12_4                 | Frequency | Percent |
|-----------------------|-----------|---------|
| One-Strongly Disagree | 21        | 7.61    |
| Two                   | 30        | 10.87   |
| Three                 | 69        | 25.00   |
| Four                  | 53        | 19.20   |
| Five-Strongly Agree   | 52        | 18.84   |
| Refused               | 2         | 0.72    |
| Don't Know            | 49        | 17.75   |

*Table 15 - Rate the following statements about natural gas using a 5-point scale where 1 is strongly disagree and 5 is strongly agree: Natural gas improves the value of your residence.*

| Q12_5                 | Frequency | Percent |
|-----------------------|-----------|---------|
| One-Strongly Disagree | 21        | 7.61    |
| Two                   | 17        | 6.16    |
| Three                 | 71        | 25.72   |
| Four                  | 57        | 20.65   |
| Five-Strongly Agree   | 56        | 20.29   |
| Refused               | 5         | 1.81    |
| Don't Know            | 49        | 17.75   |

*Table 16 - Rate the following statements about natural gas using a 5-point scale where 1 is strongly disagree and 5 is strongly agree: Natural gas is a safe product to use for heating your residence.*

| Q12_6                 | Frequency | Percent |
|-----------------------|-----------|---------|
| One-Strongly Disagree | 26        | 9.42    |
| Two                   | 15        | 5.43    |
| Three                 | 43        | 15.58   |
| Four                  | 64        | 23.19   |
| Five-Strongly Agree   | 95        | 34.42   |
| Refused               | 3         | 1.09    |
| Don't Know            | 30        | 10.87   |

*Table 17 - Rate the following statements about natural gas using a 5-point scale where 1 is strongly disagree and 5 is strongly agree: Natural gas will be a plentiful energy source for years to come.*

| Q12_7                 | Frequency | Percent |
|-----------------------|-----------|---------|
| One-Strongly Disagree | 26        | 9.42    |
| Two                   | 31        | 11.23   |
| Three                 | 71        | 25.72   |
| Four                  | 39        | 14.13   |
| Five-Strongly Agree   | 46        | 16.67   |
| Refused               | 3         | 1.09    |
| Don't Know            | 60        | 21.74   |

*Table 18 - Have you ever considered converting your home to natural gas heating?*

| Q13     | Frequency | Percent |
|---------|-----------|---------|
| Yes     | 149       | 53.99   |
| No/None | 127       | 46.01   |

*Table 19 - In deciding whether or not to switch to natural gas on a scale from 1 to 5 where 1 is not important at all and 5 is extremely important, how important are the following considerations. Effect on the value of your home*

| Q14_1                | Frequency | Percent |
|----------------------|-----------|---------|
| Not important at all | 10        | 6.71    |
| Somewhat important   | 10        | 6.71    |
| Neutral              | 33        | 22.15   |
| Very important       | 42        | 28.19   |
| Extremely important  | 46        | 30.87   |
| Don't Know           | 8         | 5.37    |

*Table 20 - In deciding whether or not to switch to natural gas on a scale from 1 to 5 where 1 is not important at all and 5 is extremely important, how important are the following considerations. Environmental friendliness*

| Q14_2                | Frequency | Percent |
|----------------------|-----------|---------|
| Not important at all | 10        | 6.71    |
| Somewhat important   | 9         | 6.04    |
| Neutral              | 33        | 22.15   |
| Very important       | 49        | 32.89   |
| Extremely important  | 43        | 28.86   |
| Refused              | 1         | 0.67    |
| Don't Know           | 4         | 2.68    |

*Table 21 - In deciding whether or not to switch to natural gas on a scale from 1 to 5 where 1 is not important at all and 5 is extremely important, how important are the following considerations. Effect on monthly energy bill*

| Q14_3                | Frequency | Percent |
|----------------------|-----------|---------|
| Not important at all | 5         | 3.36    |
| Somewhat important   | 8         | 5.37    |
| Neutral              | 25        | 16.78   |
| Very important       | 34        | 22.82   |
| Extremely important  | 65        | 43.62   |
| Refused              | 1         | 0.67    |
| Don't Know           | 11        | 7.38    |

*Table 22 - In deciding whether or not to switch to natural gas on a scale from 1 to 5 where 1 is not important at all and 5 is extremely important, how important are the following considerations. Investment to purchase new gas equipment/appliances*

| Q14_4                | Frequency | Percent |
|----------------------|-----------|---------|
| Not important at all | 16        | 10.74   |
| Somewhat important   | 13        | 8.72    |
| Neutral              | 28        | 18.79   |
| Very important       | 34        | 22.82   |
| Extremely important  | 53        | 35.57   |
| Don't Know           | 5         | 3.36    |

*Table 23 - In deciding whether or not to switch to natural gas on a scale from 1 to 5 where 1 is not important at all and 5 is extremely important , how important are the following considerations. Level of comfort*

| Q14_5                | Frequency | Percent |
|----------------------|-----------|---------|
| Not important at all | 10        | 6.71    |
| Somewhat important   | 5         | 3.36    |
| Neutral              | 36        | 24.16   |
| Very important       | 45        | 30.20   |
| Extremely important  | 45        | 30.20   |
| Refused              | 1         | 0.67    |
| Don't Know           | 7         | 4.70    |

*Table 24 - What are some of the reasons that would prevent you from converting to natural gas?*

| Q15_1   | Frequency | Percent |
|---|-----------|---------|
| Cost to purchase new gas equipment/appliances | 112       | 40.58   |
| Expense of setting up natural gas service     | 40        | 14.49   |
| Monthly energy expense                        | 1         | 0.36    |
| Satisfied with my current heat source         | 13        | 4.71    |
| Safety concerns about natural gas             | 16        | 5.80    |
| Limitations of building structure             | 11        | 3.99    |
| Plan to move soon                             | 4         | 1.45    |
| Other   | 76        | 27.54   |
| Don't Know                                    | 3         | 1.09    |

*Table 25 - What are some of the reasons that would prevent you from converting to natural gas?*

| Q15_2   | Frequency | Percent |
|---|-----------|---------|
| Cost to purchase new gas equipment/appliances | 11        | 18.33   |
| Expense of setting up natural gas service     | 24        | 40.00   |
| Monthly energy expense                        | 3         | 5.00    |
| Satisfied with my current heat source         | 1         | 1.67    |
| Safety concerns about natural gas             | 5         | 8.33    |
| Limitations of building structure             | 3         | 5.00    |
| Other   | 13        | 21.67   |

*Table 26 - What are some of the reasons that would prevent you from converting to natural gas?*

| Q15_3                             | Frequency | Percent |
|-----------------------------------|-----------|---------|
| Monthly energy expense            | 4         | 44.44   |
| Safety concerns about natural gas | 1         | 11.11   |
| Limitations of building structure | 1         | 11.11   |
| Plan to move soon                 | 1         | 11.11   |
| Other                             | 2         | 22.22   |

*Table 27 - Given the cost of converting, how likely would you be to convert to com:[INSERT HEATING TYPE FROM Q7] for your home in the next five years? Please give a number between 1 to 5, where 1 is very unlikely and 5 is highly likely.*

| Q16               | Frequency | Percent |
|-------------------|-----------|---------|
| Very unlikely     | 133       | 48.19   |
| Somewhat unlikely | 47        | 17.03   |
| Likely            | 42        | 15.22   |
| Somewhat likely   | 25        | 9.06    |
| Highly likely     | 26        | 9.42    |
| Don't Know        | 3         | 1.09    |

*Table 28 - If your utility paid com:[RANDOM BID VALUE] of the \$6,000 cost to switch to com:[INSERT HEATING TYPE FROM Q7] for your home, how likely would you be to convert in the next five years? Please give a number between 1 to 5, where 1 is very unlikely and 5 is highly likely.*

| Q17               | Bid Value:<br>\$1500 | Bid Value:<br>\$3000 | Bid Value:<br>\$4500 | Bid Value:<br>\$6000 | Total |
|-------------------|----------------------|----------------------|----------------------|----------------------|-------|
| Very unlikely     | 23                   | 26                   | 13                   | 10                   | 72    |
| Somewhat unlikely | 6                    | 12                   | 6                    | 7                    | 31    |
| Likely            | 11                   | 7                    | 15                   | 4                    | 37    |
| Somewhat likely   | 12                   | 14                   | 16                   | 11                   | 53    |
| Highly likely     | 4                    | 8                    | 19                   | 22                   | 53    |
| Don't Know        | 1                    | 1                    | 2                    |                      | 4     |

*Table 29 - How likely would you be to convert to a gas water heater at the same time as your com:[INSERT HEATING TYPE FROM Q7]? Please give a number between 1 to 5, where 1 is very unlikely and 5 is highly likely.*

| Q18                       | Frequency | Percent |
|---------------------------|-----------|---------|
| Already have a gas heater | 3         | 1.09    |
| Very unlikely             | 70        | 25.36   |
| Somewhat unlikely         | 15        | 5.43    |
| Likely                    | 30        | 10.87   |
| Somewhat likely           | 41        | 14.86   |
| Highly likely             | 111       | 40.22   |
| Refused                   | 2         | 0.72    |
| Don't Know                | 4         | 1.45    |

*Table 30 - Where 1 means you strongly disagree, and 10 means you strongly agree, indicate how much you agree or disagree with: It is very important for you to find ways to control your energy costs.*



| Q19_1                 | Frequency | Percent |
|-----------------------|-----------|---------|
| One-strongly disagree | 4         | 1.26    |
| Two                   | 2         | 0.63    |
| Three                 | 5         | 1.57    |
| Four                  | 4         | 1.26    |
| Five                  | 26        | 8.18    |
| Six                   | 11        | 3.46    |
| Seven                 | 29        | 9.12    |
| Eight                 | 58        | 18.24   |
| Nine                  | 33        | 10.38   |
| Ten-strongly agree    | 146       | 45.91   |

*Table 31 - Where 1 means you strongly disagree, and 10 means you strongly agree, indicate how much you agree or disagree with: You believe it is socially responsible to limit your use of electricity.*

| Q19_2                 | Frequency | Percent |
|-----------------------|-----------|---------|
| One-strongly disagree | 20        | 6.29    |
| Two                   | 7         | 2.20    |
| Three                 | 5         | 1.57    |
| Four                  | 10        | 3.14    |
| Five                  | 29        | 9.12    |
| Six                   | 13        | 4.09    |
| Seven                 | 32        | 10.06   |
| Eight                 | 58        | 18.24   |
| Nine                  | 29        | 9.12    |
| Ten-strongly agree    | 112       | 35.22   |
| Refused               | 1         | 0.31    |
| Don't Know            | 2         | 0.63    |

*Table 32 - Where 1 means you strongly disagree, and 10 means you strongly agree, indicate how much you agree or disagree with: You are very concerned about the environmental effects of electricity generating plants.*

| Q19_3                 | Frequency | Percent |
|-----------------------|-----------|---------|
| One-strongly disagree | 35        | 11.01   |
| Two                   | 15        | 4.72    |
| Three                 | 12        | 3.77    |
| Four                  | 22        | 6.92    |
| Five                  | 51        | 16.04   |
| Six                   | 16        | 5.03    |
| Seven                 | 32        | 10.06   |
| Eight                 | 41        | 12.89   |
| Nine                  | 14        | 4.40    |
| Ten-strongly agree    | 69        | 21.70   |
| Refused               | 1         | 0.31    |
| Don't Know            | 10        | 3.14    |

*Table 33 - Where 1 means you strongly disagree, and 10 means you strongly agree, indicate how much you agree or disagree with: You regularly review your home s energy usage, and constantly look for ways to save on energy costs.*

| Q19_4                 | Frequency | Percent |
|-----------------------|-----------|---------|
| One-strongly disagree | 9         | 2.83    |
| Two                   | 9         | 2.83    |
| Three                 | 8         | 2.52    |
| Four                  | 11        | 3.46    |
| Five                  | 38        | 11.95   |
| Six                   | 22        | 6.92    |
| Seven                 | 27        | 8.49    |
| Eight                 | 51        | 16.04   |
| Nine                  | 31        | 9.75    |
| Ten-strongly agree    | 110       | 34.59   |
| Don't Know            | 2         | 0.63    |

*Table 34 - Where 1 means you strongly disagree, and 10 means you strongly agree, indicate how much you agree or disagree with: It is just as important to conserve natural gas as it is to conserve electricity.*

| Q19_5                 | Frequency | Percent |
|-----------------------|-----------|---------|
| One-strongly disagree | 3         | 0.94    |
| Two                   | 1         | 0.31    |
| Three                 | 2         | 0.63    |
| Four                  | 5         | 1.57    |
| Five                  | 40        | 12.58   |
| Six                   | 10        | 3.14    |
| Seven                 | 28        | 8.81    |
| Eight                 | 36        | 11.32   |
| Nine                  | 25        | 7.86    |
| Ten-strongly agree    | 158       | 49.69   |
| Don't Know            | 10        | 3.14    |

*Table 35 - Where 1 means you strongly disagree, and 10 means you strongly agree, indicate how much you agree or disagree with: Of all the things you could do to help protect the environment, energy conservation is definitely the most important.*

| Q19_6                 | Frequency | Percent |
|-----------------------|-----------|---------|
| One-strongly disagree | 19        | 5.97    |
| Two                   | 4         | 1.26    |
| Three                 | 8         | 2.52    |
| Four                  | 10        | 3.14    |
| Five                  | 50        | 15.72   |
| Six                   | 24        | 7.55    |
| Seven                 | 45        | 14.15   |
| Eight                 | 60        | 18.87   |
| Nine                  | 23        | 7.23    |
| Ten-strongly agree    | 71        | 22.33   |
| Refused               | 1         | 0.31    |
| Don't Know            | 3         | 0.94    |

*Table 36 - Where 1 means you strongly disagree, and 10 means you strongly agree, indicate how much you agree or disagree with: You pay a lot of attention to energy-related issues because they affect both your home and the country as a whole*

| Q19_7                 | Frequency | Percent |
|-----------------------|-----------|---------|
| One-strongly disagree | 3         | 0.94    |
| Two                   | 5         | 1.57    |
| Three                 | 8         | 2.52    |
| Four                  | 10        | 3.14    |
| Five                  | 33        | 10.38   |
| Six                   | 17        | 5.35    |
| Seven                 | 32        | 10.06   |
| Eight                 | 61        | 19.18   |
| Nine                  | 39        | 12.26   |
| Ten-strongly agree    | 107       | 33.65   |
| Don't Know            | 3         | 0.94    |

*Table 37 - Where 1 means you strongly disagree, and 10 means you strongly agree, indicate how much you agree or disagree with: The long-term threat from global warming and climate change is real, and potentially catastrophic*

| Q19_8                 | Frequency | Percent |
|-----------------------|-----------|---------|
| One-strongly disagree | 46        | 14.47   |
| Two                   | 10        | 3.14    |
| Three                 | 14        | 4.40    |
| Four                  | 5         | 1.57    |
| Five                  | 36        | 11.32   |
| Six                   | 12        | 3.77    |
| Seven                 | 21        | 6.60    |
| Eight                 | 34        | 10.69   |
| Nine                  | 24        | 7.55    |
| Ten-strongly agree    | 106       | 33.33   |
| Refused               | 1         | 0.31    |
| Don't Know            | 9         | 2.83    |

*Table 38 - Use a scale of 1 to 10, where 1 means that factor is not at all important and 10 means that factor is extremely important when you are selecting which appliance, electronic device, or other energy-related product or service to purchase for your home. are any cost savings you might get from reduced electricity usage?*

| Q20_1                           | Frequency | Percent |
|---------------------------------|-----------|---------|
| <b>One-not at all important</b> | 3         | 0.94    |
| <b>Two</b>                      | 4         | 1.26    |
| <b>Three</b>                    | 6         | 1.89    |
| <b>Four</b>                     | 5         | 1.57    |
| <b>Five</b>                     | 29        | 9.12    |
| <b>Six</b>                      | 13        | 4.09    |
| <b>Seven</b>                    | 32        | 10.06   |
| <b>Eight</b>                    | 54        | 16.98   |
| <b>Nine</b>                     | 36        | 11.32   |
| <b>Ten-extremely important</b>  | 131       | 41.19   |
| <b>Refused</b>                  | 2         | 0.63    |
| <b>Don't Know</b>               | 3         | 0.94    |

*Table 39 - Use a scale of 1 to 10, where 1 means that factor is not at all important and 10 means that factor is extremely important when you are selecting which appliance, electronic device, or other energy-related product or service to purchase for your home. are any positive effects on the environment that might result from reduced energy usage?*

| Q20_2                           | Frequency | Percent |
|---------------------------------|-----------|---------|
| <b>One-not at all important</b> | 15        | 4.72    |
| <b>Two</b>                      | 4         | 1.26    |
| <b>Three</b>                    | 10        | 3.14    |
| <b>Four</b>                     | 7         | 2.20    |
| <b>Five</b>                     | 35        | 11.01   |
| <b>Six</b>                      | 10        | 3.14    |
| <b>Seven</b>                    | 33        | 10.38   |
| <b>Eight</b>                    | 59        | 18.55   |
| <b>Nine</b>                     | 30        | 9.43    |
| <b>Ten-extremely important</b>  | 106       | 33.33   |
| <b>Refused</b>                  | 2         | 0.63    |
| <b>Don't Know</b>               | 7         | 2.20    |

*Table 40 - Use a scale of 1 to 10, where 1 means that factor is not at all important and 10 means that factor is extremely important when you are selecting which appliance, electronic device, or other energy-related product or service to purchase for your home. are any purchase discounts that might be offered for purchasing energy efficient devices?*

| <b>Q20_3</b>                    | <b>Frequency</b> | <b>Percent</b> |
|---------------------------------|------------------|----------------|
| <b>One-not at all important</b> | 10               | 3.14           |
| <b>Two</b>                      | 4                | 1.26           |
| <b>Three</b>                    | 11               | 3.46           |
| <b>Four</b>                     | 4                | 1.26           |
| <b>Five</b>                     | 34               | 10.69          |
| <b>Six</b>                      | 16               | 5.03           |
| <b>Seven</b>                    | 33               | 10.38          |
| <b>Eight</b>                    | 59               | 18.55          |
| <b>Nine</b>                     | 25               | 7.86           |
| <b>Ten-extremely important</b>  | 116              | 36.48          |
| <b>Refused</b>                  | 2                | 0.63           |
| <b>Don't Know</b>               | 4                | 1.26           |

*Table 41 - Where 1 means that action makes no contribution toward protecting the environment at all and 10 means that action makes a major contribution toward protecting the environment tell how much impact you think each action has:Using mass transit instead of driving*

| Q21_1                     | Frequency | Percent |
|---------------------------|-----------|---------|
| One-makes no contribution | 24        | 7.55    |
| Two                       | 10        | 3.14    |
| Three                     | 4         | 1.26    |
| Four                      | 8         | 2.52    |
| Five                      | 30        | 9.43    |
| Six                       | 18        | 5.66    |
| Seven                     | 29        | 9.12    |
| Eight                     | 48        | 15.09   |
| Nine                      | 37        | 11.64   |
| Ten-major contribution    | 102       | 32.08   |
| Refused                   | 6         | 1.89    |
| Don't Know                | 2         | 0.63    |

*Table 42 - Where 1 means that action makes no contribution toward protecting the environment at all and 10 means that action makes a major contribution toward protecting the environment tell how much impact you think each action has: Recycling paper, cans, bottles and plastics*

| Q21_2                     | Frequency | Percent |
|---------------------------|-----------|---------|
| One-makes no contribution | 5         | 1.57    |
| Two                       | 6         | 1.89    |
| Three                     | 9         | 2.83    |
| Four                      | 1         | 0.31    |
| Five                      | 16        | 5.03    |
| Six                       | 19        | 5.97    |
| Seven                     | 25        | 7.86    |
| Eight                     | 45        | 14.15   |
| Nine                      | 38        | 11.95   |
| Ten-major contribution    | 148       | 46.54   |
| Refused                   | 5         | 1.57    |
| Don't Know                | 1         | 0.31    |

*Table 43 - Where 1 means that action makes no contribution toward protecting the environment at all and 10 means that action makes a major contribution toward protecting the environment tell how much impact you think each action has:Setting heating or cooling thermostats to use less energy*

| Q21_3                     | Frequency | Percent |
|---------------------------|-----------|---------|
| One-makes no contribution | 5         | 1.57    |
| Two                       | 6         | 1.89    |
| Three                     | 2         | 0.63    |
| Four                      | 4         | 1.26    |
| Five                      | 29        | 9.12    |
| Six                       | 15        | 4.72    |
| Seven                     | 31        | 9.75    |
| Eight                     | 60        | 18.87   |
| Nine                      | 33        | 10.38   |
| Ten-major contribution    | 120       | 37.74   |
| Refused                   | 5         | 1.57    |
| Don't Know                | 8         | 2.52    |

*Table 44 - Where 1 means that action makes no contribution toward protecting the environment at all and 10 means that action makes a major contribution toward protecting the environment tell how much impact you think each action has: Driving an electric or hybrid gas-electric vehicle*

| Q21_4                     | Frequency | Percent |
|---------------------------|-----------|---------|
| One-makes no contribution | 22        | 6.92    |
| Two                       | 3         | 0.94    |
| Three                     | 9         | 2.83    |
| Four                      | 5         | 1.57    |
| Five                      | 45        | 14.15   |
| Six                       | 18        | 5.66    |
| Seven                     | 41        | 12.89   |
| Eight                     | 50        | 15.72   |
| Nine                      | 33        | 10.38   |
| Ten-major contribution    | 80        | 25.16   |
| Refused                   | 6         | 1.89    |
| Don't Know                | 6         | 1.89    |



*Table 45 - Where 1 means that action makes no contribution toward protecting the environment at all and 10 means that action makes a major contribution toward protecting the environment tell how much impact you think each action has:  
Participating in a Green Power rates program to buy renewable energy*

| <b>Q21_5</b>                     | <b>Frequency</b> | <b>Percent</b> |
|----------------------------------|------------------|----------------|
| <b>One-makes no contribution</b> | 18               | 5.66           |
| <b>Two</b>                       | 11               | 3.46           |
| <b>Three</b>                     | 8                | 2.52           |
| <b>Four</b>                      | 12               | 3.77           |
| <b>Five</b>                      | 38               | 11.95          |
| <b>Six</b>                       | 12               | 3.77           |
| <b>Seven</b>                     | 36               | 11.32          |
| <b>Eight</b>                     | 53               | 16.67          |
| <b>Nine</b>                      | 20               | 6.29           |
| <b>Ten-major contribution</b>    | 78               | 24.53          |
| <b>Refused</b>                   | 6                | 1.89           |
| <b>Don't Know</b>                | 26               | 8.18           |

*Table 46 - Where 1 means that action makes no contribution toward protecting the environment at all and 10 means that action makes a major contribution toward protecting the environment tell how much impact you think each action has:  
Replacing major appliances with more energy efficient ones*

| <b>Q21_6</b>                     | <b>Frequency</b> | <b>Percent</b> |
|----------------------------------|------------------|----------------|
| <b>One-makes no contribution</b> | 5                | 1.57           |
| <b>Two</b>                       | 4                | 1.26           |
| <b>Three</b>                     | 10               | 3.14           |
| <b>Four</b>                      | 13               | 4.09           |
| <b>Five</b>                      | 40               | 12.58          |
| <b>Six</b>                       | 21               | 6.60           |
| <b>Seven</b>                     | 47               | 14.78          |
| <b>Eight</b>                     | 57               | 17.92          |
| <b>Nine</b>                      | 27               | 8.49           |
| <b>Ten-major contribution</b>    | 85               | 26.73          |
| <b>Refused</b>                   | 5                | 1.57           |
| <b>Don't Know</b>                | 4                | 1.26           |

*Table 47 - Where 1 means that action makes no contribution toward protecting the environment at all and 10 means that action makes a major contribution toward protecting the environment tell how much impact you think each action has:  
Replacing regular light bulbs and fixtures with energy efficient ones*

| <b>Q21_7</b>                     | <b>Frequency</b> | <b>Percent</b> |
|----------------------------------|------------------|----------------|
| <b>One-makes no contribution</b> | 18               | 5.66           |
| <b>Two</b>                       | 6                | 1.89           |
| <b>Three</b>                     | 8                | 2.52           |
| <b>Four</b>                      | 8                | 2.52           |
| <b>Five</b>                      | 29               | 9.12           |
| <b>Six</b>                       | 24               | 7.55           |
| <b>Seven</b>                     | 38               | 11.95          |
| <b>Eight</b>                     | 62               | 19.50          |
| <b>Nine</b>                      | 23               | 7.23           |
| <b>Ten-major contribution</b>    | 94               | 29.56          |
| <b>Refused</b>                   | 5                | 1.57           |
| <b>Don't Know</b>                | 3                | 0.94           |

*Table 48 - Where 1 means that action makes no contribution toward protecting the environment at all and 10 means that action makes a major contribution toward protecting the environment tell how much impact you think each action has:  
Installing additional or upgraded insulation or windows*

| <b>Q21_8</b>                     | <b>Frequency</b> | <b>Percent</b> |
|----------------------------------|------------------|----------------|
| <b>One-makes no contribution</b> | 8                | 2.52           |
| <b>Two</b>                       | 6                | 1.89           |
| <b>Three</b>                     | 8                | 2.52           |
| <b>Four</b>                      | 5                | 1.57           |
| <b>Five</b>                      | 23               | 7.23           |
| <b>Six</b>                       | 22               | 6.92           |
| <b>Seven</b>                     | 31               | 9.75           |
| <b>Eight</b>                     | 56               | 17.61          |
| <b>Nine</b>                      | 39               | 12.26          |
| <b>Ten-major contribution</b>    | 110              | 34.59          |
| <b>Refused</b>                   | 5                | 1.57           |
| <b>Don't Know</b>                | 5                | 1.57           |

*Table 49 - Where 1 means not at all important, and 10 means extremely important, how important is it to you that your energy utility company do the following things, even if that meant that you had to pay a little more? Actively encourage its customers to participate in energy and cost saving programs.*

| Q22_1                    | Frequency | Percent |
|--------------------------|-----------|---------|
| One-not at all important | 17        | 5.35    |
| Two                      | 2         | 0.63    |
| Three                    | 6         | 1.89    |
| Four                     | 10        | 3.14    |
| Five                     | 29        | 9.12    |
| Six                      | 13        | 4.09    |
| Seven                    | 38        | 11.95   |
| Eight                    | 51        | 16.04   |
| Nine                     | 34        | 10.69   |
| Ten-extremely important  | 110       | 34.59   |
| Refused                  | 7         | 2.20    |
| Don't Know               | 1         | 0.31    |

*Table 50 - Where 1 means not at all important, and 10 means extremely important, how important is it to you that your energy utility company do the following things, even if that meant that you had to pay a little more? Do everything possible to supply renewable, clean energy*

| Q22_2                    | Frequency | Percent |
|--------------------------|-----------|---------|
| One-not at all important | 14        | 4.40    |
| Two                      | 3         | 0.94    |
| Three                    | 5         | 1.57    |
| Four                     | 4         | 1.26    |
| Five                     | 28        | 8.81    |
| Six                      | 14        | 4.40    |
| Seven                    | 25        | 7.86    |
| Eight                    | 60        | 18.87   |
| Nine                     | 32        | 10.06   |
| Ten-extremely important  | 119       | 37.42   |
| Refused                  | 7         | 2.20    |
| Don't Know               | 7         | 2.20    |

*Table 51 - Where 1 means not at all important, and 10 means extremely important, how important is it to you that your energy utility company do the following things, even if that meant that you had to pay a little more? Operate its business in a completely environmentally friendly manner.*

| <b>Q22_3</b>                    | <b>Frequency</b> | <b>Percent</b> |
|---------------------------------|------------------|----------------|
| <b>One-not at all important</b> | 15               | 4.72           |
| <b>Two</b>                      | 8                | 2.52           |
| <b>Three</b>                    | 6                | 1.89           |
| <b>Four</b>                     | 6                | 1.89           |
| <b>Five</b>                     | 39               | 12.26          |
| <b>Six</b>                      | 16               | 5.03           |
| <b>Seven</b>                    | 34               | 10.69          |
| <b>Eight</b>                    | 54               | 16.98          |
| <b>Nine</b>                     | 34               | 10.69          |
| <b>Ten-extremely important</b>  | 92               | 28.93          |
| <b>Refused</b>                  | 7                | 2.20           |
| <b>Don't Know</b>               | 7                | 2.20           |

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# Appendix B: Data Development

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|   |               |
|---|---------------|
| <b>Appendix B.1: Commercial Measure Descriptions .....</b>      | <b>1</b>      |
| Electric Non-Equipment Measures .....                           | 1             |
| Electric Equipment Measures .....                               | 14            |
| Gas Non-Equipment Measures .....                                | 15            |
| Gas Equipment Measures .....                                    | 21            |
| Passive Renewable Measures .....                                | 23            |
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# Appendix B.1: Commercial Measure Descriptions

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## Electric Non-Equipment Measures

### Cooking

**Convection Oven.** Operates at a lower temperature and cooks more quickly than a standard oven due to fans that circulate heat evenly throughout the oven and move hot air past food. The baseline measure is a standard commercial oven.

**Cooking Fryers – Commercial.** Under heavy load, operates at 80% or better efficiency and, when idle, uses less than 1,000 Watts. This measure follows the 2006 CEE qualified electric deep fat fryers requirements.

**Hot Food Holding Cabinets – Commercial.** ENERGY STAR<sup>®</sup> hot food-holding cabinets use a maximum of 40 Watts/cubic foot less than the baseline measure, a conventional holding cabinet.<sup>1</sup>

**Steam Cookers – Commercial.** Commercial ENERGY STAR electric steam cookers have a cooking efficiency of 50%, with idle energy rates that vary depending upon pan size.<sup>2</sup>

### HVAC Auxiliary

**Automated Exhaust VFD Control – Parking Garage CO Sensor.** This measure allows the ventilation system to run only when CO<sub>2</sub> levels are above a specified level. The ventilation system would run constantly without this measure.

**Cooking Hood Controls.** Utilizing sensors and two-speed or variable speed fans, hood controls reduce exhaust (and makeup) airflow when appliances are not at capacity (or have been turned off). The baseline for this measure is no hood controls.

**HVAC Motors – Premium Efficiency.** Premium efficiency motors are more efficient than standard efficiency motors. According to the Consortium of Energy Efficiency (CEE), premium efficiency motors are typically cost-effective in applications when they operate more than 4,000 hours a year. Payback within two years is estimated. Currently, CEE and the National Electrical Manufacturers Association (NEMA) have premium efficiency standards for manufacturers to adhere to. This measure specifically relates to HVAC motors, ranging from 1 HP to 200 HP, depending on the building size.

**Motors – Pump and Fan System – Variable Speed Control.** Variable speed controls allow pump and fan motors to operate at a lower speed while still maintaining the set points during partial

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<sup>1</sup> [http://www.energystar.gov/index.cfm?c=hfhc.pr\\_hfhc](http://www.energystar.gov/index.cfm?c=hfhc.pr_hfhc)

<sup>2</sup> [http://www.energystar.gov/index.cfm?c=steamcookers.pr\\_steamcookers](http://www.energystar.gov/index.cfm?c=steamcookers.pr_steamcookers)

load conditions. Energy is reduced when motor operation can vary with load rather than run at a constant speed.

**Motors – Variable Air Volume (VAV) Box High Efficiency.** High efficiency fan-powered boxes prevent hot and cold spots by maintaining room air circulation while supply-air temperature is modulated to match load. Energy is saved by re-circulating warm air from zones that have lower heating requirements to zones with greater heating requirements. An electronically commutated motor (ECM) powers the fan in each VAV box. An ECM is a brushless DC motor with all of its speed and torque controls built in electronically, which allows the motor to adjust its speed to ensure the optimal airflow at all times.<sup>3</sup>

**Optimized Variable Volume Lab Hood Design.** Allows the volumetric flow rate to vary, which causes a constant speed through the duct, regardless of sash opening. For buildings such as universities, schools, and hospitals that use lab hoods, small savings can be obtained by using a variable, rather than constant, volume lab hood. The baseline measure is a constant volume lab hood.

## HVAC & Envelope

**Automatic Ventilation VFD Control (occupancy/CO<sub>2</sub> sensors).** The ventilation system automatically adjusts air flow when CO<sub>2</sub> levels are above a specified level. When using CO<sub>2</sub> control, a minimum ventilation rate is maintained at all times to control non-occupant contaminants like off-gassing from furniture, equipment, and building components. Without it, as a baseline, the ventilation system would run constantly.

**Building Commissioning and Retro-Commissioning.** Commissioning ensures that energy-using systems that have been installed are operating in an optimal fashion in order to maximize energy efficiency. The commissioning process can be applied to existing buildings to restore them to optimal performance. Retro-commissioning is a systematic, documented process that identifies low-cost operational and maintenance improvements in existing buildings and brings the buildings up to the design intentions of its current operation.<sup>4,5</sup> The baseline measure is no commissioning. The cost for this measure is derived by taking the cost of the initial commissioning for the first year and then taking a 40% commissioning cost in each year for the life of the measure (10 years). It is feasible to only perform retro-commissioning every three years. If this step is performed the total cost of the measure would go down, which would make the measure more cost-effective than shown in this study.

**Centrifugal Chiller – Variable Speed Drive (VSD) Remodel for Existing.** The VSD controls the rotational speed of the chiller compressor to match the output capacity with the part load cooling while maintaining full load efficiency. Baseline for this measure is a constant speed compressor motor with inlet vane control.

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<sup>3</sup> LEED qualified Justice Center reported by DCJ.com and Minnesota Power Incentive Program

<sup>4</sup> <http://www.green.ca.gov/CommissioningGuidelines/default.htm>

<sup>5</sup> <http://cbs.lbl.gov/BPA/cct.html>

***Chilled Water Piping Loop with Variable speed drive (VSD) Control.*** A VSD controller, with two-way valves at the cooling coils, controls the chilled water pump to vary pump speed and chilled water flow to match the varying cooling load, thus reducing pumping energy requirements. The baseline is a constant speed pump with three-way valves.

***Chilled Water Reset.*** Varies the temperature of the chilled water in a loop, allowing for an increase of water temperature as the cooling requirement decreases. The baseline measure is no chilled water reset.

***Chiller Water-Side Economizer.*** Consists of a heat exchanger attached to a condenser water piping loop that operates when outdoor conditions can produce condenser water colder than the mixed air temperature. A water side economizer is used if an outdoor-air economizer is not practical. The baseline measure is no economizer.

***Cooling DX Package Air-Side Economizer.*** An air-side economizer uses already cooled air (return air) mixed with a proportion of outside air to cool indoor spaces. Using the return air results in energy savings, as less air needs to be cooled.

***Cooling Tower – Decrease Approach Temperature.*** An oversized cooling tower allows a reduced approach temperature, which saves energy. The approach temperature is the difference between the tower water leaving and the wet-bulb temperature.

***Cooling Tower – Two-Speed Fan Motor.*** A two-speed fan cycles between off, low, and high speeds to maintain the tower set point. The low-speed setting option uses less energy than a single, high speed fan. The baseline measure is a single-speed fan motor.

***Cooling Tower – VSD Fan Control.*** One step more sophisticated than the two-speed fan motor is the variable speed drive (VSD). A VSD modulates the air flow so the heat rejection exactly matches the load at the desired set point.

***Direct Digital Control System – Install.*** Direct digitally controlled (DDC) systems allow for both HVAC and lighting to be controlled and monitored using an electronic or digital system. For lighting, replacing the manually operated wall switches with a digital interface allows for direct control of lights at a remote location at anytime. For HVAC, the entire system, including pumps, motors, fans, and set points, can be digitally programmed for each unit to further increase tighter control of the system.

***Direct Digital Control System – Optimization.*** Allows for digital monitoring and control of HVAC and lighting systems. The optimization of the control system consists of upgrading a high-efficiency energy management system to a premium efficiency system.

***Direct Digital Control System – Wireless Performance Monitoring.*** These are second-generation building automation systems that allow for wireless optimization and operation of building systems such as HVAC through computerized monitoring and control software and interfaces.

***Direct/Indirect Evaporative Cooling, Pre-Cooling.*** A direct evaporative cooler is a low-energy system that evaporates water into the air stream, thus reducing the temperature of the air, but

increasing the humidity. An indirect evaporative cooler uses a secondary air stream that is cooled by water and goes through a heat exchanger with the primary air stream, cooling the air but not affecting the humidity. A direct/indirect system cools the air stream first through an indirect cooler, and then cools it further through a direct cooler. Including an evaporative cooler before the DX system will reduce the overall cooling load.

**Duct Repair and Sealing.** The repair and sealing of leaky ducts creates significant energy savings by ensuring conditioned air only goes to occupied spaces, thereby reducing an excessive runtime/load on the HVAC system.

**Exhaust Air to Ventilation Air Heat Recovery.** Captures air that is exhausted out of a building during the heating season, which is warmer than the air outside. Transferring this heat to the incoming air lowers the overall heating load.

**Exhaust Hood Makeup Air.** Provides exhaust air at the hood instead of allowing the hood to exhaust the conditioned air in the room. The baseline practice is expulsion of conditioned air through exhaust hoods.

**Green Roof.** A green roof is a living roof that supports soil and plant growth. A series of carefully engineered layers are applied to the roof deck. These layers are watertight, lightweight, and long lasting. Green roofs can be incorporated into new buildings as long as load requirements are met. They are suited for roofs that have slopes ranging up to 20° and are most successful when sufficient attention has been paid to selecting plants that will thrive in the local climate and conditions. One of the most significant advantages is that a green roof can last up to three times longer than a standard roof. A green roof can also buffer temperature extremes, which improves a building's energy performance by dropping the temperatures on the roof 3° – 7°, resulting in approximately 12% reduction in cooling loads.

**Heat Pump – Commissioning.** Commissioning ensures that energy-using systems that have been installed are operating in an optimal fashion in order to maximize energy efficiency.<sup>6</sup> Retro-commissioning is a systematic, documented process that identifies low-cost operational and maintenance improvements in existing buildings and brings the buildings up to the design intentions of its current usage.<sup>7</sup> The baseline measure is no commissioning. The cost for this measure is derived by taking the cost of the initial commissioning for the first year and then on a yearly basis taking a 40% commissioning cost in each year for the life of the measure (10 years). It is feasible to only perform retro-commissioning every three years and will still only involve 40% of the initial cost for commissioning. If this step is performed, the total cost of the measure would go down making the measure cost effective than it is shown in this study.

**Heat Pump – Ground Source.** Geothermal or ground source heat pumps (GSHP) utilize the constant temperature of the earth as the exchange medium instead of the outside air temperature that is used by Air Source Heat Pumps (ASHP). This allows higher efficiencies on the coldest

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<sup>6</sup> <http://cbs.lbl.gov/BPA/cct.html>

<sup>7</sup> <http://www.green.ca.gov/CommissioningGuidelines/default.htm>

nights, compared to air-source heat pumps.<sup>8</sup> Table B.1 shows the measure and baseline energy efficiency requirements.

**Table B.1. Ground Source Heat Pump Efficiency Requirements**

| Measure Efficiency – GSHP      | Baseline Efficiency – ASHP |
|--------------------------------|----------------------------|
| COP=3.1, EER=13.4 (State Code) | COP=3.2, EER=10.1          |
| COP=4.0, EER=20                |                            |

**Heat Pump – Water Source.** Groundwater source heat pumps use natural wells or man-made lakes to circulate water through a piping system. The water is used as a medium in the pipes to either reject or absorb heat and then is put back into the water source from which it originated.

**Hotel Key Card Energy Control System.** This is a key card system to control room HVAC and lighting during non-occupied periods. Occupancy is determined by the key card and/or additional sensors. The central system first sets temperature at a minimum level and turns off lighting, then gives control to the guest for temperature and lighting when the guest enters the room.

**Infiltration Control (Caulking, Weather Stripping, etc.).** Sealing air leaks in windows, doors, roof, crawlspaces, and outside walls decreases overall heating and cooling losses. Baseline and measure values are presented in Table B.2.

**Table B.2. Infiltration Reduction Measures**

| Measure (ACH) | Baseline (ACH) |
|---------------|----------------|
| 0.65          | 1.00           |

**Insulation – Floor (Non-Slab).** These measures represent an increase in R-value to current code levels of R-19 for the floor space (non-slab) and better. Baseline and measure values are presented in Table B.3.

**Table B.3. Floor Insulation Measures**

| Measure | Baseline |
|---------|----------|
| R-10    | R-0      |
| R-19    | R-10     |

**Insulation – Ceiling.** These measures represent an increase in R-value to current code values of R-21 or better. Baseline and measure values are presented in Table B.4.

<sup>8</sup> Description source: EERE

**Table B.4. Ceiling Insulation Measures**

| Measure | Baseline                    |
|---------|-----------------------------|
| R-21    | R-0                         |
| R-21    | existing ceiling insulation |
| R-38    | R-21                        |
| R-49    | R-21                        |

**Insulation – Duct.** Packaged Direct Expansion (DX) and heat-pump equipment are generally coupled with a ducting system inside the building. Insulating the ducts reduces energy loss in the unoccupied plenum space. This measure assumes that R-0 insulation will be replaced with R-4 insulation (or that R-4 insulation will be installed), and that R-4 insulation will be replaced with R-8 (or that R-8 insulation will be installed).

**Insulation – Wall.** Wall insulation installed with a current code R-value of R-19 or better. Measures are based on 2x6 wall construction. Baseline and measure values are presented in Table B.5.

**Table B.5. Wall Insulation Measures**

| Framing Type | Measure | Baseline                 |
|--------------|---------|--------------------------|
| 2x6          | R-19    | R-0                      |
| 2x6          | R-19    | Existing wall insulation |
| 2x6 Advanced | R-25    | R-19                     |

**Leak Proof Duct Fittings.** The majority of duct leakage in residential HVAC systems is due to improperly sealed connections between ductwork and fittings. Even when duct connections are initially well-sealed, leakage may increase over time. Although the use of mastics and mechanical fasteners is becoming more widespread, a low-cost, leak-proof system will help to transform the market.

**Pipe Insulation.** Adding R-4 insulation around the pipes decreases temperature losses, thereby reducing demand on water heaters and chilled water systems.

**Sensible and Total Heat Recovery Devices.** Sensible heat recovery devices transfer energy (heat) from the return air stream back into the supply air stream, which avoids heat losses in exhausted air. This raises the incoming outdoor air temperature in the winter and cools it in the summer. Energy savings results from reduced needs for mechanical heating or cooling. Total heat devices, also called enthalpy recovery, transfer both sensible and latent heat. Latent heat significantly raises the humidity of the outdoor air in the winter and reduces it in the summer. Dehumidification in the summer can be costly and total recovery devices help reduce this.<sup>9</sup>

**Thermostat – Programmable.** A programmable thermostat controls the set point temperatures automatically, ensuring the HVAC system is not running during low-occupancy hours.

<sup>9</sup> [http://www.mcquay.com/mcquaybiz/marketing\\_tools/mt\\_corporate/EngNews/0701.pdf](http://www.mcquay.com/mcquaybiz/marketing_tools/mt_corporate/EngNews/0701.pdf)



**Turbocor Compressor.** A totally oil-free compressor that incorporates leading edge thermodynamic and electronic technologies with magnetic bearing systems to achieve significantly higher efficiencies than compressors in a similar capacity range.

**Windows – High-Efficiency.** This measure represents an increase in building performance by reducing the U-value in existing construction and new construction windows, as shown in Table B.6.

**Table B.6. High-efficiency Window Measures**

| Measure U-Value | Baseline U-Value |
|-----------------|------------------|
| 0.55            | 0.65             |
| 0.35            | 0.55             |

The code for either new construction or window replacement states the customer must go to code (U=0.55) at a minimum when installing new windows.

## Lighting

**Bi-Level Control, Stairwell Lighting.** An occupancy sensor that reduces the light load by 50% when a stairwell is unoccupied for a set amount of time. The baseline is continuous operation at full power.

**Daylighting Controls – Dimming-Continuous, Fluorescent Fixtures.** A dimming switch allows light levels to vary from 0% – 100% brightness. A continuously dimming switch permits variation throughout the range, increasing electricity savings. The baseline measure is operating fluorescent fixtures at full power.

**HE Fixtures/Design.** This measure is a generic way to indicate improved lighting efficiency. The baseline lighting technology is representative of all available technologies that make up the total Watts per square foot for that particular building type. This includes all overhead lighting such as T12, T8, T5 tubes, canned CFLs, etc. The lighting reduction package measures reduce the lighting power density (W/sqft) by installing higher efficiency technologies such as high performance T8 or T5 tubes, high-efficiency ballasts, reflective lighting fixtures, etc. A low reduction package results in a 15% decrease in power density and high reduction results in a 25% decrease in lighting power density. Lighting reduction packages such as T5HO (High Output) for high bay applications, in warehouse and grocery, can reduce the power density by 35%.

**Hotel Key Card Energy Control System.** This is a key card system to control room HVAC and lighting during non-occupied periods. Occupancy is determined by the key card and/or additional sensors. The central system first sets temperature and lighting at a minimum level then gives control to the guest for temperature and lighting when the guest enters the room.

**Light-Emitting Diodes (LED) Exit Lighting.** LED exit signs use a fraction of the Wattage that incandescent and compact fluorescent (CFL) signs use while lasting over 50,000 hours. The baseline measure is incandescent and CFL signs.



**LED Refrigeration Case Lights.** Light-emitting diodes (LEDs) are highly efficient bulbs that can be used for refrigeration case lights and exit signs, a 70% energy savings over a fluorescent bulb.

**LED Solid State White Lighting Package.** Light emitting diodes (LEDs) are solid-state devices that convert electricity to light, with very high efficiency and long life. Recently, lighting manufacturers have been able to produce "cool" white LED lighting indirectly, using ultraviolet LEDs to excite phosphors that emit a white-appearing light. Replacement for incandescent lamps.

**Occupancy Sensor Control, Fluorescent.** If a space is unoccupied for a designated amount of time, an occupancy sensor will turn off the lights. The lights will turn on again once the sensor detects a person has entered the space.

**Time Clocks and Timers (Lighting).** Includes an integrated time-clock that automatically switches lighting and other loads on and off on a time schedule, or in response to an occupancy sensor or a building automation system.

## Lighting – Traffic

**LED Pedestrian Light.** Replace incandescent pedestrian light with efficient and long-lasting LED array.

**LED Traffic Light.** LEDs are significantly more efficient at producing light than incandescent bulbs and last for years. LED traffic lights are brighter and use significantly less energy than their incandescent counterparts.

## Plug Load

**Battery Charging System.** Used to recharge a wide variety of cordless products, including power tools, small household appliances, and personal care products like electric shavers. An ENERGY STAR charging system uses 35% less energy than the baseline, non-ENERGY STAR battery charger.<sup>10</sup>

**Computers.** ENERGY STAR computers feature: (1) "on" mode, where the maximum allowed power varies based on the computer monitor's resolution; (2) "sleep" mode, where computer monitor models must consume 2 Watts or less; and, (3) "off" mode, where computer monitor models must consume 1 Watt or less. The baseline measure does not include these features.<sup>11</sup>

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<sup>10</sup> [http://www.energystar.gov/index.cfm?c=battery\\_chargers.pr\\_battery\\_chargers](http://www.energystar.gov/index.cfm?c=battery_chargers.pr_battery_chargers)

<sup>11</sup> [http://www.energystar.gov/index.cfm?fuseaction=find\\_a\\_product.ShowProductGroup&pgw\\_code=MO](http://www.energystar.gov/index.cfm?fuseaction=find_a_product.ShowProductGroup&pgw_code=MO)

**Copiers.** ENERGY STAR copiers deliver the same performance as conventional equipment and are, on average, 25% more efficient. They power down when not in use. The baseline measure is non-ENERGY STAR copiers.<sup>12</sup>

**Fax.** ENERGY STAR fax machines enter sleep mode after inactivity for at least 5 minutes. This reduces their total power consumption.<sup>13</sup>

**Monitors.** In “sleep” mode, the monitor consumes less than 2 Watts. The “sleep” mode needs to be enabled in order to de-energize the monitor when not in use.

**Office Computer Network Energy Management.** On an individual basis, the energy wasted by a computer that remains in the full-power “on” state no matter how long it remains idle is almost insignificant. But for a corporation with hundreds or thousands of workstations operating on a local area network (LAN) or a wide area network (WAN), that wasted energy can be quite significant, easily translating to tens of thousands of dollars in unnecessary electricity expenditures each year. The energy-savings potential of implementing a PC power-management policy across a LAN will vary depending on the equipment attached to the network and how that equipment is being used.

**Power Supply 80+ Office Measure.** Applies to the 80 PLUS performance specification requirements for power supplies in computers and servers. 80 PLUS specifies 80% or greater efficiency at 20%, 50% and 100% of rated load with a true power factor of 0.9 or greater.<sup>14</sup>

**Printers.** ENERGY STAR printers deploy a maximum time delay to sleep depending upon the size of the equipment. This reduces power consumption during periods of inactivity.<sup>15</sup>

**Refrigerator eCube.** The eCube is placed in a refrigerated area and monitors the temperature of the product and not the temperature of the air. The thermostat is connected to the compressor, which cycles on and off to maintain the set point, based on the product temperature. The cycles of the compressor are reduced because the temperature is now based on the product and not the air.<sup>16</sup>

**Residential-Size Refrigerator/Freezer.** ENERGY STAR residential grade refrigerators use at least 10% less energy than required by current federal standards and 40% less energy than conventional models sold in 2001.

**Scanners.** ENERGY STAR enabled scanners enter a low power “sleep” mode of less than 12 Watts within 15 minutes of inactivity.<sup>17</sup>

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<sup>12</sup> [http://www.energystar.gov/index.cfm?fuseaction=find\\_a\\_product.showProductGroup&pgw\\_code=CP](http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=CP)

<sup>13</sup> [http://www.energystar.gov/ia/products/fap/IE\\_Prog\\_Req.pdf](http://www.energystar.gov/ia/products/fap/IE_Prog_Req.pdf)

<sup>14</sup> [www.80PLUS.org](http://www.80PLUS.org)

<sup>15</sup> [http://www.energystar.gov/ia/products/fap/IE\\_Prog\\_Req.pdf](http://www.energystar.gov/ia/products/fap/IE_Prog_Req.pdf)

<sup>16</sup> <http://www.senergysolution.com/sEnergySolution/eCube.aspx>

<sup>17</sup> <http://www.energystar.gov.au/products/scanners.html>

**Vending Machines – High Efficiency.** ENERGY STAR new and rebuilt refrigerated beverage vending machines are up to 40% more energy efficient than the standard model, through more efficient compressors, fan motors, lighting systems, and low-power mode options during non-use periods.<sup>18</sup>

**Vending Miser.** Senses occupancy and cycles off the cooling of the vending machine when no occupancy is detected.

**Water Coolers.** ENERGY STAR coolers providing only cold water consume less than 0.16 kWh per day; a unit providing both hot and cold water consumes less than 1.20 kWh per day.<sup>19</sup>

## Refrigeration

**Anti-Sweat (Humidistat) Controls.** Enables the user to turn refrigeration display case anti-sweat heaters off when ambient relative humidity is low enough that sweating will not occur. Without the control, the heaters generally run continuously.

**Commercial Reach-in Refrigerator (Solid Door ENERGY STAR Refrigerators/Freezers).** ENERGY STAR labeled commercial solid door refrigerators and freezers are designed with high efficiency components such as ECM evaporator and condenser fan motors, hot gas anti-sweat heaters, or high-efficiency compressors. Compared to standard models, ENERGY STAR labeled commercial solid door refrigerators and freezers save energy.<sup>20</sup>

**Compressor VSD Retrofit.** Modulates motor speed in response to changes in load. When low-load conditions exist, the current to the compressor motor is decreased, slowing the compressor motor down. Baseline is a constant-speed compressor.

**Custom Refrigeration System.** Customized high efficiency walk-in refrigeration system combine energy efficiency measures, including: (1) a premium efficiency (EMS) system; (2) a variable speed drive (VSD) compressor; (3) a VSD condenser; (4) a VSD evaporator fan; and, (5) floating condenser head pressure controls.

**Demand Control Defrost – Hot Gas.** When frost collects on the evaporator, it reduces coil capacity by acting as a layer of insulation and reducing the airflow between the fins. In hot gas defrost, refrigerant vapor from either the compressor discharge or the high pressure receiver is used to warm the evaporator coil and melt the frost that has collected there.<sup>21</sup>

**Display Cases.** Refrigerated display cases achieve a higher performance efficiency and reduce overall energy consumption by incorporating hot gas defrost, anti-sweat controls, high

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<sup>18</sup> ENERGY STAR

<sup>19</sup> [http://www.energystar.gov/index.cfm?c=water\\_coolers.pr\\_water\\_coolers](http://www.energystar.gov/index.cfm?c=water_coolers.pr_water_coolers)

<sup>20</sup> ENERGY STAR

<sup>21</sup> Parker Refrigeration Specialists

performance evaporative fans, defrost control, improved insulation and liquid suction heat exchangers.<sup>22</sup>

**Evaporative Condenser – High-Efficiency.** In the refrigeration cycle, the condenser consumes all the input electricity to the system in order to produce cooling. A high efficiency condenser can perform the refrigeration cycle using less energy than a standard system.

**Floating Head Pressure Controls.** Allow more heat to be rejected through the condenser at low outside air temperatures, thereby increasing the compressor efficiency.

**High Efficiency Compressors.** A component of refrigeration systems, high efficiency compressors operate up to 20% more efficiently than standard-efficiency compressors.

**High-Efficiency Evaporator Fans, Walk-in Refrigerators.** A component of refrigeration systems, high-efficiency evaporator fan motors release less heat into the refrigerated room than conventional induction motors, reducing the energy draw by the fan motor and the compressor.

**Ice Makers.** High efficiency commercial ice makers use high efficiency compressors and fan motors, thicker insulation, and other measures to achieve 15% more efficiency than the baseline measure, which is a conventional automatic commercial ice maker.<sup>23</sup>

**Motors – Case Fans with ECM Motors.** The case fan is one of the components of the refrigeration system. ECM are smaller variable speed motors that operate from a single-phase power source with an electronic controller mounted in or on the motor. The baseline measure is a High-Efficiency Case Fan Motor.

**Night Covers for Display Cases.** Night covers help to eliminate wasted refrigeration cooling by insulating display cases. In addition, they reduce the heating load of buildings through less escaped refrigerated air needing to be reheated.

**Reduced Speed or Cycling of Evaporator Fans.** Allowing the evaporator fans to run less frequently or at a lower speed permits the evaporator to fit the system need, rather than run continuously at high speed. Only for new construction.

**Refrigeration Commissioning or Retro-Commissioning.** Commissioning ensures that refrigeration systems that have been installed are operating in an optimal fashion in order to maximize energy efficiency. Retro-commissioning is checking previously commissioned equipment to ensure that it is continuing to run efficiently. The baseline measure is no commissioning.<sup>24</sup> The cost for this measure is derived by taking the cost of the initial commissioning for the first year and then on a yearly basis taking a 40% commissioning cost in each year for the life of the measure (10 years). It is feasible to only perform retro-commissioning every three years and will still only involve 40% of the initial cost for

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<sup>22</sup> OakRidge National Laboratory for the US DOE-1996

<sup>23</sup> Consortium for Energy Efficiency (CEE)

<sup>24</sup> <http://cbs.lbl.gov/BPA/cct.html>

commissioning. If this step is performed, the total cost of the measure would go down making the measure cost effective than it is shown in this study.

**Refrigerator eCube.** The eCube is placed in a refrigerated area and monitors the temperature of the product, not the temperature of the air. The thermostat is connected to the compressor, which cycles on and off to maintain the set point, based on the product temperature. The cycles of the compressor are reduced because the temperature is now based on the product and not the air.<sup>25</sup>

**Special Glass Doors for Refrigerated Reach-In Cases.** “Low-E,” double pane thermal glass doors reduce cooling losses in refrigerated reach-in cases.

**Strip Curtains for Walk-Ins.** Strip curtains on walk-in refrigerators reduce the infiltration of warm air into the refrigerated space by improving the barrier between the cold space and the ambient air.

## Total

**Dry-Type High Efficiency Transformer.** Dry type transformers have coils that are exposed to air rather than oil. Energy Star versions of these transformers offer significant savings over conventional transformers.

## Water Heat

**Clothes Washer – Ozonating.** Disinfects water using a supply of ozone-enriched air, which suppresses subsequent biological activity and controls biological growth within the appliance, thus reducing the need to rely on hot water. The baseline measure is a standard commercial clothes washer.<sup>26</sup>

**Clothes Washer Commercial (w/out dryer).** This measure applies to laundromat type facilities where commercial grade clothes washers are used. Energy can be saved by using ENERGY STAR clothes washers.

**Demand-Controlled Circulating Systems.** A demand-controlled circulating system only circulates hot water when required. The baseline measure is a continuously circulating hot water system, resulting in energy loss through pipes.

**Dishwashing – Commercial – Chemical.** Sanitizes dishes with chemicals, rather than hot water, allowing for a lower water temperature. The baseline is a standard commercial dishwasher.

**Dishwashing – Commercial – High Efficiency.** Dishwashers with a minimal idle rate as well as a minimal amount of water consumption per rack of loaded dishes depending upon size and type.

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<sup>25</sup> <http://www.senergysolution.com/sEnergySolution/eCube.aspx>

<sup>26</sup> <http://www.patentstorm.us/patents/6607672-description.html>

**Dishwashing – Residential Sized System.** Residential sized dishwashing systems are often more appropriate for smaller commercial buildings. The smaller size leads to energy savings.

**Drain Water Heat Recovery (Power-Pipe) – Heat Recovery Water Heater.** Drain water heat recovery devices recover heat energy from drain water and are used to pre-heat cold water entering the hot water tank. This minimizes the temperature difference between the heating set point and the entering water temperature.<sup>27</sup>

**Faucet Aerators.** Faucet aerators, by mixing water and air, reduce the amount of water that flows through the faucet. The faucet aerator creates a fine water spray through an inserted screen in the faucet head. Flow rate requirements for this measure are presented in Table B.7.

**Table B.7. Faucet Aerator Flow Rates**

| Measure Flow Rate (GPM*) | Baseline Flow Rate (GPM) |
|--------------------------|--------------------------|
| 1.5                      | 2.5                      |
| 2.5                      | 4.0                      |

\* Gallons per minute

**Heat Pump Water Heater.** The water heating heat pump moves heat from a warm reservoir (such as air) and transfers this heat into the hot water system. The system employs an evaporator, compressor, condenser, expansion valve, hot water circulating pump, and controls to accomplish this function.<sup>28</sup>

**Hot Water Supply Pipe Insulation.** R-4 insulation added around hot water pipes decreases heat loss. Only for existing construction. The baseline measure is no insulation.

**Low-Flow Showerheads.** Low-flow showerheads mix water and air to reduce the amount of water that flows through the showerhead. The showerhead creates a fine water spray through an inserted screen in the showerhead. Flow rate requirements for this measure are presented in Table B.8.

**Table B.8. Low-Flow Showerhead Flow Rates**

| Measure Flow Rate (GPM) | Baseline Flow Rate (GPM) |
|-------------------------|--------------------------|
| 2.0                     | 2.5                      |
| 2.5                     | 4.5                      |

**Low-Flow Spray Heads.** Low-flow spray heads mix water and air to reduce the amount of water that flows through the spray head. The spray head creates a fine water spray through an inserted screen in the spray head, achieving a flow reduction of nearly 50%, from a flow rate of 1.6 GPM to 3.0 GPM.

<sup>27</sup> [www.toolbase.org/TechInventory/TechDetails.aspx?ContentDetailID=858&BucketID=6&CategoryID=9](http://www.toolbase.org/TechInventory/TechDetails.aspx?ContentDetailID=858&BucketID=6&CategoryID=9)

<sup>28</sup> Description source: U.S. Department of Energy



**Ultrasonic Faucet Control.** Ultrasonic sensors automatically turn on and off faucet water when motion is detected at the sink. This eliminates the water running continuously while washing hands.

**Water Heater Thermostat Setback.** This measure generates savings by reducing the set point temperature from 130° to 115°. Often, the set point temperature on a hot water system is set higher than necessary.

## Electric Equipment Measures

**Direct Expansion Packaged Air Conditioner System.** Direct Expansion (DX) system use a refrigerant piping circuit, compressor, and refrigerant coils to transfer heat. All components are in a single package typically installed on the building roof. As a measurement of efficiency, commercial sized units are normally rated as Energy Efficient Ratio (EER). Table B.9 displays the different models compared in this measure.

**Table B.9. DX AC Unit EER Comparisons**

| Measure EER | Baseline EER      |
|-------------|-------------------|
| 11.0        | 10.3 (state code) |
| 11.5        | 10.3 (state code) |
| 12.0        | 10.3 (state code) |

**Heat Pump – Air Source.** Air source heat pumps use a Coefficient of Performance (COP) ratio of the cooling effect produced (expressed in Btu/hr), divided by the energy input (expressed on the same basis and as an EER Ratio).<sup>29</sup> These units use the difference between outdoor air temperatures and indoor air temperatures to cool and heat your building. Table B.10 displays the different models compared in this measure.

**Table B.10. Heat Pump COP/EER Comparisons**

| Measure COP & EER             | Baseline COP & EER            |
|-------------------------------|-------------------------------|
| 3.5 (COP) & 11.0 (EER)        | 3.2 (COP) & 10.1 (EER) (code) |
| 3.8 (COP) & 11.8 (EER) (code) | 3.2 (COP) & 10.1 (EER) (code) |

**Water-Cooled Chiller, Screw Chiller.** Screw compressors are positive displacement devices. The refrigerant chamber is actively compressed to a smaller volume by the twisting motion of two interlocking, rotating screws. Refrigerant trapped in the space enclosed between the two rotating screws is compressed as it makes its way from the inlet to the outlet of the compressor. A slide valve is used to adjust the compression effect by varying the amount of compression that occurs before the refrigerant is discharged. Screw chillers are generally used for small- to medium-sized buildings. This unit uses water to cool the refrigerant.

<sup>29</sup> <http://tristate.apogee.net/cool/cfmec.asp>

**Table B.11. Screw Chiller kW/ton Comparison**

| Measure kW/ton | Baseline kW/ton                |
|----------------|--------------------------------|
| 0.461          | 0.634 (state code replacement) |
| 0.507          | 0.634 (state code replacement) |
| 0.574          | 0.634 (state code replacement) |

## Gas Non-Equipment Measures

### Cooking

**Broiler.** A type of oven unit, ENERGY STAR broilers have a rigorous start-up/shutdown and turndown schedule for additional energy savings over standard units. Improved efficiency broilers have an efficiency of 34%, compared to baseline models at 15%.

**Convection Oven.** Operates at a lower temperatures and achieves quicker cook times than a standard oven, due to fans that circulate heat evenly throughout the oven by moving hot air past the food. The baseline measure is a standard commercial oven.

**Conveyor Oven.** A high efficiency conveyor oven has 23% efficiency; in comparison, a standard conveyor oven has 15% efficiency.

**Fryers – Commercial Gas Cooking.** ENERGY STAR-rated gas fired fryers meet at least a minimal efficiency of 50% and a maximum idle rate of no more than 9,000 Btu/hr. The ENERGY STAR model is being compared to a standard fryer with an efficiency of 35%.

**Griddle.** ENERGY STAR griddles are at least 40% efficient and on average use less than 0.25 therm/hour. The baseline measure is a standard grill at 32% efficiency.<sup>30</sup>

**Power Burner Oven.** Generally, the unit incorporates a larger burner and is often sold on range-oven combination units. This burners mixes a greater percentage of air to the gas to increase the overall combustion efficiency of the burner.

**Steam Cooker.** ENERGY STAR commercial gas steam cookers must be 38% efficient, while also meeting a maximum idle rate that is based on pan size for each unit. The baseline measure is a steam cooker at 30% efficiency.

### HVAC & Envelope

**Automatic Ventilation VFD Control (occupancy/CO<sub>2</sub> sensors).** The ventilation system automatically adjust air flow when CO<sub>2</sub> levels are above a specified level. When using CO<sub>2</sub> control, a minimum ventilation rate is maintained at all times to control non-occupant

<sup>30</sup> [www.energystar.org](http://www.energystar.org)



contaminants like off-gassing from furniture, equipment and building components. Without it, as a baseline, the ventilation system would run constantly.

**Boiler – Commissioning.** Commissioning ensures that the boiler unit is properly installed, adequately sized, and operated in an optimal fashion in order to maximize energy efficiency. Some measures that are considered include turbulators, heat recovery systems, pipe insulation, out door air re-set controls, and a stack damper.<sup>31</sup> The baseline measure is no commissioning.

**Boiler – Direct Digital Control (DDC) System-Installation.** DDC controls replace manual and electromechanical controls to allow for tighter control of the boiler system. These controls include demand control ventilation, which controls air quantities based on demand, resets supply air temperature to reduce reheat energy, and employs optimal start up and setback control points.<sup>32</sup>

**Boiler – Direct Digital Control System-Optimization.** Optimizing a boiler DDC system verifies that control setpoints and general operation of the unit are working properly. This measure can be applied in both new and existing applications.

**Boiler – Direct Digital Control System – Wireless Performance Monitoring.** Second-generation building automation systems that allow for wireless optimization and operation of building systems such as HVAC through computerized monitoring and control software and interfaces.

**Boiler – Retro-Commissioning.** The commissioning process is applied to existing buildings to restore them to optimal performance. Retro-commissioning is a systematic, documented process that identifies low-cost operational and maintenance improvements in existing buildings and brings the buildings up to the design intentions of its current usage.<sup>33</sup> The baseline measure is no commissioning on existing equipment. The cost for this measure is derived by taking the cost of the initial commissioning for the first year and then on a yearly basis taking a 40% commissioning cost in each year for the life of the measure (10 years). It is feasible to only perform retro-commissioning every three years and will still only involve 40% of the initial cost for commissioning. If this step is performed, the total cost of the measure would go down making the measure cost effective than it is shown in this study. This change could potentially make the measure pass a cost effectiveness screen and would raise the total estimate for the total economic potential.

**Boiler Economizer.** Recovers heat energy that would otherwise be lost out the boiler stack. This heat energy is recovered by using a heat exchanger located on the stack to heat boiler feed water.<sup>34</sup>

**Duct Repair and Sealing.** The repair and sealing of leaky ducts creates significant energy savings by ensuring that conditioned air only goes to occupied spaces, therefore reducing an

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<sup>31</sup> [http://www.pse.com/solutions/businessPDFs/08\\_3966\\_GasBoilerTuneup.pdf](http://www.pse.com/solutions/businessPDFs/08_3966_GasBoilerTuneup.pdf)

<sup>32</sup> <http://www.oee.nrcan.gc.ca/publications/infosource/pub/ici/eii/pdf/m92-242-2002-3E.pdf>

<sup>33</sup> <http://www.green.ca.gov/CommissioningGuidelines/default.htm>

<sup>34</sup> [http://crownsolutions.com/news\\_september05.html](http://crownsolutions.com/news_september05.html)

excessive runtime/load on the HVAC system. Only for existing construction, and applicable to buildings using packaged DX equipment or heat pumps.

**Exhaust Air to Ventilation Air Heat Recovery.** The air that is exhausted out of a building during the heating season will be warmer than the air outside. Capturing some of this heat and transferring it to the incoming air lowers the overall heating load.

**Exhaust Hood Makeup Air.** Provides exhaust air at the hood instead of allowing the hood to exhaust the conditioned air in the room. The baseline measure is for conditioned air to be expelled through exhaust hoods.

**Existing Windows.** This measure replaces an assumed existing window value for the region with a more efficient window.

**Furnace – Commissioning & Retro-Commissioning.** Commissioning ensures that energy-using systems that have been installed are operating in an optimal fashion in order to maximize energy efficiency. The commissioning process can be applied to existing buildings to restore them to optimal performance. Retro-commissioning is a systematic, documented process that identifies low-cost operational and maintenance improvements in existing buildings and brings the buildings up to the design intentions of its current usage.<sup>35</sup> The baseline measure is no commissioning. The cost for this measure is derived by taking the cost of the initial commissioning for the first year and then on a yearly basis taking a 40% commissioning cost in each year for the life of the measure (10 years). It is feasible to only perform retro-commissioning every three years and will still only involve 40% of the initial cost for commissioning. If this step is performed, the total cost of the measure would go down making the measure cost effective than it is shown in this study. This change could potentially make the measure pass a cost effectiveness screen and would raise the total estimate for the total economic potential.

**Infiltration Control (Caulking, Weather Stripping, etc.).** Sealing air leaks in windows, doors, roof, crawlspaces, and outside walls decreases overall heating and cooling losses. Baseline and measure air changes/hour (ACH) values are presented in Table B.12.

**Table B.12. Infiltration Reduction Measures**

| Measure (ACH) | Baseline (ACH) |
|---------------|----------------|
| 0.65          | 1.00           |

**Insulation – Floor (Non-Slab).** These measures represent an increase in R-value to current code levels of R-19 for the floor space (non-slab) and better. Baseline and measure values are presented in Table B.13.

<sup>35</sup> <http://www.green.ca.gov/CommissioningGuidelines/default.htm>

**Table B.13. Floor Insulation Measures**

| Measure | Baseline |
|---------|----------|
| R-10    | R-0      |
| R-19    | R-10     |

**Insulation – Ceiling.** These measures represent an increase in R-value to current code values of R-21 or better. Baseline and measure values are presented in Table B.14.

**Table B.14. Ceiling Insulation Measures**

| Measure | Baseline                    |
|---------|-----------------------------|
| R-21    | R-0                         |
| R-21    | Existing ceiling insulation |
| R-38    | R-21                        |
| R-49    | R-21                        |

**Insulation (Duct) (Unconditioned Spaces).** Packaged Direct Expansion (DX) and heat-pump equipment are generally coupled with a ducting system inside the building. Insulating the ducts reduces energy loss in the unoccupied plenum space. This measure assumes that R-0 insulation will be replaced with R-4 insulation (or that R-4 insulation will be installed), and that R-4 insulation will be replaced with R-8 (or that R-8 insulation will be installed).

**Insulation – Wall.** Wall insulation installed with a current code R-value of R-19 or better. Measures are based on 2x4 or 2x6 wall construction. Baseline and measure values are presented in Table B.15.

**Table B.15. Wall Insulation Measures**

| Framing Type | Measure | Baseline                 |
|--------------|---------|--------------------------|
| 2x6          | R-19    | R-0                      |
| 2x6          | R-19    | Existing wall insulation |
| 2x6 Advanced | R-25    | R-19                     |

**Integrated Space Heating/Water Heating.** Integrated hot water heating systems provide both space conditioning and hot water heating with one appliance or energy source. Water is heated directly and space heating is accomplished with a hot water heat exchanger coil piped to the forced air heating system. Thus, a combination space/water heating system can provide high efficiency hot water heating and space heating for the cost of one high efficiency appliance.

**Leak Proof Duct Fittings.** The majority of duct leakage in residential HVAC systems is due to improperly sealed connections between ductwork and fittings. Even when duct connections are initially well-sealed, leakage may increase over time. Although the use of mastics and mechanical fasteners is becoming more widespread, a low-cost, leak-proof system will help to transform the market.

**Sensible and Total Heat Recovery Devices.** Sensible heat recovery devices transfer energy (heat) from the return air stream back into the supply air stream, avoiding wasting heat in exhausted air. This raises the indoor air temperature in the winter and cools it in the summer. Energy savings results from reduced needs for mechanical heating or cooling. Total heat devices, also called enthalpy recovery, transfer both sensible and latent heat. Latent heat significantly raises the humidity of the incoming outdoor air in the winter and reduces it in the summer. Dehumidification in the summer can be costly and total recovery devices help reduce this.<sup>36</sup>

**Steam Pipe Insulation.** Insulation of pipes from R-0 to R-4 prevents pipe losses from transferred heat. The size of the loss depends on the diameter of the pipe and the pressure of steam in PSI.

**Steam Trap Maintenance.** Prevents the dirt created from chemical treatments and or pipe scaling from plugging the trap. In most cases, plugging prevents the valve from closing, allowing live steam to escape into the condensate return line or atmosphere, wasting energy.<sup>37</sup>

**Thermostat – Programmable.** A programmable thermostat controls the set point temperatures automatically. As temperatures can be set separately for low occupancy hours, the HVAC system does not run needlessly.

**Windows.** Increases building performance by reducing the U-value in existing construction and new construction windows, as shown in Table B.16.

**Table B.16. High-Efficiency Window Measures**

| Measure U-Value (SHGC) | Baseline U-Value (SHGC) |
|------------------------|-------------------------|
| 0.55                   | 0.65                    |
| 0.35                   | 0.55                    |

The code for either new construction or window replacement states the customer must go to code (U=0.55) at a minimum when installing new windows.

## Pool Heat

**Swimming Pool/Spa Covers.** Covers a pool/spa to reduce evaporation, which is the largest source of pool/spa energy loss. It takes 1 Btu (British thermal unit) to raise 1 pound of water 1°, but each pound of 80°F water that evaporates takes 1,048 Btu of heat out of the pool.<sup>38</sup> The baseline measure is an uncovered pool or spa.

## Water Heat

**Chemical Dishwashing System.** Sanitizes dishes with chemicals, rather than hot water, allowing for a lower water temperature. The baseline measure is a standard commercial dishwasher.

<sup>36</sup> [http://www.mcquay.com/mcquaybiz/marketing\\_tools/mt\\_corporate/EngNews/0701.pdf](http://www.mcquay.com/mcquaybiz/marketing_tools/mt_corporate/EngNews/0701.pdf)

<sup>37</sup> <http://www.steamtraptesting.com/>

<sup>38</sup> [http://www.eere.energy.gov/consumer/your\\_home/water\\_heating/index.cfm/mytopic=13140](http://www.eere.energy.gov/consumer/your_home/water_heating/index.cfm/mytopic=13140)

**Clothes Washer – Ozonating.** Disinfects water using a supply of ozone-enriched air, which suppresses subsequent biological activity as well as controls biological growth within the appliance, thus reducing the need to rely on hot water. The baseline measure is a standard commercial clothes washer.<sup>39</sup>

**Clothes Washer Commercial (without Dryer).** This measure applies to laundromat-type facilities where commercial grade clothes washers are used. Energy can be saved by using ENERGY STAR clothes washers.

**Demand Controlled Circulating Systems.** A demand-controlled circulating system only circulates hot water when required. The baseline measure is a continuously circulating hot water system, resulting in energy loss through pipes.

**Dishwashing – Commercial – High Efficiency.** Dishwashers with a minimal idle rate as well as a minimal amount of water consumption per rack of loaded dishes depending upon size and type.

**Dishwashing – Residential-Sized System.** Residential-sized dishwashing systems are often more appropriate for smaller commercial buildings. The smaller size leads to energy savings.

**Drain Water Heat Recovery (Power-Pipe) – Heat Recovery Water Heater.** Drain water heat recovery devices recover heat energy from drain water and are used to pre-heat cold water entering the hot water tank. This minimizes the temperature difference between the heating set point and the entering water temperature.<sup>40</sup>

**Faucet Aerators.** Faucet aerators, by mixing water and air, reduce the amount of water that flows through the faucet. The faucet aerator creates a fine water spray with a screen that is inserted in the faucet head. Flow rate requirements for this measure are presented in Table B.17.

**Table B.17. Faucet Aerator Flow Rates**

| Measure Flow Rate (GPM) | Baseline Flow Rate (GPM) |
|-------------------------|--------------------------|
| 1.5                     | 2.5                      |
| 2.5                     | 4.0                      |

**Hot Water Pipe Insulation.** Adding R-4 insulation around the pipes for the storage hot water system will decrease heat loss.

**Integrated Space Heating/Water Heating.** Integrated hot water heating systems provide both space conditioning and hot water heating with one appliance or energy source. Water is heated directly and space heating is accomplished with a hot water heat exchanger coil piped to the forced air heating system. Thus, a combination space/water heating system can provide high efficiency hot water heating and space heating for the cost of one high efficiency appliance.

<sup>39</sup> <http://www.patentstorm.us/patents/6607672-description.html>

<sup>40</sup> [www.toolbase.org/TechInventory/TechDetails.aspx?ContentDetailID=858&BucketID=6&CategoryID=9](http://www.toolbase.org/TechInventory/TechDetails.aspx?ContentDetailID=858&BucketID=6&CategoryID=9)

**Low-Flow Showerheads.** Low-flow showerheads, by mixing water and air, reduce the amount of water that flows through the showerhead. The showerhead creates a fine water spray through an inserted screen in the showerhead. Flow rate requirements are presented in Table B.18.

**Table B.18. Low-Flow Showerhead Flow Rates**

| Measure Flow Rate (GPM) | Baseline Flow Rate (GPM) |
|-------------------------|--------------------------|
| 2.0                     | 2.5                      |
| 2.5                     | 4.5                      |

**Low-Flow Spray Heads.** Low-flow spray heads use the same principle as faucet aerators to achieve a flow reduction of nearly 50%, lowering the flow rate to 1.6 GPM from 3.0 GPM.

**Refrigeration with Heat Recovery.** Commercial walk-in refrigerators are normally equipped with their own compressor/condenser package, which is cooled to remove the heat generated by the vapor compression refrigeration cycle. Typically, this heat is released into the environment. Where the equipment is water-cooled, that heat can be recaptured for useful purposes like domestic water heating.<sup>41</sup>

**Tankless Water Heater – Commercial.** Tankless water heaters provide hot water at a preset temperature when needed without storage, thereby reducing or eliminating standby losses. An energy factor of 0.82 was used for the tankless system and compared to an existing tank with 80% thermal efficiency.

**Tankless Water Heater – Residential.** Tankless water heaters provide hot water at a preset temperature when needed without storage, thereby reducing or eliminating standby losses. An energy factor of 0.82 was used for the tankless system and compared to an energy factor of 0.59.

**Ultrasonic Faucet Control.** Ultrasonic sensors automatically turn on and off faucet water when motion is detected at the sink. This eliminates the water running continuously while washing hands.

**Water Heater Thermostat Setback.** This measure generates savings by reducing the set point temperature from 130° to 115°. Often, the set point temperature on a hot water system is set higher than necessary.

## Gas Equipment Measures

**Gas Boiler – Greater than 300 kBtuh.** Boilers are classified as condensing and non-condensing. Condensing boilers condense the flue gas and water vapor, extracting useful heat and improving the boiler efficiency. Boilers are also rated by their input fuel consumption, or in terms of horsepower, where 1 boiler hp = 33,520 Btuh. This measure compares several boilers with different thermal efficiencies and is applicable to both new and existing construction. The overall efficiency of the boiler is defined as the gross output energy divided by the input energy and is

<sup>41</sup> <http://www.oee.nrcan.gc.ca/publications/infosource/pub/ici/eii/m92-242-2002-6e.cfm?attr=24>



affected by combustion efficiency, standby losses, cycling losses and heat transfer. Table B.19 displays the different thermal efficiencies being compared in this measure.<sup>42</sup>

**Table B.19. Gas Boiler Thermal-Efficiency Comparison**

| Measure Thermal Efficiency | Baseline Thermal Efficiency |
|----------------------------|-----------------------------|
| 85%                        | 80% (state code)            |
| 90%                        | 80% (state code)            |

**Gas Boiler – Less than 300 kBtuh.** The National Energy Policy Act of 1992 mandates that all boiler manufacturers must meet the requirements of ASHRAE Standard 90.1. Boilers less than 300 kBtuh are rated using an Annual Fuel Utilization Efficiency (AFUE). AFUE measures the amount of heat actually delivered to the amount of fuel consumed during the heating season; sometimes referred to as the seasonal efficiency. Table B.50 displays the different AFUE values compared in this measure.

**Table B.20. AFUE Gas Boiler Comparison**

| Measure AFUE | Baseline AFUE |
|--------------|---------------|
| AFUE 85%     | AFUE 80%      |
| AFUE 90%     |               |

**Gas Furnace.** Similar to the small gas boiler measure, this furnace measure also compares several different AFUE values amongst different units. Table B.21 displays the different AFUE values compared in this measure.

**Table B.21. Gas Furnace AFUE Comparison**

| Measure AFUE          | Baseline AFUE         |
|-----------------------|-----------------------|
| AFUE 90%              | AFUE 80% (state code) |
| AFUE 94% (condensing) |                       |

**Water Heaters.** Gas water heaters have a range of thermal efficiencies. Table B.52 displays the different efficiencies compared and their baselines.

**Table B.22. Commercial Gas Water Heater Comparison**

| Measure Energy Factor | Baseline Energy Factor |
|-----------------------|------------------------|
| 0.67                  | 0.59 (state code)      |
| 0.90 (condensing)     |                        |

<sup>42</sup> <http://www.newbuildings.org/downloads/guidelines/BoilerGuideline.pdf>

## Passive Renewable Measures

**Smart Siting.** For new construction only, this measure analyzes the optimal building orientation to minimize heating and cooling load on the HVAC system.

**Solar Pool Heating.** A solar pool heater is generally mounted on the roof of a building and is designed to use the sun to directly heat water rather than electricity or gas. Note that this is a passive process, not one that involves photovoltaic cells.

**Solar Water Heating.** A solar water heater is generally mounted on the roof of a building and is designed to use the sun indirectly to heat water through a heat exchanger, rather than electricity or gas. Note that this is a passive process, not one that involves photovoltaic cells.

**Thermal (Trombe) Wall.** Thermal walls slow heat movement by slowing convectional currents that occur in walls. This keeps buildings warmer in the winter and cooler in the summer.

**Window Overhang.** Overhangs shade windows, reducing solar heat gains and the overall cooling load on the home.



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# Appendix B.2: Residential Measure Descriptions

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## Electric Non-Equipment Measures

### Cooking

**Convection Oven.** Operates at lower temperatures and achieves quicker cook times than a standard oven, due to fans that circulate heat evenly throughout the oven by moving hot air past the food. The baseline is a standard commercial oven.

### HVAC Aux

**ECM Motor.** Electronically commutated motors (ECM) consume less power than a standard motor. The cost difference for operating the ECM motor ranges from about 30% lower during high flow rate conditions to about 70% lower during turndown. For existing construction, ECM motors have a technical feasibility of 65% for cooling and varying amounts for HVAC auxiliary (gas or electric heating as the primary fuel). This 65% feasibility for cooling (Central AC) could be underestimating the total potential for this specific application. One reason for the lower feasibility for HVAC auxiliary measures is to account for the percentage of homes that currently use this type of equipment to heat their homes. Typically this is taken into account in equipment fuel shares and saturations, but because of the HVAC auxiliary end use these factors had to be taken into account in the technical feasibility.

**VSD Fan.** Controls the rotational speed of a piece of motor-driven equipment, through adjusting the frequency of the voltage applied to the motor. Baseline for this measure is a constant speed fan motor.

### HVAC & Envelope

**Advanced Cold Climate Heat Pump.** Cold-climate heat pumps are air-to-air heat pumps that have been optimized for colder climates. The performance of these heat pumps is expected to be approximately the same as ground-source heat pumps (GSHP).

**Blinds – Fixed Angle/Automatic.** A covering for a window or door, usually attached to the interior side of a window that reduces sunlight, thus blocking unwanted heat from the summer sun and holding in heat in cold weather. Automatic blinds adjust to the appropriate angle at the appropriate time, and make hard to reach blinds accessible for adjustment. The baseline for this measure is no interior blinds.

**Canned Lighting Air-Tight Sealing.** Proper sealing around recessed lighting fixtures prevents unwanted heat loss through these air spaces due to air pressure differentials in conditioned and unconditioned spaces in homes. The baseline is no sealing.

**Ceiling Fan.** ENERGY STAR<sup>®</sup>-qualified ceiling fans use improved motors and blade designs, allowing the user to decrease the thermostat a couple of degrees yet still feel at least 5° cooler. The fans do not create cooler temperatures. The kit does not include light fixtures; all savings are associated with the improved fan design.

**Check Me! O&M Tune Up.** For central air conditioning systems, the Check Me! procedures for certified maintenance will improve overall efficiency. Proper system tune-up/maintenance ensures that both refrigerant charge and airflow through the evaporator coil are properly tested and correctly adjusted – two factors that affect system efficiency. Maintenance includes changing filters and cleaning coils to maintain the overall performance and efficiency of the unit.

**Doors – R-5.** Composite doors with a foam core increase overall insulation, which slows heat loss. This measure includes adding a thermal door with a resistance value of R-5 to houses with neither thermal nor storm doors.

**Doors – R-11.** A steel door with a polyurethane foam core offers an insulating value of about R-11. The steel surface holds up well to normal wear and tear, and any dents can be repaired easily with auto-body putty.

**Doors – Weatherization.** To minimize infiltration door sweep, weather stripping mounts to the bottom of the door. It consists of an extruded aluminum strip that holds a flexible vinyl strip to block the air space between the door frame and the door. The baseline for this measure is no weather stripping.

**Duct Location.** In many homes, ducts are run through unconditioned areas such as attics, garages, crawlspaces, and basements for convenience and practical reasons. Ducts in unconditioned areas lose energy because of large temperature differences between conditioned air in the ducts and the surrounding space. Locating ducts in conditioned spaces helps to reduce wasted heat loss.<sup>43</sup>

**Duct Repair and Sealing.** Duct sealing cost effectively saves energy, improves air and thermal distribution (comfort and ventilation), and reduces cross contamination between different zones in the building (i.e., smoking vs. non-smoking, bio-aerosols, localized indoor air pollutants).

**Duct Sealing – Aerosol Based.** A significant amount of energy use in residential buildings is associated with duct losses due to leakage. This is an aerosol duct-sealing technology that seals holes in ducts up to ¼” in diameter from the inside by spraying atomized latex aerosol into a pressurized duct system.

**Ductless Mini-Split REM.** Ductless heat pumps, similar to mini-split systems, are used to provide heating and cooling to multiple zones without duct-work. A ductless heat pump stores the compressor outside and pipes the refrigerant to the individual units located in each zone/room inside where the heating or cooling takes place. Energy is saved by eliminating duct losses.

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<sup>43</sup> [http://www.toolbase.org/pdf/techinv/ductsinconditionedspace\\_techspec.pdf](http://www.toolbase.org/pdf/techinv/ductsinconditionedspace_techspec.pdf)

**Evaporative Space Cooling.** A direct evaporative cooler is a low-energy system that evaporates water into the air stream, thus reducing the temperature of the air, but increasing the humidity. An indirect evaporative cooler uses a secondary air stream that is cooled by water and goes through a heat exchanger with the primary air stream, cooling it but not affecting the humidity. A direct/indirect system will cool the air stream first through an indirect cooler, then cool it further through a direct cooler.

**Heat Pump – Ground or Water-Source – Open Loop.** Ground-source heat pumps use the natural heat storage capacity of the earth or ground water to provide energy efficient heating and cooling. In an open loop application, the system draws well water for use as the heat source or heat sink and, after use, returns the well water to a drainage field or another well. This measure compares an efficient model with a Energy Efficient Ratio (EER) of 16.2 and a Coefficient of Performance (COP) of 3.6 to the baseline model air-source heat pump with a 11.3 EER and 3.2 COP.<sup>44</sup>

**Heat Pump – Ground or Water-Source – Closed Loop.** In a closed-loop or earth-coupled loop, the system uses a water and antifreeze solution that is circulated in a ground loop of pipes to extract heat from the earth. Ground loops can be installed in a vertical well or a horizontal loop. Vertical wells are usually more expensive and used where space is limited. This measure compares several models to the baseline systems and is summarized in Table B.23.<sup>45</sup>

**Table B.23. Closed Loop Heat Pump Comparison**

| Measure EER/COP  | Baseline EER/COP |
|------------------|------------------|
| 14.1 EER/3.3 COP | 11.3 EER/3.2 COP |
| 16.2 EER/4.1 COP | 11.3 EER/3.2 COP |

**Heat Pump – Proper Sizing.** Properly sized heat pumps operate for long periods of time (rather than frequently cycling on and off), resulting in optimum equipment operating efficiency and better control.<sup>46</sup>

**ICF Construction.** Building a concrete home with insulating concrete forms (ICFs) saves energy and money. The greater insulation, tighter construction, and temperature-moderating mass of the walls conserve heating and cooling energy much better than conventional wood-frame walls.

**Infiltration Control (Caulk, Weather Strip, etc.).** Filling gaps in windows with synthetic filler prevents drafts and heating/cooling loss.

**Insulation (Basement – Wall) 2x4.** Adding insulation to the basement or crawlspace walls increases the thermal performance of the concrete foundation. Only for existing homes. Table B.24 summarizes the different resistance values compared in the measure.

<sup>44</sup> <http://www.toolbase.org/Technology-Inventory/HVAC/geothermal-heat-pumps>

<sup>45</sup> <http://www.toolbase.org/Technology-Inventory/HVAC/geothermal-heat-pumps>

<sup>46</sup> <http://www.toolbase.org/Technology-Inventory/HVAC/hvac-sizing-practice>

**Table B.24. Wall R-Value Comparison**

| Measure Insulation | Baseline Insulation |
|--------------------|---------------------|
| R-13 (state code)  | R-0                 |
| R-13 (state code)  | R-7 existing wall   |
| R-13 + R-5         | R-13                |

**Insulation (Ceiling).** This measure represents an increase in R-value. Adding insulation in existing buildings increases the thermal performance and brings the resistance value up to and past code, depending on vintage. Table B.25 summarizes the different resistance values compared in the measure.

**Table B.25. Ceiling R-Value Comparison**

| Measure Insulation | Baseline Insulation |
|--------------------|---------------------|
| R-38               | R-9                 |
| R-38               | R-19                |
| R-49               | R-38                |

**Insulation (Duct).** Adding insulation around the ducts in the heating system reduces heat loss to unconditioned spaces. Table B.26 summarizes the different resistance values compared in the measure.

**Table B.26. Duct R-Value Comparison**

| Measure Insulation | Baseline Insulation |
|--------------------|---------------------|
| R-8                | R-0                 |
| R-8                | R-4                 |

**Insulation (Floor).** Adding insulation to the floor increases the overall resistance value and slow heat transfer from the basement to the upper levels. Table B.27 summarizes the different resistance values compared in the measure.

**Table B.27. Floor R-Value Comparison**

| Measure Insulation | Baseline Insulation |
|--------------------|---------------------|
| R-30               | R-0                 |
| R-30               | R-20 existing floor |
| R-38               | R-30                |

**Insulation (Rim and Band Joist).** An un-insulated band joist can account for a significant portion of a building's heat loss, as the only thing separating inside from outside is 2 inches of wood and the siding material covering it. The heat loss through an un-insulated band joist increases when the basement is kept warmer, or contains heating or water heating equipment. Insulating a band joist is an easy way to improve a building's energy efficiency. The baseline is no insulation.

**Insulation (Slab).** A substantial amount of heat is lost through an un-insulated slab, resulting in cold, uncomfortable floors. Even if the foundation wall is insulated vertically under the slab, significant heat is still lost from the slab edge that is closest to the cold outside air. Table B.28 compares the different slab insulations for this measure.

**Table B.28. Slab Insulation Measures**

| Measure Insulation | Baseline Insulation          |
|--------------------|------------------------------|
| R-10               | R-0                          |
| R-10               | Existing wall insulation R-7 |
| R-15               | R-10                         |

**Insulation (Wall) 2x4.** Wall insulation can help slow the transfer of heat and reduce both the heating and cooling loads in houses. Table B.29 compares the different insulations for 2x4 framing.

**Table B.29. 2x4 Wall Insulation Measures**

| Measure Insulation   | Baseline Insulation          |
|----------------------|------------------------------|
| R-13                 | R-0                          |
| R-13                 | Existing wall insulation R-8 |
| R-13 + R-5 Sheathing | R-13                         |

**Insulation (Wall) 2x6.** Wall insulation can help slow the transfer of heat and reduce both the heating and cooling loads in houses. Table B.30 compares the different insulations for 2x6 framing.

**Table B.30. 2x6 Wall Insulation Measures**

| Measure Insulation   | Baseline Insulation          |
|----------------------|------------------------------|
| R-21                 | R-0                          |
| R-21                 | Existing wall insulation R-8 |
| R-21 + R-5 Sheathing | R-21 (State Code)            |

**Leak Proof Duct Fittings.** The majority of duct leakage in residential HVAC systems is due to improperly sealed connections between ductwork and fittings. Even when duct connections are initially well-sealed, leakage may increase over time. Although the use of mastics and mechanical fasteners is becoming more widespread, a low-cost, leak-proof system will help to transform the market.

**Microchannel Heat Exchangers.** A microchannel heat exchanger allows for a longer dwell time for the air passing over it, as compared to a standard fit-tube heat exchanger. This results in an increase in heat exchanger effectiveness.

**Motor - ECM Motor for Heat Pump.** Applicable to ENERGY STAR appliances and dryers, electronically commutated motors (ECM) provide precisely timed voltages to the coils and use

rotation position sensors for timing. This results in greater efficiency than a standard motor. Applicable to any motor, particularly those used in dryers.

**Outlet Gasket.** Provide sealing around electrical outlets to reduce drafts and heat loss through small air spaces.

**Radiant Electric Ceiling Panels.** Radiant heating systems rely on infrared radiation to heat objects, people, and surfaces. The effect is that radiant energy as received by people (directly from the heater and indirectly from other surfaces) allows them to perceive a comfort condition temperature that is 4° to 5° higher than the actual air temperature. This allows a radiant heater to operate at lower air temperatures thus decreasing the use of heating fuel by reducing air stratification within the space, side-wall and ceiling as well as building heat losses.

**Radiant Electric Floor Heating.** Radiant heating systems rely on infra red radiation to heat objects, people, and surfaces. The effect is that radiant energy as received by people (directly from the heater and indirectly from other surfaces) allows them to perceive a comfort condition temperature that is 4° to 5° higher than the actual air temperature. This allows a radiant heater to operate at lower air temperatures thus decreasing the use of heating fuel by reducing air stratification within the space, side-wall and ceiling as well as building heat losses.

**SIP Construction.** Structural insulated panels use continuous foam insulation throughout the panel that provides excellent energy efficiency and low levels of air infiltration. Baseline is standard wood framing.

**Solid State Refrigeration for Heat Pumps.** Using thermoelectric devices to convert electricity for cooling is only starting to become economical due to advances in efficiency levels.

**Spray-On Foam Insulation.** Unlike traditional insulation materials like fiberglass or cellulose, spray foam insulation seals and fills tiny cracks and seams, which virtually eliminates energy-wasting air infiltration. Because it provides a higher R-value per inch, homeowners using foam insulation can use 2x4 construction on exterior walls instead of the 2x6 studs required with traditional insulation. This measure proposes to increase the resistance value to R-23, compared to the baseline of R-13.<sup>47</sup>

**Thermostat – Clock/Programmable.** A programmable thermostat controls the set point temperatures automatically, ensuring the HVAC system is not running during low-occupancy hours.

**Thermostat – Multi-Zone.** A multi-zone programmable thermostat controls the set point temperatures automatically for multiple areas (rooms or zones), ensuring the HVAC system is not running during low-occupancy hours.

**VSD Motor for Heat Pump.** Controls the rotational speed of a piece of motor-driven equipment, through adjusting the frequency of the voltage applied to the motor. Baseline for this measure is a constant speed fan motor.

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<sup>47</sup> [http://www.powerhousetv.com/stellent2/groups/public/documents/pub/phtv\\_se\\_in\\_bu\\_000575.hcsp](http://www.powerhousetv.com/stellent2/groups/public/documents/pub/phtv_se_in_bu_000575.hcsp)



**Whole-House Dehumidifier.** A high capacity whole-house dehumidifier can be run standalone in a basement or ducted into an existing central air conditioning system. These units remove moisture content from the air and prevent mold, mildew and damp conditions.

**Whole-House Fan.** Draws cool outdoor air inside through open windows and exhausts hot indoor air through the attic to the outside. A whole house fan is a simple and inexpensive method of cooling a house when outdoor temperatures are lower than indoor temperatures.

**Windows.** This measure represents an increase in building performance by reducing the U-value in existing construction and new construction windows, as shown in Table B.31. The cost for all increments of windows does not include any labor costs associated with installing the windows. If this value was included, it will only be included in the cost associated with going from Existing windows to a lower more efficiency window. Adding this additional labor for a single family home would increase the cost by approximately \$2000 and would decrease the overall total resource cost effectiveness.

**Table B.31. High Efficiency Window Measures**

| Measure U-Value | Baseline U-Value      |
|-----------------|-----------------------|
| 0.30            | Existing Windows 0.65 |
| 0.19            | 0.30                  |

The code for either new construction or window replacement states the customer must go to code (U=0.40) at a minimum when installing new windows.

## Lighting

**CFL Lighting – 3-Way.** Three-way lights allow for different stages of illumination using different input Wattages. This measure compares a 3-way CFL lamp with 13 Watt, 20 Watt, and 25 Watt increments to a three-way incandescent lamp using 30 Watts, 75 Watts, and 100 Watts.

**Compact Fluorescent Lamps & Fixtures.** Combining the energy efficiency of fluorescent lighting with the convenience and popularity of incandescent fixtures, CFLs: (1) save up to 75% of the initial lighting energy by replacing incandescent that are roughly 3 – 4 times their Wattage, and (2) create further savings by lasting 6–15 times longer (6,000–15,000 hours). A variety of CFL fixture and lamp replacement measures exist, and this particular measure examines the savings from replacing a 60 watt incandescent bulb with a 15 watt fluorescent lamp.<sup>48</sup>

**CFL Torchieres.** A compact fluorescent torchiere is a table or floor lamp designed to direct light upward for indirect illumination. Most of the light is thrown against the ceiling and reflected back. This measure compares a standard 180 Watt halogen lamp to a 55 Watt CFL.

**Daylighting Controls (Photocell) – Indoor/Outdoors.** Photocells are used to adjust lighting levels according to the level of daylight the room is receiving. Baseline is no daylighting controls.

<sup>48</sup> [http://www.eere.energy.gov/consumer/your\\_home/lighting\\_daylighting/indexmytopic=12050](http://www.eere.energy.gov/consumer/your_home/lighting_daylighting/indexmytopic=12050)



**LED Christmas Lighting.** Typical Christmas tree lighting uses incandescent bulbs that can be costly, as well as a fire hazard. LED lights use a low wattage bulb and can save up to 90% of holiday lighting costs.

**LED Lamps.** Light emitting diodes (LEDs) are solid-state devices that convert electricity to light, potentially with very high efficiency and long life. Recently, lighting manufacturers have been able to produce “cool” white LED lighting indirectly, using ultraviolet LEDs to excite phosphors that emit a white-appearing light. These lights are viewed as a replacement for incandescent lamps.

**Occupancy Sensors.** If a space is unoccupied for a designated amount of time, an occupancy sensor will turn off the lights. The lights will turn on again once the sensor detects a person has entered the space.

**Time Clocks (Exterior Lighting).** Allows the user to program times to automatically turn lights on and off outside the residence. Programmed exterior lighting saves energy by ensuring that lights are not accidentally left on during the daytime.

## Plug Load

**1-watt Standby Power.** Standby power is the electricity used by electrical equipment when it is switched off, or not performing its main function. Minimizing this loss to one watt or less can reduce this standby energy consumption by more than 50%.

**Battery Chargers.** Battery charging systems recharge a wide variety of cordless products, including power tools, small household appliances, and personal care products like electric shavers. Conventional battery chargers — even when not actively charging a product — draw as much as 5 to 20 times more energy than actually stored in the battery. Advanced energy-saving designs are now available that, on average, use 35% less energy. The baseline is a standard battery charger.<sup>49</sup>

**Computers.** ENERGY STAR computers feature: (1) “on” mode, where the maximum allowed power varies based on the computer monitor’s resolution; (2) “sleep” mode, where computer monitor models must consume 2 Watts or less; and, (3) “off” mode, where computer monitor models must consume 1 Watt or less. The baseline equipment does not include these features.<sup>50</sup>

**Dehumidifiers.** ENERGY STAR-qualified models have more efficient refrigeration coils, compressors, and fans than conventional models, which means they use less energy to remove moisture. These qualified models remove the same amount of moisture as a similarly-sized standard unit, but uses 10% – 20% less energy. The baseline for this measure is a standard dehumidifier.<sup>51</sup>

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<sup>49</sup> [http://www.energystar.gov/index.cfm?c=battery\\_chargers.pr\\_battery\\_chargers](http://www.energystar.gov/index.cfm?c=battery_chargers.pr_battery_chargers)

<sup>50</sup> [http://www.energystar.gov/index.cfm?fuseaction=find\\_a\\_product.ShowProductGroup&pgw\\_code=MO](http://www.energystar.gov/index.cfm?fuseaction=find_a_product.ShowProductGroup&pgw_code=MO)

<sup>51</sup> [http://www.energystar.gov/index.cfm?c=dehumid.pr\\_dehumidifiers](http://www.energystar.gov/index.cfm?c=dehumid.pr_dehumidifiers)

**Digital Set Top Receiver.** ENERGY STAR receivers must consume less than 7 Watts for satellite and 5 Watts for Low Noise Blockers to qualify. The baseline measure is a standard receiver.

**DVD System.** ENERGY STAR DVD players use as little as one fourth of the energy used by standard models in the “off” mode. Baseline measure is a standard DVD player.<sup>52</sup>

**HDTVs.** Short for High-Definition Televisions, ENERGY STAR models are required to consume less than 1 Watt when switched to the off position. The baseline is a standard television, generally consuming more than 3 Watts when off.

**Home Audio Systems.** According to ENERGY STAR products, a 6% energy savings can be achieved over standard home audio systems.<sup>53</sup>

**Home Office Copiers.** ENERGY STAR copy machines enter sleep mode after inactivity for at least 30 minutes. This reduces their total power consumption.<sup>54</sup>

**Home Office Monitors.** When ENERGY STAR monitors enter sleep mode, the monitor must consume less than 2 Watts. The sleep mode needs to be enabled in order to de-energize the monitor when not in use.

**Printers.** Printers are required by ENERGY STAR standards to deploy a maximum time delay to sleep depending upon the size of the equipment. This reduces power consumption during periods of inactivity.<sup>55</sup>

**TVs.** ENERGY STAR certified televisions use approximately 30% less energy than standard models and consume less than 1 Watt when idle.

**VCRs.** ENERGY STAR certified VCRs use approximately 30% less energy than standard models and consume less than one Watt when idle.

**Power Supply Transformer/Converter - External Power Adapters.** Energy Star power adapters provide more efficient electricity conversion for a variety of devices.

**Powerstrip with Occupancy Sensor.** Energy-saving products such as power strips with an occupancy sensor are found in workstations where power strips are commonly used. The sensor will turn on and off the power to all devices such as computers, desk lights, and audio equipment that are plugged into the power strip based on occupancy within the work area.

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<sup>52</sup> [http://www.energystar.gov/index.cfm?fuseaction=find\\_a\\_product.showProductGroup&pgw\\_code=DP](http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=DP)

<sup>53</sup> [http://www.energystar.gov/index.cfm?fuseaction=find\\_a\\_product.showProductGroup&pgw\\_code=HA](http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=HA)

<sup>54</sup> [http://www.energystar.gov/ia/products/fap/IE\\_Prog\\_Req.pdf](http://www.energystar.gov/ia/products/fap/IE_Prog_Req.pdf)

<sup>55</sup> [http://www.energystar.gov/ia/products/fap/IE\\_Prog\\_Req.pdf](http://www.energystar.gov/ia/products/fap/IE_Prog_Req.pdf)

## Pool Pumps

**Pool Pump Timers.** Setting a pool pump to run during off-peak times (starting after 8 p.m. and cycling off before 10 a.m.) reduces energy costs. Cycling pumps further reduce monthly costs. Baseline is no continuous running pump.

**Pool Pumps – VSD.** Enables the pool pump motor to run at variable speeds as opposed to constantly running at full power.

## Refrigeration / Freezer

**1 kWh per day Refrigerator.** Reducing the energy use of a refrigerator to less than 1 kWh/day will result in over 25% reduction in energy use from a baseline refrigerator.

**Refrigerator//Freezer – Early Replacement.** Replacing equipment before the end of its useful life is advantageous because of the significant inefficiencies in older refrigerator/freezers, resulting in excessive energy consumption. Existing units are replaced with standard (code) models.

**Refrigerator eCube.** The eCube is placed in a refrigerated area and monitors the temperature of the product and not the temperature of the air. The thermostat is connected to the compressor, which cycles on and off to maintain the set point, based on the product temperature. The cycles of the compressor are reduced because the temperature is now based on the product and not the air.<sup>56</sup>

**Removal of Secondary Refrigerator/Freezer.** This refers to the environmentally friendly disposal of unneeded appliances such as secondary refrigerators or stand-alone freezers.

**Solid State Refrigerator.** Using thermoelectric devices to convert electricity for cooling (refrigeration) is only starting to become economical due to advances in efficiency levels.

**Stand-Alone Freezer – Removal.** Removal of stand-alone freezers is beneficial due to their inefficient use of energy. Proper disposal is required, as they use hazardous materials such as Freon & CFCs.

## Water Heat

**Clothes Washer.** Several Modified Energy Factor (MEF) models were compared in this measure, as shown in Table B.32.

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<sup>56</sup> <http://www.senergysolution.com/sEnergySolution/eCube.aspx>

**Table B.32. Clothes Washer Modified Energy Factor Comparisons**

| Measure MEF             | Baseline MEF       |
|-------------------------|--------------------|
| 1.26 Federal Code       | 1.10 Existing Unit |
| 1.83 ENERGY STAR        | 1.26 Federal Code  |
| 2.01 ENERGY STAR Tier 2 | 1.26 Federal Code  |
| 2.2 ENERGY STAR Tier 3  | 1.26 Federal Code  |

**Clothes Washer - Early Replacement.** Replacing equipment before the end of its useful life is advantageous because of the significant inefficiencies in older clothes washers, resulting in excessive energy consumption. Existing units are replaced with standard (code) models.

**Desuperheater for Central Air Conditioner (Ground-Source Heat Pump) System.**

Desuperheaters are heat recovery devices that transfer heat from the air conditioning unit to the domestic water heater, that would normally be transferred to the ground. A desuperheater provides supplemental water heating only when the heat pump operates in the cooling mode.<sup>57</sup>

**Dishwasher.** ENERGY STAR dishwashers use an estimated 41% less energy than the federal minimum standard for energy consumption. Table B.33 shows the following energy factors compared in this measure.

**Table B.33. Dishwasher Energy Factor Comparisons**

| Measure Energy Factor | Baseline Energy Factor |
|-----------------------|------------------------|
| 0.65 Federal Code     | 0.46 Existing Unit     |
| 0.77                  | 0.65 Federal Code      |

**Drain Water Heat Recovery (Power-Pipe).** Drain water heat recovery devices recover heat energy from domestic drain water and are used to pre-heat cold water entering the hot water tank. This minimizes the temperature difference between the heating set point and the entering water temperature. This measure is intended only for new construction.

**Faucet Aerators.** Faucet aerators, by mixing water and air, reduce the amount of water that flows through the faucet. The faucet aerator creates a fine water spray with a screen that is inserted in the faucet head. Flow rate requirements for this measure are presented in Table B.1735.

**Table B.34. Faucet Aerator Flow Rates**

| Measure Flow Rate (GPM*) | Baseline Flow Rate (GPM) |
|--------------------------|--------------------------|
| 2.2                      | 3.0 (existing)           |
| 1.5                      | 2.2                      |
| 0.5                      | 2.2                      |

\* Gallons per minute

<sup>57</sup> [http://www1.eere.energy.gov/femp/procurement/eep\\_groundsource\\_heatpumps.html](http://www1.eere.energy.gov/femp/procurement/eep_groundsource_heatpumps.html)

**Heat Pump Water Heater.** The water-heating heat pump moves heat from a warm reservoir (such as air) into the hot water system. The system employs an evaporator, compressor, condenser, expansion valve, hot water circulating pump and controls to accomplish this function.<sup>58</sup>

**Hot Water Pipe Insulation.** Adding R-4 insulation around the pipes will decrease heat loss.

**Low-Flow Showerheads.** Low-flow showerheads mix water and air to reduce the amount of water that flows through the showerhead. The showerhead creates a fine water spray through an inserted screen in the showerhead. Flow rate requirements for this measure are presented in Table B.836.

**Table B.35. Low-Flow Showerhead Flow Rates**

| Measure Flow Rate (GPM) | Baseline Flow Rate (GPM) |
|-------------------------|--------------------------|
| 2.5                     | 3.0                      |
| 1.75                    | 2.5                      |

**Tankless Water Heater.** Tankless water heaters produce the majority of energy savings by avoiding standby losses that occur when a normal storage tank is not in use. Tankless water heaters provide hot water at a preset temperature when needed without storage, thereby reducing or eliminating standby losses. An energy factor of 0.95 was used for the tankless system and compared to a standard electric water heater with an 0.92 EF.<sup>59</sup>

**Water Heater Thermostat Setback.** This measure generates savings by reducing the set point temperature from 130° to 120°. Often, the set point temperature on a hot water system is set higher than necessary.

## Electric Equipment Measures

**Air Conditioner – Central (2.5 ton unit).** This unit has a 30,000 BTU/hr cooling capacity. This measure compares several different SEER models, which are summarized in Table B.36

**Table B.36. Central AC SEER Comparison**

| Measure SEER | Baseline SEER          |
|--------------|------------------------|
| 14 SEER      | 13 SEER (federal code) |
| 16 SEER      |                        |
| 18 SEER      |                        |

**Air Conditioner – Central (3.0 ton unit).** This unit has a 36,000 BTU/hr cooling capacity. This measure compares several different SEER models, as summarized above in Table B.36.

<sup>58</sup> Description source: U.S. Department of Energy

<sup>59</sup> <http://www.toolbase.org/Technology-Inventory/Plumbing/tankless-water-heaters>

**Air Conditioner – Room (Individual Rooms) (10,000 BTU/HR).** ENERGY STAR-qualified room air conditioners use less energy than conventional models through improved energy performance as well as timers for better temperature control. ENERGY STAR qualified room air conditioners have a 10.8 EER value compared to a standard model that has 9.8 EER.

**Air Source Heat Pump.** Electric air-source heat pumps use the difference between outdoor air temperatures and indoor air temperatures to cool and heat the home. Table B.1039 displays the different models compared in this measure.

**Table B.37. Heat Pump SEER/HSPF Comparisons**

| Measure SEER & HSPF | Baseline SEER & HSPF |
|---------------------|----------------------|
| 14 SEER, 8.5 HSPF   |                      |
| 16 SEER, 8.8 HSPF   | 13 SEER, 7.7 HSPF    |
| 18 SEER, 9.0 HSPF   |                      |

**Clothes Dryer with Moisture Sensor.** High efficiency dryers have a moisture sensor that stops the drying cycle when the humidity in the drum falls below a certain level. Conventional drying equipment uses thermostats or timers that do not determine when clothes are dry, thereby causing excessive energy consumption due to extended run time.

**Freezer – Stand-Alone.** ENERGY STAR-qualified freezer models use at least 10% less energy than required by current federal standards from the National Appliance Energy Conservation Act (NAECA).

**Refrigerator/Freezer.** ENERGY STAR residential grade refrigerators use at least 10% less energy than required by current federal standards and 40% less energy than conventional models sold in 2001.

**Water Heater (Electric).** High efficiency water heaters are more efficient than standard electric water heaters. This measure assumes an energy factor (EF) for the high efficiency water heaters of 0.95, an increase from the code minimum of 0.92.

## Gas Non-Equipment Measures

### Cooking

**Convection Oven.** Operates at a lower temperature and achieves quicker cook times than a standard oven, due to fans that circulate heat evenly throughout the oven by moving hot air past the food. The baseline measure is a standard commercial oven.

### HVAC & Envelope

**Canned Lighting Air-Tight Sealing.** Proper sealing around recessed lighting fixtures prevents unwanted heat loss through these air spaces due to air pressure differentials in conditioned and unconditioned spaces in homes. The baseline is no sealing.



**Doors – R-5.** Composite doors with a foam core increase overall insulation, which slows heat loss. This measure includes adding a thermal door with a resistance value of R-5 to houses with neither thermal nor storm doors.

**Doors – R-11.** A steel door with a polyurethane foam core offers an insulating value of about R-11. The steel surface holds up well to normal wear and tear, and any dents can be repaired easily with auto-body putty.

**Doors – Weatherization.** To minimize infiltration door sweep, weather stripping mounts to the bottom of the door. It consists of an extruded aluminum strip that holds a flexible vinyl strip to block the air space between the door frame and the door. The baseline for this measure is no weather stripping.

**Duct Location.** In many homes, ducts are run through attics, garages, crawlspaces, and basements for convenience and practical reasons. However, ducts in unconditioned areas lose energy because of large temperature differences between air in the ducts and the surrounding space. Locating ducts in conditioned spaces helps to reduce wasted heat loss.<sup>60</sup>

**Duct Repair and Sealing.** Duct sealing cost effectively saves energy, improves air and thermal distribution (comfort and ventilation), and reduces cross contamination between different zones in the building (i.e., smoking vs. non-smoking, bio-aerosols, localized indoor air pollutants).

**Gas Boiler – Proper Sizing.** A properly sized gas boiler will operate for long periods of time (rather than frequently cycling on and off), resulting in optimum equipment operating efficiency and better control.<sup>61</sup>

**Gas Furnace – Maintenance.** This involves an overall inspection of the mechanical equipment of the furnace to ensure proper operation prior to the heating season, and also a general cleaning and replacement of the air filter. The measure does not include duct inspection.

**Gas Furnace – Maintenance – New Equipment.** Includes an overall equipment inspection and tune-up of a recently installed gas unit that may not have been optimized prior to manufacture.

**Gas Furnace – Proper Sizing.** A properly sized gas furnace will operate for long periods of time (rather than frequently cycling on and off), resulting in optimum equipment operating efficiency and better control.<sup>62</sup>

**ICF Construction.** Building a concrete home with insulating concrete forms (ICFs) saves energy and money. The greater insulation, tighter construction and temperature-moderating mass of the walls conserve heating and cooling energy much better than conventional wood-frame walls.

**Infiltration Control (Caulk, Weather Strip, etc.).** Filling gaps in windows with synthetic filler prevents drafts and heating/cooling loss.

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<sup>60</sup> [http://www.toolbase.org/pdf/techinv/ductsinconditionedspace\\_techspec.pdf](http://www.toolbase.org/pdf/techinv/ductsinconditionedspace_techspec.pdf)

<sup>61</sup> <http://www.toolbase.org/Technology-Inventory/HVAC/hvac-sizing-practice>

<sup>62</sup> <http://www.toolbase.org/Technology-Inventory/HVAC/hvac-sizing-practice>

**Insulation (Basement – Wall) 2x4.** Adding insulation to the basement or crawlspace walls increases the thermal performance of the concrete foundation. Only for existing homes. Table B.38 summarizes the different resistance values compared in the measure.

**Table B.38. Wall R-Value Comparison**

| Measure Insulation | Baseline Insulation |
|--------------------|---------------------|
| R-13               | R-0                 |
| R-13               | R-8 existing wall   |
| R-13 + R-5         | R-13                |

**Insulation (Ceiling).** This measure represents an increase in R-value. Adding insulation in existing buildings increases the thermal performance and brings the resistance value up to and past code, depending on vintage. Table B.39 summarizes the different resistance values compared in the measure.

**Table B.39. Ceiling R-Value Comparison**

| Measure Insulation | Baseline Insulation |
|--------------------|---------------------|
| R-38               | Existing Value      |
| R-38               | R-19                |
| R-49               | R-38                |

**Insulation (Duct).** Adding insulation around the ducts in the heating system reduces heat loss to unconditioned spaces. Table B.40 summarizes the different thermal resistance values compared in the measure.

**Table B.40 Duct R-Value Comparison**

| Measure Insulation | Baseline Insulation |
|--------------------|---------------------|
| R-8                | R-0                 |
| R-8                | R-4                 |

**Insulation (Floor).** Adding insulation to the floor increases the overall resistance value and slow heat transfer from the basement to the upper levels. Table B.41 summarizes the different resistance values compared in the measure.

**Table B.41. Floor R-Value Comparison**

| Measure Insulation | Baseline Insulation |
|--------------------|---------------------|
| R-30               | R-0                 |
| R-30               | R-5 existing floor  |
| R-38               | R-30                |

**Insulation (Rim and band joist).** An un-insulated band joist can account for a significant portion of a building’s heat loss, as the only thing separating inside from outside is 2 inches of wood and the siding material covering it. The heat loss through an un-insulated band joist increases when



the basement is kept warmer, or contains heating or water heating equipment. Insulating a band joist is an easy way to improve a building’s energy efficiency. The baseline is no insulation.

**Insulation (Slab).** A substantial amount of heat is lost through an un-insulated slab, resulting in cold, uncomfortable floors. Even if the foundation wall is insulated vertically under the slab, significant heat is still lost from the slab edge that is closest to the cold outside air. Table B.42 compares the different slab insulations for this measure.

**Table B.42. Insulation Slab Measures**

| Measure Insulation | Baseline Insulation |
|--------------------|---------------------|
| R-10               | R-0                 |
| R-10               | Existing insulation |
| R-15               | R-10                |

**Insulation (Wall) 2x4.** Wall insulation can help slow the transfer of heat and reduce both the heating and cooling loads in houses. Table B.43 compares the different insulations for 2x4 framing.

**Table B.43 2x4 Wall Insulation Measures**

| Measure Insulation   | Baseline Insulation          |
|----------------------|------------------------------|
| R-13                 | R-0                          |
| R-13                 | Existing wall insulation R-8 |
| R-13 + R-5 Sheathing | R-13                         |

**Insulation (Wall) 2x6.** Wall insulation slows the transfer of heat and reduces both the heating and cooling loads in houses. Table B.44 compares the different insulations for 2x6 framing.

**Table B.44 2x6 Wall Insulation Measures**

| Measure Insulation   | Baseline Insulation          |
|----------------------|------------------------------|
| R-21                 | R-0                          |
| R-21                 | Existing wall insulation R-8 |
| R-21 + R-5 Sheathing | R-21 (State Code)            |

**Integrated Space Heating/Water Heating.** Integrated hot water heating systems provide both space conditioning and hot water heating with one appliance or energy source. Domestic hot water is heated directly and space heating is accomplished with a hot water heat exchanger coil piped to the forced air heating system. Thus, a combination space/water heating system can provide high efficiency hot water heating and space heating for the cost of one high efficiency appliance.

**Leak Proof Duct Fittings.** The majority of duct leakage in residential HVAC systems is due to improperly sealed connections between ductwork and fittings. Even when duct connections are initially well-sealed, leakage may increase over time. Although the use of mastics and



mechanical fasteners is becoming more widespread, a low-cost, leak-proof system will help to transform the market.

**Outlet Gasket.** Provide sealing around electrical outlets to reduce drafts and heat loss through small air spaces.

**SIP Construction.** Structural insulated panels use continuous foam insulation throughout the panel that provides excellent energy efficiency and low levels of air infiltration. Baseline is standard wood framing.

**Spray-On Foam Insulation.** Unlike traditional insulation materials like fiberglass or cellulose, spray foam insulation seals and fills tiny cracks and seams, which virtually eliminates energy-wasting air infiltration. Because it provides a higher R-value per inch, homeowners using foam insulation can use 2x4 construction on exterior walls instead of the 2x6 studs required with traditional insulation. This measure proposes to increase the resistance value to R-26, compared to the baseline of R-13.<sup>63</sup>

**Thermostat – Clock/Programmable.** A programmable thermostat controls the set point temperatures automatically, ensuring the HVAC system is not running during low-occupancy hours.

**Thermostat – Multi-Zone.** A multi-zone programmable thermostat controls the set point temperatures automatically for multiple areas (rooms or zones), ensuring the HVAC system is not running during low-occupancy hours.

**Windows.** This measure represents an increase in building thermal performance by reducing the U-value in existing construction and new construction windows, as shown in Table B.45. The cost for all increments of windows does not include any labor costs associated with installing the windows. If this value was include, it will only be included in the cost associated with going from Existing windows to a lower more efficiency window. Adding this additional labor for a single family home would increase the cost by approximately \$2000 and would decrease the overall total resource cost effectiveness.

**Table B.45. High-Efficiency Window Measures**

| Measure U-value | Baseline U-value |
|-----------------|------------------|
| 0.30            | 0.65             |
| 0.19            | 0.30             |

The code for either new construction or window replacement states the customer must go to code (U=0.40) at a minimum when installing new windows.

<sup>63</sup> [http://www.powerhousetv.com/stellent2/groups/public/documents/pub/phtv\\_se\\_in\\_bu\\_000575.hcsp](http://www.powerhousetv.com/stellent2/groups/public/documents/pub/phtv_se_in_bu_000575.hcsp)

## Pool Heat

**Pool Heaters.** Gas pool heaters use either natural gas or propane. As the pump circulates the pool's water, the water drawn from the pool passes through a filter and then to the heater. The gas burns in the heater's combustion chamber, generating heat that transfers to the water that's returned to the pool. They're most efficient when heating pools for short periods of time, and they're ideal for quickly heating pools. The baseline is a standard gas pool heater.<sup>64</sup>

## Water Heat

**Clothes Washer.** Several Modified Energy Factor (MEF) models were compared in this measure, as shown in Table B.46.

**Table B.46 Clothes Washer Modified Energy Factor Comparisons**

| Measure MEF            | Baseline MEF      |
|------------------------|-------------------|
| 1.26 Federal Code      | 1.1 Existing Unit |
| 1.72 ENERGY STAR       | 1.26 Federal Code |
| 2.0 ENERGY STAR Tier 2 | 1.26 Federal Code |
| 2.2 ENERGY STAR Tier 3 | 1.26 Federal Code |

### ***Desuperheater for Central Air Conditioner (Ground-Source Heat Pump) System.***

Desuperheaters are heat recovery devices that transfer heat from the air conditioning unit to the domestic water heater, that would normally be transferred to the ground. A desuperheater provides supplemental water heating only when the heat pump operates in the cooling mode.<sup>65</sup>

**Dishwasher.** ENERGY STAR dishwashers use an estimated 41% less energy than the federal minimum standard for energy consumption. Table B.3349 shows the following energy factors compared in this measure.

**Table B.47. Dishwasher Energy Factor Comparisons**

| Measure Energy Factor | Baseline Energy Factor |
|-----------------------|------------------------|
| 0.65 Federal Code     | 0.46 Existing Unit     |
| 0.77                  | 0.65 Federal Code      |

**Drain Water Heat Recovery (Power-Pipe).** Drain water heat recovery devices recover heat energy from drain water and are used to pre-heat cold water entering the hot water tank. This minimizes the temperature difference between the heating set point and the entering water temperature. Only for new construction.

<sup>64</sup> [http://www.eere.energy.gov/consumer/your\\_home/water\\_heating/index.cfm/mytopic=13160](http://www.eere.energy.gov/consumer/your_home/water_heating/index.cfm/mytopic=13160)

<sup>65</sup> [http://www1.eere.energy.gov/femp/procurement/eep\\_groundsource\\_heatpumps.html](http://www1.eere.energy.gov/femp/procurement/eep_groundsource_heatpumps.html)

**Faucet Aerators.** Faucet aerators, by mixing water and air, reduce the amount of water that flows through the faucet. The faucet aerator creates a fine water spray with a screen that is inserted in the faucet head. Flow rate requirements for this measure are presented in Table B.1735.

**Table B.48. Faucet Aerator Flow Rates**

| Measure Flow Rate (GPM*) | Baseline Flow Rate (GPM) |
|--------------------------|--------------------------|
| 2.2                      | 3.0 (existing)           |
| 1.5                      | 2.2                      |
| 0.5                      | 2.2                      |

\* Gallons per minute

**Hot Water Supply Pipe Insulation.** Adding R-4 insulation around the pipes will decrease heat loss.

**Integrated Space Heating/Water Heating.** Integrated hot water heating systems provide both space conditioning and hot water heating with one appliance or energy source. Domestic hot water is heated directly and space heating is accomplished with a hot water heat exchanger coil piped to the forced air heating system. Thus, a combination space/water heating system can provide high efficiency hot water heating and space heating for the cost of one high efficiency appliance.

**Low-Flow Showerheads.** Low-flow showerheads mix water and air to reduce the amount of water that flows through the showerhead. The showerhead creates a fine water spray through an inserted screen in the showerhead. Flow rate requirements for this measure are presented in Table B.836.

**Table B.49. Low-Flow Showerhead Flow Rates**

| Measure Flow Rate (GPM) | Baseline Flow Rate (GPM) |
|-------------------------|--------------------------|
| 2.5                     | 3.0                      |
| 1.75                    | 2.5                      |

**Tankless Water Heater.** The majority of energy savings from tankless water heaters is by avoiding standby losses that occurs for a normal storage tank when it is not being used. Tankless water heaters provide hot water at a preset temperature when needed without storage, thereby reducing or eliminating standby losses. An energy factor of 0.78 was used for the tankless system and compared to the standard code gas water heater with 0.59 EF.<sup>66</sup>

**Water Heater Thermostat Setback.** This measure generates savings by reducing the set point temperature from 135° to 120°. Often, the set point temperature on a hot water system is set higher than necessary.

<sup>66</sup> <http://www.toolbase.org/Technology-Inventory/Plumbing/tankless-water-heaters>

## Gas Equipment Measures

**Clothes Dryer with Moisture Sensor.** High efficiency dryers have a moisture sensor that stops the drying cycle when the humidity in the drum falls below a certain level. Conventional drying equipment uses thermostats or timers that do not determine when clothes are dry, thereby causing excessive energy consumption due to extended run time.

**Gas Boiler.** The National Energy Policy Act of 1992 mandates that all boiler manufacturers must meet the requirements of ASHRAE Standard 90.1. Boilers less than 300 kBtuh are rated using an Annual Fuel Utilization Efficiency (AFUE). AFUE measures the amount of heat actually delivered to the amount of fuel consumed during the heating season; sometimes referred to as the seasonal efficiency. Table B.50 displays the different AFUE values compared in this measure.

**Table B.50. AFUE Gas Boiler Comparison**

| Measure AFUE | Baseline AFUE |
|--------------|---------------|
| AFUE 90%     | AFUE 82%      |
| AFUE 94%     |               |

**Gas Furnace.** This furnace measure also compares several different AFUE values among different units. Table B.51 displays the different AFUE values compared and their baselines.

**Table B.51. AFUE Gas Furnace Comparison**

| Measure AFUE          | Baseline AFUE         |
|-----------------------|-----------------------|
| AFUE 90% (condensing) | AFUE 78% (state code) |
| AFUE 95% (condensing) |                       |

**Water Heater (Gas).** Gas water heaters have a range of thermal efficiencies. Table B.52 displays the different efficiencies compared and their baselines.

**Table B.52. Residential Gas Water Heater Comparison**

| Measure Energy Factor | Baseline Energy Factor |
|-----------------------|------------------------|
| 0.62                  |                        |
| 0.80 (condensing)     | 0.59 (state code)      |
| 0.86 (condensing)     |                        |

## Passive Renewable Measures

**Deciduous Trees.** Provide shading and effectively reduce the overall solar heat gain during summer months, which reduces the cooling load on the HVAC system. Baseline for this measure is no trees.

**Pellet Stove (Corn or other Biomass Fuel).** Biomass energy is organic matter that can be processed into energy for heat, liquid fuels, or power generation. Examples of biomass energy

include: wood grasses, animal wastes, agricultural residues, urban & industrial wastes, and corn. These fuels can be used to heat homes and reduce the use of fossil fuels.

**Smart Siting.** For new construction only, this measure analyzes the optimal building orientation to minimize the heating and cooling load on the HVAC system.

**Solar Attic Fan.** Forced attic fan ventilation reduces residential heat gains from the ceiling. The baseline uses passive ventilation without a fan.

**Solar Hot Water (SHW).** Solar water heating systems include storage tanks and solar collectors. There are two types of solar water heating systems: active, which have circulating pumps and controls, and passive, which don't. Either system actively increases the entering water temperature to the storage tank, reducing the amount of energy required by the hot water heater to achieve the set point temperature.<sup>67</sup>

**Thermal (Trombe) Wall.** Thermal walls slow heat movement by slowing convectional currents that occur in walls. This keeps buildings warmer in the winter and cooler in the summer.

**Window Overhang.** Overhangs shade windows, reducing solar heat gains and the overall cooling load on the home.

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<sup>67</sup> [http://www.eere.energy.gov/consumer/your\\_home/water\\_heating/index.cfm/mytopic=12850](http://www.eere.energy.gov/consumer/your_home/water_heating/index.cfm/mytopic=12850)

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## Appendix B.3: Industrial Measure Descriptions

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### Electric Non-Equipment Measures

#### Process Related

Any measures to improve the industrial process, not specific to the building itself.

**Process Cooling Improvements.** Improvements that will decrease the energy required for process-related cooling. Examples would include avoid frost formation on evaporators, shutting off cooling water when not required, using economic thickness of insulation for low temperatures.

**Process Heating Improvements.** Improvements that will decrease the energy required for process-related heating. Examples would include optimizing schedule for drying oven, reducing temperature of process equipment when on standby, and modifying equipment to improve drying process.

**Process Heating O&M.** Changing operation and maintenance (O&M) procedures of process heating can improve overall energy efficiency of a plant. Some O&M examples include repair faulty insulation, adjust burners for efficient operation, and eliminate leaks in combustible gas lines.

**Process Heat Steam Distribution.** Any elimination in leaks or improved insulation to the ducting will reduce loss in a distribution system.

**Fan System Improvements.** Savings from variable-speed drives (VSD) and/or improvements to the design of the fan system, such as better fans, ducting, and flow design.

**Pump System Improvements.** Similar to fan system improvements, with savings from a VSD and/or improvements to the overall pump system, such as better pumps, more efficient piping and eliminating unnecessary flows. In irrigation, this would include nozzle improvements and scientific irrigation systems.

**Other Motor Improvements.** Improvements to motors not specific to fans or pumps. This would include using higher efficiency motors, improved rewind practices and correct motor sizing. In the mining industry, this would also include milling technique improvements.

**Other Motor O&M.** Changing operation and maintenance (O&M) procedures of motors can improve overall energy efficiency of a plant. Some O&M examples include develop and repair/replace policy, avoid emergency rewind of motors, and avoid rewinding motors more than twice.

**Air Compressor Improvements.** Air compressor energy efficiency, used in the industrial process, can be improved by installing compressor air intakes in coolest locations, or using optimum-sized compressors, amongst others.



***Air Compressor O&M.*** Changing operation and maintenance (O&M) procedures of an air compressor can improve the overall energy efficiency of a plant. Some O&M examples include reducing the pressure of compressed air to the minimum required, cooling compressor air intake with a heat exchanger or eliminating leaks.

***Refrigeration Improvements.*** Refrigeration improvements can include isolating hot equipment from refrigerated area, using highest allowable temperature for refrigerated space or modify refrigeration system to operate at a lower pressure.

***Other Process Improvements/O&M.*** Some generic process improvements/O&M include upgrading obsolete equipment, replace hydraulic/pneumatic equipment with electrical equipment and use optimum size and capacity equipment.

## **Building Related**

Any measures to improve the building itself, not specific to the industrial process.

***Boiler Improvements.*** The boiler is generally used to create steam or hot water for process or non-process applications. Savings can be found by installing a waste heat boiler to provide direct power or using flue gas heat to preheat boiler feedwater.

***Lighting Improvements.*** Any changes to overall illumination levels, use of natural lighting, or technology improvements to use more efficient bulbs or ballasts that will decrease the overall lighting energy consumption.

***HVAC Improvements.*** There are many changes that can be made to reduce the energy consumption in HVAC control of a plant. Many are measures found in the commercial and residential lists. A sample of improvements include: conditioning only space in use, installing timers and/or thermostats, lowering ceiling to reduce conditioned space, and installing or upgrading insulation on distribution systems.

***HVAC O&M.*** Some operation and maintenance (O&M) improvements to the HVAC control system include size air handling grills/ducts/coils to minimize air resistance, adjust vents to minimize energy use and maintain air filters by cleaning or replacement.

***Other Building Improvements.*** Some generic improvements to the building include de-energizing excess transformer capacity, increase electrical conductor size to reduce distribution losses, and optimize plant power factor.

## **Gas Non-Equipment Measures**

### **Process Related**

Any measures to improve the industrial process, not specific to the building itself.

**Process Heating Improvements.** Improvements that will decrease the energy required for process-related heating. Examples would include optimizing schedule for drying oven, reducing temperature of process equipment when on standby, and modifying equipment to improve drying process.

**Process Heating O&M.** Changing operation and maintenance (O&M) procedures of process heating can improve overall energy efficiency of a plant. Some O&M examples include repair faulty insulation, adjust burners for efficient operation, and eliminate leaks in combustible gas lines.

**Steam Distribution Systems.** Any elimination in leaks or improved insulation to the ducting will reduce loss in a distribution system.

**Other Process Improvements/O&M.** Some generic process improvements/O&M include upgrading obsolete equipment, reducing fluid flow rates, and use optimum size and capacity equipment.

## **Building Related**

Any measures to improve the building itself, not specific to the industrial process.

**HVAC Improvements.** There are many changes that can be made to reduce the energy consumption in HVAC control of a plant. Many are measures found in the commercial and residential lists. A sample of improvements include: conditioning only space in use, installing timers and/or thermostats, lowering ceiling to reduce conditioned space, and installing or upgrading insulation on distribution systems.

**HVAC O&M.** Some operation and maintenance (O&M) improvements to the HVAC control system include size air handling grills/ducts/coils to minimize air resistance, adjust vents to minimize energy use and maintain air filters by cleaning or replacement.

**Boiler Improvements.** The boiler is generally used to create steam or hot water for process or non-process applications. Savings can be found by installing a waste heat boiler to provide direct power or using flue gas heat to preheat boiler feedwater.

**Boiler O&M.** Such improvements to the boiler would include analyze flue gas for proper air/fuel ration, establishing maintenance schedule or reducing excessive boiler blowdown.

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## Appendix B.4: Building Simulations

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The consumption – both quantity and timing – of electricity associated with different end uses across building types is a critical component in the assessment of both capacity-based and energy efficiency potentials for the residential and commercial sectors. The primary sources for these data are energy model simulations, which served the following purposes in this study:

- Establish the baseline consumption for various end uses in both existing and new construction vintages
- Estimate the savings associated with equipment upgrades and improvements to both building shell and lighting
- Account for the interactive effects that occur between lighting improvements and HVAC
- Establish the annual hourly timing associated with consumption in different end uses

The two types of energy simulation programs used for this study are eQuest<sup>68</sup> (for commercial models) and Energy-10<sup>69</sup> (for residential models). eQuest is a user interface that uses the standard DOE-2 calculation engine with an emphasis on commercial building types. Energy-10 is a program developed by the National Renewable Energy Laboratory (NREL) Center for Building and Energy Storage with an emphasis on simulations for small commercial and residential building types.

Both of these programs provide hourly (8,760) demand and annual energy consumption for a specific end use (e.g., cooling, heating, water heating, etc.). The hourly values were then amalgamated and calibrated with actual hourly usage to determine the load basis for demand response programs. The annual energy consumption was used in the analysis of energy efficiency resources to determine specific building type end-use consumption. A secondary purpose of energy simulations is the ability to determine the energy savings associated with installing higher efficiency equipment (e.g., moving from a SEER 13 Central AC to a SEER 15) and shell improvements (e.g., increasing insulation values and/or using high efficiency windows). Lists of all measures modeled for the residential and commercial sectors are given in Table B.1 and Table B.2, respectively.

**Table B.1. Residential Measures Modeled in Energy-10**

| End Use    | Measure Name                             |
|------------|--|
| Central AC | Central AC - Advanced Technology SEER 18 |
|            | Central AC - High Efficiency SEER 16     |
|            | Central AC - Premium Efficiency SEER 14  |
| Heat Pump  | ASHP - Advanced Efficiency               |
|            | ASHP - High Efficiency                   |
|            | ASHP - Premium Efficiency                |

<sup>68</sup> eQuest web page: <http://doe2.com/equest/>

<sup>69</sup> Energy-10 web page: <http://www.nrel.gov/buildings/energy10.html>

|             |  |
|-------------|--|
| Gas Furnace | Furnace - Advanced Efficiency<br>Furnace - High Efficiency<br>Furnace - Premium Efficiency   |
| Gas Boiler  | Boiler - Advanced Efficiency<br>Boiler - High Efficiency<br>Boiler - Premium Efficiency  |
| HVAC        | Blinds – Fixed Angle<br>Doors – R-5 and R-11<br>Insulation-Ceiling<br>Insulation-Floor<br>Insulation-Wall 2x4<br>Insulation-Wall 2x6<br>Windows, ENERGY STAR or better |

**Table B.2. Commercial Measures Modeled in eQuest**

| End Use          | Measure Name                                |
|------------------|---|
| Cooling Chillers | Chiller-High Efficiency                     |
|                  | Chiller-Premium Efficiency                  |
|                  | Cooling Tower-Decrease Approach Temperature |
|                  | Cooling Tower-Two-Speed Fan Motor           |
|                  | Chiller-Water Side Economizer               |
| Cooling DX       | DX Package-Air Side Economizer              |
|                  | High Efficiency DX Package                  |
|                  | Premium Efficiency DX Package               |
|                  | Advanced Efficiency DX Package              |
| Heat Pump        | High Efficiency ASHP                        |
|                  | Premium Efficiency ASHP                     |
| Gas Furnace      | High Efficiency Furnace                     |
|                  | Premium Efficiency Furnace                  |
| Gas Boiler       | High Efficiency Boiler                      |
|                  | Premium Efficiency Boiler                   |
| Lighting         | Lighting Package, High Efficiency           |
|                  | Lighting Package, Premium Efficiency        |
| HVAC             | Infiltration Control                        |
|                  | Insulation - 2*4 Walls                      |
|                  | Insulation - Floor                          |
|                  | Insulation - Roof / Ceiling                 |
|                  | Windows-High Efficiency                     |
| Water Heat       | Water Heater Temperature Setback            |

There are three main steps involved in the building simulation process. The first step is the development of building prototypes, which define the typical characteristics associated with the different customer segments (residential dwelling type or commercial business type) for both existing and new construction. These characteristics, which play an important role in driving energy consumption, were developed from a number of sources. For existing buildings, values come from information gathered during the data auditing analysis for the PSE service territory in



addition to energy audits and phone surveys with PSE customers. In cases where data are lacking, engineering judgment is applied. For new construction, the specific state energy code and/or federal code (whichever is the most stringent) is used to determine the building construction and equipment efficiency requirements (International Energy Conservation Code for 2006).

## Commercial Building Prototype Parameters

**Table B.3. Dry Goods Retail**

| Dry Goods Retail                   | Gas for all Heating End Uses                              |          | Electric for All Heating End Uses |              |
|------------------------------------|---|----------|-----------------------------------|--------------|
|                                    | Existing  | New      | Existing                          | New          |
| Exterior Wall Construction         | 2x4 -16" o.c. wood with brick exterior finish medium abs. |          |                                   |              |
| Roof Construction                  | standard wood frame built up roof                         |          |                                   |              |
| # of Floors                        | 1   | 1        | 1                                 | 1            |
| Total Floor Area [sqft]            | 6,176   | 6,176    | 6,176                             | 6,176        |
| Roof Area [sqft]                   | 6,176   | 6,176    | 6,176                             | 6,176        |
| <b>Envelope</b>                    |   |          |                                   |              |
| Window U-factor                    | U=0.68  | U=0.55   | U=0.68                            | U=0.55       |
| Window to Wall Area                | 15%   | 15%      | 15%                               | 15%          |
| Wall Insulation (R Value)          | R-3   | R-19     | R-3                               | R-19         |
| Roof Insulation (R Value)          | R-7   | R-21     | R-7                               | R-21         |
| Floor Insulation (R Value)         | R-11  | R-19     | R-11                              | R-19         |
| Lighting Density [W/sqft]          | 1.95  | 1.5      | 1.95                              | 1.5          |
| Occupancy Schedule WkDay           | 9am-7pm   |          |                                   |              |
| Occupancy Schedule WkEnd           | 10am-4pm (Sat)  |          |                                   |              |
| <b>HVAC</b>                        |   |          |                                   |              |
| Modeling Gas Furnace?              | yes   | yes      | no                                | no           |
| Heating Efficiency                 | 76% AFUE  | 78% AFUE | n/a                               | n/a          |
| Modeling Heat Pump?                | no  | no       | yes                               | yes          |
| Heating Efficiency                 | n/a   | n/a      | 2.7 COP                           | 3.2 COP      |
| Percent Of Building Heated         | 100   | 100      | 100                               | 100          |
| Modeling DX Cooling?               | yes   | yes      | yes                               | yes          |
| Cooling Efficiency                 | 9.2 EER   | 10.3 EER | 9.2 EER                           | 10.3 EER     |
| Modeling Heat Pump Cooling?        | no  | no       | yes                               | yes          |
| Cooling Efficiency                 | n/a   | n/a      | 9.3 EER                           | 10.1 EER     |
| Modeling Chillers Cooling?         | no  | no       | yes                               | yes          |
| Cooling Efficiency                 | n/a   | n/a      | 0.793 kW/ton                      | 0.675 kW/ton |
| Percent Of Building cooled         | 100   | 100      | 100                               | 100          |
| Heating Daytime Set point [°F]     | 69  | 69       | 69                                | 69           |
| Heat. Setback/Setup Set point [°F] | 62  | 62       | 62                                | 62           |
| Cooling Daytime Set point [°F]     | 72  | 72       | 72                                | 72           |
| Cool. Setback/Setup Set point [°F] | 75  | 75       | 75                                | 75           |

**Table B.4. Grocery**

| Grocery                            | Gas for all Heating End Uses                              |          | Electric for All Heating End Uses |              |
|------------------------------------|---|----------|-----------------------------------|--------------|
|                                    | Existing  | New      | Existing                          | New          |
| Exterior Wall Construction         | 2x4 -16" o.c. wood with brick exterior finish medium abs. |          |                                   |              |
| Roof Construction                  | standard wood frame built up roof                         |          |                                   |              |
| # of Floors                        | 1   | 1        | 1                                 | 1            |
| Total Floor Area [sqft]            | 12,474  | 12,474   | 12,474                            | 12,474       |
| Roof Area [sqft]                   | 12,474  | 12,474   | 12,474                            | 12,474       |
| <b>Envelope</b>                    |   |          |                                   |              |
| Window U-factor                    | U=0.65  | U=0.55   | U=0.65                            | U=0.55       |
| Window to Wall Area                | 11%   | 11%      | 11%                               | 11%          |
| Wall Insulation (R Value)          | R-3   | R-19     | R-3                               | R-19         |
| Roof Insulation (R Value)          | R-7   | R-21     | R-7                               | R-21         |
| Floor Insulation (R Value)         | R-11  | R-19     | R-11                              | R-19         |
| Lighting Density [W/sqft]          | 1.7   | 1.5      | 1.7                               | 1.5          |
| Occupancy Schedule WkDay           | 7am-9pm   |          |                                   |              |
| Occupancy Schedule WkEnd           | 8am-9pm (Sat), 9am-8pm (Sun)                              |          |                                   |              |
| <b>HVAC</b>                        |   |          |                                   |              |
| Modeling Gas Furnace?              | yes   | yes      | no                                | no           |
| Heating Efficiency                 | 76% AFUE  | 78% AFUE | n/a                               | n/a          |
| Modeling Heat Pump?                | no  | no       | yes                               | yes          |
| Heating Efficiency                 | n/a   | n/a      | 2.7 COP                           | 3.2 COP      |
| Percent Of Building Heated         | 100   | 100      | 100                               | 100          |
| Modeling DX Cooling?               | yes   | yes      | yes                               | yes          |
| Cooling Efficiency                 | 9.2 EER   | 10.3 EER | 9.2 EER                           | 10.3 EER     |
| Modeling Heat Pump Cooling?        | no  | no       | yes                               | yes          |
| Cooling Efficiency                 | n/a   | n/a      | 9.3 EER                           | 10.1 EER     |
| Modeling Chillers Cooling?         | no  | no       | yes                               | yes          |
| Cooling Efficiency                 | n/a   | n/a      | 0.793 kW/ton                      | 0.675 kW/ton |
| Percent Of Building Cooled         | 100   | 100      | 100                               | 100          |
| Heating Daytime Set point [°F]     | 68  | 68       | 68                                | 68           |
| Heat. Setback/Setup Set point [°F] | 62  | 62       | 62                                | 62           |
| Cooling Daytime Set point [°F]     | 72  | 72       | 72                                | 72           |
| Cool. Setback/Setup Set point [°F] | 75  | 75       | 75                                | 75           |

**Table B.5. Hospital**

| Hospital                           | Gas for all Heating End Uses                              |          | Electric for All Heating End Uses |              |
|------------------------------------|---|----------|-----------------------------------|--------------|
|                                    | Existing  | New      | Existing                          | New          |
| Exterior Wall Construction         | 2x4 -16" o.c. wood with brick exterior finish medium abs. |          |                                   |              |
| Roof Construction                  | standard wood frame built up roof                         |          |                                   |              |
| # of Floors                        | 2   | 2        | 2                                 | 2            |
| Total Floor Area [sqft]            | 13,561  | 13,561   | 13,561                            | 13,561       |
| Roof Area [sqft]                   | 13,561  | 13,561   | 13,561                            | 13,561       |
| <b>Envelope</b>                    |   |          |                                   |              |
| Window U-factor                    | U=0.67  | U=0.55   | U=0.67                            | U=0.55       |
| Window to Wall Area                | 25%   | 25%      | 25%                               | 25%          |
| Wall Insulation (R Value)          | R-0   | R-19     | R-0                               | R-19         |
| Roof Insulation (R Value)          | R-11  | R-21     | R-11                              | R-19         |
| Floor Insulation (R Value)         | R-19  | R-19     | R-19                              | R-19         |
| Lighting Density [W/sqft]          | 1.6   | 1        | 1.6                               | 1            |
| Occupancy Schedule WkDay           | 7am-6pm   |          |                                   |              |
| Occupancy Schedule WkEnd           | 9am-4pm (Sat)   |          |                                   |              |
| <b>HVAC</b>                        |   |          |                                   |              |
| Modeling Gas Furnace?              | yes   | yes      | no                                | no           |
| Heating Efficiency                 | 76% AFUE  | 78% AFUE | n/a                               | n/a          |
| Modeling Heat Pump?                | no  | no       | yes                               | yes          |
| Heating Efficiency                 | n/a   | n/a      | 2.7 COP                           | 3.2 COP      |
| Percent Of Building Heated         | 100   | 100      | 100                               | 100          |
| Modeling DX Cooling?               | yes   | yes      | yes                               | yes          |
| Cooling Efficiency                 | 9.2 EER   | 10.3 EER | 9.2 EER                           | 10.3 EER     |
| Modeling Heat Pump Cooling?        | no  | no       | yes                               | yes          |
| Cooling Efficiency                 | n/a   | n/a      | 9.3 EER                           | 10.1 EER     |
| Modeling Chillers Cooling?         | no  | no       | yes                               | yes          |
| Cooling Efficiency                 | n/a   | n/a      | 0.793 kW/ton                      | 0.675 kW/ton |
| Percent Of Building Cooled         | 100   | 100      | 100                               | 100          |
| Heating Daytime Set point [°F]     | 71  | 71       | 71                                | 71           |
| Heat. Setback/Setup Set point [°F] | 67  | 67       | 67                                | 67           |
| Cooling Daytime Set point [°F]     | 73  | 73       | 73                                | 73           |
| Cool. Setback/Setup Set point [°F] | 75  | 75       | 75                                | 75           |



**Table B.6. Hotel / Motel**

| Hotel / Motel                      | Gas for all Heating End Uses                              |          | Electric for All Heating End Uses |              |
|------------------------------------|---|----------|-----------------------------------|--------------|
|                                    | Existing  | New      | Existing                          | New          |
| Exterior Wall Construction         | 2x4 -16" o.c. wood with brick exterior finish medium abs. |          |                                   |              |
| Roof Construction                  | standard wood frame built up roof                         |          |                                   |              |
| # of Floors                        | 4   | 4        | 4                                 | 4            |
| Total Floor Area [sqft]            | 3,559   | 3,559    | 3,559                             | 3,559        |
| Roof Area [sqft]                   | 3,559   | 3,559    | 3,559                             | 3,559        |
| <b>Envelope</b>                    |   |          |                                   |              |
| Window U-factor                    | U=0.65  | U=0.55   | U=0.65                            | U=0.55       |
| Window to Wall Area                | 30%   | 30%      | 30%                               | 30%          |
| Wall Insulation (R Value)          | R-3   | 0        | R-3                               | R-13         |
| Roof Insulation (R Value)          | R-11  | 0        | R-11                              | 0            |
| Floor Insulation (R Value)         | R-7   | 0        | R-7                               | 0            |
| Lighting Density [W/sqft]          | 1.52  | 1.35     | 1.52                              | 1.35         |
| Occupancy Schedule WkDay           | 24 hrs  | 24 hrs   | 24 hrs                            | 24 hrs       |
| Occupancy Schedule WkEnd           | 24 hrs  | 24 hrs   | 24 hrs                            | 24 hrs       |
| <b>HVAC</b>                        |   |          |                                   |              |
| Modeling Gas Furnace?              | yes   | yes      | no                                | no           |
| Heating Efficiency                 | 76% AFUE  | 78% AFUE | n/a                               | n/a          |
| Modeling Heat Pump?                | no  | no       | yes                               | yes          |
| Heating Efficiency                 | n/a   | n/a      | 2.7 COP                           | 3.2 COP      |
| Percent Of Building Heated         | 100   | 100      | 100                               | 100          |
| Modeling DX Cooling?               | yes   | yes      | yes                               | yes          |
| Cooling Efficiency                 | 9.2 EER   | 10.3 EER | 9.2 EER                           | 10.3 EER     |
| Modeling Heat Pump Cooling?        | no  | no       | yes                               | yes          |
| Cooling Efficiency                 | n/a   | n/a      | 9.3 EER                           | 9.3 EER      |
| Modeling Chillers Cooling?         | no  | no       | yes                               | yes          |
| Cooling Efficiency                 | n/a   | n/a      | 0.793 kW/ton                      | 0.793 kW/ton |
| Percent Of Building Cooled         | 100   | 100      | 100                               | 100          |
| Heating Daytime Set point [°F]     | 68  | 68       | 68                                | 68           |
| Heat. Setback/Setup Set point [°F] | 63  | 63       | 63                                | 63           |
| Cooling Daytime Set point [°F]     | 74  | 74       | 74                                | 74           |
| Cool. Setback/Setup Set point [°F] | 78  | 78       | 78                                | 78           |

**Table B.7. Office**

| Office                             | Gas for all Heating End Uses                              |          | Electric for All Heating End Uses |              |
|------------------------------------|---|----------|-----------------------------------|--------------|
|                                    | Existing  | New      | Existing                          | New          |
| Exterior Wall Construction         | 2x4 -16" o.c. wood with brick exterior finish medium abs. |          |                                   |              |
| Roof Construction                  | standard wood frame built up roof                         |          |                                   |              |
| # of Floors                        | 1   | 1        | 1                                 | 1            |
| Floor Area [sqft]                  | 4,819   | 4,819    | 4,819                             | 4,819        |
| Roof Area [sqft]                   | 4,819   | 4,819    | 4,819                             | 4,819        |
| <b>Envelope</b>                    |   |          |                                   |              |
| Window U-factor                    | U=0.60  | U=0.55   | U=0.60                            | U=0.55       |
| Window to Wall Area                | 18%   | 18%      | 18%                               | 18%          |
| Wall Insulation (R Value)          | R-3   | R-19     | R-3                               | R-19         |
| Roof Insulation (R Value)          | R-11  | R-21     | R-11                              | R-21         |
| Floor Insulation (R Value)         | R-11  | R-19     | R-11                              | R-19         |
| Lighting Density [W/sqft]          | 1.6   | 1        | 1.6                               | 1            |
| Occupancy Schedule WkDay           | 8am-5pm   |          |                                   |              |
| Occupancy Schedule WkEnd           | 11am-4pm - Sat  |          |                                   |              |
| <b>HVAC</b>                        |   |          |                                   |              |
| Modeling Gas Furnace?              | yes   | yes      | no                                | no           |
| Heating Efficiency                 | 76% AFUE  | 78% AFUE | n/a                               | n/a          |
| Modeling Heat Pump?                | no  | no       | yes                               | yes          |
| Heating Efficiency                 | n/a   | n/a      | 2.7 COP                           | 3.2 COP      |
| Percent Of Building Heated         | 100   | 100      | 100                               | 100          |
| Modeling DX Cooling?               | yes   | yes      | yes                               | yes          |
| Cooling Efficiency                 | 9.2 EER   | 10.3 EER | 9.2 EER                           | 10.3 EER     |
| Modeling Heat Pump Cooling?        | no  | no       | yes                               | yes          |
| Cooling Efficiency                 | n/a   | n/a      | 9.3 EER                           | 10.1 EER     |
| Modeling Chillers Cooling?         | no  | no       | yes                               | yes          |
| Cooling Efficiency                 | n/a   | n/a      | 0.793 kW/ton                      | 0.675 kW/ton |
| Heating Daytime Set point [°F]     | 69  | 69       | 69                                | 69           |
| Heat. Setback/Setup Set point [°F] | 61  | 61       | 61                                | 61           |
| Cooling Daytime Set point [°F]     | 72  | 72       | 72                                | 72           |
| Cool. Setback/Setup Set point [°F] | 75  | 75       | 75                                | 75           |

**Table B.8. Restaurant**

| Pacific Power Restaurant           | Gas for all Heating End Uses                              |          | Electric for All Heating End Uses |          |
|------------------------------------|---|----------|-----------------------------------|----------|
|                                    | Existing  | New      | Existing                          | New      |
| Exterior Wall Construction         | 2x4 -16" o.c. wood with brick exterior finish medium abs. |          |                                   |          |
| Roof Construction                  | standard wood frame built up roof                         |          |                                   |          |
| # of Floors                        | 1   | 1        | 1                                 | 1        |
| Total Floor Area [sqft]            | 2,247   | 2,247    | 2,247                             | 2,247    |
| Roof Area [sqft]                   | 2,247   | 2,247    | 2,247                             | 2,247    |
| <b>Envelope</b>                    |   |          |                                   |          |
| Window U-factor                    | U=0.65  | 0        | U=0.65                            | 0        |
| Window to Wall Area                | 15%   | 15%      | 15%                               | 15%      |
| Wall Insulation (R Value)          | R-3   | 0        | R-3                               | 0        |
| Roof Insulation (R Value)          | R-11  | 0        | R-11                              | 0        |
| Floor Insulation (R Value)         | R-11  | 0        | R-11                              | 0        |
| Lighting Density [W/sqft]          | 1.75  | 1        | 1.75                              | 1.2      |
| Occupancy Schedule WkDay           | 9am-9pm (Customer Operating Hours)                        |          |                                   |          |
| Occupancy Schedule WkEnd           | 9-9 Sat 11-7 Sun (Customer Operating Hours)               |          |                                   |          |
| <b>HVAC</b>                        |   |          |                                   |          |
| Modeling Gas Furnace?              | yes   | yes      | no                                | no       |
| Heating Efficiency                 | 76% AFUE  | 78% AFUE | n/a                               | n/a      |
| Modeling Heat Pump?                | no  | no       | yes                               | yes      |
| Heating Efficiency                 | n/a   | n/a      | 2.7 COP                           | 3.2 COP  |
| Percent Of Building Heated         | 100   | 100      | 100                               | 100      |
| Modeling DX Cooling?               | yes   | yes      | yes                               | yes      |
| Cooling Efficiency                 | 9.2 EER   | 10.3 EER | 9.2 EER                           | 10.3 EER |
| Modeling Heat Pump Cooling?        | no  | no       | yes                               | yes      |
| Cooling Efficiency                 | n/a   | n/a      | 9.3 EER                           | 10.1 EER |
| Modeling Chillers Cooling?         | no  | no       | no                                | no       |
| Cooling Efficiency                 | n/a   | n/a      | n/a                               | n/a      |
| Percent Of Building Cooled         | 100   | 100      | 100                               | 100      |
| Heating Daytime Set point [°F]     | 67  | 67       | 67                                | 67       |
| Heat. Setback/Setup Set point [°F] | 64  | 64       | 64                                | 64       |
| Cooling Daytime Set point [°F]     | 71  | 71       | 71                                | 71       |
| Cool. Setback/Setup Set point [°F] | 74  | 74       | 74                                | 74       |

**Table B.9. School**

| School                             | Gas for all Heating End Uses  |          | Electric for All Heating End Uses |              |
|------------------------------------|---|----------|-----------------------------------|--------------|
|                                    | Existing  | New      | Existing                          | New          |
| Exterior Wall Construction         | 2x4 -16" o.c. wood with brick exterior finish medium abs.                 |          |                                   |              |
| Roof Construction                  | standard wood frame built up roof   |          |                                   |              |
| # of Floors                        | 2   | 2        | 2                                 | 2            |
| Total Floor Area [sqft]            | 27,289  | 27,289   | 27,289                            | 27,289       |
| Roof Area [sqft]                   | 27,289  | 27,289   | 27,289                            | 27,289       |
| <b>Envelope</b>                    |   |          |                                   |              |
| Window U-factor                    | U=0.67  | U=0.55   | U=0.67                            | U=0.55       |
| Window to Wall Area                | 27%   | 27%      | 27%                               | 27%          |
| Wall Insulation (R Value)          | R-0   | R-19     | R-0                               | R-13         |
| Roof Insulation (R Value)          | R-7   | R-21     | R-7                               | R-19         |
| Floor Insulation (R Value)         | R-11  | R-19     | R-11                              | R-19         |
| Lighting Density [W/sqft]          | 1.66  | 1.35     | 1.8                               | 1.2          |
| Occupancy Schedule WkDay           | School sch.(8am-3pm), Winter-spring Break sch. (9am-2pm) Summer (9am-2pm) |          |                                   |              |
| Occupancy Schedule WkEnd           | closed  |          |                                   |              |
| <b>HVAC</b>                        |   |          |                                   |              |
| Modeling Gas Furnace?              | yes   | yes      | no                                | no           |
| Heating Efficiency                 | 76% AFUE  | 78% AFUE | n/a                               | n/a          |
| Modeling Heat Pump?                | no  | no       | yes                               | yes          |
| Heating Efficiency                 | n/a   | n/a      | 2.7 COP                           | 3.2 COP      |
| Percent Of Building Heated         | 100   | 100      | 100                               | 100          |
| Modeling DX Cooling?               | yes   | yes      | yes                               | yes          |
| Cooling Efficiency                 | 9.2 EER   | 10.3 EER | 9.2 EER                           | 10.3 EER     |
| Modeling Heat Pump Cooling?        | no  | no       | yes                               | yes          |
| Cooling Efficiency                 | n/a   | n/a      | 9.3 EER                           | 10.1 EER     |
| Modeling Chillers Cooling?         | no  | no       | yes                               | yes          |
| Cooling Efficiency                 | n/a   | n/a      | 0.793 kW/ton                      | 0.675 kW/ton |
| Percent Of Building Cooled         | 100   | 100      | 100                               | 100          |
| Heating Daytime Set point [°F]     | 70  | 70       | 70                                | 70           |
| Heat. Setback/Setup Set point [°F] | 66  | 66       | 66                                | 66           |
| Cooling Daytime Set point [°F]     | 74  | 74       | 74                                | 74           |
| Cool. Setback/Setup Set point [°F] | 78  | 78       | 78                                | 78           |

**Table B.10. University**

| University                         | Gas for all Heating End Uses  |          | Electric for All Heating End Uses |              |
|------------------------------------|---|----------|-----------------------------------|--------------|
|                                    | Existing  | New      | Existing                          | New          |
| Exterior Wall Construction         | 2x4 -16" o.c. wood with brick exterior finish medium abs.                 |          |                                   |              |
| Roof Construction                  | standard wood frame built up roof   |          |                                   |              |
| # of Floors                        | 2   | 2        | 2                                 | 2            |
| Total Floor Area [sqft]            | 27,289  | 27,289   | 27,289                            | 27,289       |
| Roof Area [sqft]                   | 27,289  | 27,289   | 27,289                            | 27,289       |
| <b>Envelope</b>                    |   |          |                                   |              |
| Window U-factor                    | U=0.67  | U=0.55   | U=0.67                            | U=0.55       |
| Window to Wall Area                | 27%   | 27%      | 27%                               | 27%          |
| Wall Insulation (R Value)          | R-0   | R-19     | R-0                               | R-13         |
| Roof Insulation (R Value)          | R-7   | R-21     | R-7                               | R-19         |
| Floor Insulation (R Value)         | R-11  | R-19     | R-11                              | R-19         |
| Lighting Density [W/sqft]          | 1.66  | 1.35     | 1.8                               | 1.2          |
| Occupancy Schedule WkDay           | School sch.(8am-3pm), Winter-spring Break sch. (9am-2pm) Summer (9am-2pm) |          |                                   |              |
| Occupancy Schedule WkEnd           | closed  |          |                                   |              |
| <b>HVAC</b>                        |   |          |                                   |              |
| Modeling Gas Furnace?              | yes   | yes      | no                                | no           |
| Heating Efficiency                 | 76% AFUE  | 78% AFUE | n/a                               | n/a          |
| Modeling Heat Pump?                | no  | no       | yes                               | yes          |
| Heating Efficiency                 | n/a   | n/a      | 2.7 COP                           | 3.2 COP      |
| Percent Of Building Heated         | 100   | 100      | 100                               | 100          |
| Modeling DX Cooling?               | yes   | yes      | yes                               | yes          |
| Cooling Efficiency                 | 9.2 EER   | 10.3 EER | 9.2 EER                           | 10.3 EER     |
| Modeling Heat Pump Cooling?        | no  | no       | yes                               | yes          |
| Cooling Efficiency                 | n/a   | n/a      | 9.3 EER                           | 10.1 EER     |
| Modeling Chillers Cooling?         | no  | no       | yes                               | yes          |
| Cooling Efficiency                 | n/a   | n/a      | 0.793 kW/ton                      | 0.675 kW/ton |
| Percent Of Building Cooled         | 100   | 100      | 100                               | 100          |
| Heating Daytime Set point [°F]     | 70  | 70       | 70                                | 70           |
| Heat. Setback/Setup Set point [°F] | 66  | 66       | 66                                | 66           |
| Cooling Daytime Set point [°F]     | 74  | 74       | 74                                | 74           |
| Cool. Setback/Setup Set point [°F] | 78  | 78       | 78                                | 78           |

**Table B.11. Warehouse**

| Warehouse                          | Gas for all Heating End Uses                              |          | Electric for All Heating End Uses |              |
|------------------------------------|---|----------|-----------------------------------|--------------|
|                                    | Existing  | New      | Existing                          | New          |
| Exterior Wall Construction         | 2x4 -16" o.c. wood with brick exterior finish medium abs. |          |                                   |              |
| Roof Construction                  | standard wood frame built up roof                         |          |                                   |              |
| # of Floors                        | 2   | 2        | 2                                 | 2            |
| Total Floor Area [sqft]            | 171,167   | 171,167  | 171,167                           | 171,167      |
| Aspect Ratio                       |   |          |                                   |              |
| Roof Area [sqft]                   | 171,167   | 171,167  | 171,167                           | 171,167      |
| <b>Envelope</b>                    |   |          |                                   |              |
| Window U-factor                    | U=0.65  | U=0.55   | U=0.65                            | U=0.55       |
| Window to Wall Area                | 5%  | 5%       | 5%                                | 5%           |
| Wall Insulation (R Value)          | R-3   | R-19     | R-3                               | R-13         |
| Roof Insulation (R Value)          | R-8   | R-21     | R-8                               | R-19         |
| Floor Insulation (R Value)         | R-8   | R-19     | R-8                               | R-19         |
| Lighting Density [W/sqft]          | 0.75  | 0.5      | 1.05                              | 0.7          |
| Occupancy Schedule WkDay           | 10am-9pmM-F   |          |                                   |              |
| Occupancy Schedule WkEnd           | 10am-6pmSat only.   |          |                                   |              |
| <b>HVAC</b>                        |   |          |                                   |              |
| Modeling Gas Furnace?              | yes   | yes      | no                                | no           |
| Heating Efficiency                 | 76% AFUE  | 78% AFUE | n/a                               | n/a          |
| Modeling Heat Pump?                | no  | no       | yes                               | yes          |
| Heating Efficiency                 | n/a   | n/a      | 2.7 COP                           | 3.2 COP      |
| Percent Of Building Heated         | 80  | 80       | 80                                | 80           |
| Modeling DX Cooling?               | yes   | yes      | yes                               | yes          |
| Cooling Efficiency                 | 9.2 EER   | 10.3 EER | 9.2 EER                           | 10.3 EER     |
| Modeling Heat Pump Cooling?        | no  | no       | yes                               | yes          |
| Cooling Efficiency                 | n/a   | n/a      | 9.3 EER                           | 10.1 EER     |
| Modeling Chillers Cooling?         | no  | no       | yes                               | yes          |
| Cooling Efficiency                 | n/a   | n/a      | 0.793 kW/ton                      | 0.675 kW/ton |
| Percent Of Building Cooled         | 80  | 80       | 80                                | 80           |
| Heating Daytime Set point [°F]     | 68  | 68       | 68                                | 68           |
| Heat. Setback/Setup Set point [°F] | 60  | 60       | 60                                | 60           |
| Cooling Daytime Set point [°F]     | 75  | 75       | 75                                | 75           |
| Cool. Setback/Setup Set point [°F] | 79  | 79       | 79                                | 79           |

# Residential Building Prototype Parameters

**Table B.12. Single Family**

| General                               | Gas for all Heating End Uses                          |   | Electric for all Heating End Uses                     |   |
|---------------------------------------|---|---|---|---|
|                                       | Existing  | New   | Existing  | New   |
| Exterior Wall Construction            | Brick, wood frame<br>2*4, insulation,<br>gypsum board | Brick, wood frame<br>2*6, insulation,<br>gypsum board | Brick, wood frame<br>2*4, insulation,<br>gypsum board | Brick, wood frame<br>2*6, insulation,<br>gypsum board |
| Roof Construction                     | Pitched roofing<br>4*12                               | Pitched roofing<br>4*12                               | Pitched roofing<br>4*12                               | Pitched roofing 4*12                                  |
| # of Floors                           | 2   | 2   | 2   | 2   |
| Total Floor Area [sqft]               | 2035  | 2190  | 2035  | 2380  |
| Roof Area [sqft]                      | 1018  | 1095  | 1018  | 1190  |
| Foundation                            | Above a Crawl<br>Space                                | Above a Crawl<br>Space                                | Above a Crawl<br>Space                                | Above a Crawl<br>Space                                |
| Glass Type                            | U=0.51,SHGC=0.55                                      | U=0.35,SHGC=0.32                                      | U=0.51,SHGC=0.55                                      | U=0.35,SHGC=0.32                                      |
| Percent of Double Pane Windows        | 84%   | 93%   | 84%   | 93%   |
| Window Percentage of Wall Area (ACH)  | 18%   | 18%   | 18%   | 18%   |
| Wall Insulation (R Value)             | 11  | 21  | 11  | 21  |
| Floor Insulation (R Value)            | 15  | 30  | 15  | 30  |
| Roof Insulation (R Value)             | 10  | 10  | 10  | 10  |
| Rim & Band Joist Insulation (R Value) | 0.58  | 0.58  | 0.58  | 0.58  |
| Floor f Factor [Btu/h-F-ft]           | 30  | 38  | 30  | 38  |
| Air leakage rate (ACH)                | 0.65  | 0.35  | 0.65  | 0.35  |
| Duct leakage Rate                     | 10%   | 5%  | 10%   | 3%  |
| Lighting Density [W/sqft]             | 1.2   | 1.2   | 1.2   | 1.2   |
| Peak, typical work day                | 0.36  | 0.30  | 0.36  | 0.30  |
| Equipment Density [W/sqft]            | 0.4   | 0.4   | 0.4   | 0.4   |
| Water Heating Fuel Type               | Gas   | Gas   | Electric  | Electric  |
| Water Heater Energy Factor            | 0.57  | 0.59  | 0.88  | 0.92  |
| Water Heater Heat Density [W/sqft]    | 0.31  | 0.25  | 0.31  | 0.25  |
| Number of Occupants                   | 2.7   | 3.3   | 2.7   | 3.3   |
| Water Heater Temp                     | 123   | 125   | 123   | 125   |
| <b>HVAC</b>                           |   |   |   |   |
| Distribution Type                     |   |   |   |   |
| Heating Type                          | Furnace   | Furnace   | Furnace   | Packaged Heat<br>Pump                                 |
| Heating Fuel                          | Gas   | Gas   | Electric  | Electric  |
| Heating Efficiency (AFUE/HSPF)        | 74%   | 78%   | 100%  | 7.7   |
| Heating System Total Oupput (Btu/h)   | 40000   | 40000   | 40000   | 40000   |
| Cooling Type                          | Central AC  | Central AC  | Central AC  | Central AC  |
| Cooling SEER                          | 11  | 13  | 11  | 13  |

|  |       |       |       |       |
|--|-------|-------|-------|-------|
| Cooling System Total Output (Btu/h)    | 36000 | 36000 | 36000 | 36000 |
| Cooling System Sensible Output (Btu/h) | 27000 | 27000 | 27000 | 27000 |
| Fan/Air Distribution (cfm)             | 1200  | 1200  | 1200  | 1200  |
| Heating Daytime Setpoint [°F]          | 65    | 67    | 65    | 68    |
| Heat. Setback/Setup Setpoint [°F]      | 58    | 62    | 58    | 62    |
| Cooling Daytime Setpoint [°F]          | 75    | 74.5  | 75    | 74.5  |
| Cool. Setback/Setup Setpoint [°F]      | 79    | 79    | 79    | 79    |

**Table B.13. Manufactured**

| General                              | Gas for all Heating End Uses                    |   | Electric for all Heating End Uses               |   |
|--------------------------------------|---|---|---|---|
|                                      | Existing  | New   | Existing  | New   |
| Exterior Wall Construction           | Brick, wood frame 2*4, insulation, gypsum board | Brick, wood frame 2*6, insulation, gypsum board | Brick, wood frame 2*4, insulation, gypsum board | Brick, wood frame 2*6, insulation, gypsum board |
| Roof Construction                    | Pitched roofing 4*12                            | Pitched roofing 4*12                            | Pitched roofing 4*12                            | Pitched roofing 4*12                            |
| # of Floors                          | 1   | 1   | 1   | 1   |
| Total Floor Area [sqft]              | 1220  | 1640  | 1220  | 1640  |
| Roof Area [sqft]                     | 1220  | 1640  | 1220  | 1640  |
| Foundation                           | Crawl Space                                     | Crawl Space                                     | Crawl Space                                     | Crawl Space                                     |
| Glass Type                           | U=0.51,SHGC=0.78                                | U=0.35,SHGC=0.32                                | U=0.51,SHGC=0.5                                 | U=0.35,SHGC=0.32                                |
| Percent of Double Pane Windows       | 64%   | 64%   | 64%   | 64%   |
| Window Percentage of Wall Area (ACH) | 18%   | 18%   | 18%   | 18%   |
| Wall Insulation (R Value)            | 8   | 21  | 10.7  | 21  |
| Floor Insulation (R Value)           | 15  | 30  | 20  | 30  |
| Roof Insulation (R Value)            | 19  | 38  | 30  | 38  |
| Air leakage rate (ACH)               | 0.65  | 0.45  | 0.75  | 0.45  |
| Duct leakage Rate                    | 10%   | 5%  | 10%   | 5%  |
| Lighting Density [W/sqft]            | 1.2   | 1.2   | 1.2   | 1.2   |
| Equipment Density [W/sqft]           | 0.4   | 0.4   | 0.2   | 0.4   |
| Water Heating Fuel Type              | Gas   | Gas   | Electric  | Electric  |
| Water Heater Energy Factor           | 0.57  | 0.59  | 0.88  | 0.92  |
| Number of Occupants                  | 2   | 2.4   | 2   | 2.4   |
| Water Heater Temp                    | 128   | 128   | 128   | 128   |
| <b>HVAC</b>                          |   |   |   |   |
| Distribution Type                    |   |   |   |   |
| Heating Type                         | Furnace   | Furnace   | Furnace   | Packaged Heat Pump                              |
| Heating Fuel                         | Gas   | Gas   | Electric  | Electric  |
| Heating Efficiency (AFUE/HSPF)       | 74%   | 78%   | 100%  | 7.7   |



|                                   |            |            |            |            |
|-----------------------------------|------------|------------|------------|------------|
| Cooling Type                      | Central AC | Central AC | Central AC | Central AC |
| Cooling SEER                      | 10         | 13         | 11         | 13         |
| Heating Daytime Setpoint [°F]     | 67         | 67         | 64         | 64         |
| Heat. Setback/Setup Setpoint [°F] | 59         | 59         | 59         | 59         |
| Cooling Daytime Setpoint [°F]     | 71         | 71         | 75         | 75         |
| Cool. Setback/Setup Setpoint [°F] | 75         | 75         | 80         | 80         |

**Table B.14. Multi Family**

| General                                 | Gas for all Heating End Uses                          |   | Electric for all Heating End Uses                     |   |
|---|---|---|---|---|
|   | Existing  | New   | Existing  | New   |
| Exterior Wall Construction              | Brick, wood frame<br>2*4, insulation,<br>gypsum board | Brick, wood frame<br>2*6, insulation,<br>gypsum board | Brick, wood frame<br>2*4, insulation,<br>gypsum board | Brick, wood frame<br>2*6, insulation,<br>gypsum board |
| Roof Construction                       | Pitched roofing<br>4*12                               | Pitched roofing<br>4*12                               | Pitched roofing<br>4*12                               | Pitched roofing 4*12                                  |
| # of Floors                             | 2   | 2   | 2   | 2   |
| Total Floor Area [sqft]                 | 4120  | 4800  | 3440  | 4800  |
| Roof Area [sqft]                        | 2060  | 2400  | 1720  | 2400  |
| Foundation                              | Slab  | Slab  | Slab  | Slab  |
| Glass Type                              | U=0.51,SHGC=0.55                                      | U=0.35,SHGC=0.32                                      | U=0.51,SHGC=0.55                                      | U=0.35,SHGC=0.32                                      |
| Percent of Double Pane Windows          | 76%   | 76%   | 76%   | 76%   |
| Window Percentage of Wall Area (ACH)    | 18%   | 18%   | 18%   | 18%   |
| Wall Insulation (R Value)               | 8   | 21  | 8   | 21  |
| Floor Insulation (R Value)              | 15  | 30  | 15  | 30  |
| Rim and Band Joist Insulation (R Value) | 10  | 10  | 10  | 10  |
| Floor f factor                          | 0.58  | 0.58  | 0.58  | 0.58  |
| Roof Insulation (R Value)               | 19  | 38  | 19  | 38  |
| Air leakage rate (ACH)                  | 0.75  | 0.45  | 0.75  | 0.45  |
| Duct leakage Rate                       | 10%   | 5%  | 10%   | 5%  |
| Lighting Density [W/sqft]               | 1.2   | 1.2   | 1.2   | 1.2   |
| Peak, typical work day                  | 0.39  | 0.28  | 0.39  | 0.28  |
| Equipment Density [W/sqft]              | 0.2   | 0.29  | 0.2   | 0.29  |
| Water Heating Fuel Type                 | Gas   | Gas   | Electric  | Electric  |
| Water Heater Energy Factor              | 0.57  | 0.59  | 0.88  | 0.92  |
| Water Heater Heat Density [W/sqft]      | 0.42  | 0.29  | 0.42  | 0.29  |
| Number of Occupants                     | 6.6   | 6.6   | 6.6   | 6.6   |
| Water Heater Temp                       | 121   | 121   | 121   | 121   |
| <b>HVAC</b>                             |   |   |   |   |
| Distribution Type                       |   |   |   |   |
| Heating Type                            | Furnace   | Furnace   | Furnace   | Packaged Heat Pump                                    |

|  |            |            |            |            |
|--|------------|------------|------------|------------|
| Heating Fuel                           | Gas        | Gas        | Electric   | Electric   |
| Heating Efficiency (AFUE/HSPF)         | 74%        | 78%        | 100%       | 7.7        |
| Heating System Total Output (Btu/h)    | 106,667    | 106,667    | 106,667    | 106,667    |
| Cooling Type                           | Central AC | Central AC | Central AC | Central AC |
| Cooling SEER                           | 11         | 13         | 11         | 13         |
| Cooling System Total Output (Btu/h)    | 96000      | 96000      | 96000      | 96000      |
| Cooling System Sensible Output (Btu/h) | 72000      | 72000      | 72000      | 72000      |
| Fan/Air Distribution (cfm)             | 3200       | 3200       | 3200       | 3200       |
| Heating Daytime Setpoint [°F]          | 69         | 67.5       | 68         | 67.5       |
| Heat. Setback/Setup Setpoint [°F]      | 65         | 61         | 64         | 61         |
| Cooling Daytime Setpoint [°F]          | 71.5       | 71         | 72         | 71         |
| Cool. Setback/Setup Setpoint [°F]      | 75.5       | 76         | 76         | 76         |

After the building prototypes are established, the second step is to select the weather station location representing the most typical weather conditions for each state. Although this step is not complicated, it is very important because weather is one of the most important factors underlying annual energy consumption for the HVAC-related measures. Weather is based on a “typical meteorological year,” or TMY. The selection of the TMY file involves two considerations. First, the location should have the closest proximity to the area of the highest energy consumption and population. Second, the TMY should closely match typical weather conditions throughout the respective service territory. The weather file chosen for PSE service territory was Seattle.

Once the building characteristics and weather files are determined, an individual model is prepared for each building type.

Once the models are completed and run, both eQuest and Energy-10 produce output files that contain the estimates of energy consumption and hourly load by end use. For the commercial customer segments, the building-level estimates are converted to represent the kBtu per square foot, also called the end use intensity (EUI). Energy consumption for residential simulations remain at the site level and are referred to as the unit energy consumption, or UEC. The full set of UECs and EUIs are presented in the tables below.

## Residential Sector Energy Consumption

**Table B.15. Residential Electric UECs (kWh/yr)**

|               | Manufactured |      | Multi-Family |      | Single Family |      |
|---------------|--------------|------|--------------|------|---------------|------|
|               | Exist.       | New  | Exist.       | New  | Exist.        | New  |
| Central AC    | 871          | 611  | 709          | 526  | 997           | 849  |
| Central Heat  | 6635         | 4688 | 5354         | 3361 | 9000          | 5561 |
| Cooking Oven  | 440          | 440  | 440          | 440  | 440           | 440  |
| Cooking Range | 536          | 536  | 536          | 536  | 536           | 536  |
| Dryer         | 1070         | 676  | 960          | 654  | 852           | 805  |
| Freezer       | 705          | 541  | 705          | 541  | 705           | 541  |
| HVAC Aux      | 670          | 410  | 441          | 344  | 557           | 483  |
| Heat Pump     | 5976         | 3398 | 4462         | 2824 | 7509          | 5421 |
| Lighting      | 1266         | 1305 | 1160         | 1162 | 2534          | 2470 |
| Plug Load     | 1500         | 1530 | 1320         | 1346 | 2070          | 2111 |
| Pool Pump     | ---          | ---  | ---          | ---  | 1500          | 1500 |
| Refrigeration | 577          | 446  | 577          | 446  | 577           | 446  |
| Room AC       | 461          | 351  | 375          | 302  | 527           | 488  |
| Room Heat     | 5109         | 3610 | 4123         | 2588 | 6930          | 4282 |
| Water Heat    | 3336         | 2783 | 1975         | 1687 | 3449          | 2885 |

**Table B.16. Residential Gas UECs**

|                      | Manufactured |     | Multi-Family |     | Single Family |     |
|----------------------|--------------|-----|--------------|-----|---------------|-----|
|                      | Exist.       | New | Exist.       | New | Exist.        | New |
| Central Heat Boiler  | 615          | 557 | 444          | 372 | 759           | 591 |
| Central Heat Furnace | 468          | 413 | 354          | 310 | 616           | 450 |
| Cooking Oven         | 19           | 19  | 19           | 19  | 19            | 19  |
| Cooking Range        | 24           | 24  | 24           | 24  | 24            | 24  |
| Dryer                | 36           | 34  | 36           | 34  | 36            | 34  |
| Pool Heat            | ---          | --- | ---          | --- | 258           | 258 |
| Water Heat           | 158          | 190 | 140          | 169 | 239           | 291 |

## Commercial Sector Energy Consumption

For the commercial sector, existing and new EUIs and sources by state are presented in Table B.17 through Table B.19.

**Table B.17. Electric EUIs for Commercial Sector by Building Type (kBtu/sq. ft. per Year)**

| Building Type    | Cooking |      | Cooling Chillers |        | Cooling DX |        | HVAC Aux |      | Heat Pump |      |
|------------------|---------|------|------------------|--------|------------|--------|----------|------|-----------|------|
|                  | Exist.  | New  | Exist.           | Exist. | Exist.     | Exist. | Exist.   | New  | Exist.    | New  |
| Dry Goods Retail | ---     | ---  | 1.94             | 0.98   | 2.11       | 1.07   | 2.71     | 2.22 | 3.21      | 1.57 |
| Grocery          | 2.66    | 2.67 | 1.68             | 1.36   | 1.83       | 1.48   | 2.13     | 2.57 | 4.99      | 1.77 |
| Hospital         | 0.54    | 0.54 | 1.86             | 0.47   | 2.02       | 0.51   | 5.37     | 4.22 | 3.98      | 1.66 |
| Hotel / Motel    | 0.65    | .66  | 1.75             | .51    | 1.91       | .55    | 3.24     | 2.04 | 4.26      | 2.14 |
| Office           | ---     | ---  | 1.62             | 0.58   | 1.77       | 0.63   | 1.53     | 1.30 | 3.43      | 1.41 |
| Other Comm.      | 0.39    | 0.39 | 1.78             | 0.78   | 1.94       | 0.85   | 2.12     | 1.76 | 3.32      | 1.49 |
| Restaurant       | 9.42    | 9.51 | ---              | ---    | 4.40       | 1.60   | 3.57     | 2.87 | 5.46      | 2.26 |
| School           | 0.22    | 0.22 | 0.36             | 0.16   | 0.39       | 0.17   | 1.32     | 0.90 | 3.04      | 1.23 |
| University       | 0.42    | 0.42 | 0.36             | 0.16   | 0.39       | 0.17   | 1.32     | 0.90 | 3.04      | 1.23 |
| Warehouse        | ---     | ---  | 0.19             | 0.22   | 0.20       | 0.24   | 0.58     | 0.57 | 0.82      | 0.57 |

**Table B.18. Electric EUIs for Commercial Sector by Building Type (kBtu/sq. ft. per Year)**

| Building Type    | Lighting |      | Other  |      | Plug Load |      | Refrigeration |       | Space Heat |      | Water Heat |      |
|------------------|----------|------|--------|------|-----------|------|---------------|-------|------------|------|------------|------|
|                  | Exist.   | New  | Exist. | New  | Exist.    | New  | Exist.        | New   | Exist.     | New  | Exist.     | New  |
| Dry Goods Retail | 5.33     | 4.20 | 0.78   | 0.78 | 2.64      | 2.71 | 2.03          | 2.04  | 2.02       | 0.45 | 0.28       | 0.28 |
| Grocery          | 8.06     | 6.46 | 0.00   | 0.00 | 2.39      | 2.45 | 20.28         | 20.40 | 2.13       | 0.19 | 0.30       | 0.30 |
| Hospital         | 4.55     | 2.87 | 0.00   | 0.00 | 3.75      | 3.85 | 0.50          | 0.50  | 1.26       | 0.70 | 1.38       | 1.39 |
| Hotel / Motel    | 2.87     | 1.91 | 0.24   | 0.24 | 2.16      | 2.23 | 0.30          | 0.30  | 4.01       | 2.58 | 1.73       | 1.75 |
| Office           | 3.80     | 2.37 | 0.07   | 0.07 | 2.20      | 2.27 | ---           | ---   | 3.21       | 0.67 | 0.47       | 0.37 |
| Other Comm.      | 2.75     | 1.96 | 0.49   | 0.49 | 2.45      | 2.51 | 0.20          | 0.20  | 2.62       | 0.56 | 0.38       | 0.37 |
| Restaurant       | 5.71     | 3.26 | 0.01   | 0.01 | 2.12      | 2.18 | 5.50          | 5.55  | 1.35       | 0.31 | 8.79       | 8.68 |
| School           | 2.73     | 1.97 | 0.03   | 0.03 | 1.50      | 1.54 | 0.50          | 0.50  | 5.67       | 1.85 | 1.43       | 1.44 |
| University       | 3.79     | 2.74 | 0.07   | 0.08 | 1.10      | 1.13 | 0.50          | 0.50  | 5.67       | 1.85 | 1.43       | 1.44 |
| Warehouse        | 2.50     | 1.69 | 0.01   | 0.01 | 0.50      | 0.51 | ---           | ---   | 1.13       | 0.38 | 0.20       | 0.20 |

**Table B.19. Gas EUIs for Commercial Sector by Building Type (kBtu/sq. ft. per Year)**

| Building Type    | Cooking |      | Pool Heat |      | Space Heat Boiler |      | Space Heat Furnace |      | Water Heat |      |
|------------------|---------|------|-----------|------|-------------------|------|--------------------|------|------------|------|
|                  | Exist   | New  | Exist.    | New  | Exist.            | New  | Exist.             | New  | Exist.     | New  |
| Dry Goods Retail | ---     | ---  | ---       | ---  | 0.08              | 0.04 | 0.11               | 0.06 | 0.03       | 0.02 |
| Grocery          | 0.19    | 0.20 | ---       | ---  | 0.26              | 0.05 | 0.35               | 0.08 | 0.13       | 0.13 |
| Hospital         | 0.04    | 0.04 | 0.03      | 0.02 | 0.36              | 0.32 | 0.49               | 0.47 | 0.42       | 0.43 |
| Hotel / Motel    | 0.08    | 0.08 | 0.11      | 0.06 | 0.18              | 0.12 | 0.25               | 0.18 | 0.32       | 0.32 |
| Office           | ---     | ---  | ---       | ---  | 0.24              | 0.11 | 0.33               | 0.17 | 0.03       | 0.04 |
| Other Comm.      | 0.04    | 0.04 | ---       | ---  | 0.16              | 0.07 | 0.22               | 0.11 | 0.03       | 0.03 |
| Restaurant       | 1.61    | 1.62 | ---       | ---  | 0.06              | 0.04 | 0.06               | 0.05 | 0.44       | 0.45 |
| School           | 0.02    | 0.02 | 0.17      | 0.03 | 0.13              | 0.10 | 0.17               | 0.14 | 0.06       | 0.06 |
| University       | 0.05    | 0.05 | 0.14      | 0.04 | 0.25              | 0.19 | 0.34               | 0.29 | 0.10       | 0.10 |
| Warehouse        | ---     | ---  | ---       | ---  | 0.09              | 0.05 | 0.13               | 0.07 | 0.02       | 0.02 |

## Industrial Sector Energy Consumption

The distribution of energy consumption in the industrial sector is based on data from the Energy Information Administration’s Manufacturing Energy Consumption Survey. The allocation of total energy consumption by end use for the various industrial facility types are presented in Table B.20.

**Table B.20. Industrial Gas Consumption by Industry Type and End Use**

| Industry Type                | HVAC | Indirect Boiler | Process Heat | Process Other | Other |
|------------------------------|------|-----------------|--------------|---------------|-------|
| Chemical Mfg                 | 2%   | 55%             | 35%          | 6%            | 2%    |
| Computer Electronic Mfg      | 32%  | 42%             | 15%          | 2%            | 10%   |
| Electrical Equip. Mfg        | 29%  | 12%             | 53%          | 0%            | 6%    |
| Fabricated Metal Products    | 21%  | 16%             | 62%          | 1%            | 0%    |
| Food Mfg                     | 7%   | 51%             | 38%          | 5%            | 0%    |
| Industrial Machinery         | 37%  | 18%             | 37%          | 3%            | 5%    |
| Miscellaneous Mfg            | 33%  | 30%             | 27%          | 0%            | 10%   |
| Nonmetallic Mineral Products | 5%   | 3%              | 86%          | 0%            | 5%    |
| Paper Mfg                    | 4%   | 61%             | 26%          | 5%            | 5%    |
| Petroleum Coal Products      | 1%   | 33%             | 60%          | 2%            | 4%    |
| Plastics Rubber Products     | 19%  | 39%             | 29%          | 2%            | 10%   |
| Primary Metal Mfg            | 7%   | 11%             | 81%          | 0%            | 1%    |
| Printing Related Support     | 35%  | 21%             | 42%          | 2%            | 0%    |
| Transportation Equipment Mfg | 33%  | 27%             | 33%          | 2%            | 6%    |
| Wastewater                   | 0%   | 0%              | 0%           | 0%            | 100%  |
| Water                        | 0%   | 0%              | 0%           | 0%            | 100%  |
| Wood Product Mfg             | 13%  | 27%             | 49%          | 4%            | 7%    |

**Table B.21. Industrial Electric Consumption by Industry Type and End Use**

| Industry Type                | HVAC | Process Cool | Process Electro Chem. | Fans | Process Air Comp. | Motors Other | Process Refrigeration |
|------------------------------|------|--------------|-----------------------|------|-------------------|--------------|-----------------------|
| Chemical Mfg                 | 6%   | 9%           | 18%                   | 7%   | 16%               | 15%          | 4%                    |
| Computer Electronic Mfg      | 29%  | 9%           | 1%                    | 5%   | 1%                | 9%           | 1%                    |
| Electrical Equip. Mfg        | 17%  | 4%           | 3%                    | 4%   | 10%               | 10%          | 3%                    |
| Fabricated Metal Products    | 10%  | 3%           | 1%                    | 6%   | 75                | 17%          | 3%                    |
| Food Mfg                     | 7%   | 25%          | 0%                    | 4%   | 4%                | 19%          | 15%                   |
| Industrial Machinery         | 18%  | 3%           | 1%                    | 7%   | 8%                | 19%          | 3%                    |
| Miscellaneous Mfg            | 20%  | 6%           | 0%                    | 6%   | 5%                | 22%          | 0%                    |
| Nonmetallic Mineral Products | 6%   | 3%           | 0%                    | 8%   | 9%                | 23%          | 4%                    |
| Paper Mfg                    | 4%   | 1%           | 2%                    | 16%  | 4%                | 32%          | 4%                    |
| Petroleum Coal Products      | 3%   | 6%           | 0%                    | 11%  | 13%               | 31%          | 5%                    |
| Plastics Rubber Products     | 10%  | 8%           | 0%                    | 7%   | 9%                | 21%          | 4%                    |
| Primary Metal Mfg            | 4%   | 1%           | 31%                   | 5%   | 5%                | 20%          | 0%                    |
| Printing Related Support     | 18%  | 4%           | 0%                    | 7%   | 8%                | 19%          | 3%                    |
| Transportation Equipment Mfg | 19%  | 5%           | 1%                    | 5%   | 12%               | 12%          | 3%                    |
| Wastewater                   | 0%   | 0%           | 0%                    | 0%   | 66%               | 0%           | 0%                    |
| Water                        | 0%   | 0%           | 0%                    | 10%  | 0%                | 10%          | 0%                    |
| Wood Product Mfg             | 7%   | 1%           | 0%                    | 10%  | 11%               | 28%          | 5%                    |

**Table B.22. Industrial Electric Consumption by Industry Type and End Use**

| Industry Type                | Other | Pumps | Process Heat | Process Other | Lighting | Indirect Boiler |
|------------------------------|-------|-------|--------------|---------------|----------|-----------------|
| Chemical Mfg                 | 2%    | 15%   | 3%           | 0%            | 4%       | 1%              |
| Computer Electronic Mfg      | 11%   | 7%    | 11%          | 3%            | 13%      | 0%              |
| Electrical Equip. Mfg        | 8%    | 9%    | 19%          | 1%            | 13%      | 0%              |
| Fabricated Metal Products    | 9%    | 11%   | 23%          | 0%            | 9%       | 0%              |
| Food Mfg                     | 7%    | 8%    | 3%           | 0%            | 7%       | 1%              |
| Industrial Machinery         | 7%    | 12%   | 7%           | 1%            | 14%      | 0%              |
| Miscellaneous Mfg            | 4%    | 3%    | 9%           | 0%            | 15%      | 9%              |
| Nonmetallic Mineral Products | 4%    | 15%   | 20%          | 1%            | 5%       | 0%              |
| Paper Mfg                    | 2%    | 25%   | 2%           | 0%            | 4%       | 3%              |
| Petroleum Coal Products      | 1%    | 20%   | 6%           | 0%            | 2%       | 1%              |
| Plastics Rubber Products     | 3%    | 13%   | 15%          | 1%            | 8%       | 0%              |
| Primary Metal Mfg            | 1%    | 3%    | 28%          | 0%            | 3%       | 0%              |
| Printing Related Support     | 14%   | 12%   | 2%           | 0%            | 11%      | 0%              |
| Transportation Equipment Mfg | 4%    | 11%   | 10%          | 1%            | 15%      | 0%              |
| Wastewater                   | 14%   | 18%   | 0%           | 0%            | 2%       | 0%              |
| Water                        | 14%   | 64%   | 0%           | 0%            | 2%       | 0%              |
| Wood Product Mfg             | 8%    | 18%   | 5%           | 0%            | 7%       | 1%              |

## Appendix C: Supplemental Material—Energy Efficiency

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# Appendix C.1: Energy Efficiency (Supplemental Material)

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## Detailed Methodology

Determination of energy-efficiency potential is based on a sequential analysis of various energy-efficiency measures in terms of technical feasibility (technical potential) and economic viability based on standard cost-effectiveness criteria (economic potential). Most of the methodology is identical for electricity and natural gas analyses, but key differences are noted below when applicable. The assessment is carried out in two main steps:

- **Baseline forecasts:** Determine 20-year future energy consumption by segment and end use calibrated to each utility's load forecasts. The baseline forecast reflects efficiency characteristics of current codes and standards, which are assumed to be fixed (frozen efficiency) over the forecast horizon.
- **Estimation of alternative forecasts of technical and technical achievable potentials:** Estimate technical and achievable technical potential based on alternative forecasts reflecting technical impacts of specific energy efficiency measures and market constraints, respectively. The difference between the baseline and each alternative forecast represents the energy-efficiency potential associated with that particular type of potential.

These steps are represented conceptually in Figure C.1, which shows a hypothetical baseline forecast along with the alternative forecasts associated with technical economic, and achievable potential.<sup>1</sup> Although economic and achievable potential were not explicitly estimated for this study, the figure shows the general method of the assessment. These alternative forecasts represent consumption under different sets of assumptions, and the difference between the baseline and each alternative forecasts represents their respective potential savings. For example, the technical potential forecast represents total consumption after incorporation of all measures, consistent with the definition above. The results are intuitive, with total consumption in the technical potential forecast much lower than the baseline, which also indicates the greatest amount of potential.

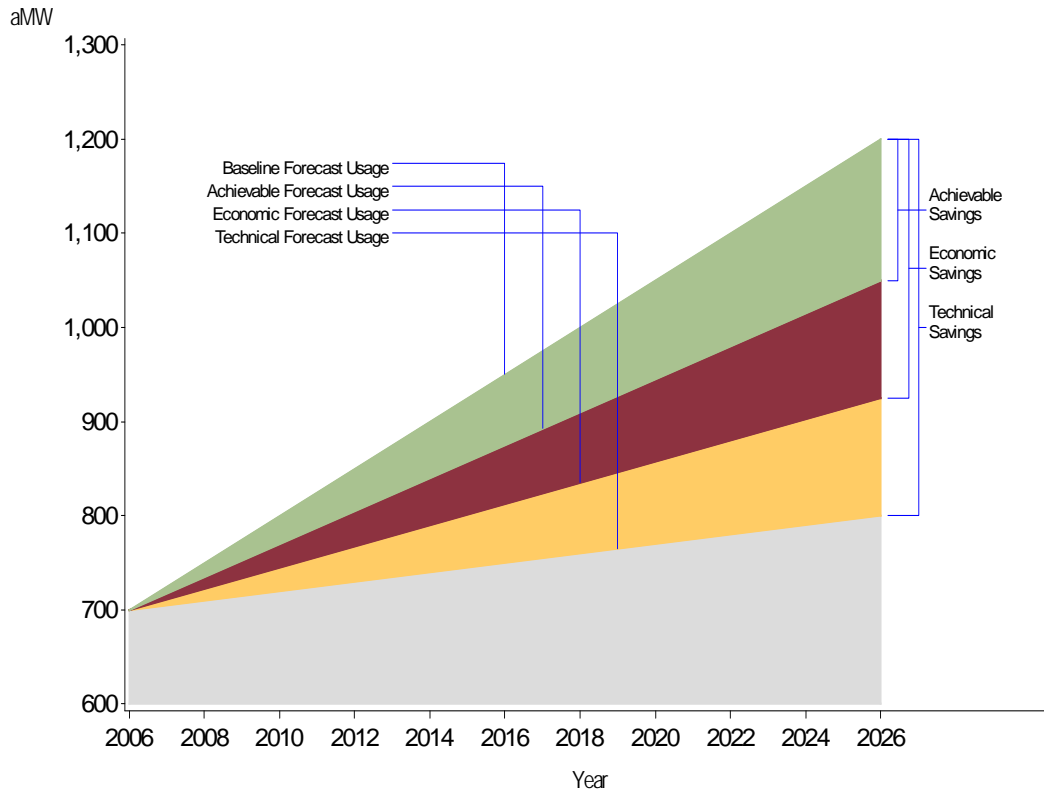
This approach has two advantages. First, savings estimates are driven by a baseline calibrated to the utility's sales forecasts and is thus consistent with filings. The sales forecast serves as a reality check and helps control for possible errors. Other approaches may simply generate the total potential by summing the estimated impacts of individual measures, which can result in estimates of total savings that represent an unrealistically high percentage of baseline sales. Second, the approach maintains consistency among all the assumptions underlying the baseline and alternative (technical and economic) forecasts. In the alternative forecasts, relevant inputs at

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<sup>1</sup> The baseline and alternative forecasts shown in Figure C.1 are purely for example and do not represent the actual data underlying this assessment.

the end-use level are changed to reflect the impact of energy-efficiency measures. Because the estimated savings represent the difference between the baseline and alternative forecasts, they can be directly attributed to specific changes made to analysis inputs. A transparent framework results that allows tracing linkages between various assumptions and calculated measure impacts.

**Figure C.1. Representation of Alternative Forecast Approach to Estimation of Energy-Efficiency Potential**



## Data Sources

The full assessment of energy-efficiency resource potential required the compilation of a large set of measure-specific technical, economic, and market data from secondary sources and through primary research. The main sources of data used in this study included:

- **PSE.** 2006 sales, customers, and forecasts, historical energy-efficiency activities, non-residential customer databases, residential audits. A complete list of data elements provided by PSE is shown in Table C.1.
- **Primary Data Collection.** Surveys of residential and non-residential customers.

**Table C.1. Energy Efficiency Utility Data Sources**

| Data Element                              | Key Variables   | Use in This Study   |
|---|---|---|
| 2006 sales and customer counts            | Number of customers and total sales by customer segment.                      | Base year customers and sales for calibration in end-use model.                   |
| 2006 load forecasts by rate class         | Sales and customer forecasts by customer segment, excluding all DSM activity. | End-use model calibration, new customers as drivers in end-use model development. |
| Historical program activity/ achievements | Program participation and historical program achievements.                    | Measure saturations, validation of measure characterization (savings, costs).     |
| Economic assumptions                      | Discount rate, inflation, line loss, etc.                                     | Measure analysis and estimates of potential at customer meter and generation      |

- **Building Simulations.** Estimates for normal consumption and load profiles for the majority of end uses in the residential and commercial sectors were developed specifically for this study using the eQuest (commercial) and Energy-10 (residential) building simulation models. Separate models were created for each fuel, customer segment, and construction vintage. Inputs and outputs for these models are presented in detail in Volume II, Appendix B4.
- **Regional Technical Forum.** The RTF measure database was used extensively in this study to ensure consistency both in terms of measures analyzed and expected measure costs and savings.
- **California Energy Commission.** This study used information available through the 2005 Database of Energy Efficiency Resources (DEER) to validate many of the assumptions and data collected on energy-efficiency measure costs and savings.
- **Ancillary Sources.** Other data sources consisted primarily of available information from past energy-efficiency market studies, energy-efficiency potential studies, and evaluations of energy-efficiency programs around the country. The primary information sources on the industrial section were the U.S. Department of Energy, Energy Information Administration Office of Industrial Technologies (including the Industrial Assessment Centers database), and the Northwest Energy Efficiency Alliance’s Industrial Efficiency Alliance initiative.

## Baseline Forecasts

PSE’s forecasts of sales form the basis for assessing energy-efficiency potential. Prior to estimating potential, these forecasts are disaggregated by customer sector (residential, commercial, and industrial), customer segment (business, dwelling, and facility types), building vintage (existing structures and new construction), and end uses (all applicable end-uses in each customer sector and segment).

The first step in developing the baseline forecasts is to determine the appropriate customer segments within each sector. These designations were based on categories available in some of

the key data sources used in this study, as well as discussion with PSE and other parties. Table C.2 through Table C.4 show the full set of customer segments and end uses for each sector analyzed in this study.

**Table C.2. Residential Sector Dwelling Types and End Uses**

| Residential Customer Segments | Electric End Uses | Gas End Uses  |
|-------------------------------|-------------------|---------------|
| Manufactured                  | Central AC        | Boiler        |
| Multi-Family                  | Central Heat      | Cooking Oven  |
| Single-Family                 | Cooking Oven      | Cooking Range |
|                               | Cooking Range     | Dryer         |
|                               | Dryer             | Furnace       |
|                               | Freezer           | Pool Heat     |
|                               | Heat Pump         | Water Heat    |
|                               | HVAC Auxiliary    |               |
|                               | Lighting          |               |
|                               | Plug Load         |               |
|                               | Pool Pump         |               |
|                               | Refrigerator      |               |
|                               | Room AC           |               |
|                               | Room Heat         |               |
|                               | Water Heat        |               |

**Table C.3. Commercial Sector Customer Segments and End Uses**

| Commercial Customer Segments | Electric End Uses  | Gas End Uses         |
|------------------------------|--------------------|----------------------|
| Dry Goods Retail             | Cooking            | Cooking              |
| Grocery                      | Cooling - Chillers | Dryer                |
| Hospital                     | Cooling - DX       | Pool Heat            |
| Hotel/Motel                  | Dryer              | Space Heat - Boiler  |
| Office                       | Heat Pump          | Space Heat - Furnace |
| Other                        | HVAC Auxiliary     | Water Heat           |
| Restaurant                   | Lighting           |                      |
| School                       | Plug Load          |                      |
| University                   | Refrigeration      |                      |
| Warehouse                    | Space Heat         |                      |
|                              | Water Heat         |                      |

**Table C.4. Industrial Sector and End Uses**

| Industrial Customer Segments (NAICS)   | Electric End Uses          | Gas End Uses      |
|--|----------------------------|-------------------|
| Chemical Manufacturing                 | Fans                       | HVAC              |
| Computer Electronics Manufacturing     | HVAC                       | Indirect Boiler   |
| Electrical Equipment Manufacturing     | Indirect Boiler            | Other             |
| Fabricated Metal Products              | Lighting                   | Process - Heating |
| Food Manufacturing                     | Motors - Other             | Process - Other   |
| Industrial\ Machinery                  | Other                      |                   |
| Miscellaneous Manufacturing            | Process – Air Compressors  |                   |
| Nonmetallic Mineral Products           | Process - Cooling          |                   |
| Paper Manufacturing                    | Process – Electro-Chemical |                   |
| Petroleum and Coal Products            | Process - Heating          |                   |
| Plastics and Rubber Products           | Process - Other            |                   |
| Primary Metal Manufacturing            | Process - Refrigeration    |                   |
| Printing Related Support               | Pumps                      |                   |
| Transportation Equipment Manufacturing |                            |                   |
| Wastewater                             |                            |                   |
| Water                                  |                            |                   |
| Wood Product Manufacturing             |                            |                   |

Once the appropriate customer segments and end uses have been determined for each sector, the integration of current and forecasted customer counts with key market and equipment usage data produced the baseline end-use forecasts. For commercial and residential sectors, the total baseline annual consumption for each end use in each customer segment is calculated as shown below:

$$EUSE_{ij} = \sum_e ACCTS_i * UPA_i * SAT_{ij} * FSH_{ij} * ESH_{ije} * EUI_{ije}$$

where:

$EUSE_{ij}$  = total energy consumption for end use  $j$  in customer segment  $i$

$ACCTS_i$  = the number of accounts/customers in customer segment  $i$

$UPA_i$  = the units per account in customer segment  $i$  ( $UPA_i$  is generally the average square feet per customer in commercial segments and 1.0 in residential dwellings, which are assessed at the whole-home level<sup>2</sup>)

$SAT_{ij}$  = the share of customers in customer segment  $i$  with end use  $j$

$FSH_{ij}$  = the share associated with electricity in end use  $j$  in customer segment  $i$

$ESH_{ije}$  = the market share of efficiency level  $e$  in the equipment for customer segment  $ij$

<sup>2</sup> It is important to note the average square footage by home type is an input into the building simulations, so weather and size of homes differences among building segments are reflected in the results.

$EUI_{ije}$  = end-use intensity, energy consumption per unit (per square foot for commercial) for the equipment configuration  $ije$

Total annual consumption in each sector is then determined as the sum of  $EUSE_{ij}$  across the end uses and customer segments. The key to ensuring accuracy of the baseline forecasts is the calibration of the end-use model estimates of total consumption to actual sales. This calibration to base year sales includes making appropriate adjustments to data where necessary to conform to known information about customer counts, appliance and equipment saturations, and fuel shares from a variety of sources.

Consistent with other potential studies and commensurate with the industrial end use consumption data that vary widely in quality, the industrial sector's allocation of loads to end uses in various segments (NAICS) was based on data available from the U.S. Department of Energy's Energy Information Administration.<sup>3</sup>

## Derivation of End-Use Consumption Estimates

Estimates of end-use energy consumption ( $EUI_{ije}$ ) are one of the most important components in the development of the baseline forecast. In the residential sector, these estimates are based on the unit energy consumption (UEC), which represents the annual energy consumption associated with the end use (in some cases, the end use represents the specific type of equipment, such as a central air conditioner or heat pump) at the building level. For the commercial sector, the consumption estimates are treated as end-use intensities (EUIs), which represent the annual energy consumption per square foot of structure. The accuracy of these estimates is critical, so they account for weather and other factors described below that drive differences among the various segments. For the industrial sector, end-use energy consumption represents the total annual facility consumption by end use as allocated by the secondary data described above.

In the residential and commercial sectors, the majority of end-use consumption estimates are derived from building simulation models (eQuest and Energy-10 for commercial and residential segments, respectively)<sup>4</sup> to account for state code, building size, and shell characteristics. For non-weather-sensitive end uses that cannot be modeled within a building simulations framework (e.g., residential refrigerators), the consumption estimates are taken from the Energy Information Administration's (EIA) Residential Energy Consumption Survey (RECS) and the Commercial Building Energy Consumption Survey (CBECS). Most key drivers in developing the simulation models (operating schedules, setback temperatures, and building size) are developed from the primary data collection outlined above.<sup>5</sup> Summaries of the estimates for end-use consumption for residential (UECs), commercial (EUIs), and industrial (end-use percentages) are provided in Volume II, Appendix F.

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<sup>3</sup> U.S. DOE, Energy Information Administration, Manufacturing Energy Consumption Survey (2002).

<sup>4</sup> For details on eQuest and Energy-10, see <http://www.doe2.com> and <http://www.sbicouncil.org/store/e10.php>, respectively.

<sup>5</sup> Extensive effort was made to validate and cross-check the results of this data collection with data from other sources, including RECS, CBECS, and other available studies.



## Estimating Technical Potential

After the development of the baseline forecasts, the next step is estimation of technical potential. Because technical potential is based on creating an alternative forecast<sup>6</sup> that reflects the installation of all possible measures, the selection of appropriate energy-efficiency resources to include in this study is a central concern. For the residential and commercial sectors, the study began with a broad range of energy-efficiency measures for possible inclusion. These measures are screened to include only measures commonly available, based on well-understood technology, and applicable to Iowa buildings and end uses. Examples of these measures are found in California’s Database of Energy Efficiency Resources (DEER).<sup>7</sup> The industrial sector measures are based on general categories of building or process improvements.<sup>8</sup>

Table C.5, Table C.7, and

Table C.9 outline the types of energy-efficiency measures assessed in the residential, commercial, and industrial sectors, respectively. Equipment measures are those replacing end-use equipment (e.g., high-efficiency central air conditioners), while non-equipment measures are those reducing end-use consumption without replacing end-use equipment (e.g., insulation). A complete list of all measures, with descriptions, is provided in Volume II, Appendix A.

**Table C.5. Residential Electric Energy-Efficiency Measures**

| End Use           | Measure Types   |
|-------------------|---|
| HVAC              | Non-Equipment: 2-stage central AC units; HVAC proper sizing; AC ductless split-system; desuperheaters for heat pumps & central AC; appropriate duct location; duct repair/sealing; ECM motors; air-to-air heat exchanger; energy efficient heat pumps; radiant heaters; programmable and multi-zone thermostats; HVAC tune-up/maintenance, VSD Fan<br>Equipment: high-efficiency heat pumps; high-efficiency central AC; high-efficiency room AC units. |
| Lighting          | Non-Equipment: CFL lamps & fixtures; air tight fixture sealing; daylight photocell; fluorescent torchieres; halogen cap lights; LED lighting; occupancy sensors; time clocks;   |
| Water Heating     | Non-Equipment: drain water heat recovery; hot water pipe insulation; faucet aerators; low-flow showerheads; temperature setback; ENERGY STAR dishwashers and clothes washers; heat pump water heater; tankless water heating; tank insulation<br>Equipment: high-efficiency water heaters.  |
| Building Envelope | Non-Equipment. Window blinds; doors; fanfolds or dow board; ICF construction; infiltration control; insulation; interior shades or thermal drapes; outlet gaskets; radiant barriers; SIP construction; smart siting; vinyl siding; high efficiency windows;   |

<sup>6</sup> The alternative forecast actually consists of four separate forecasts to allow delineation between existing and new construction and equipment and non-equipment measures. These distinctions are explained later in this section.

<sup>7</sup> Details on DEER are available at <http://eega.cpuc.ca.gov/deer>

<sup>8</sup> Industrial improvements are derived from a variety of practices and specific measures defined in the Department of Energy’s Industrial Assessment Centers Database, <http://www.iac.rutgers.edu/database/>.

| End Use    | Measure Types  |
|------------|--|
| Appliances | <p><i>Non-Equipment:</i> Attic fan; battery chargers; clothes washer; convection ovens; dehumidifier; ENERGY STAR home audio, copiers, monitors, cordless phones, receivers, computers, printers, HDTV, televisions, VCR's, ceiling fans; induction stove; pool pump timers; VSD pool pumps; range and oven; early replacement of refrigerator/freezer; refrigerator eCube; removal of secondary refrigerator/freezer; whole-house fan;</p> <p><i>Equipment:</i> ENERGY STAR freezers and refrigerators; high-efficiency clothes dryers.</p> |

**Table C.6. Residential Gas Energy-Efficiency Measures**

| End Use           | Measure Types  |
|-------------------|--|
| HVAC              | <p><i>Non-Equipment:</i> HVAC proper sizing; desuperheaters for heat pumps &amp; central AC; appropriate duct location; duct repair/sealing; programmable and multi-zone thermostats; HVAC tune-up/maintenance; integrated space/water heating.</p> <p><i>Equipment:</i> high AFUE gas boilers; high AFUE furnace.</p> |
| Water Heating     | <p><i>Non-Equipment:</i> drain water heat recovery; hot water pipe insulation; faucet aerators; low-flow showerheads; temperature setback; ENERGY STAR dishwashers and clothes washers; tankless water heating; tank insulation; pool heaters.</p> <p><i>Equipment:</i> high-efficiency water heaters.</p>             |
| Building Envelope | <p><i>Non-Equipment:</i> Doors; fanfolds or dow board; ICF construction; infiltration control; insulation; radiant barriers; vinyl siding; high efficiency windows.</p>  |
| Appliances        | <p><i>Non-Equipment:</i> Clothes washer; convection ovens; range and oven.</p> <p><i>Equipment:</i> high-efficiency clothes dryers.</p>  |

**Table C.7. Commercial Electric Energy-Efficiency Measures**

| End Use           | Measure Types   |
|-------------------|---|
| HVAC              | <p><i>Non-Equipment:</i> ventilation VFD control; chiller VSD control; chilled water piping loop w/ VSD control; chilled water reset; HVAC replacement/retro-commissioning &amp; optimization; chiller economizer; compressed air optimization; VSD compressors; cooling tower approach temperature decrease; cooling tower (two speed and variable speed); evaporative cooling; DDC system (installation and optimization); duct repair &amp; sealing; ductless AC unit; economizers; exhaust air to ventilation air heat recovery; high-efficiency condenser; exhaust hood makeup air; fan control shutoff; floating head pressure control; premium efficiency motors; constant air to VAV conversion; cooling tower improvements; optimized lab hood exhaust; pipe insulation; pump and fan (variable speed controls &amp; optimization); radiant heating; programmable thermostats; sensible/total heat recovery units; spot coolers; VSD exhaust fans.</p> <p><i>Equipment:</i> high-efficiency heat pumps; high-efficiency chillers and DX packages; Room AC units.</p> |
| Lighting          | <p><i>Non-Equipment:</i> bathroom LED light; bi-level controls; CFL lamps &amp; fixtures; fluorescent lamps &amp; fixtures; daylighting controls; delamping; induction lamps; halogen lamps; high-efficiency fixture design; HID lamps &amp; fixtures; LED lamps &amp; fixtures; traffic lights; occupancy sensors; continuous dimming and stepped dimming controls; time clock controls; task lights; twist timers; refrigeration lighting and exit signs; integrated classroom lighting.</p>  |
| Water Heating     | <p><i>Non-Equipment:</i> hot water pipe insulation; temperature setback; chemical dishwashing systems; demand controlled circulating systems; drain water heat recovery; low-flow showerheads; low-flow spray heads; low-flow faucet aerators; heat pump water heater; tankless water heaters; ultrasonic faucet controls; water heater insulation.</p> <p><i>Equipment:</i> high-efficiency water heaters.</p>   |
| Building Envelope | <p><i>Non-Equipment:</i> Blinds; infiltration control; insulation; Integrated Building design Tier I &amp; II; interior shades/thermal drapes; natural ventilation; radiant barrier; high-efficiency windows.</p>   |

| End Use            | Measure Types  |
|--------------------|--|
| Refrigeration      | <i>Non-Equipment:</i> anti-sweat controls; ECM case fans; solid-door refrigerator/freezer; high-efficiency compressors; custom refrigeration system; demand control defrost; demand controlled circulation; high performance display cases; case fans; night cover for display cases; parallel unequal compressors; reduced speed or cycling of evaporator fans; commissioning; heat recovery; refrigerator eCube; low-e glass doors; strip curtains; vending miser; floating condenser heads; anti-sweat controls; high-efficiency ice maker.                     |
| Other / Appliances | <i>Non-Equipment:</i> chemical dishwashing system; ozonating & standard clothes washers; ENERGY STAR computers, copiers, fax machines, monitors, printers, scanners, hot food holding cabinets, & water coolers; convection oven; high-efficiency fryer; high-efficiency dishwashers; office computer network management system; PowerSupply 80+; high-efficiency steam cookers; high-efficiency vending machines; power supply transformer/converter; power strip with occupancy sensor; wireless monitoring.<br><i>Equipment:</i> high efficiency clothes dryer. |

**Table C.8. Commercial Gas Energy-Efficiency Measures**

| End Use            | Measure Types   |
|--------------------|---|
| HVAC               | <i>Non-Equipment:</i> HVAC replacement/retro-commissioning & optimization; boiler economizer; boiler turbulators; direct fired makeup air units; steam trap maintenance; steam pipe insulation; DDC system (installation and optimization); duct repair & sealing; vent damper for atmospheric boiler; exhaust hood makeup air; radiant/infrared heating; programmable thermostats; sensible/total heat recovery units.<br><i>Equipment:</i> high-efficiency boilers, high-efficiency dryers, high AFUE furnace |
| Water Heating      | <i>Non-Equipment:</i> hot water pipe insulation; temperature setback; chemical dishwashing systems; demand controlled circulating systems; drain water heat recovery; integrated space/water heating; low-flow showerheads; low-flow faucet aerators; tankless water heaters (residential & commercial sized); water heater insulation.   |
| Building Envelope  | <i>Non-Equipment:</i> infiltration control; insulation; Integrated Building design Tier I & II; radiant barrier; high-efficiency windows.   |
| Refrigeration      | <i>Non-Equipment:</i> refrigeration with heat recovery.   |
| Other / Appliances | <i>Non-Equipment:</i> ENERGY STAR broilers fryers, griddles, steam cookers, chemical dishwashing system; ozonating & standard clothes washers; power burner oven; range and oven; swimming pool/spa covers; convection oven; conveyor oven; wireless monitoring.  |

**Table C.9. Industrial Electric Energy-Efficiency Measures**

| Electric Measure Types       |
|------------------------------|
| Air Compressor Improvements  |
| Air Compressor O&M           |
| Building Improvements        |
| Boiler Improvements          |
| Process Cooling Improvements |
| Process Heating Improvements |
| HVAC Improvements            |
| HVAC O&M                     |
| Lighting Improvements        |
| Motor Improvements           |
| Motor O&M                    |

| Electric Measure Types     |
|----------------------------|
| Other Improvements         |
| Other O&M                  |
| Refrigeration Improvements |

**Table C.10. Industrial Gas Energy-Efficiency Measures**

| Gas Measure Types               |
|---------------------------------|
| Boiler Improvements             |
| Boiler O&M                      |
| Process Heating Improvements    |
| Process Heating O&M             |
| HVAC Improvements               |
| HVAC O&M                        |
| Other O&M                       |
| Steam Distribution Improvements |

Once various measures are properly characterized in terms of savings and costs, technical potential is calculated by subtracting the alternative forecast from the baseline, which yields savings by all dimensions included in the segmentation design (vintage, segment, etc.). The procedure involves three analytic steps, as follows.

**Determine Measure Impacts**

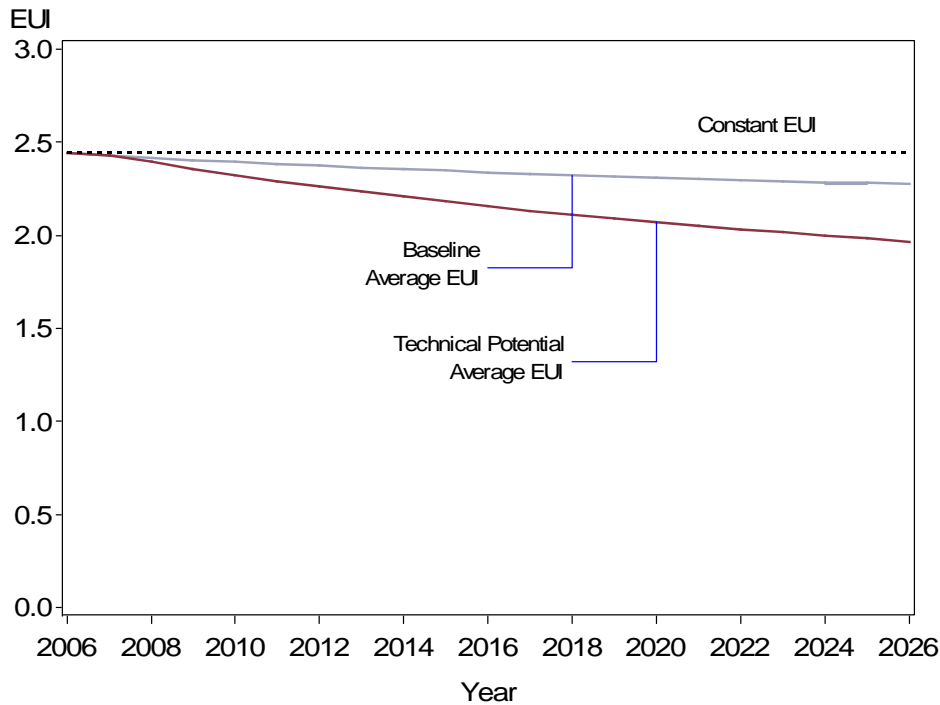
The starting point in assessment of technical potential is the estimation of measure-level impacts. It begins by compiling and analyzing data on the following measure characteristics:

- **Measure savings:** The energy savings associated with a measure as a percentage of the total end-use consumption. Sources include engineering calculations, energy simulation modeling, secondary data sources (case studies), and the California DEER database.
- **Measure costs:** The per-unit cost (either full or incremental, depending on the application) associated with installation of the measure. Sources include the DEER database, RS Means, merchant websites (Home Depot, Trane, etc.), and other secondary sources.
- **Measure life:** The expected lifetime of the measure. Sources include the DEER database, other potential studies, or DSM program evaluations.
- **Measure applicability:** A general term encompassing a number of factors, including the technical feasibility of installation and the current or naturally occurring saturation of the measure as well as factors to allocate savings associated with competing.

In estimating potential savings of equipment measures, it is assumed the baseline efficiency for the measure would shift from its current level to prevailing codes upon burnout. Thus, it is assumed the average baseline efficiencies for this class of measures would improve over time as

existing, sub-code equipment are replaced at the end of their normal, useful lives. An example of this methodology is provided in Figure C.2,<sup>9</sup> which shows the average EUI (annual kWh per square foot) associated with a piece of end use equipment in the baseline forecast, the technical potential scenario, and a constant EUI scenario, in which the effects of natural decay and current codes and standards are eliminated. The difference between the baseline EUI and the technical potential EUI represents the savings.

**Figure C.2. Example of Equipment Potential: Average EUI Over Planning Horizon**



The demonstration highlights two important aspects of the approach. First, the figure shows how average baseline usage gradually declines as more equipment decays and is replaced by units that comply with current code. In this case, based on an assumed 15-year life for this measure, its expected baseline efficiency would improve by almost 14% over 20 years. That is, by the end of this forecast period example, all the existing sub-code equipment would be replaced by code.

Second, by contrasting the average usage in the baseline with the constant efficiency scenario, the figure shows how estimates account for the effects of naturally occurring conservation. The technical potential savings are represented by the difference between the technical potential and the baseline, which would not be the case with a constant EUI. This demonstrates how this approach accurately estimates total potential and accurately accounts for naturally occurring potential. It is important to note, however, that the approach does not include any increased efficiency requirements embodied in future changes to codes and standards (that is, the baseline assumes a “frozen efficiency”).

<sup>9</sup> This is a purely illustrative example and does not contain Iowa-specific data.

The approach for non-equipment (or “retrofit”) measures is more complicated because it requires assessing the collective impacts of a variety of measures with interactive effects. For each segment and end-use combination, the objective of the analysis is to estimate the cumulative effect of the bundle of eligible measures and incorporate those impacts into the end-use model as a percentage adjustment to the baseline end-use consumption. In other words, the objective of the approach is to estimate the percentage reduction in end-use consumption that could be saved in a “typical”<sup>10</sup> structure (multifamily dwelling, small office, etc.) by installing all available measures. The starting point for this approach is characterizing individual measure savings in terms of the percentage of end-use consumption rather than their absolute energy savings. For each individual non-equipment measure, savings are estimated using the following basic relationship:

$$SAVE_{ijm} = EUI_{ije} * PCTSAV_{ijem} * APP_{ijem}$$

where:

$SAVE_{ijm}$  = annual energy savings for measure  $m$  for end use  $j$  in customer segment  $i$

$EUI_{ije}$  = calibrated annual end-use energy consumption for the equipment  $e$  for end use  $j$  and customer segment  $i$

$PCTSAV_{ijem}$  = the percentage savings of measure  $m$  relative to the base usage for the equipment configuration  $ije$ , taking into account interactions among measures such as lighting and HVAC calibrated to annual end-use energy consumption

$APP_{ijem}$  = measure applicability, a fraction that represents a combination of the technical feasibility, existing measure saturation, end-use interaction, and any adjustments to account for competing measures

As described later in this section, it is appropriate to view a measure’s savings in terms of what it saves as a percentage of baseline end-use consumption, given its overall applicability. In the case of wall insulation that saved 10% of space heating consumption, if the overall applicability is only 50%, the final percentage of the end use saved would be 5%. This value represents the percentage of baseline consumption the measure saves in an average home.

However, as stated previously, the study deals almost exclusively with cases where multiple measures affect a single end use. To avoid overestimation of total savings, the assessment of cumulative impact accounts for the interaction among the various measures, a treatment called “measure stacking.” The primary means of accounting for stacking effects is to establish a

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<sup>10</sup> This aspect of the approach requires careful determination of what a “typical” structure represents. For example, the average structure might have only a fraction of a measure installed, so it becomes necessary to think of the average single-family home, for instance, as having only 20% of a high-efficiency window already installed. Many of the attributes of structures – size, measures installed, number of stories – have been based on data collected in the surveys. These values were determined using averages from the survey results. When necessary an R-value was converted to a U-value to correctly calculate the average insulation level and then adjusted back to the typical R-value unit. Summaries of attributes associated with the prototypes used in the building simulations are presented in Volume II, Appendix F.

rolling, reduced baseline applied iteratively as measures in the stack are assessed. This is shown in the equations below, where measures 1, 2, and 3 are applied to the same end use:<sup>11</sup>

$$SAVE_{ij1} = EUI_{ije} * PCTSAV_{ije1} * APP_{ije1}$$

$$SAVE_{ij2} = (EUI_{ije} - SAVE_{ij1}) * PCTSAV_{ije2} * APP_{ije2}$$

$$SAVE_{ij3} = (EUI_{ije} - SAVE_{ij1} - SAVE_{ij2}) * PCTSAV_{ije3} * APP_{ije3}$$

After iterating through all of the measures in a bundle, the final percentage of end-use consumption reduced is the sum of the individual measures' stacked savings divided by the original baseline consumption.

Finally, the nature of this approach requires clarification in that there are actually two different savings types associated with a measure. The first is called as stand-alone savings (the savings the measure would provide when installed entirely on its own). The second is called stacked savings (savings attributable to a measure when assessed in conjunction with other measures and accounting for the various factors that affect applicability). The former represents savings associated with a single, actual installation; the latter is intended to represent the average savings measure would achieve when installed across all homes. A summary of the factors that affect the overall potential associated with a measure are presented in Table C.11.

### ***Estimate Phased-In Technical Potential***

Savings from the technical energy-efficiency potential are estimated by incorporating measure impacts (equipment and non-equipment) into the baseline forecast in four steps to develop alternative forecasts. The steps are sequential, with each case building on the previous scenario:

1. Equipment measures in existing construction, in which all equipment is upgraded to the highest level of efficiency after decay.
2. Equipment measures in new construction, in which all new construction is upgraded to the highest level of equipment efficiency.
3. Non-equipment measures in existing construction, in which collective measure energy savings impacts are applied to end-use consumption estimates.
4. Non-equipment in new construction, in which collective measure energy savings are applied to end-use consumption estimates.

The sequence of this approach is necessary to account for the interaction between equipment and non-equipment measures. As equipment is replaced over time with the highest efficiency option, average consumption associated with an end use declines. This results in a reduction in the

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<sup>11</sup> In some cases, there may not be complete interaction between measures, e.g. wall and ceiling interaction. However, based on building simulation and engineering experience, it is believed that the interaction is substantial. This method provides a somewhat conservative approach to potential estimates in some cases, but to assume no interaction could greatly inflate the actual available potential.



absolute impact associated with non-equipment measures. Accounting for this interaction results in a more accurate estimate of the potential associated with non-equipment measures.

**Table C.11. Measure Applicability Factors**

| Measure Impact            | Explanation  | Sources  |
|---------------------------|--|--|
| Fuel Saturation           | The percentage of customers that use a particular fuel (gas or electric) in lowa for the specific end use (e.g., water heat, space heat, etc.).  | Residential and commercial surveys   |
| End-Use Saturation        | The percentage of customers that have the specific end use. (If not all residential customers have a central AC unit, for example, the end-use saturation would be less than 100%.)  | Residential and non-residential surveys  |
| Measure Share             | Used to distribute the percentage of market shares for competing measures (e.g., CFLs and LEDs each have their own measure share of the market share).   | Survey of installation contractors. various secondary sources.   |
| Measure Incomplete Factor | Represents the percentage of buildings that do not have the specific measure currently installed.  | <ul style="list-style-type: none"> <li>▪ ENERGY STAR Sales Records (2003, 2004, 2005 and partial 2006).</li> <li>▪ Residential and commercial surveys</li> </ul> |
| Technical Feasibility     | Accounts for the percentage of buildings that can have the measure physically installed. A couple of factors may affect this percentage, including whether the building already has the baseline measure (e.g., dishwasher) as well as limitations on installation (e.g., size of unit and space available to install the unit). | Survey of installation contractors and trade allies.   |
| Measure Interaction       | Only considered for lighting and HVAC.   | Energy Simulation Modeling<br>Engineering Judgment.  |

## Technical Achievable Potential

As described in Volume I, Section 2, this study did not rely on the traditional process of estimating technical potential followed by economic and achievable potentials. Instead, a “technical achievable” potential was estimated to represent the potential available after accounting for market barriers other than cost-effectiveness. This was accomplished by applying expected maximum market penetration percentages to the technical potential. These percentages are show in Table C.12.

**Table C.12. 20 Year Market Penetration Rates by Fuel and Sector**

| Sector      | Electric              |                  | Gas                   |                  |
|-------------|-----------------------|------------------|-----------------------|------------------|
|             | Existing Construction | New Construction | Existing Construction | New Construction |
| Residential | 85%                   | 65%              | 75%                   | 55%              |
| Commercial  | 85%                   | 65%              | 75%                   | 55%              |
| Industrial  | 85%                   | 65%              | 75%                   | 55%              |

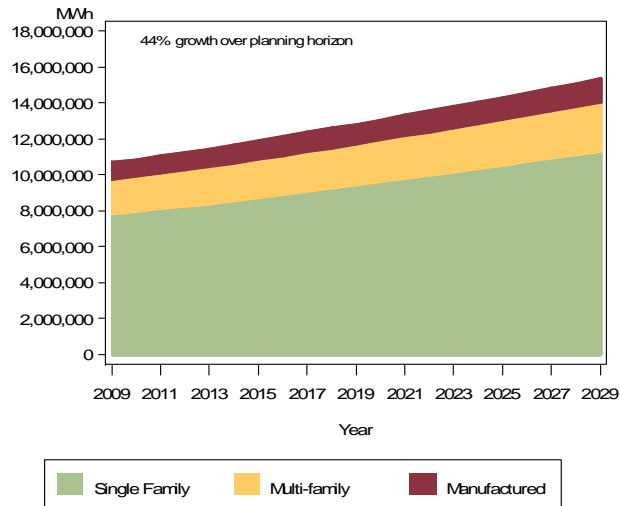


This potential was then bundled by cost of conserved energy to create bundles for use in IRP modeling.

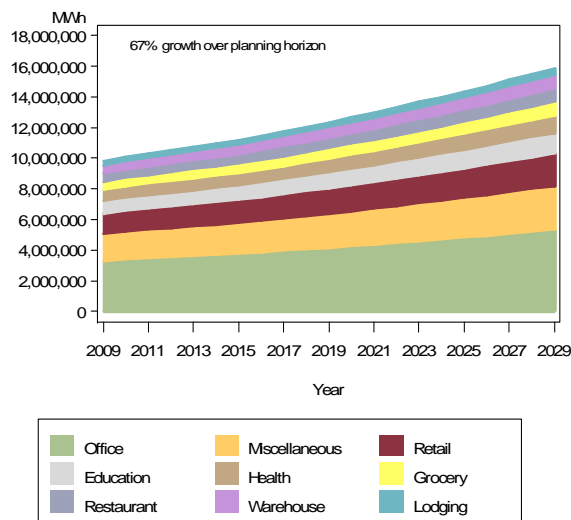
## Data & Assumptions

### Baseline Forecasts

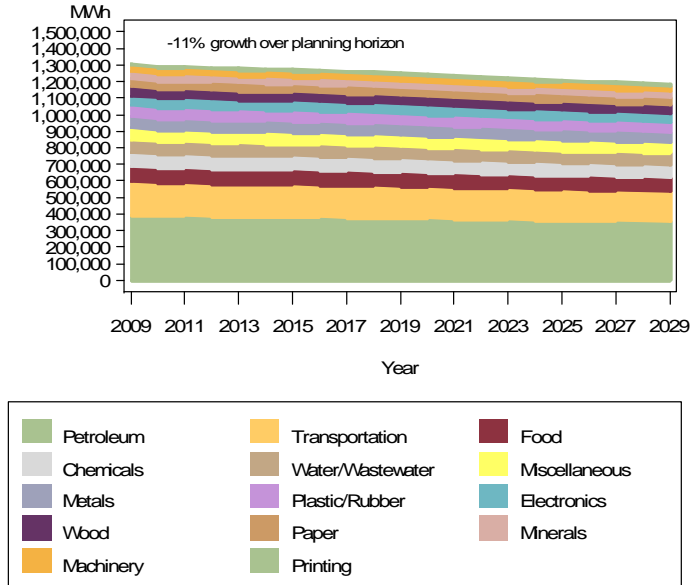
**Figure C.3. Residential Electric Sales Forecast**



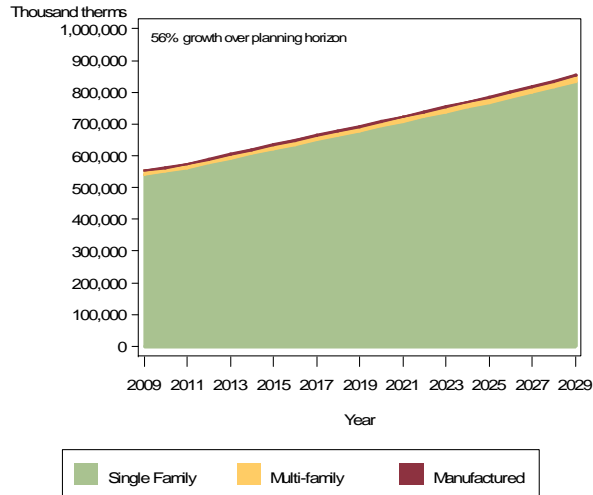
**Figure C.4. Commercial Electric Sales Forecast**



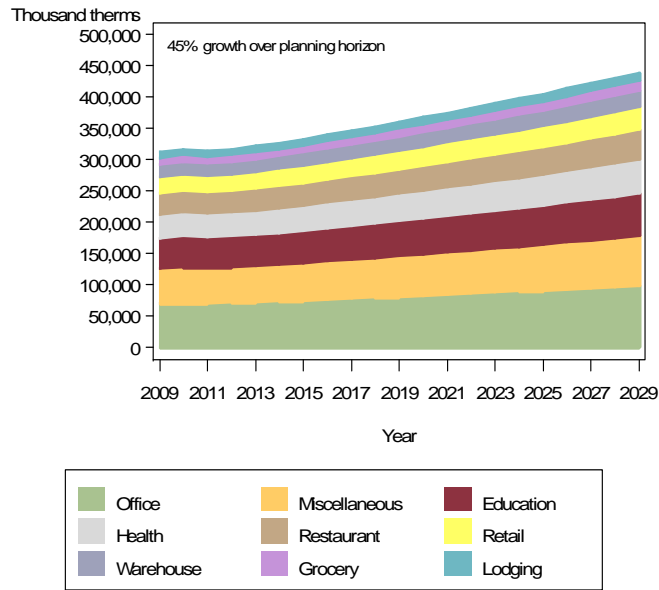
**Figure C.5. Industrial Electric Sales Forecast**



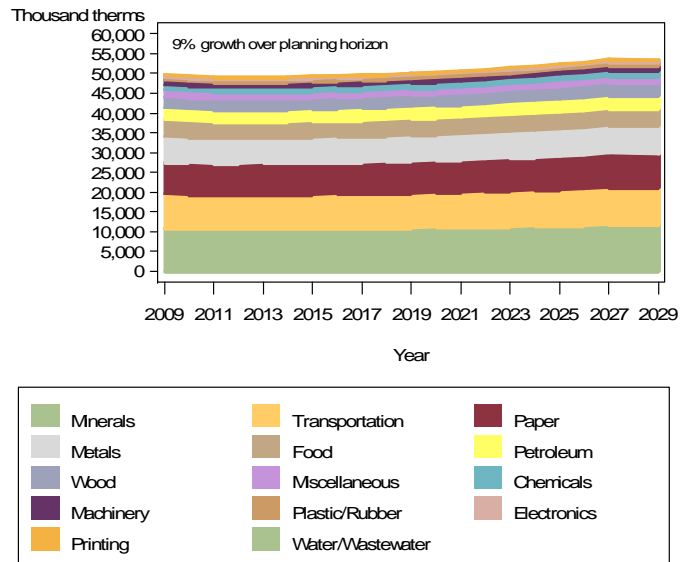
**Figure C.6. Residential Gas Sales Forecast**



**Figure C.7. Commercial Gas Sales Forecast**



**Figure C.8. Industrial Gas Sales Forecast**



## Baseline Equipment Saturations and Fuel Shares

**Table C.13. Residential Electric Equipment Saturations and Fuel Shares**

| Customer Segment/End Use | Equipment Saturation | Electric Share |
|--------------------------|----------------------|----------------|
| <b>Manufactured</b>      |                      |                |
| Central AC               | 18%                  | 100%           |
| Central Heat             | 69%                  | 58%            |
| Cooking Oven             | 103%                 | 97%            |
| Cooking Range            | 103%                 | 93%            |
| Dryer                    | 98%                  | 96%            |
| Freezer                  | 71%                  | 100%           |
| HVAC Aux                 | 100%                 | 100%           |
| Heat Pump                | 16%                  | 100%           |
| Lighting                 | 100%                 | 100%           |
| Other                    | 100%                 | 100%           |
| Plug Load                | 100%                 | 100%           |
| Pool Pump                | 3%                   | 100%           |
| Refrigerator             | 109%                 | 100%           |
| Room AC                  | 24%                  | 100%           |
| Room Heat                | 16%                  | 100%           |
| Water Heat               | 100%                 | 85%            |
| <b>Multi Family</b>      |                      |                |
| Central AC               | 3%                   | 100%           |
| Central Heat             | 22%                  | 25%            |
| Cooking Oven             | 106%                 | 96%            |
| Cooking Range            | 95%                  | 90%            |
| Dryer                    | 64%                  | 98%            |
| Freezer                  | 5%                   | 100%           |
| HVAC Aux                 | 100%                 | 100%           |
| Heat Pump                | 0%                   | 100%           |
| Lighting                 | 100%                 | 100%           |
| Other                    | 100%                 | 100%           |
| Plug Load                | 100%                 | 100%           |
| Pool Pump                | 0%                   | 100%           |
| Refrigerator             | 103%                 | 100%           |
| Room AC                  | 0%                   | 100%           |
| Room Heat                | 64%                  | 100%           |
| Water Heat               | 100%                 | 73%            |
| <b>Single Family</b>     |                      |                |
| Central AC               | 14%                  | 100%           |
| Central Heat             | 73%                  | 10%            |
| Cooking Oven             | 117%                 | 83%            |
| Cooking Range            | 97%                  | 68%            |
| Dryer                    | 99%                  | 82%            |
| Freezer                  | 64%                  | 100%           |
| HVAC Aux                 | 100%                 | 100%           |
| Heat Pump                | 5%                   | 100%           |
| Lighting                 | 100%                 | 100%           |
| Other                    | 100%                 | 100%           |

| Customer Segment/End Use | Equipment Saturation | Electric Share |
|--------------------------|----------------------|----------------|
| Plug Load                | 100%                 | 100%           |
| Pool Pump                | 3%                   | 100%           |
| Refrigerator             | 136%                 | 100%           |
| Room AC                  | 6%                   | 100%           |
| Room Heat                | 15%                  | 94%            |
| Water Heat               | 100%                 | 42%            |

**Table C.14. Residential Gas Equipment Saturations and Fuel Shares**

| Customer Segment /End Use | Equipment Saturation | Gas Share |
|---------------------------|----------------------|-----------|
| <b>Manufactured</b>       |                      |           |
| Central Heat Boiler       | 3%                   | 100%      |
| Central Heat Furnace      | 93%                  | 100%      |
| Cooking Oven              | 100%                 | 20%       |
| Cooking Range             | 100%                 | 42%       |
| Dryer                     | 100%                 | 21%       |
| Other                     | 100%                 | 100%      |
| Pool Heat                 | 0%                   | 100%      |
| Water Heat                | 100%                 | 82%       |
| <b>Multi Family</b>       |                      |           |
| Central Heat Boiler       | 5%                   | 100%      |
| Central Heat Furnace      | 51%                  | 100%      |
| Cooking Oven              | 105%                 | 31%       |
| Cooking Range             | 91%                  | 39%       |
| Dryer                     | 74%                  | 7%        |
| Other                     | 100%                 | 100%      |
| Pool Heat                 | 0%                   | 100%      |
| Water Heat                | 100%                 | 82%       |
| <b>Single Family</b>      |                      |           |
| Central Heat Boiler       | 3%                   | 100%      |
| Central Heat Furnace      | 93%                  | 96%       |
| Cooking Oven              | 115%                 | 20%       |
| Cooking Range             | 98%                  | 42%       |
| Dryer                     | 99%                  | 21%       |
| Other                     | 100%                 | 100%      |
| Pool Heat                 | 3%                   | 77%       |
| Water Heat                | 100%                 | 85%       |

**Table C.15. Commercial Electric Equipment Saturations and Fuel Shares**

| Customer Segment /End Use | Equipment Saturation | Electric Share |
|---------------------------|----------------------|----------------|
| <b>Dry Goods Retail</b>   |                      |                |
| Cooking                   | 0%                   | 28%            |
| Cooling Chillers          | 2%                   | 100%           |
| Cooling DX                | 37%                  | 100%           |
| Dryer                     | 100%                 | 25%            |
| Heat Pump                 | 9%                   | 100%           |
| HVAC Aux                  | 74%                  | 100%           |

| Customer Segment /End Use | Equipment Saturation | Electric Share |
|---------------------------|----------------------|----------------|
| Lighting                  | 100%                 | 100%           |
| Other                     | 100%                 | 100%           |
| Plug Load                 | 100%                 | 100%           |
| Refrigeration             | 100%                 | 100%           |
| Space Heat                | 62%                  | 22%            |
| Water Heat                | 100%                 | 75%            |
| <b>Grocery</b>            |                      |                |
| Cooking                   | 100%                 | 72%            |
| Cooling Chillers          | 2%                   | 100%           |
| Cooling DX                | 53%                  | 100%           |
| Dryer                     | 100%                 | 25%            |
| Heat Pump                 | 17%                  | 100%           |
| HVAC Aux                  | 84%                  | 100%           |
| Lighting                  | 100%                 | 100%           |
| Other                     | 100%                 | 100%           |
| Plug Load                 | 100%                 | 100%           |
| Refrigeration             | 100%                 | 100%           |
| Space Heat                | 65%                  | 15%            |
| Water Heat                | 100%                 | 24%            |
| <b>Hospital</b>           |                      |                |
| Cooking                   | 100%                 | 22%            |
| Cooling Chillers          | 4%                   | 100%           |
| Cooling DX                | 16%                  | 100%           |
| Dryer                     | 100%                 | 25%            |
| Heat Pump                 | 7%                   | 100%           |
| HVAC Aux                  | 76%                  | 100%           |
| Lighting                  | 100%                 | 100%           |
| Other                     | 100%                 | 100%           |
| Plug Load                 | 100%                 | 100%           |
| Refrigeration             | 100%                 | 100%           |
| Space Heat                | 69%                  | 51%            |
| Water Heat                | 100%                 | 43%            |
| <b>Hotel / Motel</b>      |                      |                |
| Cooking                   | 100%                 | 8%             |
| Cooling Chillers          | 22%                  | 100%           |
| Cooling DX                | 15%                  | 100%           |
| Dryer                     | 100%                 | 25%            |
| Heat Pump                 | 26%                  | 100%           |
| HVAC Aux                  | 82%                  | 100%           |
| Lighting                  | 100%                 | 100%           |
| Other                     | 100%                 | 100%           |
| Plug Load                 | 100%                 | 100%           |
| Refrigeration             | 100%                 | 100%           |
| Space Heat                | 53%                  | 40%            |
| Water Heat                | 100%                 | 33%            |
| <b>Office</b>             |                      |                |
| Cooking                   | 0%                   | 67%            |
| Cooling Chillers          | 27%                  | 100%           |
| Cooling DX                | 31%                  | 100%           |

| Customer Segment /End Use | Equipment Saturation | Electric Share |
|---------------------------|----------------------|----------------|
| Dryer                     | 100%                 | 25%            |
| Heat Pump                 | 25%                  | 100%           |
| HVAC Aux                  | 79%                  | 100%           |
| Lighting                  | 100%                 | 100%           |
| Other                     | 100%                 | 100%           |
| Plug Load                 | 100%                 | 100%           |
| Refrigeration             | 100%                 | 100%           |
| Space Heat                | 53%                  | 68%            |
| Water Heat                | 100%                 | 84%            |
| <b>Other</b>              |                      |                |
| Cooking                   | 100%                 | 66%            |
| Cooling Chillers          | 2%                   | 100%           |
| Cooling DX                | 11%                  | 100%           |
| Dryer                     | 100%                 | 25%            |
| Heat Pump                 | 11%                  | 100%           |
| HVAC Aux                  | 67%                  | 100%           |
| Lighting                  | 100%                 | 100%           |
| Other                     | 100%                 | 100%           |
| Plug Load                 | 100%                 | 100%           |
| Refrigeration             | 100%                 | 100%           |
| Space Heat                | 56%                  | 36%            |
| Water Heat                | 100%                 | 58%            |
| <b>Restaurant</b>         |                      |                |
| Cooking                   | 100%                 | 16%            |
| Cooling Chillers          | 0%                   | 100%           |
| Cooling DX                | 38%                  | 100%           |
| Dryer                     | 100%                 | 25%            |
| Heat Pump                 | 6%                   | 100%           |
| HVAC Aux                  | 82%                  | 100%           |
| Lighting                  | 100%                 | 100%           |
| Other                     | 100%                 | 100%           |
| Plug Load                 | 100%                 | 100%           |
| Refrigeration             | 100%                 | 100%           |
| Space Heat                | 75%                  | 3%             |
| Water Heat                | 100%                 | 29%            |
| <b>School</b>             |                      |                |
| Cooking                   | 100%                 | 62%            |
| Cooling Chillers          | 2%                   | 100%           |
| Cooling DX                | 19%                  | 100%           |
| Dryer                     | 100%                 | 25%            |
| Heat Pump                 | 26%                  | 100%           |
| HVAC Aux                  | 82%                  | 100%           |
| Lighting                  | 100%                 | 100%           |
| Other                     | 100%                 | 100%           |
| Plug Load                 | 100%                 | 100%           |
| Refrigeration             | 100%                 | 100%           |
| Space Heat                | 56%                  | 21%            |
| Water Heat                | 100%                 | 29%            |
| <b>University</b>         |                      |                |

| Customer Segment /End Use | Equipment Saturation | Electric Share |
|---------------------------|----------------------|----------------|
| Cooking                   | 100%                 | 62%            |
| Cooling Chillers          | 2%                   | 100%           |
| Cooling DX                | 19%                  | 100%           |
| Dryer                     | 100%                 | 25%            |
| Heat Pump                 | 26%                  | 100%           |
| HVAC Aux                  | 82%                  | 100%           |
| Lighting                  | 100%                 | 100%           |
| Other                     | 100%                 | 100%           |
| Plug Load                 | 100%                 | 100%           |
| Refrigeration             | 100%                 | 100%           |
| Space Heat                | 56%                  | 21%            |
| Water Heat                | 100%                 | 29%            |
| <b>Warehouse</b>          |                      |                |
| Cooking                   | 0%                   | 100%           |
| Cooling Chillers          | 5%                   | 100%           |
| Cooling DX                | 11%                  | 100%           |
| Dryer                     | 100%                 | 25%            |
| Heat Pump                 | 3%                   | 100%           |
| HVAC Aux                  | 50%                  | 100%           |
| Lighting                  | 100%                 | 100%           |
| Other                     | 100%                 | 100%           |
| Plug Load                 | 100%                 | 100%           |
| Refrigeration             | 100%                 | 100%           |
| Space Heat                | 44%                  | 26%            |
| Water Heat                | 100%                 | 89%            |

**Table C.16. Commercial Gas Equipment Saturations and Fuel Shares**

| Customer Segment /End Use | Equipment Saturation | Gas Share |
|---------------------------|----------------------|-----------|
| <b>Dry Goods Retail</b>   |                      |           |
| Cooking                   | 0%                   | 72%       |
| Other                     | 100%                 | 100%      |
| Pool Heat                 | 100%                 | 0%        |
| Space Heat Furnace        | 10%                  | 100%      |
| Space Heat Boiler         | 60%                  | 87%       |
| Water Heat                | 100%                 | 30%       |
| <b>Grocery</b>            |                      |           |
| Cooking                   | 100%                 | 28%       |
| Other                     | 100%                 | 100%      |
| Pool Heat                 | 100%                 | 0%        |
| Space Heat Furnace        | 2%                   | 100%      |
| Space Heat Boiler         | 79%                  | 91%       |
| Water Heat                | 100%                 | 88%       |
| <b>Hospital</b>           |                      |           |



| Customer Segment /End Use | Equipment Saturation | Gas Share |
|---------------------------|----------------------|-----------|
| Cooking                   | 100%                 | 74%       |
| Other                     | 100%                 | 100%      |
| Pool Heat                 | 100%                 | 3%        |
| Space Heat Furnace        | 9%                   | 76%       |
| Space Heat Boiler         | 43%                  | 81%       |
| Water Heat                | 100%                 | 74%       |
| <b>Hotel / Motel</b>      |                      |           |
| Cooking                   | 100%                 | 99%       |
| Other                     | 100%                 | 100%      |
| Pool Heat                 | 100%                 | 44%       |
| Space Heat Furnace        | 49%                  | 72%       |
| Space Heat Boiler         | 29%                  | 57%       |
| Water Heat                | 100%                 | 94%       |
| <b>Office</b>             |                      |           |
| Cooking                   | 0%                   | 36%       |
| Other                     | 100%                 | 100%      |
| Pool Heat                 | 100%                 | 0%        |
| Space Heat Furnace        | 29%                  | 56%       |
| Space Heat Boiler         | 49%                  | 30%       |
| Water Heat                | 100%                 | 31%       |
| <b>Other</b>              |                      |           |
| Cooking                   | 100%                 | 34%       |
| Other                     | 100%                 | 100%      |
| Pool Heat                 | 100%                 | 0%        |
| Space Heat Furnace        | 10%                  | 100%      |
| Space Heat Boiler         | 60%                  | 66%       |
| Water Heat                | 100%                 | 63%       |
| <b>Restaurant</b>         |                      |           |
| Cooking                   | 100%                 | 84%       |
| Other                     | 100%                 | 100%      |
| Pool Heat                 | 100%                 | 0%        |
| Space Heat Furnace        | 0%                   | 100%      |
| Space Heat Boiler         | 79%                  | 97%       |
| Water Heat                | 100%                 | 75%       |
| <b>School</b>             |                      |           |
| Cooking                   | 100%                 | 39%       |
| Other                     | 100%                 | 100%      |
| Pool Heat                 | 100%                 | 13%       |
| Space Heat Furnace        | 58%                  | 91%       |
| Space Heat Boiler         | 22%                  | 81%       |
| Water Heat                | 100%                 | 84%       |
| <b>University</b>         |                      |           |
| Cooking                   | 100%                 | 39%       |
| Other                     | 100%                 | 100%      |
| Pool Heat                 | 100%                 | 13%       |
| Space Heat Furnace        | 58%                  | 91%       |
| Space Heat Boiler         | 22%                  | 81%       |
| Water Heat                | 100%                 | 84%       |
| <b>Warehouse</b>          |                      |           |

| Customer Segment /End Use | Equipment Saturation | Gas Share |
|---------------------------|----------------------|-----------|
| Cooking                   | 0%                   | 0%        |
| Other                     | 100%                 | 100%      |
| Pool Heat                 | 100%                 | 0%        |
| Space Heat Furnace        | 0%                   | 100%      |
| Space Heat Boiler         | 58%                  | 89%       |
| Water Heat                | 100%                 | 14%       |

## Appendix C.2: Technical Measure Inputs

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# Residential Electric Measures

| Construction Vintage | Customer Segment | End Use    | Measure Name   | Measure Description                              | Base Equipment   | Baseline kWh (UEC or EUI) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|--|--|--|---------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Manufactured     | Central AC | Air Conditioner - Central (2.5 ton unit)                           | SEER 14  | SEER 13  | 765                       | 6.2%                      | NA  | NA                                  | 15           | \$336        |
| Existing             | Manufactured     | Central AC | Air Conditioner - Central (2.5 ton unit)                           | SEER 16  | SEER 13  | 765                       | 14.2%                     | NA  | NA                                  | 15           | \$880        |
| Existing             | Manufactured     | Central AC | Air Conditioner - Central (2.5 ton unit)                           | SEER 18  | SEER 13  | 765                       | 20.8%                     | NA  | NA                                  | 15           | \$1,353      |
| Existing             | Manufactured     | Central AC | Air-to-Air Heat Exchangers   | Air-to-Air Heat Exchangers                       | No Air to Air Heat Exchangers                              | 840                       | 10.0%                     | 0%  | 95%                                 | 15           | \$990        |
| Existing             | Manufactured     | Central AC | Blinds - Fixed Angle/Automatic                                     | Install Blinds (Reduce Window SHGC by 50%)       | No Interior Shading Device                                 | 840                       | 41.3%                     | 65%   | 30%                                 | 10           | \$353        |
| Existing             | Manufactured     | Central AC | Canned Lighting Air Tight Sealing                                  | Canned Lighting Air Tight Sealing                | No Air tight Sealing                                       | 840                       | 3.3%                      | 60%   | 55%                                 | 30           | \$53         |
| Existing             | Manufactured     | Central AC | Ceiling Fan  | Ceiling Fan                                      | No Ceiling Fan   | 840                       | 0.5%                      | 85%   | 45%                                 | 10           | \$104        |
| Existing             | Manufactured     | Central AC | Check Me! O&M Tune-up  | Tune-up/Maintenance                              | No Tune-up Maintenance                                     | 840                       | 10.0%                     | 90%   | 50%                                 | 5            | \$236        |
| Existing             | Manufactured     | Central AC | Cool Roofs   | Lighter Colored Shingles (White)                 | Standard Roof Shingles                                     | 840                       | 20.0%                     | 0%  | 95%                                 | 20           | \$34         |
| Existing             | Manufactured     | Central AC | Doors  | R-11 (Steel Doors with foam core)                | Standard non-thermal wood door (R-2)                       | 840                       | 0.1%                      | 85%   | 50%                                 | 30           | \$116        |
| Existing             | Manufactured     | Central AC | Doors  | R-5 (Composite Doors with foam core)             | Standard non-thermal wood door (R-2)                       | 840                       | 0.1%                      | 85%   | 55%                                 | 12           | \$42         |
| Existing             | Manufactured     | Central AC | Doors - Weatherization   | Weatherstripping And Adding Door Sweeps          | Existing Non-Efficient door                                | 840                       | 2.0%                      | 80%   | 65%                                 | 6            | \$36         |
| Existing             | Manufactured     | Central AC | Duct Sealing   | Duct Sealing                                     | No Duct Sealing  | 840                       | 6.0%                      | 60%   | 65%                                 | 20           | \$447        |
| Existing             | Manufactured     | Central AC | Duct Sealing - Aerosol-Based                                       | Spray-in ductwork sealant to minimize duct leaks | Older homes with AFUE HVAC, SEER 9                         | 840                       | 19.0%                     | 50%   | 95%                                 | 25           | \$946        |
| Existing             | Manufactured     | Central AC | Evaporative Space Cooling  | SEER 40  | SEER 13  | 840                       | 70.0%                     | 75%   | 95%                                 | 10           | \$1,119      |
| Existing             | Manufactured     | Central AC | Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test | Install Caulking And Weatherstripping            | Existing Infiltration Conditions                           | 840                       | 10.0%                     | 75%   | 85%                                 | 15           | \$455        |
| Existing             | Manufactured     | Central AC | Insulation (Ceiling)   | R-49   | State Code (R-38)  | 840                       | 0.3%                      | 87%   | 85%                                 | 25           | \$471        |
| Existing             | Manufactured     | Central AC | Insulation (Ceiling) - average existing value                      | State Code (R-38)                                | Average Existing Insulation Value (R-19)                   | 840                       | 1.0%                      | 95%   | 40%                                 | 25           | \$674        |
| Existing             | Manufactured     | Central AC | Insulation (Ceiling) - below code                                  | State Code (R-38)                                | R-9  | 840                       | 0.6%                      | 95%   | 10%                                 | 25           | \$674        |
| Existing             | Manufactured     | Central AC | Insulation (Duct)  | R-8  | No Duct Insulation   | 840                       | 3.2%                      | 12%   | 75%                                 | 25           | \$201        |
| Existing             | Manufactured     | Central AC | Insulation (Duct)  | R-8  | R-4  | 840                       | 1.6%                      | 12%   | 95%                                 | 25           | \$103        |
| Existing             | Manufactured     | Central AC | Insulation (Floor)   | R-38   | State Code (R-30)  | 840                       | 0.1%                      | 75%   | 90%                                 | 25           | \$1,061      |
| Existing             | Manufactured     | Central AC | Insulation (Floor) - average existing value                        | State Code (R-30)                                | Average Existing Insulation Value and/or Code Value (R-20) | 840                       | 0.1%                      | 30%   | 40%                                 | 25           | \$532        |
| Existing             | Manufactured     | Central AC | Insulation (Floor) - below code                                    | State Code (R-30)                                | R-0  | 840                       | 0.1%                      | 30%   | 10%                                 | 25           | \$1,595      |
| Existing             | Manufactured     | Central AC | Insulation (Wall) 2"4  | R-13 + R5 Sheathing                              | R-13   | 840                       | 0.0%                      | 10%   | 90%                                 | 25           | \$1,007      |

| Construction Vintage | Customer Segment | End Use      | Measure Name   | Measure Description   | Base Equipment  | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------|--|---|---|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Manufactured     | Central AC   | Insulation (Wall) 2'4 - average existing value                     | R-13  | Average Existing Insulation Value and/or Code Value (R-8) | 840                       | 0.1%                          | 75%   | 45%                                 | 25           | \$764        |
| Existing             | Manufactured     | Central AC   | Insulation (Wall) 2'4 - below code                                 | R-13  | R-0   | 840                       | 0.1%                          | 75%   | 5%                                  | 25           | \$764        |
| Existing             | Manufactured     | Central AC   | Insulation (wall) 2'6 - average existing value                     | State Code (R-21)   | Average Existing Insulation Value and/or Code Value (R-8) | 840                       | 0.1%                          | 0%  | 55%                                 | 25           | \$1,114      |
| Existing             | Manufactured     | Central AC   | Insulation (wall) 2'6 - below code                                 | State Code (R-21)   | R-0   | 840                       | 0.1%                          | 0%  | 45%                                 | 25           | \$1,114      |
| Existing             | Manufactured     | Central AC   | Leak Proof Duct Fittings   | Quick connect fittings that do not require mastic or drawbands (5 per unit) | 13 SEER   | 840                       | 15.0%                         | 10%   | 95%                                 | 30           | \$216        |
| Existing             | Manufactured     | Central AC   | Motor - ECM Motor  | ECM motor for Central Air Conditioner                                       | Standard Motor  | 840                       | 4.5%                          | 65%   | 95%                                 | 15           | \$368        |
| Existing             | Manufactured     | Central AC   | Outlet Gasket  | Install Outlet Gasket (Reduce Air Leakage)                                  | No Outlet Gasket  | 840                       | 2.0%                          | 95%   | 60%                                 | 5            | \$6          |
| Existing             | Manufactured     | Central AC   | Proper Sizing - Central Air Conditioner                            | Correctly Sized Air Conditioner Unit  | Oversized Air Conditioner Unit                            | 840                       | 6.0%                          | 53%   | 85%                                 | 15           | \$1          |
| Existing             | Manufactured     | Central AC   | Radiant Barrier (Ceiling)  | Install Radiant Barrier   | No Radiant Barrier  | 840                       | 6.7%                          | 0%  | 97%                                 | 30           | \$365        |
| Existing             | Manufactured     | Central AC   | Solar Attic Fan  | Solar electric attic ventilation  | Standard passive ventilation                              | 840                       | 6.0%                          | 50%   | 95%                                 | 10           | \$762        |
| Existing             | Manufactured     | Central AC   | Thermostat - Clock/Programmable                                    | Programmable Thermostat   | Manual Thermostat   | 840                       | 6.8%                          | 85%   | 50%                                 | 15           | \$27         |
| Existing             | Manufactured     | Central AC   | Thermostat - Multi-Zone  | Individual Room Temperature Control for Major Occupied Rooms                | Programmable Thermostat - Central Control Only            | 840                       | 7.0%                          | 65%   | 95%                                 | 12           | \$1,150      |
| Existing             | Manufactured     | Central AC   | VSD Motor - ECM  | Variable Speed Motor (ECM) for Central Air Conditioner                      | Constant Speed Motor                                      | 840                       | 13.5%                         | 80%   | 85%                                 | 20           | \$341        |
| Existing             | Manufactured     | Central AC   | Whole-House Dehumidifier   | Whole-House Dehumidifier  | No Dehumidifier   | 840                       | 6.0%                          | 50%   | 95%                                 | 11           | \$1,439      |
| Existing             | Manufactured     | Central AC   | Whole-House Fan  | Whole-House Fan   | No Whole-House Fan  | 840                       | 22.0%                         | 50%   | 96%                                 | 15           | \$334        |
| Existing             | Manufactured     | Central AC   | Windows  | U = 0.19  | U=0.30  | 840                       | 13.0%                         | 65%   | 95%                                 | 25           | \$2,378      |
| Existing             | Manufactured     | Central AC   | Windows  | U=0.30  | Existing Windows (U=0.65)                                 | 840                       | 36.0%                         | 65%   | 60%                                 | 25           | \$5,656      |
| Existing             | Manufactured     | Central Heat | Air-to-Air Heat Exchangers   | Air-to-Air Heat Exchangers  | No Air to Air Heat Exchangers                             | 6,556                     | 10.0%                         | 0%  | 95%                                 | 15           | \$990        |
| Existing             | Manufactured     | Central Heat | Canned Lighting Air Tight Sealing                                  | Canned Lighting Air Tight Sealing   | No Air tight Sealing                                      | 6,556                     | 3.3%                          | 60%   | 55%                                 | 30           | \$53         |
| Existing             | Manufactured     | Central Heat | Doors  | R-11 (Steel Doors with foam core)   | Standard non-thermal wood door (R-2)                      | 6,556                     | 3.0%                          | 85%   | 50%                                 | 30           | \$116        |
| Existing             | Manufactured     | Central Heat | Doors  | R-5 (Composite Doors with foam core)  | Standard non-thermal wood door (R-2)                      | 6,556                     | 2.0%                          | 85%   | 55%                                 | 12           | \$42         |
| Existing             | Manufactured     | Central Heat | Doors - Weatherization   | Weatherstripping And Adding Door Sweeps                                     | Existing Non-Efficient door                               | 6,556                     | 2.0%                          | 80%   | 65%                                 | 6            | \$36         |
| Existing             | Manufactured     | Central Heat | Duct Sealing   | Duct Sealing  | No Duct Sealing   | 6,556                     | 6.0%                          | 60%   | 65%                                 | 20           | \$447        |
| Existing             | Manufactured     | Central Heat | Duct Sealing - Aerosol-Based                                       | Spray-in ductwork sealant to minimize duct leaks                            | Older homes with AFUE HVAC, SEER 9                        | 6,556                     | 19.0%                         | 50%   | 95%                                 | 25           | \$946        |
| Existing             | Manufactured     | Central Heat | Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test | Install Caulking And Weatherstripping                                       | Existing Infiltration Conditions                          | 6,556                     | 10.0%                         | 75%   | 85%                                 | 15           | \$455        |
| Existing             | Manufactured     | Central Heat | Insulation (Ceiling)   | R-49  | State Code (R-38)   | 6,556                     | 1.0%                          | 87%   | 85%                                 | 25           | \$471        |

| Construction Vintage | Customer Segment | End Use      | Measure Name                                   | Measure Description   | Base Equipment   | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------|--|---|--|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Manufactured     | Central Heat | Insulation (Ceiling) - average existing value  | State Code (R-38)   | Average Existing Insulation Value (R-19)                   | 6,556                     | 2.0%                          | 95%   | 40%                                 | 25           | \$674        |
| Existing             | Manufactured     | Central Heat | Insulation (Ceiling) - below code              | State Code (R-38)   | R-9  | 6,556                     | 10.2%                         | 95%   | 10%                                 | 25           | \$674        |
| Existing             | Manufactured     | Central Heat | Insulation (Duct)                              | R-8   | No Duct Insulation   | 6,556                     | 4.3%                          | 12%   | 75%                                 | 25           | \$201        |
| Existing             | Manufactured     | Central Heat | Insulation (Duct)                              | R-8   | R-4  | 6,556                     | 2.1%                          | 12%   | 95%                                 | 25           | \$103        |
| Existing             | Manufactured     | Central Heat | Insulation (Floor)                             | R-38  | State Code (R-30)  | 6,556                     | 1.0%                          | 75%   | 90%                                 | 25           | \$1,061      |
| Existing             | Manufactured     | Central Heat | Insulation (Floor) - average existing value    | State Code (R-30)   | Average Existing Insulation Value and/or Code Value (R-20) | 6,556                     | 2.0%                          | 30%   | 40%                                 | 25           | \$532        |
| Existing             | Manufactured     | Central Heat | Insulation (Floor) - below code                | State Code (R-30)   | R-0  | 6,556                     | 10.0%                         | 30%   | 10%                                 | 25           | \$1,595      |
| Existing             | Manufactured     | Central Heat | Insulation (Wall) 2*4                          | R-13 + R5 Sheathing   | R-13   | 6,556                     | 2.2%                          | 10%   | 90%                                 | 25           | \$1,007      |
| Existing             | Manufactured     | Central Heat | Insulation (Wall) 2*4 - average existing value | R-13  | Average Existing Insulation Value and/or Code Value (R-8)  | 6,556                     | 5.0%                          | 75%   | 45%                                 | 25           | \$764        |
| Existing             | Manufactured     | Central Heat | Insulation (Wall) 2*4 - below code             | R-13  | R-0  | 6,556                     | 44.0%                         | 75%   | 5%                                  | 25           | \$764        |
| Existing             | Manufactured     | Central Heat | Insulation (wall) 2*6 - average existing value | State Code (R-21)   | Average Existing Insulation Value and/or Code Value (R-8)  | 6,556                     | 12.0%                         | 0%  | 55%                                 | 25           | \$1,114      |
| Existing             | Manufactured     | Central Heat | Insulation (wall) 2*6 - below code             | State Code (R-21)   | R-0  | 6,556                     | 49.0%                         | 0%  | 45%                                 | 25           | \$1,114      |
| Existing             | Manufactured     | Central Heat | Leak Proof Duct Fittings                       | Quick connect fittings that do not require mastic or drawbands (5 per unit) | 13 SEER  | 6,556                     | 15.0%                         | 10%   | 95%                                 | 30           | \$216        |
| Existing             | Manufactured     | Central Heat | Outlet Gasket                                  | Install Outlet Gasket (Reduce Air Leakage)                                  | No Outlet Gasket   | 6,556                     | 2.0%                          | 95%   | 60%                                 | 5            | \$6          |
| Existing             | Manufactured     | Central Heat | Radiant Barrier (Ceiling)                      | Install Radiant Barrier   | No Radiant Barrier   | 6,556                     | 2.0%                          | 0%  | 97%                                 | 30           | \$365        |
| Existing             | Manufactured     | Central Heat | Spray in insulation 2*4 Wall                   | 2*4Wall - closed cell foam insulation R-23                                  | 2*4Wall R-13   | 6,556                     | 12.0%                         | 0%  | 95%                                 | 25           | \$3,675      |
| Existing             | Manufactured     | Central Heat | Thermostat - Clock/Programmable                | Programmable Thermostat   | Manual Thermostat  | 6,556                     | 6.8%                          | 85%   | 50%                                 | 15           | \$27         |
| Existing             | Manufactured     | Central Heat | Thermostat - Multi-Zone                        | Individual Room Temperature Control for Major Occupied Rooms                | Programmable Thermostat - Central Control Only             | 6,556                     | 7.0%                          | 65%   | 95%                                 | 12           | \$1,150      |
| Existing             | Manufactured     | Central Heat | Windows  | U = 0.19  | U=0.30   | 6,556                     | 6.0%                          | 65%   | 95%                                 | 25           | \$2,378      |
| Existing             | Manufactured     | Central Heat | Windows  | U=0.30  | Existing Windows (U=0.65)                                  | 6,556                     | 15.0%                         | 65%   | 60%                                 | 25           | \$5,656      |
| Existing             | Manufactured     | Cooking Oven | Convection Oven                                | Convection Oven (wall oven)   | Standard Oven (wall oven)                                  | 435                       | 23.0%                         | 85%   | 85%                                 | 15           | \$432        |
| Existing             | Manufactured     | Dryer        | Clothes Dryer With Moisture Sensor             | High-Efficiency Clothes Dryer With Moisture Sensor                          | Standard Dryer Without Moisture Sensor                     | 720                       | 13.0%                         | NA  | NA                                  | 18           | \$58         |
| Existing             | Manufactured     | Freezer      | Freezer - Stand-Alone                          | Energy Star 14.8 cu ft Chest Freezer  | Standard 14.8 cu ft Freezer                                | 553                       | 10.0%                         | NA  | NA                                  | 12           | \$26         |
| Existing             | Manufactured     | Freezer      | Stand-Alone Freezer - Early Replacement        | Energy Star Freezer   | Existing Non-Efficient Freezer                             | 665                       | 9.4%                          | 35%   | 80%                                 | 12           | \$489        |
| Existing             | Manufactured     | Freezer      | Stand-Alone Freezer - Removal                  | Proper Disposal of Freezer  | Existing Non-Efficient Freezer                             | 665                       | 248.7%                        | 35%   | 80%                                 | 6            | \$103        |

| Construction Vintage | Customer Segment | End Use   | Measure Name   | Measure Description                        | Base Equipment   | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|--|--|--|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Manufactured     | HVAC Aux  | Motor - ECM Motor  | ECM Motor for Forced Air Electric Furnace  | Standard Motor   | 662                       | 25.0%                         | 65%   | 95%                                 | 15           | \$368        |
| Existing             | Manufactured     | HVAC Aux  | Motor - ECM Motor  | ECM Motor for Forced Air Gas Furnace       | Standard Motor   | 662                       | 25.0%                         | 65%   | 95%                                 | 15           | \$368        |
| Existing             | Manufactured     | HVAC Aux  | VSD Fan  | Variable Speed Fan - Electric Furnace      | Constant Speed Fan   | 662                       | 75.0%                         | 40%   | 85%                                 | 20           | \$447        |
| Existing             | Manufactured     | HVAC Aux  | VSD Fan  | Variable Speed Fan - Gas Furnace           | Constant Speed Fan   | 662                       | 75.0%                         | 29%   | 85%                                 | 20           | \$447        |
| Existing             | Manufactured     | Heat Pump | Air Source Heat_Pump   | 2.5 ton, 14 SEER, 8.5 HSPF                 | 2.5 ton, 13 SEER, 7.7 HSPF                                 | 5,256                     | 4.9%                          | NA  | NA                                  | 15           | \$420        |
| Existing             | Manufactured     | Heat Pump | Air Source Heat_Pump   | 2.5 ton, 16 SEER, 8.8 HSPF                 | 2.5 ton, 13 SEER, 7.7 HSPF                                 | 5,256                     | 7.4%                          | NA  | NA                                  | 15           | \$543        |
| Existing             | Manufactured     | Heat Pump | Air Source Heat_Pump   | 2.5 ton, 18 SEER, 9.0 HSPF                 | 2.5 ton, 13 SEER, 7.7 HSPF                                 | 5,256                     | 9.2%                          | NA  | NA                                  | 15           | \$1,210      |
| Existing             | Manufactured     | Heat Pump | Advanced Cold-Climate Heat Pump                                    | 16 SEER, 9.6 HSPF                          | 13 SEER, 7.7 HSPF, 2.5 ton                                 | 5,478                     | 14.0%                         | 20%   | 99%                                 | 20           | \$3,677      |
| Existing             | Manufactured     | Heat Pump | Air-to-Air Heat Exchangers   | Air-to-Air Heat Exchangers                 | No Air to Air Heat Exchangers                              | 5,478                     | 10.0%                         | 0%  | 95%                                 | 15           | \$990        |
| Existing             | Manufactured     | Heat Pump | Blinds - Fixed Angle/Automatic                                     | Install Blinds (Reduce Window SHGC by 50%) | No Interior Shading Device                                 | 5,478                     | 5.8%                          | 65%   | 30%                                 | 10           | \$353        |
| Existing             | Manufactured     | Heat Pump | Canned Lighting Air Tight Sealing                                  | Canned Lighting Air Tight Sealing          | No Air tight Sealing                                       | 5,478                     | 3.3%                          | 60%   | 55%                                 | 30           | \$53         |
| Existing             | Manufactured     | Heat Pump | Ceiling Fan  | Ceiling Fan                                | No Ceiling Fan   | 5,478                     | 0.1%                          | 85%   | 45%                                 | 10           | \$104        |
| Existing             | Manufactured     | Heat Pump | Cool Roofs   | Lighter Colored Shingles (White)           | Standard Roof Shingles                                     | 5,478                     | 2.8%                          | 0%  | 95%                                 | 20           | \$34         |
| Existing             | Manufactured     | Heat Pump | Doors  | R-11 (Steel Doors with foam core)          | Standard non-thermal wood door (R-2)                       | 5,478                     | 2.0%                          | 85%   | 50%                                 | 30           | \$116        |
| Existing             | Manufactured     | Heat Pump | Doors  | R-5 (Composite Doors with foam core)       | Standard non-thermal wood door (R-2)                       | 5,478                     | 2.0%                          | 85%   | 55%                                 | 12           | \$42         |
| Existing             | Manufactured     | Heat Pump | Doors - Weatherization   | Weatherstripping And Adding Door Sweeps    | Existing Non-Efficient door                                | 5,478                     | 2.0%                          | 80%   | 65%                                 | 6            | \$31         |
| Existing             | Manufactured     | Heat Pump | Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test | Install Caulking And Weatherstripping      | Existing Infiltration Conditions                           | 5,478                     | 10.0%                         | 75%   | 85%                                 | 15           | \$455        |
| Existing             | Manufactured     | Heat Pump | Insulation (Ceiling)   | R-49                                       | State Code (R-38)  | 5,478                     | 1.0%                          | 87%   | 85%                                 | 25           | \$471        |
| Existing             | Manufactured     | Heat Pump | Insulation (Ceiling) - average existing value                      | State Code (R-38)                          | Average Existing Insulation Value (R-19)                   | 5,478                     | 2.0%                          | 95%   | 40%                                 | 25           | \$674        |
| Existing             | Manufactured     | Heat Pump | Insulation (Ceiling) - below code                                  | State Code (R-38)                          | R-9  | 5,478                     | 8.0%                          | 95%   | 10%                                 | 25           | \$674        |
| Existing             | Manufactured     | Heat Pump | Insulation (Duct)  | R-8  | No Duct Insulation   | 5,478                     | 4.1%                          | 12%   | 75%                                 | 25           | \$201        |
| Existing             | Manufactured     | Heat Pump | Insulation (Duct)  | R-8  | R-4  | 5,478                     | 2.0%                          | 12%   | 95%                                 | 25           | \$103        |
| Existing             | Manufactured     | Heat Pump | Insulation (Floor)   | R-38                                       | State Code (R-30)  | 5,478                     | 0.3%                          | 75%   | 90%                                 | 25           | \$1,061      |
| Existing             | Manufactured     | Heat Pump | Insulation (Floor) - average existing value                        | State Code (R-30)                          | Average Existing Insulation Value and/or Code Value (R-20) | 5,478                     | 1.0%                          | 30%   | 40%                                 | 25           | \$532        |
| Existing             | Manufactured     | Heat Pump | Insulation (Floor) - below code                                    | State Code (R-30)                          | R-0  | 5,478                     | 5.0%                          | 30%   | 10%                                 | 25           | \$1,595      |
| Existing             | Manufactured     | Heat Pump | Insulation (Wall) 2*4  | R-13 + R5 Sheathing                        | R-13   | 5,478                     | 1.3%                          | 10%   | 90%                                 | 25           | \$1,007      |
| Existing             | Manufactured     | Heat Pump | Insulation (Wall) 2*4 - average existing value                     | R-13                                       | Average Existing Insulation Value and/or Code Value (R-8)  | 5,478                     | 3.0%                          | 75%   | 45%                                 | 25           | \$764        |
| Existing             | Manufactured     | Heat Pump | Insulation (Wall) 2*4 - below code                                 | R-13                                       | R-0  | 5,478                     | 28.0%                         | 75%   | 5%                                  | 25           | \$764        |

| Construction Vintage | Customer Segment | End Use   | Measure Name   | Measure Description   | Base Equipment  | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|--|---|---|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Manufactured     | Heat Pump | Insulation (wall) 2*6 - average existing value         | State Code (R-21)   | Average Existing Insulation Value and/or Code Value (R-8) | 5,478                     | 8.0%                          | 0%  | 55%                                 | 25           | \$1,114      |
| Existing             | Manufactured     | Heat Pump | Insulation (wall) 2*6 - below code                     | State Code (R-21)   | R-0   | 5,478                     | 37.0%                         | 0%  | 45%                                 | 25           | \$1,114      |
| Existing             | Manufactured     | Heat Pump | Leak Proof Duct Fittings                               | Quick connect fittings that do not require mastic or drawbands (5 per unit) | 13 SEER   | 5,478                     | 15.0%                         | 10%   | 95%                                 | 30           | \$216        |
| Existing             | Manufactured     | Heat Pump | Micro Channel Heat Exchangers (Evaporator)             | Micro Channel Heat Exchangers (5 ton unit)                                  | 13 SEER, 7.7 HSPF, 2.5 ton                                | 5,478                     | 5.0%                          | 15%   | 99%                                 | 18           | \$3,890      |
| Existing             | Manufactured     | Heat Pump | Motor - ECM Motor                                      | ECM motor for Heat Pump   | Standard Motor  | 5,478                     | 1.3%                          | 65%   | 95%                                 | 15           | \$368        |
| Existing             | Manufactured     | Heat Pump | Outlet Gasket  | Install Outlet Gasket (Reduce Air Leakage)                                  | No Outlet Gasket  | 5,478                     | 2.0%                          | 95%   | 60%                                 | 5            | \$6          |
| Existing             | Manufactured     | Heat Pump | PTCS Aerosol-Based Duct Sealing                        | Spray-in ductwork sealant to minimize duct leaks                            | Older homes with AFUE HVAC, SEER 9                        | 5,478                     | 19.0%                         | 80%   | 65%                                 | 25           | \$946        |
| Existing             | Manufactured     | Heat Pump | PTCS Duct Sealing                                      | PTCS Duct Sealing   | No Duct Sealing   | 5,478                     | 15.0%                         | 80%   | 65%                                 | 20           | \$447        |
| Existing             | Manufactured     | Heat Pump | Proper Sizing - Heat Pump                              | Correctly Sized Heat_Pump (Cooling And Heating Unit)                        | Oversized Heat_Pump                                       | 5,478                     | 8.6%                          | 53%   | 85%                                 | 15           | \$1          |
| Existing             | Manufactured     | Heat Pump | Radiant Barrier (Ceiling)                              | Install Radiant Barrier   | No Radiant Barrier  | 5,478                     | 2.7%                          | 0%  | 97%                                 | 30           | \$365        |
| Existing             | Manufactured     | Heat Pump | Small Scale Absorption Cooling                         | Small Scale Absorption Cooling (5 ton)                                      | 13 SEER, 7.7 HSPF, 2.5 ton                                | 5,478                     | 9.0%                          | 0%  | 99%                                 | 20           | \$946        |
| Existing             | Manufactured     | Heat Pump | Solar Attic Fan  | Solar electric attic ventilation  | Standard passive ventilation                              | 5,478                     | 0.8%                          | 50%   | 95%                                 | 10           | \$762        |
| Existing             | Manufactured     | Heat Pump | Solid state refrigeration (cool chips™) for heat pumps | Solid State Thermoelectric cooling system                                   | 13 SEER, 7.7 HSPF, 2.5 ton                                | 5,478                     | 18.0%                         | 29%   | 99%                                 | 18           | \$2,101      |
| Existing             | Manufactured     | Heat Pump | Spray in insulation 2*4 Wall                           | 2*4Wall - closed cell foam insulation R-23                                  | 2*4Wall R-13  | 5,478                     | 10.0%                         | 0%  | 95%                                 | 25           | \$3,675      |
| Existing             | Manufactured     | Heat Pump | Thermostat - Clock/Programmable                        | Programmable Thermostat   | Manual Thermostat   | 5,478                     | 6.8%                          | 85%   | 25%                                 | 15           | \$27         |
| Existing             | Manufactured     | Heat Pump | Thermostat - Multi-Zone                                | Individual Room Temperature Control for Major Occupied Rooms                | Programmable Thermostat - Central Control Only            | 5,478                     | 7.0%                          | 65%   | 95%                                 | 12           | \$1,150      |
| Existing             | Manufactured     | Heat Pump | VSD Motor - ECM  | Variable Speed Motor (ECM) for Heat Pump                                    | Constant Speed Motor                                      | 5,478                     | 3.8%                          | 80%   | 85%                                 | 20           | \$341        |
| Existing             | Manufactured     | Heat Pump | Whole-House Fan  | Whole-House Fan   | No Whole-House Fan  | 5,478                     | 3.3%                          | 50%   | 96%                                 | 15           | \$334        |
| Existing             | Manufactured     | Heat Pump | Windows  | U = 0.19  | U=0.30  | 5,478                     | 8.0%                          | 65%   | 95%                                 | 25           | \$2,378      |
| Existing             | Manufactured     | Heat Pump | Windows  | U=0.30  | Existing Windows (U=0.65)                                 | 5,478                     | 11.0%                         | 65%   | 60%                                 | 25           | \$5,656      |
| Existing             | Manufactured     | Lighting  | CFL Fixtures, High Use                                 | 2-15 W CFLs, 4.0 hr/day (37%)   | 2-60 W Incandescent                                       | 1,251                     | 4.7%                          | 98%   | 62%                                 | 20           | \$35         |
| Existing             | Manufactured     | Lighting  | CFL Fixtures, Low Use                                  | 2-15 W CFLs, 1.0 hr/day (32%)   | 2-60 W Incandescent                                       | 1,251                     | 4.0%                          | 98%   | 62%                                 | 20           | \$30         |
| Existing             | Manufactured     | Lighting  | CFL Fixtures, Medium Use                               | 2-15 W CFLs, 2.5 hr/day (33%)   | 2-60 W Incandescent                                       | 1,251                     | 4.2%                          | 98%   | 62%                                 | 20           | \$33         |
| Existing             | Manufactured     | Lighting  | CFL Lamps, High Use                                    | 1-15W, 4.0 hr/day (37%)   | Incandescent 60W  | 1,251                     | 34.0%                         | 86%   | 62%                                 | 7            | \$2          |
| Existing             | Manufactured     | Lighting  | CFL Lamps, Low Use                                     | 1-15W, 1.0 hr/day (32%)   | Incandescent 60W  | 1,251                     | 9.7%                          | 86%   | 62%                                 | 27           | \$2          |
| Existing             | Manufactured     | Lighting  | CFL Lamps, Medium Use                                  | 1-15W, 2.5 hr/day (33%)   | Incandescent 60W  | 1,251                     | 14.0%                         | 86%   | 62%                                 | 11           | \$2          |
| Existing             | Manufactured     | Lighting  | CFL Lighting - 3-Way                                   | 13 W, 20W And 25W   | 30W, 75W, 100W  | 1,251                     | 1.8%                          | 75%   | 62%                                 | 7            | \$13         |



| Construction Vintage | Customer Segment | End Use      | Measure Name   | Measure Description  | Base Equipment                           | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------|--|--|--|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Manufactured     | Lighting     | CFL Torchieries, High Use                                    | 55 W CFL, (20%)  | Incandescent Torchieries, 180W Halogen   | 1,251                     | 0.4%                          | 70%   | 65%                                 | 7            | \$7          |
| Existing             | Manufactured     | Lighting     | CFL Torchieries, Low Use                                     | 55 W CFL, (20%)  | Incandescent Torchieries, 180W Halogen   | 1,251                     | 0.4%                          | 70%   | 65%                                 | 27           | \$7          |
| Existing             | Manufactured     | Lighting     | CFL Torchieries, Medium Use                                  | 55 W CFL, (60%)  | Incandescent Torchieries, 180W Halogen   | 1,251                     | 1.3%                          | 70%   | 65%                                 | 11           | \$7          |
| Existing             | Manufactured     | Lighting     | Daylighting Controls (Photocell) - Indoor/Outdoors           | Install Photocell  | No Daylighting Controls                  | 1,251                     | 4.5%                          | 0%  | 95%                                 | 10           | \$151        |
| Existing             | Manufactured     | Lighting     | LED Christmas Lighting                                       | LED Christmas Lighting   | Incandescent Christmas Lighting          | 1,251                     | 0.4%                          | 40%   | 85%                                 | 13           | \$11         |
| Existing             | Manufactured     | Lighting     | LED Interior Lighting (White), High Use                      | LED 4W   | Incandescent 60W                         | 1,251                     | 42.3%                         | 85%   | 98%                                 | 13           | \$31         |
| Existing             | Manufactured     | Lighting     | LED Interior Lighting (White), Low Use                       | LED 4W   | Incandescent 60W                         | 1,251                     | 12.1%                         | 85%   | 98%                                 | 13           | \$31         |
| Existing             | Manufactured     | Lighting     | LED Interior Lighting (White), Medium Use                    | LED 4W   | Incandescent 60W                         | 1,251                     | 17.4%                         | 85%   | 98%                                 | 13           | \$31         |
| Existing             | Manufactured     | Lighting     | Occupancy Sensors  | Wall-Switch Occupancy Sensors  | No Occupancy Sensor                      | 1,251                     | 14.0%                         | 75%   | 85%                                 | 10           | \$64         |
| Existing             | Manufactured     | Lighting     | Time Clocks (Exterior Lighting)                              | Exterior Lighting on a Time Clock  | Exterior Lighting (Manual Control)       | 1,251                     | 1.9%                          | 75%   | 90%                                 | 10           | \$93         |
| Existing             | Manufactured     | Plug Load    | 1-Watt Standby Power   | 1W or less standby power use for small appliances                            | Standard plug load appliance.            | 1,542                     | 4.2%                          | 15%   | 85%                                 | 7            | \$32         |
| Existing             | Manufactured     | Plug Load    | Energy Star Battery Chargers                                 | Energy Star Battery Chargers   | Standard Battery Chargers                | 1,542                     | 0.2%                          | 55%   | 40%                                 | 7            | \$4          |
| Existing             | Manufactured     | Plug Load    | Energy Star DVD System                                       | Energy Star DVD System   | Standard DVD System                      | 1,542                     | 1.9%                          | 100%  | 24%                                 | 7            | \$12         |
| Existing             | Manufactured     | Plug Load    | Energy Star Dehumidifiers                                    | Energy Star Dehumidifiers  | Standard Dehumidifiers                   | 1,542                     | 0.5%                          | 15%   | 5%                                  | 10           | \$13         |
| Existing             | Manufactured     | Plug Load    | Energy Star Digital Set Top Receiver                         | Energy Star Digital Set Top Receiver   | Standard Digital Set Top Receiver        | 1,542                     | 1.9%                          | 94%   | 62%                                 | 6            | \$37         |
| Existing             | Manufactured     | Plug Load    | Energy Star HDTV   | Energy Star HDTV   | Standard HDTV                            | 1,542                     | 2.5%                          | 24%   | 70%                                 | 9            | \$105        |
| Existing             | Manufactured     | Plug Load    | Energy Star Home Audio System                                | Energy Star Home Audio System  | Standard Home Audio system               | 1,542                     | 2.6%                          | 92%   | 90%                                 | 7            | \$21         |
| Existing             | Manufactured     | Plug Load    | Energy Star Office Computer                                  | Energy Star Office Computer  | Standard Office Computer                 | 1,542                     | 10.4%                         | 73%   | 15%                                 | 4            | \$84         |
| Existing             | Manufactured     | Plug Load    | Energy Star Office Copiers                                   | Energy Star Office Copiers   | Standard Office Copiers                  | 1,542                     | 1.5%                          | 17%   | 55%                                 | 6            | \$53         |
| Existing             | Manufactured     | Plug Load    | Energy Star Office Monitor                                   | Energy Star Office Monitor   | Standard Office Monitor                  | 1,542                     | 3.3%                          | 100%  | 15%                                 | 4            | \$16         |
| Existing             | Manufactured     | Plug Load    | Energy Star Office Printer                                   | Energy Star Office Printer   | Standard Office Printer                  | 1,542                     | 0.3%                          | 62%   | 40%                                 | 5            | \$11         |
| Existing             | Manufactured     | Plug Load    | Energy Star TV   | Energy Star TV   | Standard TV                              | 1,542                     | 3.5%                          | 100%  | 38%                                 | 9            | \$32         |
| Existing             | Manufactured     | Plug Load    | Energy Star VCR  | Energy Star VCR/DVD Combo  | Standard Home VCR                        | 1,542                     | 0.7%                          | 100%  | 45%                                 | 4            | \$38         |
| Existing             | Manufactured     | Plug Load    | Power supply transformer/converter - External power adapters | Power supply transformer/converter - High efficiency External power adapters | Standard Efficiency                      | 1,542                     | 0.7%                          | 85%   | 40%                                 | 7            | \$8          |
| Existing             | Manufactured     | Plug Load    | Powerstrip with Occupancy Sensor                             | Powerstrip with Occupancy Sensor   | Powerstrip w/o Occupany Sensor           | 1,542                     | 1.0%                          | 75%   | 90%                                 | 10           | \$88         |
| Existing             | Manufactured     | Refrigerator | Refrigerator/Freezer - Energy Star                           | Energy Star Refrigerator   | Standard Refrigerator                    | 490                       | 20.0%                         | NA  | NA                                  | 18           | \$32         |
| Existing             | Manufactured     | Refrigerator | 1 kWh/day Refrigerator                                       | 20 cf top-freezer using no more than 1 kWh/day                               | Standard Refrigerator, 20cf, top-freezer | 538                       | 30.0%                         | 90%   | 97%                                 | 19           | \$74         |
| Existing             | Manufactured     | Refrigerator | Refrigerator eCube   | Refrigerator eCube   | No Refrigerator eCube                    | 538                       | 6.3%                          | 85%   | 95%                                 | 5            | \$236        |

| Construction Vintage | Customer Segment | End Use      | Measure Name   | Measure Description                        | Base Equipment   | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------|--|--|--|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Manufactured     | Refrigerator | Refrigerator/Freezer - Early Replacement                           | Standard Refrigerator                      | Existing Refrigerator                                      | 538                       | 100.0%                        | 19%   | 85%                                 | 9            | \$452        |
| Existing             | Manufactured     | Refrigerator | Refrigerator/Freezer - Energy Star                                 | Energy Star Refrigerator                   | Existing Refrigerator                                      | 538                       | 20.0%                         | 0%  | 40%                                 | 18           | \$651        |
| Existing             | Manufactured     | Refrigerator | Refrigerator/Freezer - Removal of Secondary                        | Proper Disposal of Refrigerator/Freezer    | Existing Non-Efficient Refrigerator/Freezer                | 538                       | 282.8%                        | 19%   | 95%                                 | 9            | \$103        |
| Existing             | Manufactured     | Refrigerator | Solid state refrigeration (cool chips™) for refrigerators          | Thermoelectric refrigerator, 1.7 cubic ft. | Compact refrigerator, 1.7 cubic ft.                        | 538                       | 4.0%                          | 75%   | 95%                                 | 19           | \$56         |
| Existing             | Manufactured     | Room AC      | Air Conditioner - Room (Individual Rooms) (10,000 BTU/HR)          | EER = 10.8                                 | EER = 9.8  | 440                       | 8.3%                          | NA  | NA                                  | 10           | \$42         |
| Existing             | Manufactured     | Room AC      | Blinds - Fixed Angle/Automatic                                     | Install Blinds (Reduce Window SHGC by 50%) | No Interior Shading Device                                 | 449                       | 41.3%                         | 65%   | 30%                                 | 10           | \$353        |
| Existing             | Manufactured     | Room AC      | Canned Lighting Air Tight Sealing                                  | Canned Lighting Air Tight Sealing          | No Air tight Sealing                                       | 449                       | 3.3%                          | 60%   | 55%                                 | 30           | \$53         |
| Existing             | Manufactured     | Room AC      | Ceiling Fan  | Ceiling Fan                                | No Ceiling Fan   | 449                       | 0.5%                          | 85%   | 45%                                 | 10           | \$104        |
| Existing             | Manufactured     | Room AC      | Cool Roofs   | Lighter Colored Shingles (White)           | Standard Roof Shingles                                     | 449                       | 20.0%                         | 0%  | 95%                                 | 20           | \$34         |
| Existing             | Manufactured     | Room AC      | Doors  | R-11 (Steel Doors with foam core)          | Standard non-thermal wood door (R-2)                       | 449                       | 0.1%                          | 85%   | 50%                                 | 30           | \$116        |
| Existing             | Manufactured     | Room AC      | Doors  | R-5 (Composite Doors with foam core)       | Standard non-thermal wood door (R-2)                       | 449                       | 0.1%                          | 85%   | 55%                                 | 12           | \$42         |
| Existing             | Manufactured     | Room AC      | Doors - Weatherization   | Weatherstripping And Adding Door Sweeps    | Existing Non-Efficient door                                | 449                       | 2.0%                          | 80%   | 65%                                 | 6            | \$31         |
| Existing             | Manufactured     | Room AC      | Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test | Install Caulking And Weatherstripping      | Existing Infiltration Conditions                           | 449                       | 10.0%                         | 75%   | 85%                                 | 15           | \$455        |
| Existing             | Manufactured     | Room AC      | Insulation (Ceiling)   | R-49                                       | State Code (R-38)  | 449                       | 0.3%                          | 87%   | 85%                                 | 25           | \$471        |
| Existing             | Manufactured     | Room AC      | Insulation (Ceiling) - average existing value                      | State Code (R-38)                          | Average Existing Insulation Value (R-19)                   | 449                       | 1.0%                          | 95%   | 40%                                 | 25           | \$674        |
| Existing             | Manufactured     | Room AC      | Insulation (Ceiling) - below code                                  | State Code (R-38)                          | R-9  | 449                       | 0.6%                          | 95%   | 10%                                 | 25           | \$674        |
| Existing             | Manufactured     | Room AC      | Insulation (Duct)  | R-8  | No Duct Insulation   | 449                       | 3.2%                          | 12%   | 75%                                 | 25           | \$201        |
| Existing             | Manufactured     | Room AC      | Insulation (Duct)  | R-8  | R-4  | 449                       | 1.6%                          | 12%   | 95%                                 | 25           | \$103        |
| Existing             | Manufactured     | Room AC      | Insulation (Floor)   | R-38                                       | State Code (R-30)  | 449                       | 0.1%                          | 75%   | 90%                                 | 25           | \$1,061      |
| Existing             | Manufactured     | Room AC      | Insulation (Floor) - average existing value                        | State Code (R-30)                          | Average Existing Insulation Value and/or Code Value (R-20) | 449                       | 0.1%                          | 30%   | 40%                                 | 25           | \$532        |
| Existing             | Manufactured     | Room AC      | Insulation (Floor) - below code                                    | State Code (R-30)                          | R-0  | 449                       | 0.1%                          | 30%   | 10%                                 | 25           | \$1,595      |
| Existing             | Manufactured     | Room AC      | Insulation (Wall) 2*4  | R-13 + R5 Sheathing                        | R-13   | 449                       | 0.0%                          | 10%   | 90%                                 | 25           | \$1,007      |
| Existing             | Manufactured     | Room AC      | Insulation (Wall) 2*4 - average existing value                     | R-13                                       | Average Existing Insulation Value and/or Code Value (R-8)  | 449                       | 0.1%                          | 75%   | 45%                                 | 25           | \$764        |
| Existing             | Manufactured     | Room AC      | Insulation (Wall) 2*4 - below code                                 | R-13                                       | R-0  | 449                       | 0.1%                          | 75%   | 5%                                  | 25           | \$764        |
| Existing             | Manufactured     | Room AC      | Insulation (wall) 2*6 - average existing value                     | State Code (R-21)                          | Average Existing Insulation Value and/or Code Value (R-8)  | 449                       | 0.1%                          | 0%  | 55%                                 | 25           | \$1,114      |
| Existing             | Manufactured     | Room AC      | Insulation (wall) 2*6 - below code                                 | State Code (R-21)                          | R-0  | 449                       | 0.1%                          | 0%  | 45%                                 | 25           | \$1,114      |

| Construction Vintage | Customer Segment | End Use   | Measure Name   | Measure Description                          | Base Equipment   | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|--|--|--|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Manufactured     | Room AC   | Outlet Gasket  | Install Outlet Gasket (Reduce Air Leakage)   | No Outlet Gasket   | 449                       | 2.0%                          | 95%   | 60%                                 | 5            | \$6          |
| Existing             | Manufactured     | Room AC   | Radiant Barrier (Ceiling)  | Install Radiant Barrier                      | No Radiant Barrier   | 449                       | 6.7%                          | 0%  | 97%                                 | 30           | \$365        |
| Existing             | Manufactured     | Room AC   | Windows  | U = 0.19                                     | U=0.30   | 449                       | 13.0%                         | 65%   | 95%                                 | 25           | \$2,378      |
| Existing             | Manufactured     | Room AC   | Windows  | U=0.30                                       | Existing Windows (U=0.65)                                  | 449                       | 36.0%                         | 65%   | 60%                                 | 25           | \$5,656      |
| Existing             | Manufactured     | Room Heat | Canned Lighting Air Tight Sealing                                  | Canned Lighting Air Tight Sealing            | No Air tight Sealing                                       | 5,048                     | 3.3%                          | 60%   | 55%                                 | 30           | \$53         |
| Existing             | Manufactured     | Room Heat | Doors  | R-11 (Steel Doors with foam core)            | Standard non-thermal wood door (R-2)                       | 5,048                     | 3.0%                          | 85%   | 50%                                 | 30           | \$116        |
| Existing             | Manufactured     | Room Heat | Doors  | R-5 (Composite Doors with foam core)         | Standard non-thermal wood door (R-2)                       | 5,048                     | 2.0%                          | 85%   | 55%                                 | 12           | \$42         |
| Existing             | Manufactured     | Room Heat | Doors - Weatherization   | Weatherstripping And Adding Door Sweeps      | Existing Non-Efficient door                                | 5,048                     | 2.0%                          | 80%   | 65%                                 | 6            | \$31         |
| Existing             | Manufactured     | Room Heat | Ductless Mini-Split REM  | 2.5 ton, SEER 15, HSPF 9.0                   | Electric Baseboard Heating HSPF=1                          | 5,048                     | 62.1%                         | 25%   | 95%                                 | 15           | \$5,311      |
| Existing             | Manufactured     | Room Heat | Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test | Install Caulking And Weatherstripping        | Existing Infiltration Conditions                           | 5,048                     | 10.0%                         | 75%   | 85%                                 | 15           | \$455        |
| Existing             | Manufactured     | Room Heat | Insulation (Ceiling)   | R-49   | State Code (R-38)  | 5,048                     | 1.0%                          | 87%   | 85%                                 | 25           | \$471        |
| Existing             | Manufactured     | Room Heat | Insulation (Ceiling) - average existing value                      | State Code (R-38)                            | Average Existing Insulation Value (R-19)                   | 5,048                     | 2.0%                          | 95%   | 40%                                 | 25           | \$674        |
| Existing             | Manufactured     | Room Heat | Insulation (Ceiling) - below code                                  | State Code (R-38)                            | R-9  | 5,048                     | 10.2%                         | 95%   | 10%                                 | 25           | \$674        |
| Existing             | Manufactured     | Room Heat | Insulation (Duct)  | R-8  | No Duct Insulation   | 5,048                     | 4.3%                          | 12%   | 75%                                 | 25           | \$201        |
| Existing             | Manufactured     | Room Heat | Insulation (Duct)  | R-8  | R-4  | 5,048                     | 2.1%                          | 12%   | 95%                                 | 25           | \$103        |
| Existing             | Manufactured     | Room Heat | Insulation (Floor)   | R-38   | State Code (R-30)  | 5,048                     | 1.0%                          | 75%   | 90%                                 | 25           | \$1,061      |
| Existing             | Manufactured     | Room Heat | Insulation (Floor) - average existing value                        | State Code (R-30)                            | Average Existing Insulation Value and/or Code Value (R-20) | 5,048                     | 2.0%                          | 30%   | 40%                                 | 25           | \$532        |
| Existing             | Manufactured     | Room Heat | Insulation (Floor) - below code                                    | State Code (R-30)                            | R-0  | 5,048                     | 10.0%                         | 30%   | 10%                                 | 25           | \$1,595      |
| Existing             | Manufactured     | Room Heat | Insulation (Wall) 2*4  | R-13 + R5 Sheathing                          | R-13   | 5,048                     | 2.2%                          | 10%   | 90%                                 | 25           | \$1,007      |
| Existing             | Manufactured     | Room Heat | Insulation (Wall) 2*4 - average existing value                     | R-13   | Average Existing Insulation Value and/or Code Value (R-8)  | 5,048                     | 5.0%                          | 75%   | 45%                                 | 25           | \$764        |
| Existing             | Manufactured     | Room Heat | Insulation (Wall) 2*4 - below code                                 | R-13   | R-0  | 5,048                     | 44.0%                         | 75%   | 5%                                  | 25           | \$764        |
| Existing             | Manufactured     | Room Heat | Insulation (wall) 2*6 - average existing value                     | State Code (R-21)                            | Average Existing Insulation Value and/or Code Value (R-8)  | 5,048                     | 12.0%                         | 0%  | 55%                                 | 25           | \$1,114      |
| Existing             | Manufactured     | Room Heat | Insulation (wall) 2*6 - below code                                 | State Code (R-21)                            | R-0  | 5,048                     | 49.0%                         | 0%  | 45%                                 | 25           | \$1,114      |
| Existing             | Manufactured     | Room Heat | Outlet Gasket  | Install Outlet Gasket (Reduce Air Leakage)   | No Outlet Gasket   | 5,048                     | 2.0%                          | 95%   | 60%                                 | 5            | \$6          |
| Existing             | Manufactured     | Room Heat | Radiant Barrier (Ceiling)  | Install Radiant Barrier                      | No Radiant Barrier   | 5,048                     | 2.0%                          | 0%  | 97%                                 | 30           | \$365        |
| Existing             | Manufactured     | Room Heat | Radiant Electric Ceiling Panels                                    | Radiant Electric Heating with Ceiling Panels | Electric Baseboard Heating                                 | 5,048                     | 52.0%                         | 45%   | 98%                                 | 20           | \$3,313      |
| Existing             | Manufactured     | Room Heat | Spray in insulation 2*4 Wall                                       | 2*4Wall - closed cell foam insulation R-23   | 2*4Wall R-13   | 5,048                     | 12.0%                         | 0%  | 95%                                 | 25           | \$3,675      |

| Construction Vintage | Customer Segment | End Use    | Measure Name                             | Measure Description                                 | Base Equipment                      | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|--|---|-------------------------------------|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Manufactured     | Room Heat  | Windows                                  | U = 0.19  | U=0.30                              | 5,048                     | 6.0%                          | 65%   | 95%                                 | 25           | \$2,378      |
| Existing             | Manufactured     | Room Heat  | Windows                                  | U=0.30  | Existing Windows (U=0.65)           | 5,048                     | 15.0%                         | 65%   | 60%                                 | 25           | \$5,656      |
| Existing             | Manufactured     | Water Heat | Water_Heater (40 Gallon Electric)        | EF = 0.95   | EF = 0.92                           | 3,199                     | 3.2%                          | NA  | NA                                  | 15           | \$129        |
| Existing             | Manufactured     | Water Heat | Clothes Washer                           | Energy Star MEF = 1.83 (top Load)                   | Standard Clothes Washer (1.26)      | 3,277                     | 9.3%                          | 30%   | 68%                                 | 14           | \$252        |
| Existing             | Manufactured     | Water Heat | Clothes Washer                           | Tier 2. MEF = 2.01 (front load)                     | Standard Clothes Washer (1.26)      | 3,277                     | 11.2%                         | 30%   | 91%                                 | 14           | \$312        |
| Existing             | Manufactured     | Water Heat | Clothes Washer                           | Tier 2. MEF = 2.2 (front load)                      | Standard Clothes Washer (1.26)      | 3,277                     | 12.8%                         | 30%   | 91%                                 | 14           | \$417        |
| Existing             | Manufactured     | Water Heat | Clothes Washer - Early Replacement       | Standard Clothes Washer (1.26)                      | Existing Clothes Washer (MEF = 1.1) | 3,277                     | 3.8%                          | 30%   | 25%                                 | 14           | \$378        |
| Existing             | Manufactured     | Water Heat | Desuperheater (Ground-Source system)     | Heat_Pump) Desuperheater with Standard Water_Heater | Standard Water_Heater - EF = 0.92   | 3,277                     | 55.2%                         | 5%  | 90%                                 | 10           | \$251        |
| Existing             | Manufactured     | Water Heat | Dishwasher                               | EF = 0.77   | EF = 0.65 (ENERGY STAR)             | 3,277                     | 1.2%                          | 23%   | 35%                                 | 13           | \$514        |
| Existing             | Manufactured     | Water Heat | Dishwasher - Existing                    | EF = 0.65 (ENERGY STAR)                             | EF = 0.46 Existing Dishwasher       | 3,277                     | 2.2%                          | 23%   | 15%                                 | 13           | \$11         |
| Existing             | Manufactured     | Water Heat | Drain Water Heat Recovery                | Drain Water Heat Recovery (GFX or Power-Pipe)       | No Drain Water Heat Recovery        | 3,277                     | 18.5%                         | 0%  | 95%                                 | 30           | \$630        |
| Existing             | Manufactured     | Water Heat | Faucet Aerators                          | 0.5 GPM   | 2.2 GPM                             | 3,277                     | 4.9%                          | 95%   | 95%                                 | 9            | \$3          |
| Existing             | Manufactured     | Water Heat | Faucet Aerators                          | 1.5 GPM   | 2.2 GPM                             | 3,277                     | 2.0%                          | 95%   | 55%                                 | 9            | \$2          |
| Existing             | Manufactured     | Water Heat | Faucet Aerators                          | 2.2 GPM   | Existing Faucet Aerator (3.0 GPM)   | 3,277                     | 2.3%                          | 95%   | 10%                                 | 9            | \$2          |
| Existing             | Manufactured     | Water Heat | Heat Pump Water Heater                   | EF=2.9  | No Heat Pump Water Heater           | 3,277                     | 54.6%                         | 30%   | 95%                                 | 15           | \$2,322      |
| Existing             | Manufactured     | Water Heat | Hot Water Pipe Insulation                | R-4 Wrap  | No insulation                       | 3,277                     | 1.2%                          | 65%   | 25%                                 | 5            | \$8          |
| Existing             | Manufactured     | Water Heat | Low-Flow Showerheads                     | 1.75 GPM  | 2.5 GPM                             | 3,277                     | 8.4%                          | 95%   | 85%                                 | 10           | \$5          |
| Existing             | Manufactured     | Water Heat | Low-Flow Showerheads                     | 2.5 GPM   | 3.0 GPM                             | 3,277                     | 5.6%                          | 95%   | 33%                                 | 10           | \$12         |
| Existing             | Manufactured     | Water Heat | Solar Hot Water (SHW)                    | Solar thermal collector                             | Non-solar hot water heater          | 3,277                     | 44.4%                         | 20%   | 95%                                 | 20           | \$8,930      |
| Existing             | Manufactured     | Water Heat | Tankless Water_Heater                    | EF = 0.95, 4.0 gpm                                  | EF = 0.92                           | 3,277                     | 3.2%                          | 85%   | 96%                                 | 20           | \$1,429      |
| Existing             | Manufactured     | Water Heat | Water_Heater Tank Blanket/Insulation     | Install Insulation (R-5)                            | No Tank Insulation                  | 3,277                     | 6.5%                          | 0%  | 55%                                 | 10           | \$19         |
| Existing             | Manufactured     | Water Heat | Water_Heater Thermostat Setback          | 120 degrees   | 135 degrees                         | 3,277                     | 6.0%                          | 95%   | 43%                                 | 4            | \$0          |
| New                  | Manufactured     | Central AC | Air Conditioner - Central (2.5 ton unit) | SEER 14   | SEER 13                             | 621                       | 6.4%                          | NA  | NA                                  | 15           | \$336        |
| New                  | Manufactured     | Central AC | Air Conditioner - Central (2.5 ton unit) | SEER 16   | SEER 13                             | 621                       | 16.1%                         | NA  | NA                                  | 15           | \$880        |
| New                  | Manufactured     | Central AC | Air Conditioner - Central (2.5 ton unit) | SEER 18   | SEER 13                             | 621                       | 23.6%                         | NA  | NA                                  | 15           | \$1,353      |
| New                  | Manufactured     | Central AC | Air-to-Air Heat Exchangers               | Air-to-Air Heat Exchangers                          | No Air to Air Heat Exchangers       | 538                       | 10.0%                         | 0%  | 95%                                 | 15           | \$990        |
| New                  | Manufactured     | Central AC | Blinds - Fixed Angle/Automatic           | Install Blinds (Reduce Window SHGC by 50%)          | No Interior Shading Device          | 538                       | 31.5%                         | 65%   | 30%                                 | 10           | \$353        |
| New                  | Manufactured     | Central AC | Canned Lighting Air Tight Sealing        | Canned Lighting Air Tight Sealing                   | No Air tight Sealing                | 538                       | 3.3%                          | 75%   | 25%                                 | 30           | \$3          |
| New                  | Manufactured     | Central AC | Ceiling Fan                              | Ceiling Fan   | No Ceiling Fan                      | 538                       | 0.5%                          | 85%   | 45%                                 | 10           | \$104        |

| Construction Vintage | Customer Segment | End Use    | Measure Name                            | Measure Description   | Base Equipment                                 | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|---|--|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Manufactured     | Central AC | Check Mel O&M Tune-up                   | Tune-up/Maintenance   | No Tune-up Maintenance                         | 538                       | 10.0%                         | 90%   | 50%                                 | 5            | \$236        |
| New                  | Manufactured     | Central AC | Construction - ICF                      | Concrete Framing  | Standard Wood Framing                          | 538                       | 32.0%                         | 1%  | 95%                                 | 30           | \$6,442      |
| New                  | Manufactured     | Central AC | Construction - SIP                      | Specialty Framing   | Standard Wood Framing                          | 538                       | 14.0%                         | 1%  | 95%                                 | 30           | \$5,680      |
| New                  | Manufactured     | Central AC | Cool Roofs                              | Lighter Colored Shingles (White)  | Standard Roof Shingles                         | 538                       | 20.0%                         | 0%  | 95%                                 | 20           | \$34         |
| New                  | Manufactured     | Central AC | Doors                                   | R-11 (Steel Doors with foam core)   | Standard non-thermal wood door (R-2)           | 538                       | 0.1%                          | 85%   | 50%                                 | 30           | \$116        |
| New                  | Manufactured     | Central AC | Doors                                   | R-5 (Composite Doors with foam core)  | Standard non-thermal wood door (R-2)           | 538                       | 0.1%                          | 85%   | 55%                                 | 12           | \$42         |
| New                  | Manufactured     | Central AC | Duct Location                           | Conditioned Space Design - Duct Loss Is Not A Concern                       | Ducts in Unconditioned Space (Duct loss)       | 538                       | 8.0%                          | 85%   | 75%                                 | 30           | \$126        |
| New                  | Manufactured     | Central AC | Duct Sealing                            | Duct Sealing  | No Duct Sealing                                | 538                       | 6.0%                          | 0%  | 65%                                 | 20           | \$447        |
| New                  | Manufactured     | Central AC | Duct Sealing - Aerosol-Based            | Spray-in ductwork sealant to minimize duct leaks                            | New homes with AFUE HVAC, SEER 13              | 538                       | 19.0%                         | 0%  | 95%                                 | 25           | \$525        |
| New                  | Manufactured     | Central AC | Ductless Mini-Split REM                 | 2.5 ton, SEER 15, HSPF 9.0  | SEER 13 Central AC                             | 538                       | 10.8%                         | 80%   | 95%                                 | 15           | \$1,713      |
| New                  | Manufactured     | Central AC | Evaporative Space Cooling               | SEER 40   | SEER 13  | 538                       | 70.0%                         | 75%   | 95%                                 | 10           | \$1,119      |
| New                  | Manufactured     | Central AC | Green Roof                              | ecorooft  | Standard Roof                                  | 538                       | 6.5%                          | 0%  | 98%                                 | 40           | \$12669      |
| New                  | Manufactured     | Central AC | Insulation (Ceiling)                    | R-49  | State Code (R-38)                              | 538                       | 0.1%                          | 87%   | 85%                                 | 25           | \$582        |
| New                  | Manufactured     | Central AC | Insulation (Floor)                      | R-38  | State Code (R-30)                              | 538                       | 0.1%                          | 75%   | 90%                                 | 25           | \$1,061      |
| New                  | Manufactured     | Central AC | Insulation (wall) 2*6                   | R-21 + R5 Sheathing   | State Code (R-21)                              | 538                       | 0.0%                          | 95%   | 50%                                 | 25           | \$372        |
| New                  | Manufactured     | Central AC | Leak Proof Duct Fittings                | Quick connect fittings that do not require mastic or drawbands (5 per unit) | 13 SEER  | 538                       | 15.0%                         | 0%  | 95%                                 | 30           | \$96         |
| New                  | Manufactured     | Central AC | Motor - ECM Motor                       | ECM motor for Central Air Conditioner                                       | Standard Motor                                 | 538                       | 4.5%                          | 65%   | 95%                                 | 15           | \$368        |
| New                  | Manufactured     | Central AC | Outlet Gasket                           | Install Outlet Gasket (Reduce Air Leakage)                                  | No Outlet Gasket                               | 538                       | 2.0%                          | 95%   | 40%                                 | 5            | \$6          |
| New                  | Manufactured     | Central AC | Proper Sizing - Central Air Conditioner | Correctly Sized Air Conditioner Unit  | Oversized Air Conditioner Unit                 | 538                       | 6.0%                          | 53%   | 85%                                 | 15           | \$1          |
| New                  | Manufactured     | Central AC | Radiant Barrier (Ceiling)               | Install Radiant Barrier   | No Radiant Barrier                             | 538                       | 6.7%                          | 0%  | 97%                                 | 30           | \$365        |
| New                  | Manufactured     | Central AC | Solar Attic Fan                         | Solar electric attic ventilation  | Standard passive ventilation                   | 538                       | 6.0%                          | 70%   | 95%                                 | 10           | \$762        |
| New                  | Manufactured     | Central AC | Thermostat - Clock/Programmable         | Programmable Thermostat   | Manual Thermostat                              | 538                       | 6.8%                          | 85%   | 50%                                 | 15           | \$27         |
| New                  | Manufactured     | Central AC | Thermostat - Multi-Zone                 | Individual Room Temperature Control for Major Occupied Rooms                | Programmable Thermostat - Central Control Only | 538                       | 7.0%                          | 65%   | 95%                                 | 12           | \$1,150      |
| New                  | Manufactured     | Central AC | VSD Motor - ECM                         | Variable Speed Motor (ECM) for Central Air Conditioner                      | Constant Speed Motor                           | 538                       | 13.5%                         | 90%   | 85%                                 | 20           | \$341        |
| New                  | Manufactured     | Central AC | Whole-House Dehumidifier                | Whole-House Dehumidifier  | No Dehumidifier                                | 538                       | 6.0%                          | 50%   | 95%                                 | 11           | \$1,439      |
| New                  | Manufactured     | Central AC | Whole-House Fan                         | Whole-House Fan   | No Whole-House Fan                             | 538                       | 22.0%                         | 50%   | 96%                                 | 15           | \$334        |
| New                  | Manufactured     | Central AC | Window Overhang                         | Overhangs over windows for shading  | No window overhangs                            | 538                       | 14.0%                         | 50%   | 80%                                 | 30           | \$724        |

| Construction Vintage | Customer Segment | End Use      | Measure Name                       | Measure Description   | Base Equipment                                 | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------|------------------------------------|---|--|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Manufactured     | Central AC   | Windows                            | U = 0.19  | U=0.30   | 538                       | 5.0%                          | 85%   | 95%                                 | 25           | \$2,757      |
| New                  | Manufactured     | Central Heat | Air-to-Air Heat Exchangers         | Air-to-Air Heat Exchangers  | No Air to Air Heat Exchangers                  | 4,632                     | 10.0%                         | 0%  | 95%                                 | 15           | \$990        |
| New                  | Manufactured     | Central Heat | Canned Lighting Air Tight Sealing  | Canned Lighting Air Tight Sealing   | No Air tight Sealing                           | 4,632                     | 3.3%                          | 75%   | 25%                                 | 30           | \$3          |
| New                  | Manufactured     | Central Heat | Construction - ICF                 | Concrete Framing  | Standard Wood Framing                          | 4,632                     | 44.0%                         | 1%  | 95%                                 | 30           | \$6,442      |
| New                  | Manufactured     | Central Heat | Construction - SIP                 | Specialty Framing   | Standard Wood Framing                          | 4,632                     | 14.0%                         | 1%  | 95%                                 | 30           | \$5,680      |
| New                  | Manufactured     | Central Heat | Doors                              | R-11 (Steel Doors with foam core)   | Standard non-thermal wood door (R-2)           | 4,632                     | 5.0%                          | 85%   | 50%                                 | 30           | \$116        |
| New                  | Manufactured     | Central Heat | Doors                              | R-5 (Composite Doors with foam core)  | Standard non-thermal wood door (R-2)           | 4,632                     | 3.0%                          | 85%   | 55%                                 | 12           | \$42         |
| New                  | Manufactured     | Central Heat | Duct Location                      | Conditioned Space Design - Duct Loss Is Not A Concern                       | Ducts in Unconditioned Space (Duct loss)       | 4,632                     | 8.0%                          | 85%   | 75%                                 | 30           | \$126        |
| New                  | Manufactured     | Central Heat | Duct Sealing                       | Duct Sealing  | No Duct Sealing                                | 4,632                     | 6.0%                          | 0%  | 65%                                 | 20           | \$447        |
| New                  | Manufactured     | Central Heat | Duct Sealing - Aerosol-Based       | Spray-in ductwork sealant to minimize duct leaks                            | New homes with AFUE HVAC, SEER 13              | 4,632                     | 19.0%                         | 0%  | 95%                                 | 25           | \$525        |
| New                  | Manufactured     | Central Heat | Green Roof                         | ecorroof  | Standard Roof                                  | 4,632                     | 6.5%                          | 0%  | 98%                                 | 40           | \$12669      |
| New                  | Manufactured     | Central Heat | Insulation (Ceiling)               | R-49  | State Code (R-38)                              | 4,632                     | 3.0%                          | 87%   | 85%                                 | 25           | \$582        |
| New                  | Manufactured     | Central Heat | Insulation (Floor)                 | R-38  | State Code (R-30)                              | 4,632                     | 2.0%                          | 75%   | 90%                                 | 25           | \$1,061      |
| New                  | Manufactured     | Central Heat | Insulation (wall) 2*6              | R-21 + R5 Sheathing   | State Code (R-21)                              | 4,632                     | 3.2%                          | 95%   | 50%                                 | 25           | \$372        |
| New                  | Manufactured     | Central Heat | Leak Proof Duct Fittings           | Quick connect fittings that do not require mastic or drawbands (5 per unit) | 13 SEER  | 4,632                     | 15.0%                         | 0%  | 95%                                 | 30           | \$96         |
| New                  | Manufactured     | Central Heat | Outlet Gasket                      | Install Outlet Gasket (Reduce Air Leakage)                                  | No Outlet Gasket                               | 4,632                     | 2.0%                          | 95%   | 40%                                 | 5            | \$6          |
| New                  | Manufactured     | Central Heat | Radiant Barrier (Ceiling)          | Install Radiant Barrier   | No Radiant Barrier                             | 4,632                     | 2.0%                          | 0%  | 97%                                 | 30           | \$365        |
| New                  | Manufactured     | Central Heat | Spray in insulation 2*4 Wall       | 2*4Wall - closed cell foam insulation R-23                                  | 2*6Wall R-21                                   | 4,632                     | 3.0%                          | 90%   | 90%                                 | 25           | \$4,071      |
| New                  | Manufactured     | Central Heat | Spray in insulation 2*6 Wall       | 2*6Wall - closed cell foam insulation R-37                                  | 2*6Wall R-21                                   | 4,632                     | 10.0%                         | 90%   | 90%                                 | 25           | \$5,843      |
| New                  | Manufactured     | Central Heat | Thermostat - Clock/Programmable    | Programmable Thermostat   | Manual Thermostat                              | 4,632                     | 6.8%                          | 85%   | 50%                                 | 15           | \$27         |
| New                  | Manufactured     | Central Heat | Thermostat - Multi-Zone            | Individual Room Temperature Control for Major Occupied Rooms                | Programmable Thermostat - Central Control Only | 4,632                     | 7.0%                          | 65%   | 95%                                 | 12           | \$1,150      |
| New                  | Manufactured     | Central Heat | Windows                            | U = 0.19  | U=0.30   | 4,632                     | 16.0%                         | 85%   | 95%                                 | 25           | \$2,757      |
| New                  | Manufactured     | Cooking Oven | Convection Oven                    | Convection Oven (wall oven)   | Standard Oven (wall oven)                      | 435                       | 23.0%                         | 85%   | 85%                                 | 15           | \$432        |
| New                  | Manufactured     | Dryer        | Clothes Dryer With Moisture Sensor | High-Efficiency Clothes Dryer With Moisture Sensor                          | Standard Dryer Without Moisture Sensor         | 720                       | 13.0%                         | NA  | NA                                  | 18           | \$58         |
| New                  | Manufactured     | Freezer      | Freezer - Stand-Alone              | Energy Star 14.8 cu ft Chest Freezer  | Standard 14.8 cu ft Freezer                    | 553                       | 10.0%                         | NA  | NA                                  | 12           | \$26         |
| New                  | Manufactured     | HVAC Aux     | Motor - ECM Motor                  | ECM Motor for Forced Air Electric Furnace                                   | Standard Motor                                 | 405                       | 25.0%                         | 6%  | 95%                                 | 15           | \$368        |
| New                  | Manufactured     | HVAC Aux     | Motor - ECM Motor                  | ECM Motor for Forced Air Gas Furnace  | Standard Motor                                 | 405                       | 25.0%                         | 72%   | 95%                                 | 15           | \$368        |

| Construction Vintage | Customer Segment | End Use   | Measure Name   | Measure Description   | Base Equipment  | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|--|---|---|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Manufactured     | HVAC Aux  | VSD Fan  | Variable Speed Fan - Electric Furnace                                       | Constant Speed Fan  | 405                       | 75.0%                         | 40%   | 85%                                 | 20           | \$447        |
| New                  | Manufactured     | HVAC Aux  | VSD Fan  | Variable Speed Fan - Gas Furnace  | Constant Speed Fan  | 405                       | 75.0%                         | 29%   | 85%                                 | 20           | \$447        |
| New                  | Manufactured     | Heat Pump | Air Source Heat_Pump   | 2.5 ton, 14 SEER, 8.5 HSPF  | 2.5 ton, 13 SEER, 7.7 HSPF  | 3,441                     | 4.9%                          | NA  | NA                                  | 15           | \$420        |
| New                  | Manufactured     | Heat Pump | Air Source Heat_Pump   | 2.5 ton, 16 SEER, 8.8 HSPF  | 2.5 ton, 13 SEER, 7.7 HSPF  | 3,441                     | 7.4%                          | NA  | NA                                  | 15           | \$543        |
| New                  | Manufactured     | Heat Pump | Air Source Heat_Pump   | 2.5 ton, 18 SEER, 9.0 HSPF  | 2.5 ton, 13 SEER, 7.7 HSPF  | 3,441                     | 9.2%                          | NA  | NA                                  | 15           | \$1,210      |
| New                  | Manufactured     | Heat Pump | Advanced Cold-Climate Heat Pump                                  | 16 SEER, 9.6 HSPF   | 13 SEER, 7.7 HSPF, 2.5 ton  | 3,249                     | 14.0%                         | 20%   | 99%                                 | 20           | \$3,677      |
| New                  | Manufactured     | Heat Pump | Air-to-Air Heat Exchangers                                       | Air-to-Air Heat Exchangers  | No Air to Air Heat Exchangers   | 3,249                     | 10.0%                         | 0%  | 95%                                 | 15           | \$990        |
| New                  | Manufactured     | Heat Pump | Blinds - Fixed Angle/Automatic                                   | Install Blinds (Reduce Window SHGC by 50%)                                  | No Interior Shading Device  | 3,249                     | 4.4%                          | 65%   | 30%                                 | 10           | \$353        |
| New                  | Manufactured     | Heat Pump | Canned Lighting Air Tight Sealing                                | Canned Lighting Air Tight Sealing   | No Air tight Sealing  | 3,249                     | 3.3%                          | 75%   | 25%                                 | 30           | \$3          |
| New                  | Manufactured     | Heat Pump | Ceiling Fan  | Ceiling Fan   | No Ceiling Fan  | 3,249                     | 0.1%                          | 85%   | 45%                                 | 10           | \$104        |
| New                  | Manufactured     | Heat Pump | Construction - ICF   | Concrete Framing  | Standard Wood Framing   | 3,249                     | 43.3%                         | 1%  | 95%                                 | 30           | \$6,442      |
| New                  | Manufactured     | Heat Pump | Construction - SIP   | Specialty Framing   | Standard Wood Framing   | 3,249                     | 14.0%                         | 1%  | 95%                                 | 30           | \$5,680      |
| New                  | Manufactured     | Heat Pump | Cool Roofs   | Lighter Colored Shingles (White)  | Standard Roof Shingles  | 3,249                     | 2.8%                          | 0%  | 95%                                 | 20           | \$34         |
| New                  | Manufactured     | Heat Pump | Doors  | R-11 (Steel Doors with foam core)   | Standard non-thermal wood door (R-2)  | 3,249                     | 3.0%                          | 85%   | 50%                                 | 30           | \$116        |
| New                  | Manufactured     | Heat Pump | Doors  | R-5 (Composite Doors with foam core)  | Standard non-thermal wood door (R-2)  | 3,249                     | 2.0%                          | 85%   | 55%                                 | 12           | \$42         |
| New                  | Manufactured     | Heat Pump | Duct Location  | Conditioned Space Design - Duct Loss Is Not A Concern                       | Ducts in Unconditioned Space (Duct loss)                                    | 3,249                     | 8.0%                          | 85%   | 75%                                 | 30           | \$126        |
| New                  | Manufactured     | Heat Pump | Green Roof   | ecorooft  | Standard Roof   | 3,249                     | 6.5%                          | 0%  | 98%                                 | 40           | \$12669      |
| New                  | Manufactured     | Heat Pump | Heat_Pump - Ground or Water-Source - Open Loop (Desuperheater)   | EER = 16.2, COP = 3.6   | Air Source Heat_Pump - 13 SEER, 7.7 HSPF (Federal Code) (11.3 EER, 3.2 COP) | 3,249                     | 16.8%                         | 15%   | 99%                                 | 18           | \$13492      |
| New                  | Manufactured     | Heat Pump | Heat_Pump - Ground or Water-Source - Closed Loop (Desuperheater) | EER = 14.1, COP = 3.3   | Air Source Heat_Pump - 13 SEER, 7.7 HSPF (Federal Code) (11.3 EER, 3.2 COP) | 3,249                     | 6.2%                          | 30%   | 99%                                 | 18           | \$13492      |
| New                  | Manufactured     | Heat Pump | Insulation (Ceiling)   | R-49  | State Code (R-38)   | 3,249                     | 2.0%                          | 87%   | 85%                                 | 25           | \$582        |
| New                  | Manufactured     | Heat Pump | Insulation (Floor)   | R-38  | State Code (R-30)   | 3,249                     | 1.0%                          | 75%   | 90%                                 | 25           | \$1,061      |
| New                  | Manufactured     | Heat Pump | Insulation (wall) 2*6  | R-21 + R5 Sheathing   | State Code (R-21)   | 3,249                     | 2.1%                          | 95%   | 50%                                 | 25           | \$372        |
| New                  | Manufactured     | Heat Pump | Leak Proof Duct Fittings   | Quick connect fittings that do not require mastic or drawbands (5 per unit) | 13 SEER   | 3,249                     | 15.0%                         | 0%  | 95%                                 | 30           | \$96         |
| New                  | Manufactured     | Heat Pump | Micro Channel Heat Exchangers (Evaporator)                       | Micro Channel Heat Exchangers (5 ton unit)                                  | 13 SEER, 7.7 HSPF, 2.5 ton  | 3,249                     | 5.0%                          | 15%   | 99%                                 | 18           | \$3,890      |
| New                  | Manufactured     | Heat Pump | Motor - ECM Motor  | ECM motor for Heat Pump   | Standard Motor  | 3,249                     | 1.3%                          | 65%   | 95%                                 | 15           | \$368        |
| New                  | Manufactured     | Heat Pump | Outlet Gasket  | Install Outlet Gasket (Reduce Air Leakage)                                  | No Outlet Gasket  | 3,249                     | 2.0%                          | 95%   | 40%                                 | 5            | \$6          |
| New                  | Manufactured     | Heat Pump | PTCS Aerosol-Based Duct Sealing                                  | Spray-in ductwork sealant to minimize duct leaks                            | No Duct Sealing   | 3,249                     | 19.0%                         | 60%   | 65%                                 | 25           | \$525        |



| Construction Vintage | Customer Segment | End Use   | Measure Name   | Measure Description  | Base Equipment                                 | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|--|--|--|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Manufactured     | Heat Pump | PTCS Duct Sealing                                      | PTCS Duct Sealing  | No Duct Sealing                                | 3,249                     | 15.0%                         | 60%   | 65%                                 | 20           | \$447        |
| New                  | Manufactured     | Heat Pump | Proper Sizing - Heat Pump                              | Correctly Sized Heat_Pump (Cooling And Heating Unit)         | Oversized Heat_Pump                            | 3,249                     | 8.6%                          | 53%   | 85%                                 | 15           | \$1          |
| New                  | Manufactured     | Heat Pump | Radiant Barrier (Ceiling)                              | Install Radiant Barrier                                      | No Radiant Barrier                             | 3,249                     | 2.7%                          | 0%  | 97%                                 | 30           | \$365        |
| New                  | Manufactured     | Heat Pump | Small Scale Absorption Cooling                         | Small Scale Absorption Cooling (5 ton)                       | 13 SEER, 7.7 HSPF, 2.5 ton                     | 3,249                     | 9.0%                          | 0%  | 99%                                 | 20           | \$946        |
| New                  | Manufactured     | Heat Pump | Solar Attic Fan  | Solar electric attic ventilation                             | Standard passive ventilation                   | 3,249                     | 0.8%                          | 70%   | 95%                                 | 10           | \$762        |
| New                  | Manufactured     | Heat Pump | Solid state refrigeration (cool chips™) for heat pumps | Solid State Thermoelectric cooling system                    | 13 SEER, 7.7 HSPF, 2.5 ton                     | 3,249                     | 18.0%                         | 29%   | 99%                                 | 18           | \$2,101      |
| New                  | Manufactured     | Heat Pump | Spray in insulation 2*4 Wall                           | 2*4Wall - closed cell foam insulation R-23                   | 2*6Wall R-21                                   | 3,249                     | 3.0%                          | 90%   | 90%                                 | 25           | \$4,071      |
| New                  | Manufactured     | Heat Pump | Spray in insulation 2*6 Wall                           | 2*6Wall - closed cell foam insulation R-37                   | 2*6Wall R-21                                   | 3,249                     | 8.0%                          | 90%   | 90%                                 | 25           | \$5,843      |
| New                  | Manufactured     | Heat Pump | Thermostat - Clock/Programmable                        | Programmable Thermostat                                      | Manual Thermostat                              | 3,249                     | 6.8%                          | 0%  | 25%                                 | 15           | \$27         |
| New                  | Manufactured     | Heat Pump | Thermostat - Multi-Zone                                | Individual Room Temperature Control for Major Occupied Rooms | Programmable Thermostat - Central Control Only | 3,249                     | 7.0%                          | 65%   | 95%                                 | 12           | \$1,150      |
| New                  | Manufactured     | Heat Pump | VSD Motor - ECM  | Variable Speed Motor (ECM) for Heat Pump                     | Constant Speed Motor                           | 3,249                     | 3.8%                          | 90%   | 85%                                 | 20           | \$341        |
| New                  | Manufactured     | Heat Pump | Whole-House Fan  | Whole-House Fan  | No Whole-House Fan                             | 3,249                     | 3.3%                          | 50%   | 96%                                 | 15           | \$334        |
| New                  | Manufactured     | Heat Pump | Windows  | U = 0.19   | U=0.30   | 3,249                     | 11.0%                         | 85%   | 95%                                 | 25           | \$2,757      |
| New                  | Manufactured     | Lighting  | CFL Fixtures, High Use                                 | 2-15 W CFLs, 4.0 hr/day (37%)                                | 2-60 W Incandescent                            | 1,289                     | 4.7%                          | 98%   | 62%                                 | 20           | \$35         |
| New                  | Manufactured     | Lighting  | CFL Fixtures, Low Use                                  | 2-15 W CFLs, 1.0 hr/day (32%)                                | 2-60 W Incandescent                            | 1,289                     | 4.0%                          | 98%   | 62%                                 | 20           | \$30         |
| New                  | Manufactured     | Lighting  | CFL Fixtures, Medium Use                               | 2-15 W CFLs, 2.5 hr/day (33%)                                | 2-60 W Incandescent                            | 1,289                     | 4.2%                          | 98%   | 62%                                 | 20           | \$33         |
| New                  | Manufactured     | Lighting  | CFL Lamps, High Use                                    | 1-15W, 4.0 hr/day (37%)                                      | Incandescent 60W                               | 1,289                     | 34.0%                         | 86%   | 62%                                 | 7            | \$2          |
| New                  | Manufactured     | Lighting  | CFL Lamps, Low Use                                     | 1-15W, 1.0 hr/day (32%)                                      | Incandescent 60W                               | 1,289                     | 9.7%                          | 86%   | 62%                                 | 27           | \$2          |
| New                  | Manufactured     | Lighting  | CFL Lamps, Medium Use                                  | 1-15W, 2.5 hr/day (33%)                                      | Incandescent 60W                               | 1,289                     | 14.0%                         | 86%   | 62%                                 | 11           | \$2          |
| New                  | Manufactured     | Lighting  | CFL Lighting - 3-Way                                   | 13 W, 20W And 25W  | 30W, 75W, 100W                                 | 1,289                     | 1.8%                          | 75%   | 62%                                 | 7            | \$13         |
| New                  | Manufactured     | Lighting  | CFL Torchieries, High Use                              | 55 W CFL, (20%)  | Incandescent Torchieries, 180W Halogen         | 1,289                     | 0.4%                          | 70%   | 35%                                 | 7            | \$7          |
| New                  | Manufactured     | Lighting  | CFL Torchieries, Low Use                               | 55 W CFL, (20%)  | Incandescent Torchieries, 180W Halogen         | 1,289                     | 0.4%                          | 70%   | 35%                                 | 27           | \$7          |
| New                  | Manufactured     | Lighting  | CFL Torchieries, Medium Use                            | 55 W CFL, (60%)  | Incandescent Torchieries, 180W Halogen         | 1,289                     | 1.3%                          | 70%   | 35%                                 | 11           | \$7          |
| New                  | Manufactured     | Lighting  | Daylighting Controls (Photocell) - Indoor/Outdoors     | Install Photocell  | No Daylighting Controls                        | 1,289                     | 4.5%                          | 0%  | 95%                                 | 10           | \$110        |
| New                  | Manufactured     | Lighting  | LED Christmas Lighting                                 | LED Christmas Lighting                                       | Incandescent Christmas Lighting                | 1,289                     | 0.4%                          | 40%   | 85%                                 | 13           | \$11         |
| New                  | Manufactured     | Lighting  | LED Interior Lighting (White), High Use                | LED 4W   | Incandescent 60W                               | 1,289                     | 42.3%                         | 85%   | 98%                                 | 13           | \$31         |
| New                  | Manufactured     | Lighting  | LED Interior Lighting (White), Low Use                 | LED 4W   | Incandescent 60W                               | 1,289                     | 12.1%                         | 85%   | 98%                                 | 13           | \$31         |
| New                  | Manufactured     | Lighting  | LED Interior Lighting (White), Medium Use              | LED 4W   | Incandescent 60W                               | 1,289                     | 17.4%                         | 85%   | 98%                                 | 13           | \$31         |



| Construction Vintage | Customer Segment | End Use      | Measure Name   | Measure Description  | Base Equipment                           | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------|--|--|--|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Manufactured     | Lighting     | Occupancy Sensors  | Wall-Switch Occupancy Sensors  | No Occupancy Sensor                      | 1,289                     | 14.0%                         | 75%   | 85%                                 | 10           | \$64         |
| New                  | Manufactured     | Lighting     | Time Clocks (Exterior Lighting)                              | Exterior Lighting on a Time Clock  | Exterior Lighting (Manual Control)       | 1,289                     | 1.9%                          | 75%   | 90%                                 | 10           | \$93         |
| New                  | Manufactured     | Plug Load    | 1-Watt Standby Power   | 1W or less standby power use for small appliances                            | Standard plug load appliance.            | 1,542                     | 4.2%                          | 15%   | 85%                                 | 7            | \$32         |
| New                  | Manufactured     | Plug Load    | Energy Star Battery Chargers                                 | Energy Star Battery Chargers   | Standard Battery Chargers                | 1,542                     | 0.2%                          | 55%   | 40%                                 | 7            | \$4          |
| New                  | Manufactured     | Plug Load    | Energy Star DVD System                                       | Energy Star DVD System   | Standard DVD System                      | 1,542                     | 1.9%                          | 100%  | 24%                                 | 7            | \$12         |
| New                  | Manufactured     | Plug Load    | Energy Star Dehumidifiers                                    | Energy Star Dehumidifiers  | Standard Dehumidifiers                   | 1,542                     | 0.5%                          | 15%   | 5%                                  | 10           | \$13         |
| New                  | Manufactured     | Plug Load    | Energy Star Digital Set Top Receiver                         | Energy Star Digital Set Top Receiver   | Standard Digital Set Top Receiver        | 1,542                     | 1.9%                          | 94%   | 62%                                 | 6            | \$37         |
| New                  | Manufactured     | Plug Load    | Energy Star HDTV   | Energy Star HDTV   | Standard HDTV                            | 1,542                     | 2.5%                          | 24%   | 70%                                 | 9            | \$105        |
| New                  | Manufactured     | Plug Load    | Energy Star Home Audio System                                | Energy Star Home Audio System  | Standard Home Audio system               | 1,542                     | 2.6%                          | 92%   | 90%                                 | 7            | \$21         |
| New                  | Manufactured     | Plug Load    | Energy Star Office Computer                                  | Energy Star Office Computer  | Standard Office Computer                 | 1,542                     | 10.4%                         | 73%   | 15%                                 | 4            | \$84         |
| New                  | Manufactured     | Plug Load    | Energy Star Office Copiers                                   | Energy Star Office Copiers   | Standard Office Copiers                  | 1,542                     | 1.5%                          | 17%   | 55%                                 | 6            | \$53         |
| New                  | Manufactured     | Plug Load    | Energy Star Office Monitor                                   | Energy Star Office Monitor   | Standard Office Monitor                  | 1,542                     | 3.3%                          | 100%  | 15%                                 | 4            | \$16         |
| New                  | Manufactured     | Plug Load    | Energy Star Office Printer                                   | Energy Star Office Printer   | Standard Office Printer                  | 1,542                     | 0.3%                          | 62%   | 40%                                 | 5            | \$11         |
| New                  | Manufactured     | Plug Load    | Energy Star TV   | Energy Star TV   | Standard TV                              | 1,542                     | 3.5%                          | 100%  | 38%                                 | 9            | \$32         |
| New                  | Manufactured     | Plug Load    | Energy Star VCR  | Energy Star VCR/DVD Combo  | Standard Home VCR                        | 1,542                     | 0.7%                          | 100%  | 45%                                 | 4            | \$38         |
| New                  | Manufactured     | Plug Load    | Power supply transformer/converter - External power adapters | Power supply transformer/converter - High efficiency External power adapters | Standard Efficiency                      | 1,542                     | 0.7%                          | 85%   | 40%                                 | 7            | \$8          |
| New                  | Manufactured     | Plug Load    | Powerstrip with Occupancy Sensor                             | Powerstrip with Occupancy Sensor   | Powerstrip w/o Occupancy Sensor          | 1,542                     | 1.0%                          | 75%   | 90%                                 | 10           | \$88         |
| New                  | Manufactured     | Refrigerator | Refrigerator/Freezer - Energy Star                           | Energy Star Refrigerator   | Standard Refrigerator                    | 490                       | 20.0%                         | NA  | NA                                  | 18           | \$32         |
| New                  | Manufactured     | Refrigerator | 1 kWh/day Refrigerator                                       | 20 cf top-freezer using no more than 1 kWh/day                               | Standard Refrigerator, 20cf, top-freezer | 416                       | 30.0%                         | 90%   | 97%                                 | 19           | \$74         |
| New                  | Manufactured     | Refrigerator | Refrigerator eCube   | Refrigerator eCube   | No Refrigerator eCube                    | 416                       | 6.3%                          | 85%   | 95%                                 | 5            | \$236        |
| New                  | Manufactured     | Refrigerator | Solid state refrigeration (cool chips™) for refrigerators    | Thermoelectric refrigerator, 1.7 cubic ft.                                   | Compact refrigerator, 1.7 cubic ft.      | 416                       | 4.0%                          | 75%   | 95%                                 | 19           | \$56         |
| New                  | Manufactured     | Room AC      | Air Conditioner - Room (Individual Rooms) (10,000 BTU/HR)    | EER = 10.8   | EER = 9.8                                | 357                       | 8.6%                          | NA  | NA                                  | 10           | \$42         |
| New                  | Manufactured     | Room AC      | Blinds - Fixed Angle/Automatic                               | Install Blinds (Reduce Window SHGC by 50%)                                   | No Interior Shading Device               | 336                       | 31.5%                         | 65%   | 30%                                 | 10           | \$353        |
| New                  | Manufactured     | Room AC      | Canned Lighting Air Tight Sealing                            | Canned Lighting Air Tight Sealing  | No Air tight Sealing                     | 336                       | 3.3%                          | 75%   | 25%                                 | 30           | \$3          |
| New                  | Manufactured     | Room AC      | Ceiling Fan  | Ceiling Fan  | No Ceiling Fan                           | 336                       | 0.5%                          | 85%   | 45%                                 | 10           | \$104        |
| New                  | Manufactured     | Room AC      | Construction - ICF   | Concrete Framing   | Standard Wood Framing                    | 336                       | 32.0%                         | 1%  | 95%                                 | 30           | \$6,442      |
| New                  | Manufactured     | Room AC      | Construction - SIP   | Specialty Framing  | Standard Wood Framing                    | 336                       | 14.0%                         | 1%  | 95%                                 | 30           | \$5,680      |

| Construction Vintage | Customer Segment | End Use    | Measure Name                      | Measure Description                              | Base Equipment                       | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|-----------------------------------|--|--------------------------------------|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Manufactured     | Room AC    | Cool Roofs                        | Lighter Colored Shingles (White)                 | Standard Roof Shingles               | 336                       | 20.0%                         | 0%  | 95%                                 | 20           | \$34         |
| New                  | Manufactured     | Room AC    | Doors                             | R-11 (Steel Doors with foam core)                | Standard non-thermal wood door (R-2) | 336                       | 0.1%                          | 85%   | 50%                                 | 30           | \$116        |
| New                  | Manufactured     | Room AC    | Doors                             | R-5 (Composite Doors with foam core)             | Standard non-thermal wood door (R-2) | 336                       | 0.1%                          | 85%   | 55%                                 | 12           | \$42         |
| New                  | Manufactured     | Room AC    | Green Roof                        | ecorof   | Standard Roof                        | 336                       | 6.5%                          | 0%  | 98%                                 | 40           | \$12669      |
| New                  | Manufactured     | Room AC    | Insulation (Ceiling)              | R-49   | State Code (R-38)                    | 336                       | 0.1%                          | 87%   | 85%                                 | 25           | \$582        |
| New                  | Manufactured     | Room AC    | Insulation (Floor)                | R-38   | State Code (R-30)                    | 336                       | 0.1%                          | 75%   | 90%                                 | 25           | \$1,061      |
| New                  | Manufactured     | Room AC    | Insulation (wall) 2*6             | R-21 + R5 Sheathing                              | State Code (R-21)                    | 336                       | 0.0%                          | 95%   | 50%                                 | 25           | \$372        |
| New                  | Manufactured     | Room AC    | Outlet Gasket                     | Install Outlet Gasket (Reduce Air Leakage)       | No Outlet Gasket                     | 336                       | 2.0%                          | 95%   | 40%                                 | 5            | \$6          |
| New                  | Manufactured     | Room AC    | Radiant Barrier (Ceiling)         | Install Radiant Barrier                          | No Radiant Barrier                   | 336                       | 6.7%                          | 0%  | 97%                                 | 30           | \$365        |
| New                  | Manufactured     | Room AC    | Window Overhang                   | Overhangs over windows for shading               | No window overhangs                  | 336                       | 14.0%                         | 50%   | 80%                                 | 30           | \$724        |
| New                  | Manufactured     | Room AC    | Windows                           | U = 0.19   | U=0.30                               | 336                       | 5.0%                          | 85%   | 95%                                 | 25           | \$2,757      |
| New                  | Manufactured     | Room Heat  | Canned Lighting Air Tight Sealing | Canned Lighting Air Tight Sealing                | No Air tight Sealing                 | 3,567                     | 3.3%                          | 75%   | 25%                                 | 30           | \$3          |
| New                  | Manufactured     | Room Heat  | Construction - ICF                | Concrete Framing                                 | Standard Wood Framing                | 3,567                     | 44.0%                         | 1%  | 95%                                 | 30           | \$6,442      |
| New                  | Manufactured     | Room Heat  | Construction - SIP                | Specialty Framing                                | Standard Wood Framing                | 3,567                     | 14.0%                         | 1%  | 95%                                 | 30           | \$5,680      |
| New                  | Manufactured     | Room Heat  | Doors                             | R-11 (Steel Doors with foam core)                | Standard non-thermal wood door (R-2) | 3,567                     | 5.0%                          | 85%   | 50%                                 | 30           | \$116        |
| New                  | Manufactured     | Room Heat  | Doors                             | R-5 (Composite Doors with foam core)             | Standard non-thermal wood door (R-2) | 3,567                     | 3.0%                          | 85%   | 55%                                 | 12           | \$42         |
| New                  | Manufactured     | Room Heat  | Ductless Mini-Split REM           | 2.5 ton, SEER 15, HSPF 9.0                       | Electric Baseboard Heating HSPF=1    | 3,567                     | 62.1%                         | 80%   | 95%                                 | 15           | \$5,311      |
| New                  | Manufactured     | Room Heat  | Green Roof                        | ecorof   | Standard Roof                        | 3,567                     | 6.5%                          | 0%  | 98%                                 | 40           | \$12669      |
| New                  | Manufactured     | Room Heat  | Insulation (Ceiling)              | R-49   | State Code (R-38)                    | 3,567                     | 3.0%                          | 87%   | 85%                                 | 25           | \$582        |
| New                  | Manufactured     | Room Heat  | Insulation (Floor)                | R-38   | State Code (R-30)                    | 3,567                     | 2.0%                          | 75%   | 90%                                 | 25           | \$1,061      |
| New                  | Manufactured     | Room Heat  | Insulation (wall) 2*6             | R-21 + R5 Sheathing                              | State Code (R-21)                    | 3,567                     | 3.2%                          | 95%   | 50%                                 | 25           | \$372        |
| New                  | Manufactured     | Room Heat  | Outlet Gasket                     | Install Outlet Gasket (Reduce Air Leakage)       | No Outlet Gasket                     | 3,567                     | 2.0%                          | 95%   | 40%                                 | 5            | \$6          |
| New                  | Manufactured     | Room Heat  | Radiant Barrier (Ceiling)         | Install Radiant Barrier                          | No Radiant Barrier                   | 3,567                     | 2.0%                          | 0%  | 97%                                 | 30           | \$365        |
| New                  | Manufactured     | Room Heat  | Radiant Electric Ceiling Panels   | Radiant Electric Heating with Ceiling Panels     | Electric Baseboard Heating           | 3,567                     | 52.0%                         | 75%   | 98%                                 | 20           | \$3,187      |
| New                  | Manufactured     | Room Heat  | Radiant Electric Floor Heating    | Radiant Heating with Electric Cables in Flooring | Electric Baseboard Heating           | 3,567                     | 20.0%                         | 75%   | 95%                                 | 25           | \$17460      |
| New                  | Manufactured     | Room Heat  | Spray in insulation 2*4 Wall      | 2*4Wall - closed cell foam insulation R-23       | 2*6Wall R-21                         | 3,567                     | 3.0%                          | 90%   | 90%                                 | 25           | \$4,071      |
| New                  | Manufactured     | Room Heat  | Spray in insulation 2*6 Wall      | 2*6Wall - closed cell foam insulation R-37       | 2*6Wall R-21                         | 3,567                     | 10.0%                         | 90%   | 90%                                 | 25           | \$5,843      |
| New                  | Manufactured     | Room Heat  | Windows                           | U = 0.19   | U=0.30                               | 3,567                     | 16.0%                         | 85%   | 95%                                 | 25           | \$2,757      |
| New                  | Manufactured     | Water Heat | Water_Heater (40 Gallon Electric) | EF = 0.95  | EF = 0.92                            | 2,765                     | 3.2%                          | NA  | NA                                  | 15           | \$129        |

| Construction Vintage | Customer Segment | End Use    | Measure Name                             | Measure Description                                 | Base Equipment                       | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|--|---|--------------------------------------|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Manufactured     | Water Heat | Clothes Washer                           | Energy Star MEF = 1.83 (top Load)                   | Standard Clothes Washer (1.26)       | 2,713                     | 9.3%                          | 30%   | 68%                                 | 14           | \$252        |
| New                  | Manufactured     | Water Heat | Clothes Washer                           | Tier 2. MEF = 2.01 (front load)                     | Standard Clothes Washer (1.26)       | 2,713                     | 11.2%                         | 30%   | 91%                                 | 14           | \$312        |
| New                  | Manufactured     | Water Heat | Clothes Washer                           | Tier 2. MEF = 2.2 (front load)                      | Standard Clothes Washer (1.26)       | 2,713                     | 12.8%                         | 30%   | 91%                                 | 14           | \$417        |
| New                  | Manufactured     | Water Heat | Desuperheater (Ground-Source system)     | Heat_Pump) Desuperheater with Standard Water_Heater | Standard Water_Heater - EF = 0.92    | 2,713                     | 55.2%                         | 5%  | 90%                                 | 10           | \$251        |
| New                  | Manufactured     | Water Heat | Dishwasher                               | EF = 0.77   | EF = 0.65 (ENERGY STAR)              | 2,713                     | 1.2%                          | 23%   | 35%                                 | 13           | \$514        |
| New                  | Manufactured     | Water Heat | Dishwasher - Existing                    | EF = 0.65 (ENERGY STAR)                             | EF = 0.46 Existing Dishwasher        | 2,713                     | 2.2%                          | 23%   | 15%                                 | 13           | \$11         |
| New                  | Manufactured     | Water Heat | Drain Water Heat Recovery                | Drain Water Heat Recovery (GFX or Power-Pipe)       | No Drain Water Heat Recovery         | 2,713                     | 18.5%                         | 50%   | 95%                                 | 30           | \$630        |
| New                  | Manufactured     | Water Heat | Faucet Aerators                          | 0.5 GPM   | 2.2 GPM                              | 2,713                     | 5.9%                          | 95%   | 95%                                 | 9            | \$3          |
| New                  | Manufactured     | Water Heat | Faucet Aerators                          | 1.5 GPM   | 2.2 GPM                              | 2,713                     | 2.4%                          | 95%   | 55%                                 | 9            | \$2          |
| New                  | Manufactured     | Water Heat | Heat Pump Water Heater                   | EF=2.9  | No Heat Pump Water Heater            | 2,713                     | 54.6%                         | 30%   | 95%                                 | 15           | \$2,322      |
| New                  | Manufactured     | Water Heat | Hot Water Pipe Insulation                | R-4 Wrap  | No insulation                        | 2,713                     | 1.2%                          | 85%   | 25%                                 | 5            | \$8          |
| New                  | Manufactured     | Water Heat | Low-Flow Showerheads                     | 1.75 GPM  | 2.5 GPM                              | 2,713                     | 10.0%                         | 95%   | 85%                                 | 10           | \$5          |
| New                  | Manufactured     | Water Heat | Solar Hot Water (SHW)                    | Solar thermal collector                             | Non-solar hot water heater           | 2,713                     | 47.2%                         | 20%   | 95%                                 | 20           | \$8,930      |
| New                  | Manufactured     | Water Heat | Tankless Water_Heater                    | EF = 0.95, 4.0 gpm                                  | EF = 0.92                            | 2,713                     | 3.2%                          | 85%   | 96%                                 | 20           | \$1,302      |
| New                  | Manufactured     | Water Heat | Water_Heater Tank Blanket/Insulation     | Install Insulation (R-5)                            | No Tank Insulation                   | 2,713                     | 6.5%                          | 0%  | 55%                                 | 10           | \$19         |
| New                  | Manufactured     | Water Heat | Water_Heater Thermostat Setback          | 120 degrees   | 135 degrees                          | 2,713                     | 6.0%                          | 95%   | 43%                                 | 4            | \$0          |
| Existing             | Multi Family     | Central AC | Air Conditioner - Central (2.5 ton unit) | SEER 14   | SEER 13                              | 619                       | 5.9%                          | NA  | NA                                  | 15           | \$336        |
| Existing             | Multi Family     | Central AC | Air Conditioner - Central (2.5 ton unit) | SEER 16   | SEER 13                              | 619                       | 15.0%                         | NA  | NA                                  | 15           | \$880        |
| Existing             | Multi Family     | Central AC | Air Conditioner - Central (2.5 ton unit) | SEER 18   | SEER 13                              | 619                       | 22.2%                         | NA  | NA                                  | 15           | \$1,353      |
| Existing             | Multi Family     | Central AC | Air-to-Air Heat Exchangers               | Air-to-Air Heat Exchangers                          | No Air to Air Heat Exchangers        | 683                       | 10.0%                         | 0%  | 95%                                 | 15           | \$990        |
| Existing             | Multi Family     | Central AC | Blinds - Fixed Angle/Automatic           | Install Blinds (Reduce Window SHGC by 50%)          | No Interior Shading Device           | 683                       | 41.3%                         | 65%   | 30%                                 | 10           | \$172        |
| Existing             | Multi Family     | Central AC | Canned Lighting Air Tight Sealing        | Canned Lighting Air Tight Sealing                   | No Air tight Sealing                 | 683                       | 3.3%                          | 60%   | 55%                                 | 30           | \$53         |
| Existing             | Multi Family     | Central AC | Ceiling Fan                              | Ceiling Fan   | No Ceiling Fan                       | 683                       | 0.4%                          | 85%   | 45%                                 | 10           | \$104        |
| Existing             | Multi Family     | Central AC | Check Mel O&M Tune-up                    | Tune-up/Maintenance                                 | No Tune-up Maintenance               | 683                       | 10.0%                         | 90%   | 50%                                 | 5            | \$236        |
| Existing             | Multi Family     | Central AC | Cool Roofs                               | Lighter Colored Shingles (White)                    | Standard Roof Shingles               | 683                       | 20.0%                         | 0%  | 95%                                 | 20           | \$24         |
| Existing             | Multi Family     | Central AC | Doors                                    | R-11 (Steel Doors with foam core)                   | Standard non-thermal wood door (R-2) | 683                       | 0.1%                          | 85%   | 50%                                 | 30           | \$58         |
| Existing             | Multi Family     | Central AC | Doors                                    | R-5 (Composite Doors with foam core)                | Standard non-thermal wood door (R-2) | 683                       | 0.1%                          | 85%   | 55%                                 | 12           | \$21         |
| Existing             | Multi Family     | Central AC | Doors - Weatherization                   | Weatherstripping And Adding Door Sweeps             | Existing Non-Efficient door          | 683                       | 2.0%                          | 80%   | 55%                                 | 6            | \$36         |
| Existing             | Multi Family     | Central AC | Duct Sealing                             | Duct Sealing  | No Duct Sealing                      | 683                       | 6.0%                          | 60%   | 65%                                 | 20           | \$447        |

| Construction Vintage | Customer Segment | End Use    | Measure Name   | Measure Description   | Base Equipment   | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|--|---|--|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Multi Family     | Central AC | Duct Sealing - Aerosol-Based                                       | Spray-in ductwork sealant to minimize duct leaks                            | Older homes with AFUE HVAC, SEER 9                         | 683                       | 19.0%                         | 50%   | 95%                                 | 25           | \$946        |
| Existing             | Multi Family     | Central AC | Evaporative Space Cooling  | SEER 40   | SEER 13  | 683                       | 70.0%                         | 0%  | 95%                                 | 10           | \$1,119      |
| Existing             | Multi Family     | Central AC | Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test | Install Caulking And Weatherstripping                                       | Existing Infiltration Conditions                           | 683                       | 10.0%                         | 75%   | 75%                                 | 15           | \$228        |
| Existing             | Multi Family     | Central AC | Insulation (Ceiling)   | R-49  | State Code (R-38)  | 683                       | 0.3%                          | 87%   | 85%                                 | 25           | \$246        |
| Existing             | Multi Family     | Central AC | Insulation (Ceiling) - average existing value                      | State Code (R-38)   | Average Existing Insulation Value (R-19)                   | 683                       | 1.0%                          | 95%   | 40%                                 | 25           | \$475        |
| Existing             | Multi Family     | Central AC | Insulation (Ceiling) - below code                                  | State Code (R-38)   | R-9  | 683                       | 0.6%                          | 95%   | 10%                                 | 25           | \$475        |
| Existing             | Multi Family     | Central AC | Insulation (Duct)  | R-8   | No Duct Insulation   | 683                       | 3.2%                          | 12%   | 75%                                 | 25           | \$141        |
| Existing             | Multi Family     | Central AC | Insulation (Duct)  | R-8   | R-4  | 683                       | 1.6%                          | 12%   | 95%                                 | 25           | \$73         |
| Existing             | Multi Family     | Central AC | Insulation (Floor)   | R-38  | State Code (R-30)  | 683                       | 0.1%                          | 75%   | 90%                                 | 25           | \$747        |
| Existing             | Multi Family     | Central AC | Insulation (Floor) - average existing value                        | State Code (R-30)   | Average Existing Insulation Value and/or Code Value (R-20) | 683                       | 0.1%                          | 80%   | 40%                                 | 25           | \$375        |
| Existing             | Multi Family     | Central AC | Insulation (Floor) - below code                                    | State Code (R-30)   | R-0  | 683                       | 0.1%                          | 80%   | 10%                                 | 25           | \$1,125      |
| Existing             | Multi Family     | Central AC | Insulation (Slab)  | R-15  | State Code (R-10)  | 683                       | 1.4%                          | 0%  | 87%                                 | 25           | \$221        |
| Existing             | Multi Family     | Central AC | Insulation (Slab) - average existing value                         | State Code (R-10)   | Average Existing Insulation Value and/or Code Value (R-7)  | 683                       | 1.3%                          | 0%  | 65%                                 | 25           | \$994        |
| Existing             | Multi Family     | Central AC | Insulation (Slab) - below code                                     | State Code (R-10)   | R-0  | 683                       | 4.3%                          | 0%  | 60%                                 | 25           | \$994        |
| Existing             | Multi Family     | Central AC | Insulation (Wall) 2*4  | R-13 + R5 Sheathing   | R-13   | 683                       | 0.0%                          | 10%   | 90%                                 | 25           | \$452        |
| Existing             | Multi Family     | Central AC | Insulation (Wall) 2*4 - average existing value                     | R-13  | Average Existing Insulation Value and/or Code Value (R-8)  | 683                       | 0.1%                          | 75%   | 45%                                 | 25           | \$314        |
| Existing             | Multi Family     | Central AC | Insulation (Wall) 2*4 - below code                                 | R-13  | R-0  | 683                       | 0.1%                          | 75%   | 5%                                  | 25           | \$314        |
| Existing             | Multi Family     | Central AC | Insulation (wall) 2*6 - average existing value                     | State Code (R-21)   | Average Existing Insulation Value and/or Code Value (R-8)  | 683                       | 0.1%                          | 0%  | 40%                                 | 25           | \$513        |
| Existing             | Multi Family     | Central AC | Insulation (wall) 2*6 - below code                                 | State Code (R-21)   | R-0  | 683                       | 0.1%                          | 0%  | 35%                                 | 25           | \$513        |
| Existing             | Multi Family     | Central AC | Leak Proof Duct Fittings   | Quick connect fittings that do not require mastic or drawbands (4 per unit) | 13 SEER  | 683                       | 15.0%                         | 10%   | 95%                                 | 30           | \$216        |
| Existing             | Multi Family     | Central AC | Motor - ECM Motor  | ECM motor for Central Air Conditioner                                       | Standard Motor   | 683                       | 4.5%                          | 65%   | 95%                                 | 15           | \$368        |
| Existing             | Multi Family     | Central AC | Outlet Gasket  | Install Outlet Gasket (Reduce Air Leakage)                                  | No Outlet Gasket   | 683                       | 2.0%                          | 95%   | 60%                                 | 5            | \$4          |
| Existing             | Multi Family     | Central AC | Proper Sizing - Central Air Conditioner                            | Correctly Sized Air Conditioner Unit  | Oversized Air Conditioner Unit                             | 683                       | 6.0%                          | 53%   | 85%                                 | 15           | \$1          |
| Existing             | Multi Family     | Central AC | Radiant Barrier (Ceiling)  | Install Radiant Barrier   | No Radiant Barrier   | 683                       | 6.7%                          | 0%  | 97%                                 | 30           | \$258        |
| Existing             | Multi Family     | Central AC | Solar Attic Fan  | Solar electric attic ventilation  | Standard passive ventilation                               | 683                       | 6.0%                          | 50%   | 95%                                 | 10           | \$762        |
| Existing             | Multi Family     | Central AC | Thermostat - Clock/Programmable                                    | Programmable Thermostat   | Manual Thermostat  | 683                       | 6.8%                          | 85%   | 25%                                 | 15           | \$27         |

| Construction Vintage | Customer Segment | End Use      | Measure Name   | Measure Description  | Base Equipment   | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------|--|--|--|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Multi Family     | Central AC   | Thermostat - Multi-Zone  | Individual Room Temperature Control for Major Occupied Rooms | Programmable Thermostat - Central Control Only             | 683                       | 7.0%                          | 65%   | 95%                                 | 12           | \$1,150      |
| Existing             | Multi Family     | Central AC   | VSD Motor - ECM  | Variable Speed Motor (ECM) for Central Air Conditioner       | Constant Speed Motor                                       | 683                       | 13.5%                         | 80%   | 85%                                 | 20           | \$341        |
| Existing             | Multi Family     | Central AC   | Whole-House Dehumidifier   | Whole-House Dehumidifier                                     | No Dehumidifier  | 683                       | 6.0%                          | 0%  | 95%                                 | 11           | \$1,439      |
| Existing             | Multi Family     | Central AC   | Whole-House Fan  | Whole-House Fan  | No Whole-House Fan   | 683                       | 22.0%                         | 0%  | 96%                                 | 15           | \$334        |
| Existing             | Multi Family     | Central AC   | Windows  | U = 0.19   | U=0.30   | 683                       | 13.0%                         | 75%   | 95%                                 | 25           | \$815        |
| Existing             | Multi Family     | Central AC   | Windows  | U=0.30   | Existing Windows (U=0.65)                                  | 683                       | 36.0%                         | 75%   | 60%                                 | 25           | \$1,939      |
| Existing             | Multi Family     | Central Heat | Air-to-Air Heat Exchangers   | Air-to-Air Heat Exchangers                                   | No Air to Air Heat Exchangers                              | 5,290                     | 10.0%                         | 0%  | 95%                                 | 15           | \$990        |
| Existing             | Multi Family     | Central Heat | Canned Lighting Air Tight Sealing                                  | Canned Lighting Air Tight Sealing                            | No Air tight Sealing                                       | 5,290                     | 3.3%                          | 60%   | 55%                                 | 30           | \$53         |
| Existing             | Multi Family     | Central Heat | Doors  | R-11 (Steel Doors with foam core)                            | Standard non-thermal wood door (R-2)                       | 5,290                     | 3.0%                          | 85%   | 50%                                 | 30           | \$58         |
| Existing             | Multi Family     | Central Heat | Doors  | R-5 (Composite Doors with foam core)                         | Standard non-thermal wood door (R-2)                       | 5,290                     | 2.0%                          | 85%   | 55%                                 | 12           | \$21         |
| Existing             | Multi Family     | Central Heat | Doors - Weatherization   | Weatherstripping And Adding Door Sweeps                      | Existing Non-Efficient door                                | 5,290                     | 2.0%                          | 80%   | 55%                                 | 6            | \$36         |
| Existing             | Multi Family     | Central Heat | Duct Sealing   | Duct Sealing   | No Duct Sealing  | 5,290                     | 6.0%                          | 60%   | 65%                                 | 20           | \$447        |
| Existing             | Multi Family     | Central Heat | Duct Sealing - Aerosol-Based                                       | Spray-in ductwork sealant to minimize duct leaks             | Older homes with AFUE HVAC, SEER 9                         | 5,290                     | 19.0%                         | 50%   | 95%                                 | 25           | \$946        |
| Existing             | Multi Family     | Central Heat | Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test | Install Caulking And Weatherstripping                        | Existing Infiltration Conditions                           | 5,290                     | 10.0%                         | 75%   | 75%                                 | 15           | \$228        |
| Existing             | Multi Family     | Central Heat | Insulation (Ceiling)   | R-49   | State Code (R-38)  | 5,290                     | 1.0%                          | 87%   | 85%                                 | 25           | \$246        |
| Existing             | Multi Family     | Central Heat | Insulation (Ceiling) - average existing value                      | State Code (R-38)  | Average Existing Insulation Value (R-19)                   | 5,290                     | 2.0%                          | 95%   | 40%                                 | 25           | \$475        |
| Existing             | Multi Family     | Central Heat | Insulation (Ceiling) - below code                                  | State Code (R-38)  | R-9  | 5,290                     | 10.2%                         | 95%   | 10%                                 | 25           | \$475        |
| Existing             | Multi Family     | Central Heat | Insulation (Duct)  | R-8  | No Duct Insulation   | 5,290                     | 4.3%                          | 12%   | 75%                                 | 25           | \$141        |
| Existing             | Multi Family     | Central Heat | Insulation (Duct)  | R-8  | R-4  | 5,290                     | 2.1%                          | 12%   | 95%                                 | 25           | \$73         |
| Existing             | Multi Family     | Central Heat | Insulation (Floor)   | R-38   | State Code (R-30)  | 5,290                     | 1.0%                          | 75%   | 90%                                 | 25           | \$747        |
| Existing             | Multi Family     | Central Heat | Insulation (Floor) - average existing value                        | State Code (R-30)  | Average Existing Insulation Value and/or Code Value (R-20) | 5,290                     | 2.0%                          | 80%   | 40%                                 | 25           | \$375        |
| Existing             | Multi Family     | Central Heat | Insulation (Floor) - below code                                    | State Code (R-30)  | R-0  | 5,290                     | 10.0%                         | 80%   | 10%                                 | 25           | \$1,125      |
| Existing             | Multi Family     | Central Heat | Insulation (Slab)  | R-15   | State Code (R-10)  | 5,290                     | 1.4%                          | 0%  | 87%                                 | 25           | \$221        |
| Existing             | Multi Family     | Central Heat | Insulation (Slab) - average existing value                         | State Code (R-10)  | Average Existing Insulation Value and/or Code Value (R-7)  | 5,290                     | 1.3%                          | 0%  | 65%                                 | 25           | \$994        |
| Existing             | Multi Family     | Central Heat | Insulation (Slab) - below code                                     | State Code (R-10)  | R-0  | 5,290                     | 4.3%                          | 0%  | 60%                                 | 25           | \$994        |
| Existing             | Multi Family     | Central Heat | Insulation (Wall) 2*4  | R-13 + R5 Sheathing  | R-13   | 5,290                     | 2.2%                          | 10%   | 90%                                 | 25           | \$452        |

| Construction Vintage | Customer Segment | End Use      | Measure Name                                   | Measure Description   | Base Equipment  | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------|--|---|---|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Multi Family     | Central Heat | Insulation (Wall) 2*4 - average existing value | R-13  | Average Existing Insulation Value and/or Code Value (R-8) | 5,290                     | 5.0%                          | 75%   | 45%                                 | 25           | \$314        |
| Existing             | Multi Family     | Central Heat | Insulation (Wall) 2*4 - below code             | R-13  | R-0   | 5,290                     | 44.0%                         | 75%   | 5%                                  | 25           | \$314        |
| Existing             | Multi Family     | Central Heat | Insulation (wall) 2*6 - average existing value | State Code (R-21)   | Average Existing Insulation Value and/or Code Value (R-8) | 5,290                     | 12.0%                         | 0%  | 40%                                 | 25           | \$513        |
| Existing             | Multi Family     | Central Heat | Insulation (wall) 2*6 - below code             | State Code (R-21)   | R-0   | 5,290                     | 49.0%                         | 0%  | 35%                                 | 25           | \$513        |
| Existing             | Multi Family     | Central Heat | Leak Proof Duct Fittings                       | Quick connect fittings that do not require mastic or drawbands (4 per unit) | 13 SEER   | 5,290                     | 15.0%                         | 10%   | 95%                                 | 30           | \$216        |
| Existing             | Multi Family     | Central Heat | Outlet Gasket                                  | Install Outlet Gasket (Reduce Air Leakage)                                  | No Outlet Gasket  | 5,290                     | 2.0%                          | 95%   | 60%                                 | 5            | \$4          |
| Existing             | Multi Family     | Central Heat | Radiant Barrier (Ceiling)                      | Install Radiant Barrier   | No Radiant Barrier  | 5,290                     | 2.0%                          | 0%  | 97%                                 | 30           | \$258        |
| Existing             | Multi Family     | Central Heat | Spray in insulation 2*4 Wall                   | 2*4Wall - closed cell foam insulation R-23                                  | 2*4Wall R-13  | 5,290                     | 12.0%                         | 0%  | 95%                                 | 25           | \$1,511      |
| Existing             | Multi Family     | Central Heat | Thermostat - Clock/Programmable                | Programmable Thermostat   | Manual Thermostat   | 5,290                     | 6.8%                          | 85%   | 75%                                 | 15           | \$27         |
| Existing             | Multi Family     | Central Heat | Thermostat - Multi-Zone                        | Individual Room Temperature Control for Major Occupied Rooms                | Programmable Thermostat - Central Control Only            | 5,290                     | 7.0%                          | 65%   | 95%                                 | 12           | \$1,150      |
| Existing             | Multi Family     | Central Heat | Windows  | U = 0.19  | U=0.30  | 5,290                     | 6.0%                          | 75%   | 95%                                 | 25           | \$815        |
| Existing             | Multi Family     | Central Heat | Windows  | U=0.30  | Existing Windows (U=0.65)                                 | 5,290                     | 15.0%                         | 75%   | 60%                                 | 25           | \$1,939      |
| Existing             | Multi Family     | Cooking Oven | Convection Oven                                | Convection Oven (wall oven)   | Standard Oven (wall oven)                                 | 435                       | 23.0%                         | 85%   | 85%                                 | 15           | \$432        |
| Existing             | Multi Family     | Dryer        | Clothes Dryer With Moisture Sensor             | High-Efficiency Clothes Dryer With Moisture Sensor                          | Standard Dryer Without Moisture Sensor                    | 646                       | 13.0%                         | NA  | NA                                  | 18           | \$58         |
| Existing             | Multi Family     | Freezer      | Freezer - Stand-Alone                          | Energy Star 14.8 cu ft Chest Freezer  | Standard 14.8 cu ft Freezer                               | 553                       | 10.0%                         | NA  | NA                                  | 12           | \$26         |
| Existing             | Multi Family     | Freezer      | Stand-Alone Freezer - Early Replacement        | Energy Star Freezer   | Existing Non-Efficient Freezer                            | 665                       | 9.4%                          | 35%   | 80%                                 | 12           | \$489        |
| Existing             | Multi Family     | Freezer      | Stand-Alone Freezer - Removal                  | Proper Disposal of Freezer  | Existing Non-Efficient Freezer                            | 665                       | 248.7%                        | 35%   | 80%                                 | 6            | \$103        |
| Existing             | Multi Family     | HVAC Aux     | Motor - ECM Motor                              | ECM Motor for Forced Air Electric Furnace                                   | Standard Motor  | 436                       | 25.0%                         | 65%   | 95%                                 | 15           | \$368        |
| Existing             | Multi Family     | HVAC Aux     | Motor - ECM Motor                              | ECM Motor for Forced Air Gas Furnace  | Standard Motor  | 436                       | 25.0%                         | 65%   | 95%                                 | 15           | \$368        |
| Existing             | Multi Family     | HVAC Aux     | VSD Fan  | Variable Speed Fan - Electric Furnace                                       | Constant Speed Fan  | 436                       | 75.0%                         | 5%  | 85%                                 | 20           | \$447        |
| Existing             | Multi Family     | HVAC Aux     | VSD Fan  | Variable Speed Fan - Gas Furnace  | Constant Speed Fan  | 436                       | 75.0%                         | 16%   | 85%                                 | 20           | \$447        |
| Existing             | Multi Family     | Lighting     | CFL Fixtures, High Use                         | 2-15 W CFLs, 4.0 hr/day (37%)   | 2-60 W Incandescent                                       | 1,146                     | 4.7%                          | 98%   | 79%                                 | 20           | \$35         |
| Existing             | Multi Family     | Lighting     | CFL Fixtures, Low Use                          | 2-15 W CFLs, 1.0 hr/day (32%)   | 2-60 W Incandescent                                       | 1,146                     | 4.0%                          | 98%   | 79%                                 | 20           | \$30         |
| Existing             | Multi Family     | Lighting     | CFL Fixtures, Medium Use                       | 2-15 W CFLs, 2.5 hr/day (33%)   | 2-60 W Incandescent                                       | 1,146                     | 4.2%                          | 98%   | 79%                                 | 20           | \$33         |
| Existing             | Multi Family     | Lighting     | CFL Lamps, High Use                            | 1-15W, 4.0 hr/day (37%)   | Incandescent 60W  | 1,146                     | 34.0%                         | 86%   | 79%                                 | 7            | \$2          |
| Existing             | Multi Family     | Lighting     | CFL Lamps, Low Use                             | 1-15W, 1.0 hr/day (32%)   | Incandescent 60W  | 1,146                     | 9.7%                          | 86%   | 79%                                 | 27           | \$2          |

| Construction Vintage | Customer Segment | End Use      | Measure Name   | Measure Description  | Base Equipment                         | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------|--|--|--|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Multi Family     | Lighting     | CFL Lamps, Medium Use  | 1-15W, 2.5 hr/day (33%)  | Incandescent 60W                       | 1,146                     | 14.0%                         | 86%   | 79%                                 | 11           | \$2          |
| Existing             | Multi Family     | Lighting     | CFL Lighting - 3-Way   | 13 W, 20W And 25W  | 30W, 75W, 100W                         | 1,146                     | 1.8%                          | 75%   | 79%                                 | 7            | \$13         |
| Existing             | Multi Family     | Lighting     | CFL Torchieries, High Use                                    | 55 W CFL, (20%)  | Incandescent Torchieries, 180W Halogen | 1,146                     | 0.4%                          | 70%   | 65%                                 | 7            | \$7          |
| Existing             | Multi Family     | Lighting     | CFL Torchieries, Low Use                                     | 55 W CFL, (20%)  | Incandescent Torchieries, 180W Halogen | 1,146                     | 0.4%                          | 70%   | 65%                                 | 27           | \$7          |
| Existing             | Multi Family     | Lighting     | CFL Torchieries, Medium Use                                  | 55 W CFL, (60%)  | Incandescent Torchieries, 180W Halogen | 1,146                     | 1.3%                          | 70%   | 65%                                 | 11           | \$7          |
| Existing             | Multi Family     | Lighting     | Daylighting Controls (Photocell) - Indoor/Outdoors           | Install Photocell  | No Daylighting Controls                | 1,146                     | 4.5%                          | 0%  | 95%                                 | 10           | \$151        |
| Existing             | Multi Family     | Lighting     | LED Christmas Lighting                                       | LED Christmas Lighting   | Incandescent Christmas Lighting        | 1,146                     | 0.4%                          | 40%   | 85%                                 | 13           | \$11         |
| Existing             | Multi Family     | Lighting     | LED Interior Lighting (White), High Use                      | LED 4W   | Incandescent 60W                       | 1,146                     | 42.3%                         | 85%   | 98%                                 | 13           | \$31         |
| Existing             | Multi Family     | Lighting     | LED Interior Lighting (White), Low Use                       | LED 4W   | Incandescent 60W                       | 1,146                     | 12.1%                         | 85%   | 98%                                 | 13           | \$31         |
| Existing             | Multi Family     | Lighting     | LED Interior Lighting (White), Medium Use                    | LED 4W   | Incandescent 60W                       | 1,146                     | 17.4%                         | 85%   | 98%                                 | 13           | \$31         |
| Existing             | Multi Family     | Lighting     | Occupancy Sensors  | Wall-Switch Occupancy Sensors  | No Occupancy Sensor                    | 1,146                     | 14.0%                         | 75%   | 85%                                 | 10           | \$64         |
| Existing             | Multi Family     | Lighting     | Time Clocks (Exterior Lighting)                              | Exterior Lighting on a Time Clock  | Exterior Lighting (Manual Control)     | 1,146                     | 1.9%                          | 75%   | 90%                                 | 10           | \$93         |
| Existing             | Multi Family     | Plug Load    | 1-Watt Standby Power   | 1W or less standby power use for small appliances                            | Standard plug load appliance.          | 1,357                     | 4.2%                          | 15%   | 85%                                 | 7            | \$32         |
| Existing             | Multi Family     | Plug Load    | Energy Star Battery Chargers                                 | Energy Star Battery Chargers   | Standard Battery Chargers              | 1,357                     | 0.2%                          | 55%   | 40%                                 | 7            | \$4          |
| Existing             | Multi Family     | Plug Load    | Energy Star DVD System                                       | Energy Star DVD System   | Standard DVD System                    | 1,357                     | 2.7%                          | 74%   | 24%                                 | 7            | \$12         |
| Existing             | Multi Family     | Plug Load    | Energy Star Dehumidifiers                                    | Energy Star Dehumidifiers  | Standard Dehumidifiers                 | 1,357                     | 0.6%                          | 15%   | 5%                                  | 10           | \$13         |
| Existing             | Multi Family     | Plug Load    | Energy Star Digital Set Top Receiver                         | Energy Star Digital Set Top Receiver   | Standard Digital Set Top Receiver      | 1,357                     | 1.9%                          | 68%   | 62%                                 | 6            | \$37         |
| Existing             | Multi Family     | Plug Load    | Energy Star HDTV   | Energy Star HDTV   | Standard HDTV                          | 1,357                     | 1.6%                          | 22%   | 70%                                 | 9            | \$105        |
| Existing             | Multi Family     | Plug Load    | Energy Star Home Audio System                                | Energy Star Home Audio System  | Standard Home Audio system             | 1,357                     | 2.4%                          | 66%   | 90%                                 | 7            | \$21         |
| Existing             | Multi Family     | Plug Load    | Energy Star Office Computer                                  | Energy Star Office Computer  | Standard Office Computer               | 1,357                     | 12.8%                         | 64%   | 15%                                 | 4            | \$84         |
| Existing             | Multi Family     | Plug Load    | Energy Star Office Copiers                                   | Energy Star Office Copiers   | Standard Office Copiers                | 1,357                     | 1.5%                          | 14%   | 55%                                 | 6            | \$53         |
| Existing             | Multi Family     | Plug Load    | Energy Star Office Monitor                                   | Energy Star Office Monitor   | Standard Office Monitor                | 1,357                     | 3.0%                          | 82%   | 15%                                 | 4            | \$16         |
| Existing             | Multi Family     | Plug Load    | Energy Star Office Printer                                   | Energy Star Office Printer   | Standard Office Printer                | 1,357                     | 0.2%                          | 56%   | 40%                                 | 5            | \$11         |
| Existing             | Multi Family     | Plug Load    | Energy Star TV   | Energy Star TV   | Standard TV                            | 1,357                     | 3.9%                          | 100%  | 38%                                 | 9            | \$32         |
| Existing             | Multi Family     | Plug Load    | Energy Star VCR  | Energy Star VCR/DVD Combo  | Standard Home VCR                      | 1,357                     | 0.9%                          | 85%   | 45%                                 | 4            | \$38         |
| Existing             | Multi Family     | Plug Load    | Power supply transformer/converter - External power adapters | Power supply transformer/converter - High efficiency External power adapters | Standard Efficiency                    | 1,357                     | 0.7%                          | 85%   | 40%                                 | 7            | \$8          |
| Existing             | Multi Family     | Plug Load    | Powerstrip with Occupancy Sensor                             | Powerstrip with Occupancy Sensor   | Powerstrip w/o Occupancy Sensor        | 1,357                     | 1.2%                          | 65%   | 90%                                 | 10           | \$88         |
| Existing             | Multi Family     | Refrigerator | Refrigerator/Freezer - Energy Star                           | Energy Star Refrigerator   | Standard Refrigerator                  | 490                       | 20.0%                         | NA  | NA                                  | 18           | \$32         |



| Construction Vintage | Customer Segment | End Use      | Measure Name   | Measure Description                            | Base Equipment   | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------|--|--|--|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Multi Family     | Refrigerator | 1 kWh/day Refrigerator   | 20 cf top-freezer using no more than 1 kWh/day | Standard Refrigerator, 20cf, top-freezer                   | 538                       | 30.0%                         | 90%   | 97%                                 | 19           | \$74         |
| Existing             | Multi Family     | Refrigerator | Refrigerator eCube   | Refrigerator eCube                             | No Refrigerator eCube                                      | 538                       | 6.3%                          | 85%   | 95%                                 | 5            | \$236        |
| Existing             | Multi Family     | Refrigerator | Refrigerator/Freezer - Early Replacement                           | Standard Refrigerator                          | Existing Refrigerator                                      | 538                       | 100.0%                        | 7%  | 85%                                 | 9            | \$452        |
| Existing             | Multi Family     | Refrigerator | Refrigerator/Freezer - Energy Star                                 | Energy Star Refrigerator                       | Existing Refrigerator                                      | 538                       | 20.0%                         | 0%  | 40%                                 | 18           | \$651        |
| Existing             | Multi Family     | Refrigerator | Refrigerator/Freezer - Removal of Secondary                        | Proper Disposal of Refrigerator/Freezer        | Existing Non-Efficient Refrigerator/Freezer                | 538                       | 282.8%                        | 7%  | 99%                                 | 9            | \$103        |
| Existing             | Multi Family     | Refrigerator | Solid state refrigeration (cool chips™) for refrigerators          | Thermoelectric refrigerator, 1.7 cubic ft.     | Compact refrigerator, 1.7 cubic ft.                        | 538                       | 4.0%                          | 75%   | 95%                                 | 19           | \$56         |
| Existing             | Multi Family     | Room Heat    | Canned Lighting Air Tight Sealing                                  | Canned Lighting Air Tight Sealing              | No Air tight Sealing                                       | 4,074                     | 3.3%                          | 60%   | 55%                                 | 30           | \$53         |
| Existing             | Multi Family     | Room Heat    | Doors  | R-11 (Steel Doors with foam core)              | Standard non-thermal wood door (R-2)                       | 4,074                     | 3.0%                          | 85%   | 50%                                 | 30           | \$58         |
| Existing             | Multi Family     | Room Heat    | Doors  | R-5 (Composite Doors with foam core)           | Standard non-thermal wood door (R-2)                       | 4,074                     | 2.0%                          | 85%   | 55%                                 | 12           | \$21         |
| Existing             | Multi Family     | Room Heat    | Doors - Weatherization   | Weatherstripping And Adding Door Sweeps        | Existing Non-Efficient door                                | 4,074                     | 2.0%                          | 80%   | 55%                                 | 6            | \$31         |
| Existing             | Multi Family     | Room Heat    | Ductless Mini-Split REM  | 2.5 ton, SEER 15, HSPF 9.0                     | Electric Baseboard Heating HSPF=1                          | 4,074                     | 62.1%                         | 25%   | 95%                                 | 15           | \$5,311      |
| Existing             | Multi Family     | Room Heat    | Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test | Install Caulking And Weatherstripping          | Existing Infiltration Conditions                           | 4,074                     | 10.0%                         | 75%   | 75%                                 | 15           | \$228        |
| Existing             | Multi Family     | Room Heat    | Insulation (Ceiling)   | R-49   | State Code (R-38)  | 4,074                     | 1.0%                          | 87%   | 85%                                 | 25           | \$246        |
| Existing             | Multi Family     | Room Heat    | Insulation (Ceiling) - average existing value                      | State Code (R-38)                              | Average Existing Insulation Value (R-19)                   | 4,074                     | 2.0%                          | 95%   | 40%                                 | 25           | \$475        |
| Existing             | Multi Family     | Room Heat    | Insulation (Ceiling) - below code                                  | State Code (R-38)                              | R-9  | 4,074                     | 10.2%                         | 95%   | 10%                                 | 25           | \$475        |
| Existing             | Multi Family     | Room Heat    | Insulation (Duct)  | R-8  | No Duct Insulation   | 4,074                     | 4.3%                          | 12%   | 75%                                 | 25           | \$141        |
| Existing             | Multi Family     | Room Heat    | Insulation (Duct)  | R-8  | R-4  | 4,074                     | 2.1%                          | 12%   | 95%                                 | 25           | \$73         |
| Existing             | Multi Family     | Room Heat    | Insulation (Floor)   | R-38   | State Code (R-30)  | 4,074                     | 1.0%                          | 75%   | 90%                                 | 25           | \$747        |
| Existing             | Multi Family     | Room Heat    | Insulation (Floor) - average existing value                        | State Code (R-30)                              | Average Existing Insulation Value and/or Code Value (R-20) | 4,074                     | 2.0%                          | 80%   | 40%                                 | 25           | \$375        |
| Existing             | Multi Family     | Room Heat    | Insulation (Floor) - below code                                    | State Code (R-30)                              | R-0  | 4,074                     | 10.0%                         | 80%   | 10%                                 | 25           | \$1,125      |
| Existing             | Multi Family     | Room Heat    | Insulation (Slab)  | R-15   | State Code (R-10)  | 4,074                     | 1.4%                          | 0%  | 87%                                 | 25           | \$221        |
| Existing             | Multi Family     | Room Heat    | Insulation (Slab) - average existing value                         | State Code (R-10)                              | Average Existing Insulation Value and/or Code Value (R-7)  | 4,074                     | 1.3%                          | 0%  | 65%                                 | 25           | \$994        |
| Existing             | Multi Family     | Room Heat    | Insulation (Slab) - below code                                     | State Code (R-10)                              | R-0  | 4,074                     | 4.3%                          | 0%  | 60%                                 | 25           | \$994        |
| Existing             | Multi Family     | Room Heat    | Insulation (Wall) 2*4  | R-13 + R5 Sheathing                            | R-13   | 4,074                     | 2.2%                          | 10%   | 90%                                 | 25           | \$452        |
| Existing             | Multi Family     | Room Heat    | Insulation (Wall) 2*4 - average existing value                     | R-13   | Average Existing Insulation Value and/or Code Value (R-8)  | 4,074                     | 5.0%                          | 75%   | 45%                                 | 25           | \$314        |
| Existing             | Multi Family     | Room Heat    | Insulation (Wall) 2*4 - below code                                 | R-13   | R-0  | 4,074                     | 44.0%                         | 75%   | 5%                                  | 25           | \$314        |



| Construction Vintage | Customer Segment | End Use    | Measure Name                                   | Measure Description                           | Base Equipment  | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|--|---|---|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Multi Family     | Room Heat  | Insulation (wall) 2*6 - average existing value | State Code (R-21)                             | Average Existing Insulation Value and/or Code Value (R-8) | 4,074                     | 12.0%                         | 0%  | 40%                                 | 25           | \$513        |
| Existing             | Multi Family     | Room Heat  | Insulation (wall) 2*6 - below code             | State Code (R-21)                             | R-0   | 4,074                     | 49.0%                         | 0%  | 35%                                 | 25           | \$513        |
| Existing             | Multi Family     | Room Heat  | Outlet Gasket                                  | Install Outlet Gasket (Reduce Air Leakage)    | No Outlet Gasket  | 4,074                     | 2.0%                          | 95%   | 60%                                 | 5            | \$4          |
| Existing             | Multi Family     | Room Heat  | Radiant Barrier (Ceiling)                      | Install Radiant Barrier                       | No Radiant Barrier  | 4,074                     | 2.0%                          | 0%  | 97%                                 | 30           | \$258        |
| Existing             | Multi Family     | Room Heat  | Radiant Electric Ceiling Panels                | Radiant Electric Heating with Ceiling Panels  | Electric Baseboard Heating                                | 4,074                     | 52.0%                         | 45%   | 98%                                 | 20           | \$3,313      |
| Existing             | Multi Family     | Room Heat  | Spray in insulation 2*4 Wall                   | 2*4Wall - closed cell foam insulation R-23    | 2*4Wall R-13  | 4,074                     | 12.0%                         | 0%  | 95%                                 | 25           | \$1,511      |
| Existing             | Multi Family     | Room Heat  | Windows  | U = 0.19                                      | U=0.30  | 4,074                     | 6.0%                          | 75%   | 95%                                 | 25           | \$815        |
| Existing             | Multi Family     | Room Heat  | Windows  | U=0.30  | Existing Windows (U=0.65)                                 | 4,074                     | 15.0%                         | 75%   | 60%                                 | 25           | \$1,939      |
| Existing             | Multi Family     | Water Heat | Water_Heater (40 Gallon Electric)              | EF = 0.95                                     | EF = 0.92   | 1,893                     | 3.1%                          | NA  | NA                                  | 15           | \$129        |
| Existing             | Multi Family     | Water Heat | Clothes Washer                                 | Energy Star MEF = 1.83 (top Load)             | Standard Clothes Washer (1.26)                            | 1,940                     | 9.3%                          | 25%   | 68%                                 | 14           | \$252        |
| Existing             | Multi Family     | Water Heat | Clothes Washer                                 | Tier 2. MEF = 2.01 (front load)               | Standard Clothes Washer (1.26)                            | 1,940                     | 11.2%                         | 25%   | 85%                                 | 14           | \$312        |
| Existing             | Multi Family     | Water Heat | Clothes Washer                                 | Tier 2. MEF = 2.2 (front load)                | Standard Clothes Washer (1.26)                            | 1,940                     | 12.8%                         | 25%   | 85%                                 | 14           | \$417        |
| Existing             | Multi Family     | Water Heat | Clothes Washer - Early Replacement             | Standard Clothes Washer (1.26)                | Existing Clothes Washer (MEF = 1.1)                       | 1,940                     | 3.8%                          | 25%   | 25%                                 | 14           | \$378        |
| Existing             | Multi Family     | Water Heat | Desuperheater (Ground-Source Heat_Pump) system | Desuperheater with Standard Water_Heater      | Standard Water_Heater - EF = 0.92                         | 1,940                     | 55.2%                         | 5%  | 90%                                 | 10           | \$251        |
| Existing             | Multi Family     | Water Heat | Dishwasher                                     | EF = 0.77                                     | EF = 0.65 (ENERGY STAR)                                   | 1,940                     | 1.6%                          | 27%   | 35%                                 | 13           | \$514        |
| Existing             | Multi Family     | Water Heat | Dishwasher - Existing                          | EF = 0.65 (ENERGY STAR)                       | EF = 0.46 Existing Dishwasher                             | 1,940                     | 3.0%                          | 27%   | 15%                                 | 13           | \$11         |
| Existing             | Multi Family     | Water Heat | Drain Water Heat Recovery                      | Drain Water Heat Recovery (GFX or Power-Pipe) | No Drain Water Heat Recovery                              | 1,940                     | 18.5%                         | 0%  | 95%                                 | 30           | \$630        |
| Existing             | Multi Family     | Water Heat | Faucet Aerators                                | 0.5 GPM                                       | 2.2 GPM   | 1,940                     | 8.3%                          | 95%   | 95%                                 | 9            | \$3          |
| Existing             | Multi Family     | Water Heat | Faucet Aerators                                | 1.5 GPM                                       | 2.2 GPM   | 1,940                     | 3.4%                          | 95%   | 55%                                 | 9            | \$2          |
| Existing             | Multi Family     | Water Heat | Faucet Aerators                                | 2.2 GPM                                       | Existing Faucet Aerator (3.0 GPM)                         | 1,940                     | 3.9%                          | 95%   | 10%                                 | 9            | \$2          |
| Existing             | Multi Family     | Water Heat | Heat Pump Water Heater                         | EF=2.9  | No Heat Pump Water Heater                                 | 1,940                     | 54.6%                         | 30%   | 95%                                 | 15           | \$2,322      |
| Existing             | Multi Family     | Water Heat | Hot Water Pipe Insulation                      | R-4 Wrap                                      | No insulation   | 1,940                     | 1.2%                          | 65%   | 62%                                 | 5            | \$8          |
| Existing             | Multi Family     | Water Heat | Low-Flow Showerheads                           | 1.75 GPM                                      | 2.5 GPM   | 1,940                     | 14.1%                         | 95%   | 85%                                 | 10           | \$5          |
| Existing             | Multi Family     | Water Heat | Low-Flow Showerheads                           | 2.5 GPM                                       | 3.0 GPM   | 1,940                     | 9.4%                          | 95%   | 33%                                 | 10           | \$12         |
| Existing             | Multi Family     | Water Heat | Solar Hot Water (SHW)                          | Solar thermal collector                       | Non-solar hot water heater                                | 1,940                     | 37.5%                         | 20%   | 95%                                 | 20           | \$4,465      |
| Existing             | Multi Family     | Water Heat | Tankless Water_Heater                          | EF = 0.95, 4.0 gpm                            | EF = 0.92   | 1,940                     | 3.2%                          | 85%   | 98%                                 | 20           | \$1,429      |
| Existing             | Multi Family     | Water Heat | Water_Heater Tank Blanket/Insulation           | Install Insulation (R-5)                      | No Tank Insulation  | 1,940                     | 6.5%                          | 0%  | 73%                                 | 10           | \$19         |
| Existing             | Multi Family     | Water Heat | Water_Heater Thermostat Setback                | 120 degrees                                   | 135 degrees   | 1,940                     | 6.0%                          | 95%   | 64%                                 | 4            | \$0          |

| Construction Vintage | Customer Segment | End Use    | Measure Name                             | Measure Description   | Base Equipment                           | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|--|---|--|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Multi Family     | Central AC | Air Conditioner - Central (2.5 ton unit) | SEER 14   | SEER 13                                  | 534                       | 6.1%                          | NA  | NA                                  | 15           | \$336        |
| New                  | Multi Family     | Central AC | Air Conditioner - Central (2.5 ton unit) | SEER 16   | SEER 13                                  | 534                       | 15.4%                         | NA  | NA                                  | 15           | \$880        |
| New                  | Multi Family     | Central AC | Air Conditioner - Central (2.5 ton unit) | SEER 18   | SEER 13                                  | 534                       | 22.8%                         | NA  | NA                                  | 15           | \$1,353      |
| New                  | Multi Family     | Central AC | Air-to-Air Heat Exchangers               | Air-to-Air Heat Exchangers  | No Air to Air Heat Exchangers            | 465                       | 10.0%                         | 0%  | 95%                                 | 15           | \$990        |
| New                  | Multi Family     | Central AC | Blinds - Fixed Angle/Automatic           | Install Blinds (Reduce Window SHGC by 50%)                                  | No Interior Shading Device               | 465                       | 31.5%                         | 65%   | 30%                                 | 10           | \$172        |
| New                  | Multi Family     | Central AC | Canned Lighting Air Tight Sealing        | Canned Lighting Air Tight Sealing   | No Air tight Sealing                     | 465                       | 3.3%                          | 75%   | 25%                                 | 30           | \$3          |
| New                  | Multi Family     | Central AC | Ceiling Fan                              | Ceiling Fan   | No Ceiling Fan                           | 465                       | 0.4%                          | 85%   | 45%                                 | 10           | \$104        |
| New                  | Multi Family     | Central AC | Check Mel O&M Tune-up                    | Tune-up/Maintenance   | No Tune-up Maintenance                   | 465                       | 10.0%                         | 90%   | 50%                                 | 5            | \$236        |
| New                  | Multi Family     | Central AC | Construction - ICF                       | Concrete Framing  | Standard Wood Framing                    | 465                       | 32.0%                         | 45%   | 95%                                 | 30           | \$2,650      |
| New                  | Multi Family     | Central AC | Construction - SIP                       | Specialty Framing   | Standard Wood Framing                    | 465                       | 14.0%                         | 20%   | 95%                                 | 30           | \$2,380      |
| New                  | Multi Family     | Central AC | Cool Roofs                               | Lighter Colored Shingles (White)  | Standard Roof Shingles                   | 465                       | 20.0%                         | 0%  | 95%                                 | 20           | \$24         |
| New                  | Multi Family     | Central AC | Doors                                    | R-11 (Steel Doors with foam core)   | Standard non-thermal wood door (R-2)     | 465                       | 0.1%                          | 85%   | 50%                                 | 30           | \$58         |
| New                  | Multi Family     | Central AC | Doors                                    | R-5 (Composite Doors with foam core)  | Standard non-thermal wood door (R-2)     | 465                       | 0.1%                          | 85%   | 55%                                 | 12           | \$21         |
| New                  | Multi Family     | Central AC | Duct Location                            | Conditioned Space Design - Duct Loss Is Not A Concern                       | Ducts in Unconditioned Space (Duct loss) | 465                       | 8.0%                          | 85%   | 10%                                 | 30           | \$106        |
| New                  | Multi Family     | Central AC | Duct Sealing                             | Duct Sealing  | No Duct Sealing                          | 465                       | 6.0%                          | 0%  | 65%                                 | 20           | \$447        |
| New                  | Multi Family     | Central AC | Duct Sealing - Aerosol-Based             | Spray-in ductwork sealant to minimize duct leaks                            | New homes with AFUE HVAC, SEER 13        | 465                       | 19.0%                         | 0%  | 95%                                 | 25           | \$525        |
| New                  | Multi Family     | Central AC | Ductless Mini-Split REM                  | 2.5 ton, SEER 15, HSPF 9.0  | SEER 13 Central AC                       | 465                       | 11.3%                         | 80%   | 95%                                 | 15           | \$2,114      |
| New                  | Multi Family     | Central AC | Evaporative Space Cooling                | SEER 40   | SEER 13                                  | 465                       | 70.0%                         | 0%  | 95%                                 | 10           | \$1,119      |
| New                  | Multi Family     | Central AC | Green Roof                               | ecorooF   | Standard Roof                            | 465                       | 6.5%                          | 0%  | 98%                                 | 40           | \$6,206      |
| New                  | Multi Family     | Central AC | Insulation (Ceiling)                     | R-49  | State Code (R-38)                        | 465                       | 0.1%                          | 87%   | 85%                                 | 25           | \$336        |
| New                  | Multi Family     | Central AC | Insulation (Floor)                       | R-38  | State Code (R-30)                        | 465                       | 0.1%                          | 75%   | 90%                                 | 25           | \$747        |
| New                  | Multi Family     | Central AC | Insulation (Slab)                        | R-15  | State Code (R-10)                        | 465                       | 1.4%                          | 65%   | 64%                                 | 25           | \$221        |
| New                  | Multi Family     | Central AC | Insulation (wall) 2*6                    | R-21 + R5 Sheathing   | State Code (R-21)                        | 465                       | 0.0%                          | 95%   | 90%                                 | 25           | \$372        |
| New                  | Multi Family     | Central AC | Leak Proof Duct Fittings                 | Quick connect fittings that do not require mastic or drawbands (4 per unit) | 13 SEER                                  | 465                       | 15.0%                         | 0%  | 95%                                 | 30           | \$96         |
| New                  | Multi Family     | Central AC | Motor - ECM Motor                        | ECM motor for Central Air Conditioner                                       | Standard Motor                           | 465                       | 4.5%                          | 65%   | 95%                                 | 15           | \$368        |
| New                  | Multi Family     | Central AC | Outlet Gasket                            | Install Outlet Gasket (Reduce Air Leakage)                                  | No Outlet Gasket                         | 465                       | 2.0%                          | 95%   | 40%                                 | 5            | \$4          |
| New                  | Multi Family     | Central AC | Proper Sizing - Central Air Conditioner  | Correctly Sized Air Conditioner Unit  | Oversized Air Conditioner Unit           | 465                       | 6.0%                          | 53%   | 85%                                 | 15           | \$1          |
| New                  | Multi Family     | Central AC | Radiant Barrier (Ceiling)                | Install Radiant Barrier   | No Radiant Barrier                       | 465                       | 6.7%                          | 0%  | 97%                                 | 30           | \$258        |

| Construction Vintage | Customer Segment | End Use      | Measure Name                      | Measure Description   | Base Equipment                                 | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------|-----------------------------------|---|--|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Multi Family     | Central AC   | Solar Attic Fan                   | Solar electric attic ventilation  | Standard passive ventilation                   | 465                       | 6.0%                          | 70%   | 95%                                 | 10           | \$762        |
| New                  | Multi Family     | Central AC   | Thermostat - Clock/Programmable   | Programmable Thermostat   | Manual Thermostat                              | 465                       | 6.8%                          | 85%   | 25%                                 | 15           | \$27         |
| New                  | Multi Family     | Central AC   | Thermostat - Multi-Zone           | Individual Room Temperature Control for Major Occupied Rooms                | Programmable Thermostat - Central Control Only | 465                       | 7.0%                          | 65%   | 95%                                 | 12           | \$1,150      |
| New                  | Multi Family     | Central AC   | VSD Motor - ECM                   | Variable Speed Motor (ECM) for Central Air Conditioner                      | Constant Speed Motor                           | 465                       | 13.5%                         | 90%   | 85%                                 | 20           | \$341        |
| New                  | Multi Family     | Central AC   | Whole-House Dehumidifier          | Whole-House Dehumidifier  | No Dehumidifier                                | 465                       | 6.0%                          | 0%  | 95%                                 | 11           | \$1,439      |
| New                  | Multi Family     | Central AC   | Whole-House Fan                   | Whole-House Fan   | No Whole-House Fan                             | 465                       | 22.0%                         | 0%  | 96%                                 | 15           | \$334        |
| New                  | Multi Family     | Central AC   | Window Overhang                   | Overhangs over windows for shading  | No window overhangs                            | 465                       | 14.0%                         | 50%   | 80%                                 | 30           | \$724        |
| New                  | Multi Family     | Central AC   | Windows                           | U = 0.19  | U=0.30   | 465                       | 5.0%                          | 85%   | 95%                                 | 25           | \$1,155      |
| New                  | Multi Family     | Central Heat | Air-to-Air Heat Exchangers        | Air-to-Air Heat Exchangers  | No Air to Air Heat Exchangers                  | 3,321                     | 10.0%                         | 0%  | 95%                                 | 15           | \$990        |
| New                  | Multi Family     | Central Heat | Canned Lighting Air Tight Sealing | Canned Lighting Air Tight Sealing   | No Air tight Sealing                           | 3,321                     | 3.3%                          | 75%   | 25%                                 | 30           | \$3          |
| New                  | Multi Family     | Central Heat | Construction - ICF                | Concrete Framing  | Standard Wood Framing                          | 3,321                     | 44.0%                         | 45%   | 95%                                 | 30           | \$2,650      |
| New                  | Multi Family     | Central Heat | Construction - SIP                | Specialty Framing   | Standard Wood Framing                          | 3,321                     | 14.0%                         | 20%   | 95%                                 | 30           | \$2,380      |
| New                  | Multi Family     | Central Heat | Doors                             | R-11 (Steel Doors with foam core)   | Standard non-thermal wood door (R-2)           | 3,321                     | 5.0%                          | 85%   | 50%                                 | 30           | \$58         |
| New                  | Multi Family     | Central Heat | Doors                             | R-5 (Composite Doors with foam core)  | Standard non-thermal wood door (R-2)           | 3,321                     | 3.0%                          | 85%   | 55%                                 | 12           | \$21         |
| New                  | Multi Family     | Central Heat | Duct Location                     | Conditioned Space Design - Duct Loss Is Not A Concern                       | Ducts in Unconditioned Space (Duct loss)       | 3,321                     | 8.0%                          | 85%   | 10%                                 | 30           | \$106        |
| New                  | Multi Family     | Central Heat | Duct Sealing                      | Duct Sealing  | No Duct Sealing                                | 3,321                     | 6.0%                          | 0%  | 65%                                 | 20           | \$447        |
| New                  | Multi Family     | Central Heat | Duct Sealing - Aerosol-Based      | Spray-in ductwork sealant to minimize duct leaks                            | New homes with AFUE HVAC, SEER 13              | 3,321                     | 19.0%                         | 0%  | 95%                                 | 25           | \$525        |
| New                  | Multi Family     | Central Heat | Green Roof                        | ecorroof  | Standard Roof                                  | 3,321                     | 6.5%                          | 0%  | 98%                                 | 40           | \$6,206      |
| New                  | Multi Family     | Central Heat | Insulation (Ceiling)              | R-49  | State Code (R-38)                              | 3,321                     | 3.0%                          | 87%   | 85%                                 | 25           | \$336        |
| New                  | Multi Family     | Central Heat | Insulation (Floor)                | R-38  | State Code (R-30)                              | 3,321                     | 2.0%                          | 75%   | 90%                                 | 25           | \$747        |
| New                  | Multi Family     | Central Heat | Insulation (Slab)                 | R-15  | State Code (R-10)                              | 3,321                     | 1.4%                          | 65%   | 64%                                 | 25           | \$221        |
| New                  | Multi Family     | Central Heat | Insulation (wall) 2*6             | R-21 + R5 Sheathing   | State Code (R-21)                              | 3,321                     | 3.2%                          | 95%   | 90%                                 | 25           | \$372        |
| New                  | Multi Family     | Central Heat | Leak Proof Duct Fittings          | Quick connect fittings that do not require mastic or drawbands (4 per unit) | 13 SEER  | 3,321                     | 15.0%                         | 0%  | 95%                                 | 30           | \$96         |
| New                  | Multi Family     | Central Heat | Outlet Gasket                     | Install Outlet Gasket (Reduce Air Leakage)                                  | No Outlet Gasket                               | 3,321                     | 2.0%                          | 95%   | 40%                                 | 5            | \$4          |
| New                  | Multi Family     | Central Heat | Radiant Barrier (Ceiling)         | Install Radiant Barrier   | No Radiant Barrier                             | 3,321                     | 2.0%                          | 0%  | 97%                                 | 30           | \$258        |
| New                  | Multi Family     | Central Heat | Spray in insulation 2*4 Wall      | 2*4Wall - closed cell foam insulation R-23                                  | 2*6Wall R-21                                   | 3,321                     | 3.0%                          | 90%   | 90%                                 | 25           | \$1,706      |
| New                  | Multi Family     | Central Heat | Spray in insulation 2*6 Wall      | 2*6Wall - closed cell foam insulation R-37                                  | 2*6Wall R-21                                   | 3,321                     | 10.0%                         | 90%   | 90%                                 | 25           | \$2,448      |

| Construction Vintage | Customer Segment | End Use      | Measure Name                                       | Measure Description  | Base Equipment                                 | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------|--|--|--|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Multi Family     | Central Heat | Thermostat - Clock/Programmable                    | Programmable Thermostat                                      | Manual Thermostat                              | 3,321                     | 6.8%                          | 85%   | 75%                                 | 15           | \$27         |
| New                  | Multi Family     | Central Heat | Thermostat - Multi-Zone                            | Individual Room Temperature Control for Major Occupied Rooms | Programmable Thermostat - Central Control Only | 3,321                     | 7.0%                          | 65%   | 95%                                 | 12           | \$1,150      |
| New                  | Multi Family     | Central Heat | Windows  | U = 0.19   | U=0.30   | 3,321                     | 16.0%                         | 85%   | 95%                                 | 25           | \$1,155      |
| New                  | Multi Family     | Cooking Oven | Convection Oven                                    | Convection Oven (wall oven)                                  | Standard Oven (wall oven)                      | 435                       | 23.0%                         | 85%   | 85%                                 | 15           | \$432        |
| New                  | Multi Family     | Dryer        | Clothes Dryer With Moisture Sensor                 | High-Efficiency Clothes Dryer With Moisture Sensor           | Standard Dryer Without Moisture Sensor         | 646                       | 13.0%                         | NA  | NA                                  | 18           | \$58         |
| New                  | Multi Family     | Freezer      | Freezer - Stand-Alone                              | Energy Star 14.8 cu ft Chest Freezer                         | Standard 14.8 cu ft Freezer                    | 553                       | 10.0%                         | NA  | NA                                  | 12           | \$26         |
| New                  | Multi Family     | HVAC Aux     | Motor - ECM Motor                                  | ECM Motor for Forced Air Electric Furnace                    | Standard Motor                                 | 340                       | 25.0%                         | 10%   | 95%                                 | 15           | \$368        |
| New                  | Multi Family     | HVAC Aux     | Motor - ECM Motor                                  | ECM Motor for Forced Air Gas Furnace                         | Standard Motor                                 | 340                       | 25.0%                         | 72%   | 95%                                 | 15           | \$368        |
| New                  | Multi Family     | HVAC Aux     | VSD Fan  | Variable Speed Fan - Electric Furnace                        | Constant Speed Fan                             | 340                       | 75.0%                         | 5%  | 85%                                 | 20           | \$447        |
| New                  | Multi Family     | HVAC Aux     | VSD Fan  | Variable Speed Fan - Gas Furnace                             | Constant Speed Fan                             | 340                       | 75.0%                         | 16%   | 85%                                 | 20           | \$447        |
| New                  | Multi Family     | Lighting     | CFL Fixtures, High Use                             | 2-15 W CFLs, 4.0 hr/day (37%)                                | 2-60 W Incandescent                            | 1,148                     | 4.7%                          | 98%   | 79%                                 | 20           | \$35         |
| New                  | Multi Family     | Lighting     | CFL Fixtures, Low Use                              | 2-15 W CFLs, 1.0 hr/day (32%)                                | 2-60 W Incandescent                            | 1,148                     | 4.0%                          | 98%   | 79%                                 | 20           | \$30         |
| New                  | Multi Family     | Lighting     | CFL Fixtures, Medium Use                           | 2-15 W CFLs, 2.5 hr/day (33%)                                | 2-60 W Incandescent                            | 1,148                     | 4.2%                          | 98%   | 79%                                 | 20           | \$33         |
| New                  | Multi Family     | Lighting     | CFL Lamps, High Use                                | 1-15W, 4.0 hr/day (37%)                                      | Incandescent 60W                               | 1,148                     | 34.0%                         | 86%   | 79%                                 | 7            | \$2          |
| New                  | Multi Family     | Lighting     | CFL Lamps, Low Use                                 | 1-15W, 1.0 hr/day (32%)                                      | Incandescent 60W                               | 1,148                     | 9.7%                          | 86%   | 79%                                 | 27           | \$2          |
| New                  | Multi Family     | Lighting     | CFL Lamps, Medium Use                              | 1-15W, 2.5 hr/day (33%)                                      | Incandescent 60W                               | 1,148                     | 14.0%                         | 86%   | 79%                                 | 11           | \$2          |
| New                  | Multi Family     | Lighting     | CFL Lighting - 3-Way                               | 13 W, 20W And 25W  | 30W, 75W, 100W                                 | 1,148                     | 1.8%                          | 75%   | 79%                                 | 7            | \$13         |
| New                  | Multi Family     | Lighting     | CFL Torchieries, High Use                          | 55 W CFL, (20%)  | Incandescent Torchieries, 180W Halogen         | 1,148                     | 0.4%                          | 70%   | 35%                                 | 7            | \$7          |
| New                  | Multi Family     | Lighting     | CFL Torchieries, Low Use                           | 55 W CFL, (20%)  | Incandescent Torchieries, 180W Halogen         | 1,148                     | 0.4%                          | 70%   | 35%                                 | 27           | \$7          |
| New                  | Multi Family     | Lighting     | CFL Torchieries, Medium Use                        | 55 W CFL, (60%)  | Incandescent Torchieries, 180W Halogen         | 1,148                     | 1.3%                          | 70%   | 35%                                 | 11           | \$7          |
| New                  | Multi Family     | Lighting     | Daylighting Controls (Photocell) - Indoor/Outdoors | Install Photocell  | No Daylighting Controls                        | 1,148                     | 4.5%                          | 0%  | 95%                                 | 10           | \$110        |
| New                  | Multi Family     | Lighting     | LED Christmas Lighting                             | LED Christmas Lighting                                       | Incandescent Christmas Lighting                | 1,148                     | 0.4%                          | 40%   | 85%                                 | 13           | \$11         |
| New                  | Multi Family     | Lighting     | LED Interior Lighting (White), High Use            | LED 4W   | Incandescent 60W                               | 1,148                     | 42.3%                         | 85%   | 98%                                 | 13           | \$31         |
| New                  | Multi Family     | Lighting     | LED Interior Lighting (White), Low Use             | LED 4W   | Incandescent 60W                               | 1,148                     | 12.1%                         | 85%   | 98%                                 | 13           | \$31         |
| New                  | Multi Family     | Lighting     | LED Interior Lighting (White), Medium Use          | LED 4W   | Incandescent 60W                               | 1,148                     | 17.4%                         | 85%   | 98%                                 | 13           | \$31         |
| New                  | Multi Family     | Lighting     | Occupancy Sensors                                  | Wall-Switch Occupancy Sensors                                | No Occupancy Sensor                            | 1,148                     | 14.0%                         | 75%   | 85%                                 | 10           | \$64         |
| New                  | Multi Family     | Lighting     | Time Clocks (Exterior Lighting)                    | Exterior Lighting on a Time Clock                            | Exterior Lighting (Manual Control)             | 1,148                     | 1.9%                          | 75%   | 90%                                 | 10           | \$93         |

| Construction Vintage | Customer Segment | End Use      | Measure Name   | Measure Description  | Base Equipment                           | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------|--|--|--|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Multi Family     | Plug Load    | 1-Watt Standby Power   | 1W or less standby power use for small appliances                            | Standard plug load appliance.            | 1,357                     | 4.2%                          | 15%   | 85%                                 | 7            | \$32         |
| New                  | Multi Family     | Plug Load    | Energy Star Battery Chargers                                 | Energy Star Battery Chargers   | Standard Battery Chargers                | 1,357                     | 0.2%                          | 55%   | 40%                                 | 7            | \$4          |
| New                  | Multi Family     | Plug Load    | Energy Star DVD System                                       | Energy Star DVD System   | Standard DVD System                      | 1,357                     | 2.7%                          | 74%   | 24%                                 | 7            | \$12         |
| New                  | Multi Family     | Plug Load    | Energy Star Dehumidifiers                                    | Energy Star Dehumidifiers  | Standard Dehumidifiers                   | 1,357                     | 0.6%                          | 15%   | 5%                                  | 10           | \$13         |
| New                  | Multi Family     | Plug Load    | Energy Star Digital Set Top Receiver                         | Energy Star Digital Set Top Receiver   | Standard Digital Set Top Receiver        | 1,357                     | 1.9%                          | 68%   | 62%                                 | 6            | \$37         |
| New                  | Multi Family     | Plug Load    | Energy Star HDTV   | Energy Star HDTV   | Standard HDTV                            | 1,357                     | 1.6%                          | 22%   | 70%                                 | 9            | \$105        |
| New                  | Multi Family     | Plug Load    | Energy Star Home Audio System                                | Energy Star Home Audio System  | Standard Home Audio system               | 1,357                     | 2.4%                          | 66%   | 90%                                 | 7            | \$21         |
| New                  | Multi Family     | Plug Load    | Energy Star Office Computer                                  | Energy Star Office Computer  | Standard Office Computer                 | 1,357                     | 12.8%                         | 64%   | 15%                                 | 4            | \$84         |
| New                  | Multi Family     | Plug Load    | Energy Star Office Copiers                                   | Energy Star Office Copiers   | Standard Office Copiers                  | 1,357                     | 1.5%                          | 14%   | 55%                                 | 6            | \$53         |
| New                  | Multi Family     | Plug Load    | Energy Star Office Monitor                                   | Energy Star Office Monitor   | Standard Office Monitor                  | 1,357                     | 3.0%                          | 82%   | 15%                                 | 4            | \$16         |
| New                  | Multi Family     | Plug Load    | Energy Star Office Printer                                   | Energy Star Office Printer   | Standard Office Printer                  | 1,357                     | 0.2%                          | 56%   | 40%                                 | 5            | \$11         |
| New                  | Multi Family     | Plug Load    | Energy Star TV   | Energy Star TV   | Standard TV                              | 1,357                     | 3.9%                          | 100%  | 38%                                 | 9            | \$32         |
| New                  | Multi Family     | Plug Load    | Energy Star VCR  | Energy Star VCR/DVD Combo  | Standard Home VCR                        | 1,357                     | 0.9%                          | 85%   | 45%                                 | 4            | \$38         |
| New                  | Multi Family     | Plug Load    | Power supply transformer/converter - External power adapters | Power supply transformer/converter - High efficiency External power adapters | Standard Efficiency                      | 1,357                     | 0.7%                          | 85%   | 40%                                 | 7            | \$8          |
| New                  | Multi Family     | Plug Load    | Powerstrip with Occupancy Sensor                             | Powerstrip with Occupancy Sensor   | Powerstrip w/o Occupany Sensor           | 1,357                     | 1.2%                          | 65%   | 90%                                 | 10           | \$88         |
| New                  | Multi Family     | Refrigerator | Refrigerator/Freezer - Energy Star                           | Energy Star Refrigerator   | Standard Refrigerator                    | 490                       | 20.0%                         | NA  | NA                                  | 18           | \$32         |
| New                  | Multi Family     | Refrigerator | 1 kWh/day Refrigerator                                       | 20 cf top-freezer using no more than 1 kWh/day                               | Standard Refrigerator, 20cf, top-freezer | 416                       | 30.0%                         | 90%   | 97%                                 | 19           | \$74         |
| New                  | Multi Family     | Refrigerator | Refrigerator eCube   | Refrigerator eCube   | No Refrigerator eCube                    | 416                       | 6.3%                          | 85%   | 95%                                 | 5            | \$236        |
| New                  | Multi Family     | Refrigerator | Solid state refrigeration (cool chips™) for refrigerators    | Thermoelectric refrigerator, 1.7 cubic ft. refrigerators                     | Compact refrigerator, 1.7 cubic ft.      | 416                       | 4.0%                          | 75%   | 95%                                 | 19           | \$56         |
| New                  | Multi Family     | Room Heat    | Canned Lighting Air Tight Sealing                            | Canned Lighting Air Tight Sealing  | No Air tight Sealing                     | 2,557                     | 3.3%                          | 75%   | 25%                                 | 30           | \$3          |
| New                  | Multi Family     | Room Heat    | Construction - ICF   | Concrete Framing   | Standard Wood Framing                    | 2,557                     | 44.0%                         | 45%   | 95%                                 | 30           | \$2,650      |
| New                  | Multi Family     | Room Heat    | Construction - SIP   | Specialty Framing  | Standard Wood Framing                    | 2,557                     | 14.0%                         | 20%   | 95%                                 | 30           | \$2,380      |
| New                  | Multi Family     | Room Heat    | Doors  | R-11 (Steel Doors with foam core)  | Standard non-thermal wood door (R-2)     | 2,557                     | 5.0%                          | 85%   | 50%                                 | 30           | \$58         |
| New                  | Multi Family     | Room Heat    | Doors  | R-5 (Composite Doors with foam core)   | Standard non-thermal wood door (R-2)     | 2,557                     | 3.0%                          | 85%   | 55%                                 | 12           | \$21         |
| New                  | Multi Family     | Room Heat    | Ductless Mini-Split REM                                      | 2.5 ton, SEER 15, HSPF 9.0   | Electric Baseboard Heating HSPF=1        | 2,557                     | 62.1%                         | 80%   | 95%                                 | 15           | \$5,311      |
| New                  | Multi Family     | Room Heat    | Green Roof   | ecorroof   | Standard Roof                            | 2,557                     | 6.5%                          | 0%  | 98%                                 | 40           | \$6,206      |
| New                  | Multi Family     | Room Heat    | Insulation (Ceiling)   | R-49   | State Code (R-38)                        | 2,557                     | 3.0%                          | 87%   | 85%                                 | 25           | \$336        |
| New                  | Multi Family     | Room Heat    | Insulation (Floor)   | R-38   | State Code (R-30)                        | 2,557                     | 2.0%                          | 75%   | 90%                                 | 25           | \$747        |

| Construction Vintage | Customer Segment | End Use    | Measure Name                                   | Measure Description                              | Base Equipment                    | Baseline kWh (UEC or EUI) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|--|--|-----------------------------------|---------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Multi Family     | Room Heat  | Insulation (Slab)                              | R-15   | State Code (R-10)                 | 2,557                     | 1.4%                      | 65%   | 64%                                 | 25           | \$221        |
| New                  | Multi Family     | Room Heat  | Insulation (wall) 2*6                          | R-21 + R5 Sheathing                              | State Code (R-21)                 | 2,557                     | 3.2%                      | 95%   | 90%                                 | 25           | \$372        |
| New                  | Multi Family     | Room Heat  | Outlet Gasket                                  | Install Outlet Gasket (Reduce Air Leakage)       | No Outlet Gasket                  | 2,557                     | 2.0%                      | 95%   | 40%                                 | 5            | \$4          |
| New                  | Multi Family     | Room Heat  | Radiant Barrier (Ceiling)                      | Install Radiant Barrier                          | No Radiant Barrier                | 2,557                     | 2.0%                      | 0%  | 97%                                 | 30           | \$258        |
| New                  | Multi Family     | Room Heat  | Radiant Electric Ceiling Panels                | Radiant Electric Heating with Ceiling Panels     | Electric Baseboard Heating        | 2,557                     | 52.0%                     | 75%   | 98%                                 | 20           | \$3,187      |
| New                  | Multi Family     | Room Heat  | Radiant Electric Floor Heating                 | Radiant Heating with Electric Cables in Flooring | Electric Baseboard Heating        | 2,557                     | 20.0%                     | 75%   | 95%                                 | 25           | \$12838      |
| New                  | Multi Family     | Room Heat  | Spray in insulation 2*4 Wall                   | 2*4Wall - closed cell foam insulation R-23       | 2*6Wall R-21                      | 2,557                     | 3.0%                      | 90%   | 90%                                 | 25           | \$1,706      |
| New                  | Multi Family     | Room Heat  | Spray in insulation 2*6 Wall                   | 2*6Wall - closed cell foam insulation R-37       | 2*6Wall R-21                      | 2,557                     | 10.0%                     | 90%   | 90%                                 | 25           | \$2,448      |
| New                  | Multi Family     | Room Heat  | Windows  | U = 0.19   | U=0.30                            | 2,557                     | 16.0%                     | 85%   | 95%                                 | 25           | \$1,155      |
| New                  | Multi Family     | Water Heat | Water_Heater (40 Gallon Electric)              | EF = 0.95  | EF = 0.92                         | 1,676                     | 3.1%                      | NA  | NA                                  | 15           | \$129        |
| New                  | Multi Family     | Water Heat | Clothes Washer                                 | Energy Star MEF = 1.83 (top Load)                | Standard Clothes Washer (1.26)    | 1,645                     | 9.3%                      | 25%   | 68%                                 | 14           | \$252        |
| New                  | Multi Family     | Water Heat | Clothes Washer                                 | Tier 2. MEF = 2.01 (front load)                  | Standard Clothes Washer (1.26)    | 1,645                     | 11.2%                     | 25%   | 85%                                 | 14           | \$312        |
| New                  | Multi Family     | Water Heat | Clothes Washer                                 | Tier 2. MEF = 2.2 (front load)                   | Standard Clothes Washer (1.26)    | 1,645                     | 12.8%                     | 25%   | 85%                                 | 14           | \$417        |
| New                  | Multi Family     | Water Heat | Desuperheater system (Ground-Source Heat_Pump) | Desuperheater with Standard Water_Heater         | Standard Water_Heater - EF = 0.92 | 1,645                     | 55.2%                     | 5%  | 90%                                 | 10           | \$251        |
| New                  | Multi Family     | Water Heat | Dishwasher                                     | EF = 0.77  | EF = 0.65 (ENERGY STAR)           | 1,645                     | 1.6%                      | 27%   | 35%                                 | 13           | \$514        |
| New                  | Multi Family     | Water Heat | Dishwasher - Existing                          | EF = 0.65 (ENERGY STAR)                          | EF = 0.46 Existing Dishwasher     | 1,645                     | 3.0%                      | 27%   | 15%                                 | 13           | \$11         |
| New                  | Multi Family     | Water Heat | Drain Water Heat Recovery                      | Drain Water Heat Recovery (GFX or Power-Pipe)    | No Drain Water Heat Recovery      | 1,645                     | 18.5%                     | 50%   | 95%                                 | 30           | \$630        |
| New                  | Multi Family     | Water Heat | Faucet Aerators                                | 0.5 GPM  | 2.2 GPM                           | 1,645                     | 9.7%                      | 95%   | 95%                                 | 9            | \$3          |
| New                  | Multi Family     | Water Heat | Faucet Aerators                                | 1.5 GPM  | 2.2 GPM                           | 1,645                     | 4.0%                      | 95%   | 55%                                 | 9            | \$2          |
| New                  | Multi Family     | Water Heat | Heat Pump Water Heater                         | EF=2.9   | No Heat Pump Water Heater         | 1,645                     | 54.6%                     | 30%   | 95%                                 | 15           | \$2,322      |
| New                  | Multi Family     | Water Heat | Hot Water Pipe Insulation                      | R-4 Wrap   | No insulation                     | 1,645                     | 1.2%                      | 85%   | 62%                                 | 5            | \$8          |
| New                  | Multi Family     | Water Heat | Low-Flow Showerheads                           | 1.75 GPM   | 2.5 GPM                           | 1,645                     | 16.5%                     | 95%   | 85%                                 | 10           | \$5          |
| New                  | Multi Family     | Water Heat | Solar Hot Water (SHW)                          | Solar thermal collector                          | Non-solar hot water heater        | 1,645                     | 38.9%                     | 20%   | 95%                                 | 20           | \$4,465      |
| New                  | Multi Family     | Water Heat | Tankless Water_Heater                          | EF = 0.95, 4.0 gpm                               | EF = 0.92                         | 1,645                     | 3.2%                      | 85%   | 98%                                 | 20           | \$1,302      |
| New                  | Multi Family     | Water Heat | Water_Heater Tank Blanket/Insulation           | Install Insulation (R-5)                         | No Tank Insulation                | 1,645                     | 6.5%                      | 0%  | 73%                                 | 10           | \$19         |
| New                  | Multi Family     | Water Heat | Water_Heater Thermostat Setback                | 120 degrees                                      | 135 degrees                       | 1,645                     | 6.0%                      | 95%   | 64%                                 | 4            | \$0          |
| Existing             | Single Family    | Central AC | Air Conditioner - Central (3.0 ton unit)       | SEER 14  | SEER 13                           | 864                       | 5.7%                      | NA  | NA                                  | 15           | \$368        |
| Existing             | Single Family    | Central AC | Air Conditioner - Central (3.0 ton unit)       | SEER 16  | SEER 13                           | 864                       | 15.1%                     | NA  | NA                                  | 15           | \$1,061      |
| Existing             | Single Family    | Central AC | Air Conditioner - Central (3.0 ton unit)       | SEER 18  | SEER 13                           | 864                       | 26.9%                     | NA  | NA                                  | 15           | \$1,789      |

| Construction Vintage | Customer Segment | End Use    | Measure Name   | Measure Description                              | Base Equipment   | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|--|--|--|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Single Family    | Central AC | Air-to-Air Heat Exchangers   | Air-to-Air Heat Exchangers                       | No Air to Air Heat Exchangers                              | 958                       | 10.0%                         | 0%  | 95%                                 | 15           | \$990        |
| Existing             | Single Family    | Central AC | Blinds - Fixed Angle/Automatic                                     | Install Blinds (Reduce Window SHGC by 50%)       | No Interior Shading Device                                 | 958                       | 41.3%                         | 65%   | 30%                                 | 10           | \$603        |
| Existing             | Single Family    | Central AC | Canned Lighting Air Tight Sealing                                  | Canned Lighting Air Tight Sealing                | No Air tight Sealing                                       | 958                       | 3.3%                          | 60%   | 55%                                 | 30           | \$53         |
| Existing             | Single Family    | Central AC | Ceiling Fan  | Ceiling Fan                                      | No Ceiling Fan   | 958                       | 0.3%                          | 85%   | 20%                                 | 10           | \$104        |
| Existing             | Single Family    | Central AC | Check Mel O&M Tune-up  | Tune-up/Maintenance                              | No Tune-up Maintenance                                     | 958                       | 10.0%                         | 90%   | 50%                                 | 5            | \$236        |
| Existing             | Single Family    | Central AC | Cool Roofs   | Lighter Colored Shingles (White)                 | Standard Roof Shingles                                     | 958                       | 20.0%                         | 0%  | 95%                                 | 20           | \$57         |
| Existing             | Single Family    | Central AC | Doors  | R-11 (Steel Doors with foam core)                | Standard non-thermal wood door (R-2)                       | 958                       | 0.1%                          | 85%   | 50%                                 | 30           | \$116        |
| Existing             | Single Family    | Central AC | Doors  | R-5 (Composite Doors with foam core)             | Standard non-thermal wood door (R-2)                       | 958                       | 0.1%                          | 85%   | 55%                                 | 12           | \$42         |
| Existing             | Single Family    | Central AC | Doors - Weatherization   | Weatherstripping And Adding Door Sweeps          | Existing Non-Efficient door                                | 958                       | 2.0%                          | 80%   | 45%                                 | 6            | \$36         |
| Existing             | Single Family    | Central AC | Duct Sealing   | Duct Sealing                                     | No Duct Sealing  | 958                       | 6.0%                          | 60%   | 65%                                 | 20           | \$447        |
| Existing             | Single Family    | Central AC | Duct Sealing - Aerosol-Based                                       | Spray-in ductwork sealant to minimize duct leaks | Older homes with AFUE HVAC, SEER 9                         | 958                       | 19.0%                         | 50%   | 95%                                 | 25           | \$946        |
| Existing             | Single Family    | Central AC | Evaporative Space Cooling  | SEER 40  | SEER 13  | 958                       | 70.0%                         | 75%   | 95%                                 | 10           | \$1,119      |
| Existing             | Single Family    | Central AC | Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test | Install Caulking And Weatherstripping            | Existing Infiltration Conditions                           | 958                       | 10.0%                         | 75%   | 75%                                 | 15           | \$455        |
| Existing             | Single Family    | Central AC | Insulation (Basement - Wall) 2'4                                   | R-13 + R-5 sheathing                             | R-13   | 958                       | 6.1%                          | 13%   | 95%                                 | 25           | \$708        |
| Existing             | Single Family    | Central AC | Insulation (Basement - Wall) 2'4 - average existing value          | R-13   | Average Existing Insulation Value and/or Code Value (R-7)  | 958                       | 6.9%                          | 13%   | 70%                                 | 25           | \$906        |
| Existing             | Single Family    | Central AC | Insulation (Basement - Wall) 2'4 - below code                      | R-13   | R-0  | 958                       | 14.9%                         | 13%   | 70%                                 | 25           | \$906        |
| Existing             | Single Family    | Central AC | Insulation (Ceiling)   | R-49   | State Code (R-38)  | 958                       | 0.3%                          | 87%   | 85%                                 | 25           | \$344        |
| Existing             | Single Family    | Central AC | Insulation (Ceiling) - average existing value                      | State Code (R-38)                                | Average Existing Insulation Value (R-19)                   | 958                       | 1.0%                          | 95%   | 40%                                 | 25           | \$562        |
| Existing             | Single Family    | Central AC | Insulation (Ceiling) - below code                                  | State Code (R-38)                                | R-9  | 958                       | 0.6%                          | 95%   | 10%                                 | 25           | \$562        |
| Existing             | Single Family    | Central AC | Insulation (Duct)  | R-8  | No Duct Insulation   | 958                       | 3.2%                          | 12%   | 75%                                 | 25           | \$335        |
| Existing             | Single Family    | Central AC | Insulation (Duct)  | R-8  | R-4  | 958                       | 1.6%                          | 12%   | 95%                                 | 25           | \$172        |
| Existing             | Single Family    | Central AC | Insulation (Floor)   | R-38   | State Code (R-30)  | 958                       | 0.1%                          | 75%   | 90%                                 | 25           | \$884        |
| Existing             | Single Family    | Central AC | Insulation (Floor) - average existing value                        | State Code (R-30)                                | Average Existing Insulation Value and/or Code Value (R-20) | 958                       | 0.1%                          | 55%   | 40%                                 | 25           | \$443        |
| Existing             | Single Family    | Central AC | Insulation (Floor) - below code                                    | State Code (R-30)                                | R-0  | 958                       | 0.1%                          | 55%   | 10%                                 | 25           | \$1,331      |
| Existing             | Single Family    | Central AC | Insulation (Rim And Band Joist)                                    | R-10   | No Rim And Band Joist Insulation                           | 958                       | 3.0%                          | 60%   | 45%                                 | 25           | \$130        |
| Existing             | Single Family    | Central AC | Insulation (Rim And Band Joist)                                    | R-19   | R-10   | 958                       | 4.0%                          | 60%   | 75%                                 | 25           | \$84         |
| Existing             | Single Family    | Central AC | Insulation (Slab)  | R-15   | State Code (R-10)  | 958                       | 1.4%                          | 0%  | 87%                                 | 25           | \$223        |



| Construction Vintage | Customer Segment | End Use      | Measure Name                                   | Measure Description   | Base Equipment  | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------|--|---|---|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Single Family    | Central AC   | Insulation (Slab) - average existing value     | State Code (R-10)   | Average Existing Insulation Value and/or Code Value (R-7) | 958                       | 1.3%                          | 0%  | 65%                                 | 25           | \$1,049      |
| Existing             | Single Family    | Central AC   | Insulation (Slab) - below code                 | State Code (R-10)   | R-0   | 958                       | 4.3%                          | 0%  | 60%                                 | 25           | \$1,049      |
| Existing             | Single Family    | Central AC   | Insulation (Wall) 2*4                          | R-13 + R5 Sheathing   | R-13  | 958                       | 0.0%                          | 10%   | 90%                                 | 25           | \$1,786      |
| Existing             | Single Family    | Central AC   | Insulation (Wall) 2*4 - average existing value | R-13  | Average Existing Insulation Value and/or Code Value (R-8) | 958                       | 0.1%                          | 75%   | 45%                                 | 25           | \$1,396      |
| Existing             | Single Family    | Central AC   | Insulation (Wall) 2*4 - below code             | R-13  | R-0   | 958                       | 0.1%                          | 75%   | 5%                                  | 25           | \$1,396      |
| Existing             | Single Family    | Central AC   | Insulation (wall) 2*6 - average existing value | State Code (R-21)   | Average Existing Insulation Value and/or Code Value (R-8) | 958                       | 0.1%                          | 0%  | 60%                                 | 25           | \$2,276      |
| Existing             | Single Family    | Central AC   | Insulation (wall) 2*6 - below code             | State Code (R-21)   | R-0   | 958                       | 0.1%                          | 0%  | 50%                                 | 25           | \$2,276      |
| Existing             | Single Family    | Central AC   | Leak Proof Duct Fittings                       | Quick connect fittings that do not require mastic or drawbands (6 per unit) | 13 SEER   | 958                       | 15.0%                         | 10%   | 95%                                 | 30           | \$288        |
| Existing             | Single Family    | Central AC   | Motor - ECM Motor                              | ECM motor for Central Air Conditioner                                       | Standard Motor  | 958                       | 4.5%                          | 65%   | 95%                                 | 15           | \$368        |
| Existing             | Single Family    | Central AC   | Outlet Gasket                                  | Install Outlet Gasket (Reduce Air Leakage)                                  | No Outlet Gasket  | 958                       | 2.0%                          | 95%   | 60%                                 | 5            | \$7          |
| Existing             | Single Family    | Central AC   | Proper Sizing - Central Air Conditioner        | Correctly Sized Air Conditioner Unit  | Oversized Air Conditioner Unit                            | 958                       | 6.0%                          | 53%   | 85%                                 | 15           | \$1          |
| Existing             | Single Family    | Central AC   | Radiant Barrier (Ceiling)                      | Install Radiant Barrier   | No Radiant Barrier  | 958                       | 6.7%                          | 0%  | 97%                                 | 30           | \$305        |
| Existing             | Single Family    | Central AC   | Solar Attic Fan                                | Solar electric attic ventilation  | Standard passive ventilation                              | 958                       | 6.0%                          | 50%   | 95%                                 | 10           | \$762        |
| Existing             | Single Family    | Central AC   | Thermostat - Clock/Programmable                | Programmable Thermostat   | Manual Thermostat   | 958                       | 6.8%                          | 85%   | 24%                                 | 15           | \$27         |
| Existing             | Single Family    | Central AC   | Thermostat - Multi-Zone                        | Individual Room Temperature Control for Major Occupied Rooms                | Programmable Thermostat - Central Control Only            | 958                       | 7.0%                          | 65%   | 95%                                 | 12           | \$1,422      |
| Existing             | Single Family    | Central AC   | VSD Motor - ECM                                | Variable Speed Motor (ECM) for Central Air Conditioner                      | Constant Speed Motor                                      | 958                       | 13.5%                         | 80%   | 85%                                 | 20           | \$341        |
| Existing             | Single Family    | Central AC   | Whole-House Dehumidifier                       | Whole-House Dehumidifier  | No Dehumidifier   | 958                       | 6.0%                          | 50%   | 95%                                 | 11           | \$1,439      |
| Existing             | Single Family    | Central AC   | Whole-House Fan                                | Whole-House Fan   | No Whole-House Fan  | 958                       | 22.0%                         | 50%   | 96%                                 | 15           | \$334        |
| Existing             | Single Family    | Central AC   | Windows  | U = 0.19  | U=0.30  | 958                       | 13.0%                         | 75%   | 95%                                 | 25           | \$4,343      |
| Existing             | Single Family    | Central AC   | Windows  | U=0.30  | Existing Windows (U=0.65)                                 | 958                       | 36.0%                         | 75%   | 60%                                 | 25           | \$10331      |
| Existing             | Single Family    | Central Heat | Air-to-Air Heat Exchangers                     | Air-to-Air Heat Exchangers  | No Air to Air Heat Exchangers                             | 8,893                     | 10.0%                         | 0%  | 95%                                 | 15           | \$990        |
| Existing             | Single Family    | Central Heat | Canned Lighting Air Tight Sealing              | Canned Lighting Air Tight Sealing   | No Air tight Sealing                                      | 8,893                     | 3.3%                          | 60%   | 55%                                 | 30           | \$53         |
| Existing             | Single Family    | Central Heat | Doors  | R-11 (Steel Doors with foam core)   | Standard non-thermal wood door (R-2)                      | 8,893                     | 3.0%                          | 85%   | 50%                                 | 30           | \$116        |
| Existing             | Single Family    | Central Heat | Doors  | R-5 (Composite Doors with foam core)  | Standard non-thermal wood door (R-2)                      | 8,893                     | 2.0%                          | 85%   | 55%                                 | 12           | \$42         |
| Existing             | Single Family    | Central Heat | Doors - Weatherization                         | Weatherstripping And Adding Door Sweeps                                     | Existing Non-Efficient door                               | 8,893                     | 2.0%                          | 80%   | 45%                                 | 6            | \$36         |
| Existing             | Single Family    | Central Heat | Duct Sealing                                   | Duct Sealing  | No Duct Sealing   | 8,893                     | 6.0%                          | 60%   | 65%                                 | 20           | \$447        |



| Construction Vintage | Customer Segment | End Use      | Measure Name   | Measure Description   | Base Equipment   | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------|--|---|--|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Single Family    | Central Heat | Duct Sealing - Aerosol-Based                                       | Spray-in ductwork sealant to minimize duct leaks                            | Older homes with AFUE HVAC, SEER 9                         | 8,893                     | 19.0%                         | 50%   | 95%                                 | 25           | \$946        |
| Existing             | Single Family    | Central Heat | Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test | Install Caulking And Weatherstripping                                       | Existing Infiltration Conditions                           | 8,893                     | 10.0%                         | 75%   | 75%                                 | 15           | \$455        |
| Existing             | Single Family    | Central Heat | Insulation (Basement - Wall) 2*4                                   | R-13 + R-5 sheathing  | R-13   | 8,893                     | 6.1%                          | 13%   | 95%                                 | 25           | \$708        |
| Existing             | Single Family    | Central Heat | Insulation (Basement - Wall) 2*4 - average existing value          | R-13  | Average Existing Insulation Value and/or Code Value (R-7)  | 8,893                     | 6.9%                          | 13%   | 70%                                 | 25           | \$906        |
| Existing             | Single Family    | Central Heat | Insulation (Basement - Wall) 2*4 - below code                      | R-13  | R-0  | 8,893                     | 14.9%                         | 13%   | 70%                                 | 25           | \$906        |
| Existing             | Single Family    | Central Heat | Insulation (Ceiling)   | R-49  | State Code (R-38)  | 8,893                     | 1.0%                          | 87%   | 85%                                 | 25           | \$344        |
| Existing             | Single Family    | Central Heat | Insulation (Ceiling) - average existing value                      | State Code (R-38)   | Average Existing Insulation Value (R-19)                   | 8,893                     | 2.0%                          | 95%   | 40%                                 | 25           | \$562        |
| Existing             | Single Family    | Central Heat | Insulation (Ceiling) - below code                                  | State Code (R-38)   | R-9  | 8,893                     | 10.2%                         | 95%   | 10%                                 | 25           | \$562        |
| Existing             | Single Family    | Central Heat | Insulation (Duct)  | R-8   | No Duct Insulation   | 8,893                     | 4.3%                          | 12%   | 75%                                 | 25           | \$335        |
| Existing             | Single Family    | Central Heat | Insulation (Duct)  | R-8   | R-4  | 8,893                     | 2.1%                          | 12%   | 95%                                 | 25           | \$172        |
| Existing             | Single Family    | Central Heat | Insulation (Floor)   | R-38  | State Code (R-30)  | 8,893                     | 1.0%                          | 75%   | 90%                                 | 25           | \$884        |
| Existing             | Single Family    | Central Heat | Insulation (Floor) - average existing value                        | State Code (R-30)   | Average Existing Insulation Value and/or Code Value (R-20) | 8,893                     | 2.0%                          | 55%   | 40%                                 | 25           | \$443        |
| Existing             | Single Family    | Central Heat | Insulation (Floor) - below code                                    | State Code (R-30)   | R-0  | 8,893                     | 10.0%                         | 55%   | 10%                                 | 25           | \$1,331      |
| Existing             | Single Family    | Central Heat | Insulation (Rim And Band Joist)                                    | R-10  | No Rim And Band Joist Insulation                           | 8,893                     | 3.0%                          | 60%   | 45%                                 | 25           | \$130        |
| Existing             | Single Family    | Central Heat | Insulation (Rim And Band Joist)                                    | R-19  | R-10   | 8,893                     | 4.0%                          | 60%   | 75%                                 | 25           | \$84         |
| Existing             | Single Family    | Central Heat | Insulation (Slab)  | R-15  | State Code (R-10)  | 8,893                     | 1.4%                          | 0%  | 87%                                 | 25           | \$223        |
| Existing             | Single Family    | Central Heat | Insulation (Slab) - average existing value                         | State Code (R-10)   | Average Existing Insulation Value and/or Code Value (R-7)  | 8,893                     | 1.3%                          | 0%  | 65%                                 | 25           | \$1,049      |
| Existing             | Single Family    | Central Heat | Insulation (Slab) - below code                                     | State Code (R-10)   | R-0  | 8,893                     | 4.3%                          | 0%  | 60%                                 | 25           | \$1,049      |
| Existing             | Single Family    | Central Heat | Insulation (Wall) 2*4  | R-13 + R5 Sheathing   | R-13   | 8,893                     | 2.2%                          | 10%   | 90%                                 | 25           | \$1,786      |
| Existing             | Single Family    | Central Heat | Insulation (Wall) 2*4 - average existing value                     | R-13  | Average Existing Insulation Value and/or Code Value (R-8)  | 8,893                     | 5.0%                          | 75%   | 45%                                 | 25           | \$1,396      |
| Existing             | Single Family    | Central Heat | Insulation (Wall) 2*4 - below code                                 | R-13  | R-0  | 8,893                     | 44.0%                         | 75%   | 5%                                  | 25           | \$1,396      |
| Existing             | Single Family    | Central Heat | Insulation (wall) 2*6 - average existing value                     | State Code (R-21)   | Average Existing Insulation Value and/or Code Value (R-8)  | 8,893                     | 12.0%                         | 0%  | 60%                                 | 25           | \$2,276      |
| Existing             | Single Family    | Central Heat | Insulation (wall) 2*6 - below code                                 | State Code (R-21)   | R-0  | 8,893                     | 49.0%                         | 0%  | 50%                                 | 25           | \$2,276      |
| Existing             | Single Family    | Central Heat | Leak Proof Duct Fittings   | Quick connect fittings that do not require mastic or drawbands (6 per unit) | 13 SEER  | 8,893                     | 15.0%                         | 10%   | 95%                                 | 30           | \$288        |
| Existing             | Single Family    | Central Heat | Outlet Gasket  | Install Outlet Gasket (Reduce Air Leakage)                                  | No Outlet Gasket   | 8,893                     | 2.0%                          | 95%   | 60%                                 | 5            | \$7          |

| Construction Vintage | Customer Segment | End Use      | Measure Name                            | Measure Description  | Base Equipment                                 | Baseline kWh (UEC or EUI) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------|---|--|--|---------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Single Family    | Central Heat | Radiant Barrier (Ceiling)               | Install Radiant Barrier                                      | No Radiant Barrier                             | 8,893                     | 2.0%                      | 0%  | 97%                                 | 30           | \$305        |
| Existing             | Single Family    | Central Heat | Spray in insulation 2*4 Wall            | 2*4Wall - closed cell foam insulation R-23                   | 2*4Wall R-13                                   | 8,893                     | 12.0%                     | 0%  | 95%                                 | 25           | \$6,711      |
| Existing             | Single Family    | Central Heat | Thermostat - Clock/Programmable         | Programmable Thermostat                                      | Manual Thermostat                              | 8,893                     | 6.8%                      | 85%   | 33%                                 | 15           | \$27         |
| Existing             | Single Family    | Central Heat | Thermostat - Multi-Zone                 | Individual Room Temperature Control for Major Occupied Rooms | Programmable Thermostat - Central Control Only | 8,893                     | 7.0%                      | 65%   | 95%                                 | 12           | \$1,422      |
| Existing             | Single Family    | Central Heat | Windows                                 | U = 0.19   | U=0.30   | 8,893                     | 6.0%                      | 75%   | 95%                                 | 25           | \$4,343      |
| Existing             | Single Family    | Central Heat | Windows                                 | U=0.30   | Existing Windows (U=0.65)                      | 8,893                     | 15.0%                     | 75%   | 60%                                 | 25           | \$10331      |
| Existing             | Single Family    | Cooking Oven | Convection Oven                         | Convection Oven (wall oven)                                  | Standard Oven (wall oven)                      | 435                       | 23.0%                     | 85%   | 85%                                 | 15           | \$432        |
| Existing             | Single Family    | Dryer        | Clothes Dryer With Moisture Sensor      | High-Efficiency Clothes Dryer With Moisture Sensor           | Standard Dryer Without Moisture Sensor         | 858                       | 13.0%                     | NA  | NA                                  | 18           | \$58         |
| Existing             | Single Family    | Freezer      | Freezer - Stand-Alone                   | Energy Star 14.8 cu ft Chest Freezer                         | Standard 14.8 cu ft Freezer                    | 553                       | 10.0%                     | NA  | NA                                  | 12           | \$26         |
| Existing             | Single Family    | Freezer      | Stand-Alone Freezer - Early Replacement | Energy Star Freezer  | Existing Non-Efficient Freezer                 | 665                       | 9.4%                      | 35%   | 80%                                 | 12           | \$489        |
| Existing             | Single Family    | Freezer      | Stand-Alone Freezer - Removal           | Proper Disposal of Freezer                                   | Existing Non-Efficient Freezer                 | 665                       | 248.7%                    | 35%   | 80%                                 | 6            | \$103        |
| Existing             | Single Family    | HVAC Aux     | Motor - ECM Motor                       | ECM Motor for Forced Air Electric Furnace                    | Standard Motor                                 | 550                       | 25.0%                     | 65%   | 95%                                 | 15           | \$368        |
| Existing             | Single Family    | HVAC Aux     | Motor - ECM Motor                       | ECM Motor for Forced Air Gas Furnace                         | Standard Motor                                 | 550                       | 25.0%                     | 65%   | 95%                                 | 15           | \$368        |
| Existing             | Single Family    | HVAC Aux     | VSD Fan                                 | Variable Speed Fan - Electric Furnace                        | Constant Speed Fan                             | 550                       | 75.0%                     | 7%  | 85%                                 | 20           | \$447        |
| Existing             | Single Family    | HVAC Aux     | VSD Fan                                 | Variable Speed Fan - Gas Furnace                             | Constant Speed Fan                             | 550                       | 75.0%                     | 66%   | 85%                                 | 20           | \$447        |
| Existing             | Single Family    | Heat Pump    | Air Source Heat_Pump                    | 3 ton, 14 SEER, 8.5 HSPF                                     | 3 ton, 13 SEER, 7.7 HSPF                       | 6,748                     | 4.9%                      | NA  | NA                                  | 15           | \$517        |
| Existing             | Single Family    | Heat Pump    | Air Source Heat_Pump                    | 3 ton, 16 SEER, 8.8 HSPF                                     | 3 ton, 13 SEER, 7.7 HSPF                       | 6,748                     | 7.4%                      | NA  | NA                                  | 15           | \$660        |
| Existing             | Single Family    | Heat Pump    | Air Source Heat_Pump                    | 3 ton, 18 SEER, 9.0 HSPF                                     | 3 ton, 13 SEER, 7.7 HSPF                       | 6,748                     | 9.2%                      | NA  | NA                                  | 15           | \$1,435      |
| Existing             | Single Family    | Heat Pump    | Advanced Cold-Climate Heat Pump         | 16 SEER, 9.6 HSPF  | 13 SEER, 7.7 HSPF, 3 ton                       | 7,033                     | 14.0%                     | 20%   | 99%                                 | 20           | \$3,677      |
| Existing             | Single Family    | Heat Pump    | Air-to-Air Heat Exchangers              | Air-to-Air Heat Exchangers                                   | No Air to Air Heat Exchangers                  | 7,033                     | 10.0%                     | 0%  | 95%                                 | 15           | \$990        |
| Existing             | Single Family    | Heat Pump    | Blinds - Fixed Angle/Automatic          | Install Blinds (Reduce Window SHGC by 50%)                   | No Interior Shading Device                     | 7,033                     | 5.8%                      | 65%   | 30%                                 | 10           | \$603        |
| Existing             | Single Family    | Heat Pump    | Canned Lighting Air Tight Sealing       | Canned Lighting Air Tight Sealing                            | No Air tight Sealing                           | 7,033                     | 3.3%                      | 60%   | 55%                                 | 30           | \$53         |
| Existing             | Single Family    | Heat Pump    | Ceiling Fan                             | Ceiling Fan  | No Ceiling Fan                                 | 7,033                     | 0.0%                      | 85%   | 20%                                 | 10           | \$104        |
| Existing             | Single Family    | Heat Pump    | Cool Roofs                              | Lighter Colored Shingles (White)                             | Standard Roof Shingles                         | 7,033                     | 2.8%                      | 0%  | 95%                                 | 20           | \$57         |
| Existing             | Single Family    | Heat Pump    | Doors                                   | R-11 (Steel Doors with foam core)                            | Standard non-thermal wood door (R-2)           | 7,033                     | 2.0%                      | 85%   | 50%                                 | 30           | \$116        |
| Existing             | Single Family    | Heat Pump    | Doors                                   | R-5 (Composite Doors with foam core)                         | Standard non-thermal wood door (R-2)           | 7,033                     | 2.0%                      | 85%   | 55%                                 | 12           | \$42         |
| Existing             | Single Family    | Heat Pump    | Doors - Weatherization                  | Weatherstripping And Adding Door Sweeps                      | Existing Non-Efficient door                    | 7,033                     | 2.0%                      | 80%   | 45%                                 | 6            | \$31         |

| Construction Vintage | Customer Segment | End Use   | Measure Name   | Measure Description   | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|--|---|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Single Family    | Heat Pump | Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test | Install Caulking And Weatherstripping                                       | Existing Infiltration Conditions                           | 7,033                    | 10.0%                         | 75%   | 75%                                 | 15           | \$455        |
| Existing             | Single Family    | Heat Pump | Insulation (Basement - Wall) 2*4                                   | R-13 + R-5 sheathing  | R-13   | 7,033                    | 6.1%                          | 13%   | 95%                                 | 25           | \$708        |
| Existing             | Single Family    | Heat Pump | Insulation (Basement - Wall) 2*4 - average existing value          | R-13  | Average Existing Insulation Value and/or Code Value (R-7)  | 7,033                    | 6.9%                          | 13%   | 70%                                 | 25           | \$906        |
| Existing             | Single Family    | Heat Pump | Insulation (Basement - Wall) 2*4 - below code                      | R-13  | R-0  | 7,033                    | 14.9%                         | 13%   | 70%                                 | 25           | \$906        |
| Existing             | Single Family    | Heat Pump | Insulation (Ceiling)   | R-49  | State Code (R-38)  | 7,033                    | 1.0%                          | 87%   | 85%                                 | 25           | \$344        |
| Existing             | Single Family    | Heat Pump | Insulation (Ceiling) - average existing value                      | State Code (R-38)   | Average Existing Insulation Value (R-19)                   | 7,033                    | 2.0%                          | 95%   | 40%                                 | 25           | \$562        |
| Existing             | Single Family    | Heat Pump | Insulation (Ceiling) - below code                                  | State Code (R-38)   | R-9  | 7,033                    | 8.0%                          | 95%   | 10%                                 | 25           | \$562        |
| Existing             | Single Family    | Heat Pump | Insulation (Duct)  | R-8   | No Duct Insulation   | 7,033                    | 4.1%                          | 12%   | 75%                                 | 25           | \$335        |
| Existing             | Single Family    | Heat Pump | Insulation (Duct)  | R-8   | R-4  | 7,033                    | 2.0%                          | 12%   | 95%                                 | 25           | \$172        |
| Existing             | Single Family    | Heat Pump | Insulation (Floor)   | R-38  | State Code (R-30)  | 7,033                    | 0.3%                          | 75%   | 90%                                 | 25           | \$884        |
| Existing             | Single Family    | Heat Pump | Insulation (Floor) - average existing value                        | State Code (R-30)   | Average Existing Insulation Value and/or Code Value (R-20) | 7,033                    | 1.0%                          | 55%   | 40%                                 | 25           | \$443        |
| Existing             | Single Family    | Heat Pump | Insulation (Floor) - below code                                    | State Code (R-30)   | R-0  | 7,033                    | 5.0%                          | 55%   | 10%                                 | 25           | \$1,331      |
| Existing             | Single Family    | Heat Pump | Insulation (Rim And Band Joist)                                    | R-10  | No Rim And Band Joist Insulation                           | 7,033                    | 3.0%                          | 60%   | 45%                                 | 25           | \$130        |
| Existing             | Single Family    | Heat Pump | Insulation (Rim And Band Joist)                                    | R-19  | R-10   | 7,033                    | 4.0%                          | 60%   | 75%                                 | 25           | \$84         |
| Existing             | Single Family    | Heat Pump | Insulation (Slab)  | R-15  | State Code (R-10)  | 7,033                    | 1.4%                          | 0%  | 87%                                 | 25           | \$223        |
| Existing             | Single Family    | Heat Pump | Insulation (Slab) - average existing value                         | State Code (R-10)   | Average Existing Insulation Value and/or Code Value (R-7)  | 7,033                    | 1.3%                          | 0%  | 65%                                 | 25           | \$1,049      |
| Existing             | Single Family    | Heat Pump | Insulation (Slab) - below code                                     | State Code (R-10)   | R-0  | 7,033                    | 4.3%                          | 0%  | 60%                                 | 25           | \$1,049      |
| Existing             | Single Family    | Heat Pump | Insulation (Wall) 2*4  | R-13 + R5 Sheathing   | R-13   | 7,033                    | 1.3%                          | 10%   | 90%                                 | 25           | \$1,786      |
| Existing             | Single Family    | Heat Pump | Insulation (Wall) 2*4 - average existing value                     | R-13  | Average Existing Insulation Value and/or Code Value (R-8)  | 7,033                    | 3.0%                          | 75%   | 45%                                 | 25           | \$1,396      |
| Existing             | Single Family    | Heat Pump | Insulation (Wall) 2*4 - below code                                 | R-13  | R-0  | 7,033                    | 28.0%                         | 75%   | 5%                                  | 25           | \$1,396      |
| Existing             | Single Family    | Heat Pump | Insulation (wall) 2*6 - average existing value                     | State Code (R-21)   | Average Existing Insulation Value and/or Code Value (R-8)  | 7,033                    | 8.0%                          | 0%  | 60%                                 | 25           | \$2,276      |
| Existing             | Single Family    | Heat Pump | Insulation (wall) 2*6 - below code                                 | State Code (R-21)   | R-0  | 7,033                    | 37.0%                         | 0%  | 50%                                 | 25           | \$2,276      |
| Existing             | Single Family    | Heat Pump | Leak Proof Duct Fittings   | Quick connect fittings that do not require mastic or drawbands (6 per unit) | 13 SEER  | 7,033                    | 15.0%                         | 10%   | 95%                                 | 30           | \$288        |
| Existing             | Single Family    | Heat Pump | Micro Channel Heat Exchangers (Evaporator)                         | Micro Channel Heat Exchangers (5 ton unit)                                  | 13 SEER, 7.7 HSPF, 3 ton                                   | 7,033                    | 5.0%                          | 15%   | 99%                                 | 18           | \$3,732      |
| Existing             | Single Family    | Heat Pump | Motor - ECM Motor  | ECM motor for Heat Pump   | Standard Motor   | 7,033                    | 1.3%                          | 65%   | 95%                                 | 15           | \$368        |

| Construction Vintage | Customer Segment | End Use   | Measure Name   | Measure Description  | Base Equipment                                 | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|--|--|--|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Single Family    | Heat Pump | Outlet Gasket  | Install Outlet Gasket (Reduce Air Leakage)                   | No Outlet Gasket                               | 7,033                     | 2.0%                          | 95%   | 60%                                 | 5            | \$7          |
| Existing             | Single Family    | Heat Pump | PTCS Aerosol-Based Duct Sealing                        | Spray-in ductwork sealant to minimize duct leaks             | Older homes with AFUE HVAC, SEER 9             | 7,033                     | 19.0%                         | 80%   | 65%                                 | 25           | \$946        |
| Existing             | Single Family    | Heat Pump | PTCS Duct Sealing                                      | PTCS Duct Sealing  | No Duct Sealing                                | 7,033                     | 15.0%                         | 80%   | 65%                                 | 20           | \$447        |
| Existing             | Single Family    | Heat Pump | Proper Sizing - Heat Pump                              | Correctly Sized Heat_Pump (Cooling And Heating Unit)         | Oversized Heat_Pump                            | 7,033                     | 8.6%                          | 53%   | 85%                                 | 15           | \$1          |
| Existing             | Single Family    | Heat Pump | Radiant Barrier (Ceiling)                              | Install Radiant Barrier                                      | No Radiant Barrier                             | 7,033                     | 2.7%                          | 0%  | 97%                                 | 30           | \$305        |
| Existing             | Single Family    | Heat Pump | Small Scale Absorption Cooling                         | Small Scale Absorption Cooling (5 ton)                       | 13 SEER, 7.7 HSPF, 3 ton                       | 7,033                     | 9.0%                          | 0%  | 99%                                 | 20           | \$946        |
| Existing             | Single Family    | Heat Pump | Solar Attic Fan  | Solar electric attic ventilation                             | Standard passive ventilation                   | 7,033                     | 0.8%                          | 50%   | 95%                                 | 10           | \$762        |
| Existing             | Single Family    | Heat Pump | Solid state refrigeration (cool chips™) for heat pumps | Solid State Thermoelectric cooling system                    | 13 SEER, 7.7 HSPF, 3 ton                       | 7,033                     | 18.0%                         | 29%   | 99%                                 | 18           | \$2,101      |
| Existing             | Single Family    | Heat Pump | Spray in insulation 2*4 Wall                           | 2*4Wall - closed cell foam insulation R-23                   | 2*4Wall R-13                                   | 7,033                     | 10.0%                         | 0%  | 95%                                 | 25           | \$6,711      |
| Existing             | Single Family    | Heat Pump | Thermostat - Clock/Programmable                        | Programmable Thermostat                                      | Manual Thermostat                              | 7,033                     | 6.8%                          | 85%   | 27%                                 | 15           | \$27         |
| Existing             | Single Family    | Heat Pump | Thermostat - Multi-Zone                                | Individual Room Temperature Control for Major Occupied Rooms | Programmable Thermostat - Central Control Only | 7,033                     | 7.0%                          | 65%   | 95%                                 | 12           | \$1,422      |
| Existing             | Single Family    | Heat Pump | VSD Motor - ECM  | Variable Speed Motor (ECM) for Heat Pump                     | Constant Speed Motor                           | 7,033                     | 3.8%                          | 80%   | 85%                                 | 20           | \$341        |
| Existing             | Single Family    | Heat Pump | Whole-House Fan  | Whole-House Fan  | No Whole-House Fan                             | 7,033                     | 3.3%                          | 50%   | 96%                                 | 15           | \$334        |
| Existing             | Single Family    | Heat Pump | Windows  | U = 0.19   | U=0.30   | 7,033                     | 8.0%                          | 75%   | 95%                                 | 25           | \$4,343      |
| Existing             | Single Family    | Heat Pump | Windows  | U=0.30   | Existing Windows (U=0.65)                      | 7,033                     | 11.0%                         | 75%   | 60%                                 | 25           | \$10331      |
| Existing             | Single Family    | Lighting  | CFL Fixtures, High Use                                 | 2-15 W CFLs, 4.0 hr/day (37%)                                | 2-60 W Incandescent                            | 2,504                     | 4.7%                          | 98%   | 73%                                 | 20           | \$35         |
| Existing             | Single Family    | Lighting  | CFL Fixtures, Low Use                                  | 2-15 W CFLs, 1.0 hr/day (32%)                                | 2-60 W Incandescent                            | 2,504                     | 4.0%                          | 98%   | 73%                                 | 20           | \$30         |
| Existing             | Single Family    | Lighting  | CFL Fixtures, Medium Use                               | 2-15 W CFLs, 2.5 hr/day (33%)                                | 2-60 W Incandescent                            | 2,504                     | 4.2%                          | 98%   | 73%                                 | 20           | \$33         |
| Existing             | Single Family    | Lighting  | CFL Lamps, High Use                                    | 1-15W, 4.0 hr/day (37%)                                      | Incandescent 60W                               | 2,504                     | 34.0%                         | 86%   | 73%                                 | 7            | \$2          |
| Existing             | Single Family    | Lighting  | CFL Lamps, Low Use                                     | 1-15W, 1.0 hr/day (32%)                                      | Incandescent 60W                               | 2,504                     | 9.7%                          | 86%   | 73%                                 | 27           | \$2          |
| Existing             | Single Family    | Lighting  | CFL Lamps, Medium Use                                  | 1-15W, 2.5 hr/day (33%)                                      | Incandescent 60W                               | 2,504                     | 14.0%                         | 86%   | 73%                                 | 11           | \$2          |
| Existing             | Single Family    | Lighting  | CFL Lighting - 3-Way                                   | 13 W, 20W And 25W  | 30W, 75W, 100W                                 | 2,504                     | 1.8%                          | 75%   | 73%                                 | 7            | \$13         |
| Existing             | Single Family    | Lighting  | CFL Torchieries, High Use                              | 55 W CFL, (20%)  | Incandescent Torchieries, 180W Halogen         | 2,504                     | 0.4%                          | 70%   | 65%                                 | 7            | \$7          |
| Existing             | Single Family    | Lighting  | CFL Torchieries, Low Use                               | 55 W CFL, (20%)  | Incandescent Torchieries, 180W Halogen         | 2,504                     | 0.4%                          | 70%   | 65%                                 | 27           | \$7          |
| Existing             | Single Family    | Lighting  | CFL Torchieries, Medium Use                            | 55 W CFL, (60%)  | Incandescent Torchieries, 180W Halogen         | 2,504                     | 1.3%                          | 70%   | 65%                                 | 11           | \$7          |
| Existing             | Single Family    | Lighting  | Daylighting Controls (Photocell) - Indoor/Outdoors     | Install Photocell  | No Daylighting Controls                        | 2,504                     | 4.5%                          | 0%  | 95%                                 | 10           | \$151        |
| Existing             | Single Family    | Lighting  | LED Christmas Lighting                                 | LED Christmas Lighting                                       | Incandescent Christmas Lighting                | 2,504                     | 0.4%                          | 40%   | 85%                                 | 13           | \$11         |
| Existing             | Single Family    | Lighting  | LED Interior Lighting (White), High Use                | LED 4W   | Incandescent 60W                               | 2,504                     | 42.3%                         | 85%   | 98%                                 | 13           | \$31         |

| Construction Vintage | Customer Segment | End Use      | Measure Name   | Measure Description  | Base Equipment                              | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------|--|--|---|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Single Family    | Lighting     | LED Interior Lighting (White), Low Use                       | LED 4W   | Incandescent 60W                            | 2,504                     | 12.1%                         | 85%   | 98%                                 | 13           | \$31         |
| Existing             | Single Family    | Lighting     | LED Interior Lighting (White), Medium Use                    | LED 4W   | Incandescent 60W                            | 2,504                     | 17.4%                         | 85%   | 98%                                 | 13           | \$31         |
| Existing             | Single Family    | Lighting     | Occupancy Sensors  | Wall-Switch Occupancy Sensors  | No Occupancy Sensor                         | 2,504                     | 14.0%                         | 75%   | 85%                                 | 10           | \$64         |
| Existing             | Single Family    | Lighting     | Time Clocks (Exterior Lighting)                              | Exterior Lighting on a Time Clock  | Exterior Lighting (Manual Control)          | 2,504                     | 1.9%                          | 75%   | 90%                                 | 10           | \$93         |
| Existing             | Single Family    | Plug Load    | 1-Watt Standby Power   | 1W or less standby power use for small appliances                            | Standard plug load appliance.               | 2,128                     | 4.2%                          | 15%   | 85%                                 | 7            | \$32         |
| Existing             | Single Family    | Plug Load    | Energy Star Battery Chargers                                 | Energy Star Battery Chargers   | Standard Battery Chargers                   | 2,128                     | 0.2%                          | 55%   | 40%                                 | 7            | \$4          |
| Existing             | Single Family    | Plug Load    | Energy Star DVD System                                       | Energy Star DVD System   | Standard DVD System                         | 2,128                     | 1.9%                          | 100%  | 24%                                 | 7            | \$12         |
| Existing             | Single Family    | Plug Load    | Energy Star Dehumidifiers                                    | Energy Star Dehumidifiers  | Standard Dehumidifiers                      | 2,128                     | 0.4%                          | 15%   | 5%                                  | 10           | \$13         |
| Existing             | Single Family    | Plug Load    | Energy Star Digital Set Top Receiver                         | Energy Star Digital Set Top Receiver   | Standard Digital Set Top Receiver           | 2,128                     | 1.7%                          | 81%   | 62%                                 | 6            | \$37         |
| Existing             | Single Family    | Plug Load    | Energy Star HDTV   | Energy Star HDTV   | Standard HDTV                               | 2,128                     | 3.2%                          | 38%   | 70%                                 | 9            | \$105        |
| Existing             | Single Family    | Plug Load    | Energy Star Home Audio System                                | Energy Star Home Audio System  | Standard Home Audio system                  | 2,128                     | 2.5%                          | 91%   | 90%                                 | 7            | \$21         |
| Existing             | Single Family    | Plug Load    | Energy Star Office Computer                                  | Energy Star Office Computer  | Standard Office Computer                    | 2,128                     | 13.7%                         | 100%  | 15%                                 | 4            | \$84         |
| Existing             | Single Family    | Plug Load    | Energy Star Office Copiers                                   | Energy Star Office Copiers   | Standard Office Copiers                     | 2,128                     | 1.9%                          | 25%   | 55%                                 | 6            | \$53         |
| Existing             | Single Family    | Plug Load    | Energy Star Office Monitor                                   | Energy Star Office Monitor   | Standard Office Monitor                     | 2,128                     | 4.1%                          | 100%  | 15%                                 | 4            | \$16         |
| Existing             | Single Family    | Plug Load    | Energy Star Office Printer                                   | Energy Star Office Printer   | Standard Office Printer                     | 2,128                     | 0.0%                          | 75%   | 40%                                 | 5            | \$11         |
| Existing             | Single Family    | Plug Load    | Energy Star TV   | Energy Star TV   | Standard TV                                 | 2,128                     | 3.3%                          | 100%  | 38%                                 | 9            | \$32         |
| Existing             | Single Family    | Plug Load    | Energy Star VCR  | Energy Star VCR/DVD Combo  | Standard Home VCR                           | 2,128                     | 0.6%                          | 100%  | 45%                                 | 4            | \$38         |
| Existing             | Single Family    | Plug Load    | Power supply transformer/converter - External power adapters | Power supply transformer/converter - High efficiency External power adapters | Standard Efficiency                         | 2,128                     | 0.3%                          | 85%   | 40%                                 | 7            | \$8          |
| Existing             | Single Family    | Plug Load    | Powerstrip with Occupancy Sensor                             | Powerstrip with Occupancy Sensor   | Powerstrip w/o Occupancy Sensor             | 2,128                     | 0.6%                          | 85%   | 90%                                 | 10           | \$88         |
| Existing             | Single Family    | Pool Pump    | Pool Pump Timers   | Pool Pump Timers   | Pool Pump No Timers                         | 1,482                     | 50.0%                         | 3%  | 83%                                 | 10           | \$52         |
| Existing             | Single Family    | Pool Pump    | Pool Pumps - VSD   | Pool Pumps (VSD)   | Pool Pumps constant speed                   | 1,482                     | 85.0%                         | 3%  | 92%                                 | 10           | \$714        |
| Existing             | Single Family    | Refrigerator | Refrigerator/Freezer - Energy Star                           | Energy Star Refrigerator   | Standard Refrigerator                       | 490                       | 20.0%                         | NA  | NA                                  | 18           | \$32         |
| Existing             | Single Family    | Refrigerator | 1 kWh/day Refrigerator                                       | 20 cf top-freezer using no more than 1 kWh/day                               | Standard Refrigerator, 20.5 cf, top-freezer | 538                       | 30.0%                         | 90%   | 97%                                 | 19           | \$74         |
| Existing             | Single Family    | Refrigerator | Refrigerator eCube   | Refrigerator eCube   | No Refrigerator eCube                       | 538                       | 6.3%                          | 85%   | 95%                                 | 5            | \$236        |
| Existing             | Single Family    | Refrigerator | Refrigerator/Freezer - Early Replacement                     | Standard Refrigerator  | Existing Refrigerator                       | 538                       | 100.0%                        | 11%   | 85%                                 | 9            | \$452        |
| Existing             | Single Family    | Refrigerator | Refrigerator/Freezer - Energy Star                           | Energy Star Refrigerator   | Existing Refrigerator                       | 538                       | 20.0%                         | 0%  | 40%                                 | 18           | \$651        |
| Existing             | Single Family    | Refrigerator | Refrigerator/Freezer - Removal of Secondary                  | Proper Disposal of Refrigerator/Freezer                                      | Existing Non-Efficient Refrigerator/Freezer | 538                       | 282.8%                        | 11%   | 82%                                 | 9            | \$103        |
| Existing             | Single Family    | Refrigerator | Solid state refrigeration (cool chips™) for refrigerators    | Thermoelectric refrigerator, 1.7 cubic ft.                                   | Compact refrigerator, 1.7 cubic ft.         | 538                       | 4.0%                          | 75%   | 95%                                 | 19           | \$56         |

| Construction Vintage | Customer Segment | End Use | Measure Name   | Measure Description                        | Base Equipment   | Baseline kWh (UEC or EUI) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------|--|--|--|---------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Single Family    | Room AC | Air Conditioner - Room (Individual Rooms) (10,000 BTU/HR)          | EER = 10.8                                 | EER = 9.8  | 497                       | 8.0%                      | NA  | NA                                  | 10           | \$42         |
| Existing             | Single Family    | Room AC | Blinds - Fixed Angle/Automatic                                     | Install Blinds (Reduce Window SHGC by 50%) | No Interior Shading Device                                 | 513                       | 41.3%                     | 65%   | 30%                                 | 10           | \$603        |
| Existing             | Single Family    | Room AC | Canned Lighting Air Tight Sealing                                  | Canned Lighting Air Tight Sealing          | No Air tight Sealing                                       | 513                       | 3.3%                      | 60%   | 55%                                 | 30           | \$53         |
| Existing             | Single Family    | Room AC | Ceiling Fan  | Ceiling Fan                                | No Ceiling Fan   | 513                       | 0.3%                      | 85%   | 20%                                 | 10           | \$104        |
| Existing             | Single Family    | Room AC | Cool Roofs   | Lighter Colored Shingles (White)           | Standard Roof Shingles                                     | 513                       | 20.0%                     | 0%  | 95%                                 | 20           | \$57         |
| Existing             | Single Family    | Room AC | Doors  | R-11 (Steel Doors with foam core)          | Standard non-thermal wood door (R-2)                       | 513                       | 0.1%                      | 85%   | 50%                                 | 30           | \$116        |
| Existing             | Single Family    | Room AC | Doors  | R-5 (Composite Doors with foam core)       | Standard non-thermal wood door (R-2)                       | 513                       | 0.1%                      | 85%   | 55%                                 | 12           | \$42         |
| Existing             | Single Family    | Room AC | Doors - Weatherization   | Weatherstripping And Adding Door Sweeps    | Existing Non-Efficient door                                | 513                       | 2.0%                      | 80%   | 45%                                 | 6            | \$31         |
| Existing             | Single Family    | Room AC | Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test | Install Caulking And Weatherstripping      | Existing Infiltration Conditions                           | 513                       | 10.0%                     | 75%   | 75%                                 | 15           | \$455        |
| Existing             | Single Family    | Room AC | Insulation (Basement - Wall) 2'4                                   | R-13 + R-5 sheathing                       | R-13   | 513                       | 6.1%                      | 13%   | 95%                                 | 25           | \$708        |
| Existing             | Single Family    | Room AC | Insulation (Basement - Wall) 2'4 - average existing value          | R-13                                       | Average Existing Insulation Value and/or Code Value (R-7)  | 513                       | 6.9%                      | 13%   | 70%                                 | 25           | \$906        |
| Existing             | Single Family    | Room AC | Insulation (Basement - Wall) 2'4 - below code                      | R-13                                       | R-0  | 513                       | 14.9%                     | 13%   | 70%                                 | 25           | \$906        |
| Existing             | Single Family    | Room AC | Insulation (Ceiling)   | R-49                                       | State Code (R-38)  | 513                       | 0.3%                      | 87%   | 85%                                 | 25           | \$344        |
| Existing             | Single Family    | Room AC | Insulation (Ceiling) - average existing value                      | State Code (R-38)                          | Average Existing Insulation Value (R-19)                   | 513                       | 1.0%                      | 95%   | 40%                                 | 25           | \$562        |
| Existing             | Single Family    | Room AC | Insulation (Ceiling) - below code                                  | State Code (R-38)                          | R-9  | 513                       | 0.6%                      | 95%   | 10%                                 | 25           | \$562        |
| Existing             | Single Family    | Room AC | Insulation (Duct)  | R-8  | No Duct Insulation   | 513                       | 3.2%                      | 12%   | 75%                                 | 25           | \$335        |
| Existing             | Single Family    | Room AC | Insulation (Duct)  | R-8  | R-4  | 513                       | 1.6%                      | 12%   | 95%                                 | 25           | \$172        |
| Existing             | Single Family    | Room AC | Insulation (Floor)   | R-38                                       | State Code (R-30)  | 513                       | 0.1%                      | 75%   | 90%                                 | 25           | \$884        |
| Existing             | Single Family    | Room AC | Insulation (Floor) - average existing value                        | State Code (R-30)                          | Average Existing Insulation Value and/or Code Value (R-20) | 513                       | 0.1%                      | 55%   | 40%                                 | 25           | \$443        |
| Existing             | Single Family    | Room AC | Insulation (Floor) - below code                                    | State Code (R-30)                          | R-0  | 513                       | 0.1%                      | 55%   | 10%                                 | 25           | \$1,331      |
| Existing             | Single Family    | Room AC | Insulation (Rim And Band Joist)                                    | R-10                                       | No Rim And Band Joist Insulation                           | 513                       | 3.0%                      | 60%   | 45%                                 | 25           | \$130        |
| Existing             | Single Family    | Room AC | Insulation (Rim And Band Joist)                                    | R-19                                       | R-10   | 513                       | 4.0%                      | 60%   | 75%                                 | 25           | \$84         |
| Existing             | Single Family    | Room AC | Insulation (Slab)  | R-15                                       | State Code (R-10)  | 513                       | 1.4%                      | 0%  | 87%                                 | 25           | \$223        |
| Existing             | Single Family    | Room AC | Insulation (Slab) - average existing value                         | State Code (R-10)                          | Average Existing Insulation Value and/or Code Value (R-7)  | 513                       | 1.3%                      | 0%  | 65%                                 | 25           | \$1,049      |
| Existing             | Single Family    | Room AC | Insulation (Slab) - below code                                     | State Code (R-10)                          | R-0  | 513                       | 4.3%                      | 0%  | 60%                                 | 25           | \$1,049      |
| Existing             | Single Family    | Room AC | Insulation (Wall) 2'4  | R-13 + R5 Sheathing                        | R-13   | 513                       | 0.0%                      | 10%   | 90%                                 | 25           | \$1,786      |

| Construction Vintage | Customer Segment | End Use   | Measure Name   | Measure Description                        | Base Equipment   | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|--|--|--|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Single Family    | Room AC   | Insulation (Wall) 2'4 - average existing value                     | R-13                                       | Average Existing Insulation Value and/or Code Value (R-8)  | 513                       | 0.1%                          | 75%   | 45%                                 | 25           | \$1,396      |
| Existing             | Single Family    | Room AC   | Insulation (Wall) 2'4 - below code                                 | R-13                                       | R-0  | 513                       | 0.1%                          | 75%   | 5%                                  | 25           | \$1,396      |
| Existing             | Single Family    | Room AC   | Insulation (wall) 2'6 - average existing value                     | State Code (R-21)                          | Average Existing Insulation Value and/or Code Value (R-8)  | 513                       | 0.1%                          | 0%  | 60%                                 | 25           | \$2,276      |
| Existing             | Single Family    | Room AC   | Insulation (wall) 2'6 - below code                                 | State Code (R-21)                          | R-0  | 513                       | 0.1%                          | 0%  | 50%                                 | 25           | \$2,276      |
| Existing             | Single Family    | Room AC   | Outlet Gasket  | Install Outlet Gasket (Reduce Air Leakage) | No Outlet Gasket   | 513                       | 2.0%                          | 95%   | 60%                                 | 5            | \$7          |
| Existing             | Single Family    | Room AC   | Radiant Barrier (Ceiling)  | Install Radiant Barrier                    | No Radiant Barrier   | 513                       | 6.7%                          | 0%  | 97%                                 | 30           | \$305        |
| Existing             | Single Family    | Room AC   | Windows  | U = 0.19                                   | U=0.30   | 513                       | 13.0%                         | 75%   | 95%                                 | 25           | \$4,343      |
| Existing             | Single Family    | Room AC   | Windows  | U=0.30                                     | Existing Windows (U=0.65)                                  | 513                       | 36.0%                         | 75%   | 60%                                 | 25           | \$10331      |
| Existing             | Single Family    | Room Heat | Canned Lighting Air Tight Sealing                                  | Canned Lighting Air Tight Sealing          | No Air tight Sealing                                       | 6,847                     | 3.3%                          | 60%   | 55%                                 | 30           | \$53         |
| Existing             | Single Family    | Room Heat | Doors  | R-11 (Steel Doors with foam core)          | Standard non-thermal wood door (R-2)                       | 6,847                     | 3.0%                          | 85%   | 50%                                 | 30           | \$116        |
| Existing             | Single Family    | Room Heat | Doors  | R-5 (Composite Doors with foam core)       | Standard non-thermal wood door (R-2)                       | 6,847                     | 2.0%                          | 85%   | 55%                                 | 12           | \$42         |
| Existing             | Single Family    | Room Heat | Doors - Weatherization   | Weatherstripping And Adding Door Sweeps    | Existing Non-Efficient door                                | 6,847                     | 2.0%                          | 80%   | 45%                                 | 6            | \$31         |
| Existing             | Single Family    | Room Heat | Ductless Mini-Split REM  | 3 ton, SEER 15, HSPF 9.0                   | Electric Baseboard Heating HSPF=1                          | 6,847                     | 62.1%                         | 25%   | 95%                                 | 15           | \$5,700      |
| Existing             | Single Family    | Room Heat | Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test | Install Caulking And Weatherstripping      | Existing Infiltration Conditions                           | 6,847                     | 10.0%                         | 75%   | 75%                                 | 15           | \$455        |
| Existing             | Single Family    | Room Heat | Insulation (Basement - Wall) 2'4                                   | R-13 + R-5 sheathing                       | R-13   | 6,847                     | 6.1%                          | 13%   | 95%                                 | 25           | \$708        |
| Existing             | Single Family    | Room Heat | Insulation (Basement - Wall) 2'4 - average existing value          | R-13                                       | Average Existing Insulation Value and/or Code Value (R-7)  | 6,847                     | 6.9%                          | 13%   | 70%                                 | 25           | \$906        |
| Existing             | Single Family    | Room Heat | Insulation (Basement - Wall) 2'4 - below code                      | R-13                                       | R-0  | 6,847                     | 14.9%                         | 13%   | 70%                                 | 25           | \$906        |
| Existing             | Single Family    | Room Heat | Insulation (Ceiling)   | R-49                                       | State Code (R-38)  | 6,847                     | 1.0%                          | 87%   | 85%                                 | 25           | \$344        |
| Existing             | Single Family    | Room Heat | Insulation (Ceiling) - average existing value                      | State Code (R-38)                          | Average Existing Insulation Value (R-19)                   | 6,847                     | 2.0%                          | 95%   | 40%                                 | 25           | \$562        |
| Existing             | Single Family    | Room Heat | Insulation (Ceiling) - below code                                  | State Code (R-38)                          | R-9  | 6,847                     | 10.2%                         | 95%   | 10%                                 | 25           | \$562        |
| Existing             | Single Family    | Room Heat | Insulation (Duct)  | R-8  | No Duct Insulation   | 6,847                     | 4.3%                          | 12%   | 75%                                 | 25           | \$335        |
| Existing             | Single Family    | Room Heat | Insulation (Duct)  | R-8  | R-4  | 6,847                     | 2.1%                          | 12%   | 95%                                 | 25           | \$172        |
| Existing             | Single Family    | Room Heat | Insulation (Floor)   | R-38                                       | State Code (R-30)  | 6,847                     | 1.0%                          | 75%   | 90%                                 | 25           | \$884        |
| Existing             | Single Family    | Room Heat | Insulation (Floor) - average existing value                        | State Code (R-30)                          | Average Existing Insulation Value and/or Code Value (R-20) | 6,847                     | 2.0%                          | 55%   | 40%                                 | 25           | \$443        |
| Existing             | Single Family    | Room Heat | Insulation (Floor) - below code                                    | State Code (R-30)                          | R-0  | 6,847                     | 10.0%                         | 55%   | 10%                                 | 25           | \$1,331      |
| Existing             | Single Family    | Room Heat | Insulation (Rim And Band Joist)                                    | R-10                                       | No Rim And Band Joist Insulation                           | 6,847                     | 3.0%                          | 60%   | 45%                                 | 25           | \$130        |
| Existing             | Single Family    | Room Heat | Insulation (Rim And Band Joist)                                    | R-19                                       | R-10   | 6,847                     | 4.0%                          | 60%   | 75%                                 | 25           | \$84         |



| Construction Vintage | Customer Segment | End Use    | Measure Name                                   | Measure Description                             | Base Equipment  | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|--|---|---|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Single Family    | Room Heat  | Insulation (Slab)                              | R-15  | State Code (R-10)   | 6,847                     | 1.4%                          | 0%  | 87%                                 | 25           | \$223        |
| Existing             | Single Family    | Room Heat  | Insulation (Slab) - average existing value     | State Code (R-10)                               | Average Existing Insulation Value and/or Code Value (R-7) | 6,847                     | 1.3%                          | 0%  | 65%                                 | 25           | \$1,049      |
| Existing             | Single Family    | Room Heat  | Insulation (Slab) - below code                 | State Code (R-10)                               | R-0   | 6,847                     | 4.3%                          | 0%  | 60%                                 | 25           | \$1,049      |
| Existing             | Single Family    | Room Heat  | Insulation (Wall) 2*4                          | R-13 + R5 Sheathing                             | R-13  | 6,847                     | 2.2%                          | 10%   | 90%                                 | 25           | \$1,786      |
| Existing             | Single Family    | Room Heat  | Insulation (Wall) 2*4 - average existing value | R-13  | Average Existing Insulation Value and/or Code Value (R-8) | 6,847                     | 5.0%                          | 75%   | 45%                                 | 25           | \$1,396      |
| Existing             | Single Family    | Room Heat  | Insulation (Wall) 2*4 - below code             | R-13  | R-0   | 6,847                     | 44.0%                         | 75%   | 5%                                  | 25           | \$1,396      |
| Existing             | Single Family    | Room Heat  | Insulation (wall) 2*6 - average existing value | State Code (R-21)                               | Average Existing Insulation Value and/or Code Value (R-8) | 6,847                     | 12.0%                         | 0%  | 60%                                 | 25           | \$2,276      |
| Existing             | Single Family    | Room Heat  | Insulation (wall) 2*6 - below code             | State Code (R-21)                               | R-0   | 6,847                     | 49.0%                         | 0%  | 50%                                 | 25           | \$2,276      |
| Existing             | Single Family    | Room Heat  | Outlet Gasket                                  | Install Outlet Gasket (Reduce Air Leakage)      | No Outlet Gasket  | 6,847                     | 2.0%                          | 95%   | 60%                                 | 5            | \$7          |
| Existing             | Single Family    | Room Heat  | Radiant Barrier (Ceiling)                      | Install Radiant Barrier                         | No Radiant Barrier  | 6,847                     | 2.0%                          | 0%  | 97%                                 | 30           | \$305        |
| Existing             | Single Family    | Room Heat  | Radiant Electric Ceiling Panels                | Radiant Electric Heating with Ceiling Panels    | Electric Baseboard Heating                                | 6,847                     | 52.0%                         | 45%   | 98%                                 | 20           | \$4,364      |
| Existing             | Single Family    | Room Heat  | Spray in insulation 2*4 Wall                   | 2*4Wall - closed cell foam insulation R-23      | 2*4Wall R-13  | 6,847                     | 12.0%                         | 0%  | 95%                                 | 25           | \$6,711      |
| Existing             | Single Family    | Room Heat  | Windows  | U = 0.19  | U=0.30  | 6,847                     | 6.0%                          | 75%   | 95%                                 | 25           | \$4,343      |
| Existing             | Single Family    | Room Heat  | Windows  | U=0.30  | Existing Windows (U=0.65)                                 | 6,847                     | 15.0%                         | 75%   | 60%                                 | 25           | \$10331      |
| Existing             | Single Family    | Water Heat | Water_Heater (40 Gallon Electric)              | EF = 0.95                                       | EF = 0.92   | 3,308                     | 3.2%                          | NA  | NA                                  | 15           | \$129        |
| Existing             | Single Family    | Water Heat | Clothes Washer                                 | Energy Star MEF = 1.83 (top Load)               | Standard Clothes Washer (1.26)                            | 3,392                     | 9.3%                          | 35%   | 68%                                 | 14           | \$252        |
| Existing             | Single Family    | Water Heat | Clothes Washer                                 | Tier 2. MEF = 2.01 (front load)                 | Standard Clothes Washer (1.26)                            | 3,392                     | 11.2%                         | 35%   | 77%                                 | 14           | \$312        |
| Existing             | Single Family    | Water Heat | Clothes Washer                                 | Tier 2. MEF = 2.2 (front load)                  | Standard Clothes Washer (1.26)                            | 3,392                     | 12.8%                         | 35%   | 77%                                 | 14           | \$417        |
| Existing             | Single Family    | Water Heat | Clothes Washer - Early Replacement             | Standard Clothes Washer (1.26)                  | Existing Clothes Washer (MEF = 1.1)                       | 3,392                     | 3.8%                          | 35%   | 25%                                 | 14           | \$378        |
| Existing             | Single Family    | Water Heat | Desuperheater (Ground-Source Heat_Pump) system | Desuperheater with Standard Water_Heater system | Standard Water_Heater - EF = 0.92                         | 3,392                     | 55.2%                         | 5%  | 90%                                 | 10           | \$251        |
| Existing             | Single Family    | Water Heat | Dishwasher                                     | EF = 0.77                                       | EF = 0.65 (ENERGY STAR)                                   | 3,392                     | 1.1%                          | 30%   | 35%                                 | 13           | \$514        |
| Existing             | Single Family    | Water Heat | Dishwasher - Existing                          | EF = 0.65 (ENERGY STAR)                         | EF = 0.46 Existing Dishwasher                             | 3,392                     | 2.1%                          | 30%   | 15%                                 | 13           | \$11         |
| Existing             | Single Family    | Water Heat | Drain Water Heat Recovery                      | Drain Water Heat Recovery (GFX or Power-Pipe)   | No Drain Water Heat Recovery                              | 3,392                     | 18.5%                         | 0%  | 95%                                 | 30           | \$630        |
| Existing             | Single Family    | Water Heat | Faucet Aerators                                | 0.5 GPM   | 2.2 GPM   | 3,392                     | 7.1%                          | 95%   | 95%                                 | 9            | \$4          |
| Existing             | Single Family    | Water Heat | Faucet Aerators                                | 1.5 GPM   | 2.2 GPM   | 3,392                     | 2.9%                          | 95%   | 55%                                 | 9            | \$3          |
| Existing             | Single Family    | Water Heat | Faucet Aerators                                | 2.2 GPM   | Existing Faucet Aerator (3.0 GPM)                         | 3,392                     | 3.3%                          | 95%   | 10%                                 | 9            | \$2          |
| Existing             | Single Family    | Water Heat | Heat Pump Water Heater                         | EF=2.9  | No Heat Pump Water Heater                                 | 3,392                     | 54.6%                         | 30%   | 95%                                 | 15           | \$2,322      |



| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description                                   | Base Equipment  | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|---|---|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Single Family    | Water Heat | Hot Water Pipe Insulation                                 | R-4 Wrap  | No insulation   | 3,392                     | 1.2%                          | 65%   | 38%                                 | 5            | \$8          |
| Existing             | Single Family    | Water Heat | Low-Flow Showerheads                                      | 1.75 GPM  | 2.5 GPM   | 3,392                     | 16.2%                         | 95%   | 85%                                 | 10           | \$11         |
| Existing             | Single Family    | Water Heat | Low-Flow Showerheads                                      | 2.5 GPM   | 3.0 GPM   | 3,392                     | 10.8%                         | 95%   | 33%                                 | 10           | \$25         |
| Existing             | Single Family    | Water Heat | Solar Hot Water (SHW)                                     | Solar thermal collector                               | Non-solar hot water heater                                | 3,392                     | 42.9%                         | 20%   | 95%                                 | 20           | \$8,930      |
| Existing             | Single Family    | Water Heat | Tankless Water_Heater                                     | EF = 0.95, 4.0 gpm                                    | EF = 0.92   | 3,392                     | 3.2%                          | 85%   | 97%                                 | 20           | \$1,429      |
| Existing             | Single Family    | Water Heat | Water_Heater Tank Blanket/Insulation                      | Install Insulation (R-5)                              | No Tank Insulation  | 3,392                     | 6.5%                          | 0%  | 65%                                 | 10           | \$19         |
| Existing             | Single Family    | Water Heat | Water_Heater Thermostat Setback                           | 120 degrees   | 135 degrees   | 3,392                     | 6.0%                          | 95%   | 43%                                 | 4            | \$0          |
| New                  | Single Family    | Central AC | Air Conditioner - Central (3.0 ton unit)                  | SEER 14   | SEER 13   | 863                       | 6.3%                          | NA  | NA                                  | 15           | \$368        |
| New                  | Single Family    | Central AC | Air Conditioner - Central (3.0 ton unit)                  | SEER 16   | SEER 13   | 863                       | 15.9%                         | NA  | NA                                  | 15           | \$1,061      |
| New                  | Single Family    | Central AC | Air Conditioner - Central (3.0 ton unit)                  | SEER 18   | SEER 13   | 863                       | 23.4%                         | NA  | NA                                  | 15           | \$1,789      |
| New                  | Single Family    | Central AC | Air-to-Air Heat Exchangers                                | Air-to-Air Heat Exchangers                            | No Air to Air Heat Exchangers                             | 749                       | 10.0%                         | 0%  | 95%                                 | 15           | \$990        |
| New                  | Single Family    | Central AC | Blinds - Fixed Angle/Automatic                            | Install Blinds (Reduce Window SHGC by 50%)            | No Interior Shading Device                                | 749                       | 31.5%                         | 65%   | 30%                                 | 10           | \$603        |
| New                  | Single Family    | Central AC | Canned Lighting Air Tight Sealing                         | Canned Lighting Air Tight Sealing                     | No Air tight Sealing                                      | 749                       | 3.3%                          | 75%   | 25%                                 | 30           | \$3          |
| New                  | Single Family    | Central AC | Ceiling Fan   | Ceiling Fan   | No Ceiling Fan  | 749                       | 0.3%                          | 85%   | 20%                                 | 10           | \$104        |
| New                  | Single Family    | Central AC | Check Me! O&M Tune-up                                     | Tune-up/Maintenance                                   | No Tune-up Maintenance                                    | 749                       | 10.0%                         | 90%   | 50%                                 | 5            | \$236        |
| New                  | Single Family    | Central AC | Construction - ICF  | Concrete Framing                                      | Standard Wood Framing                                     | 749                       | 32.0%                         | 45%   | 95%                                 | 30           | \$11629      |
| New                  | Single Family    | Central AC | Construction - SIP  | Specialty Framing                                     | Standard Wood Framing                                     | 749                       | 14.0%                         | 45%   | 95%                                 | 30           | \$4,839      |
| New                  | Single Family    | Central AC | Cool Roofs  | Lighter Colored Shingles (White)                      | Standard Roof Shingles                                    | 749                       | 20.0%                         | 0%  | 95%                                 | 20           | \$57         |
| New                  | Single Family    | Central AC | Doors   | R-11 (Steel Doors with foam core)                     | Standard non-thermal wood door (R-2)                      | 749                       | 0.1%                          | 85%   | 50%                                 | 30           | \$116        |
| New                  | Single Family    | Central AC | Doors   | R-5 (Composite Doors with foam core)                  | Standard non-thermal wood door (R-2)                      | 749                       | 0.1%                          | 85%   | 55%                                 | 12           | \$42         |
| New                  | Single Family    | Central AC | Duct Location   | Conditioned Space Design - Duct Loss Is Not A Concern | Ducts in Unconditioned Space (Duct loss)                  | 749                       | 8.0%                          | 85%   | 15%                                 | 30           | \$210        |
| New                  | Single Family    | Central AC | Duct Sealing  | Duct Sealing  | No Duct Sealing   | 749                       | 6.0%                          | 0%  | 65%                                 | 20           | \$447        |
| New                  | Single Family    | Central AC | Duct Sealing - Aerosol-Based                              | Spray-in ductwork sealant to minimize duct leaks      | New homes with AFUE HVAC, SEER 13                         | 749                       | 19.0%                         | 0%  | 95%                                 | 25           | \$525        |
| New                  | Single Family    | Central AC | Ductless Mini-Split REM                                   | 3 ton, SEER 15, HSPF 9.0                              | SEER 13 Central AC  | 749                       | 11.1%                         | 80%   | 95%                                 | 15           | \$1,480      |
| New                  | Single Family    | Central AC | Evaporative Space Cooling                                 | SEER 40   | SEER 13   | 749                       | 70.0%                         | 75%   | 95%                                 | 10           | \$1,119      |
| New                  | Single Family    | Central AC | Green Roof  | ecorooft  | Standard Roof   | 749                       | 6.5%                          | 0%  | 98%                                 | 40           | \$21956      |
| New                  | Single Family    | Central AC | Insulation (Basement - Wall) 2*4                          | R-13 + R-5 sheathing                                  | R-13  | 749                       | 6.1%                          | 20%   | 95%                                 | 25           | \$474        |
| New                  | Single Family    | Central AC | Insulation (Basement - Wall) 2*4 - average existing value | R-13  | Average Existing Insulation Value and/or Code Value (R-7) | 749                       | 6.9%                          | 20%   | 70%                                 | 25           | \$671        |

| Construction Vintage | Customer Segment | End Use      | Measure Name                            | Measure Description   | Base Equipment                                 | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------|---|---|--|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Single Family    | Central AC   | Insulation (Ceiling)                    | R-49  | State Code (R-38)                              | 749                       | 0.1%                          | 87%   | 85%                                 | 25           | \$390        |
| New                  | Single Family    | Central AC   | Insulation (Floor)                      | R-38  | State Code (R-30)                              | 749                       | 0.1%                          | 75%   | 90%                                 | 25           | \$884        |
| New                  | Single Family    | Central AC   | Insulation (Rim And Band Joist)         | R-10  | No Rim And Band Joist Insulation               | 749                       | 3.0%                          | 80%   | 45%                                 | 25           | \$130        |
| New                  | Single Family    | Central AC   | Insulation (Rim And Band Joist)         | R-19  | R-10   | 749                       | 4.0%                          | 80%   | 75%                                 | 25           | \$84         |
| New                  | Single Family    | Central AC   | Insulation (Slab)                       | R-15  | State Code (R-10)                              | 749                       | 1.4%                          | 32%   | 64%                                 | 25           | \$223        |
| New                  | Single Family    | Central AC   | Insulation (wall) 2*6                   | R-21 + R5 Sheathing   | State Code (R-21)                              | 749                       | 0.0%                          | 95%   | 85%                                 | 25           | \$2,363      |
| New                  | Single Family    | Central AC   | Leak Proof Duct Fittings                | Quick connect fittings that do not require mastic or drawbands (6 per unit) | 13 SEER  | 749                       | 15.0%                         | 0%  | 95%                                 | 30           | \$127        |
| New                  | Single Family    | Central AC   | Motor - ECM Motor                       | ECM motor for Central Air Conditioner                                       | Standard Motor                                 | 749                       | 4.5%                          | 65%   | 95%                                 | 15           | \$368        |
| New                  | Single Family    | Central AC   | Outlet Gasket                           | Install Outlet Gasket (Reduce Air Leakage)                                  | No Outlet Gasket                               | 749                       | 2.0%                          | 95%   | 40%                                 | 5            | \$7          |
| New                  | Single Family    | Central AC   | Proper Sizing - Central Air Conditioner | Correctly Sized Air Conditioner Unit  | Oversized Air Conditioner Unit                 | 749                       | 6.0%                          | 53%   | 85%                                 | 15           | \$1          |
| New                  | Single Family    | Central AC   | Radiant Barrier (Ceiling)               | Install Radiant Barrier   | No Radiant Barrier                             | 749                       | 6.7%                          | 0%  | 97%                                 | 30           | \$305        |
| New                  | Single Family    | Central AC   | Solar Attic Fan                         | Solar electric attic ventilation  | Standard passive ventilation                   | 749                       | 6.0%                          | 70%   | 95%                                 | 10           | \$762        |
| New                  | Single Family    | Central AC   | Thermostat - Clock/Programmable         | Programmable Thermostat   | Manual Thermostat                              | 749                       | 6.8%                          | 85%   | 24%                                 | 15           | \$27         |
| New                  | Single Family    | Central AC   | Thermostat - Multi-Zone                 | Individual Room Temperature Control for Major Occupied Rooms                | Programmable Thermostat - Central Control Only | 749                       | 7.0%                          | 65%   | 95%                                 | 12           | \$1,422      |
| New                  | Single Family    | Central AC   | VSD Motor - ECM                         | Variable Speed Motor (ECM) for Central Air Conditioner                      | Constant Speed Motor                           | 749                       | 13.5%                         | 90%   | 85%                                 | 20           | \$341        |
| New                  | Single Family    | Central AC   | Whole-House Dehumidifier                | Whole-House Dehumidifier  | No Dehumidifier                                | 749                       | 6.0%                          | 50%   | 95%                                 | 11           | \$1,439      |
| New                  | Single Family    | Central AC   | Whole-House Fan                         | Whole-House Fan   | No Whole-House Fan                             | 749                       | 22.0%                         | 50%   | 96%                                 | 15           | \$334        |
| New                  | Single Family    | Central AC   | Window Overhang                         | Overhangs over windows for shading  | No window overhangs                            | 749                       | 14.0%                         | 50%   | 80%                                 | 30           | \$905        |
| New                  | Single Family    | Central AC   | Windows                                 | U = 0.19  | U=0.30   | 749                       | 5.0%                          | 85%   | 95%                                 | 25           | \$4,696      |
| New                  | Single Family    | Central Heat | Air-to-Air Heat Exchangers              | Air-to-Air Heat Exchangers  | No Air to Air Heat Exchangers                  | 5,495                     | 10.0%                         | 0%  | 95%                                 | 15           | \$990        |
| New                  | Single Family    | Central Heat | Canned Lighting Air Tight Sealing       | Canned Lighting Air Tight Sealing   | No Air tight Sealing                           | 5,495                     | 3.3%                          | 75%   | 25%                                 | 30           | \$3          |
| New                  | Single Family    | Central Heat | Construction - ICF                      | Concrete Framing  | Standard Wood Framing                          | 5,495                     | 44.0%                         | 45%   | 95%                                 | 30           | \$11629      |
| New                  | Single Family    | Central Heat | Construction - SIP                      | Specialty Framing   | Standard Wood Framing                          | 5,495                     | 14.0%                         | 45%   | 95%                                 | 30           | \$4,839      |
| New                  | Single Family    | Central Heat | Doors                                   | R-11 (Steel Doors with foam core)   | Standard non-thermal wood door (R-2)           | 5,495                     | 5.0%                          | 85%   | 50%                                 | 30           | \$116        |
| New                  | Single Family    | Central Heat | Doors                                   | R-5 (Composite Doors with foam core)  | Standard non-thermal wood door (R-2)           | 5,495                     | 3.0%                          | 85%   | 55%                                 | 12           | \$42         |
| New                  | Single Family    | Central Heat | Duct Location                           | Conditioned Space Design - Duct Loss Is Not A Concern                       | Ducts in Unconditioned Space (Duct loss)       | 5,495                     | 8.0%                          | 85%   | 15%                                 | 30           | \$210        |
| New                  | Single Family    | Central Heat | Duct Sealing                            | Duct Sealing  | No Duct Sealing                                | 5,495                     | 6.0%                          | 0%  | 65%                                 | 20           | \$447        |

| Construction Vintage | Customer Segment | End Use      | Measure Name  | Measure Description   | Base Equipment  | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------|---|---|---|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Single Family    | Central Heat | Duct Sealing - Aerosol-Based                              | Spray-in ductwork sealant to minimize duct leaks                            | New homes with AFUE HVAC, SEER 13                         | 5,495                     | 19.0%                         | 0%  | 95%                                 | 25           | \$525        |
| New                  | Single Family    | Central Heat | Green Roof  | ecorooft  | Standard Roof   | 5,495                     | 6.5%                          | 0%  | 98%                                 | 40           | \$21956      |
| New                  | Single Family    | Central Heat | Insulation (Basement - Wall) 2*4                          | R-13 + R-5 sheathing  | R-13  | 5,495                     | 6.1%                          | 20%   | 95%                                 | 25           | \$474        |
| New                  | Single Family    | Central Heat | Insulation (Basement - Wall) 2*4 - average existing value | R-13  | Average Existing Insulation Value and/or Code Value (R-7) | 5,495                     | 6.9%                          | 20%   | 70%                                 | 25           | \$671        |
| New                  | Single Family    | Central Heat | Insulation (Ceiling)                                      | R-49  | State Code (R-38)   | 5,495                     | 3.0%                          | 87%   | 85%                                 | 25           | \$390        |
| New                  | Single Family    | Central Heat | Insulation (Floor)  | R-38  | State Code (R-30)   | 5,495                     | 2.0%                          | 75%   | 90%                                 | 25           | \$884        |
| New                  | Single Family    | Central Heat | Insulation (Rim And Band Joist)                           | R-10  | No Rim And Band Joist Insulation                          | 5,495                     | 3.0%                          | 80%   | 45%                                 | 25           | \$130        |
| New                  | Single Family    | Central Heat | Insulation (Rim And Band Joist)                           | R-19  | R-10  | 5,495                     | 4.0%                          | 80%   | 75%                                 | 25           | \$84         |
| New                  | Single Family    | Central Heat | Insulation (Slab)   | R-15  | State Code (R-10)   | 5,495                     | 1.4%                          | 32%   | 64%                                 | 25           | \$223        |
| New                  | Single Family    | Central Heat | Insulation (wall) 2*6                                     | R-21 + R5 Sheathing   | State Code (R-21)   | 5,495                     | 3.2%                          | 95%   | 85%                                 | 25           | \$2,363      |
| New                  | Single Family    | Central Heat | Leak Proof Duct Fittings                                  | Quick connect fittings that do not require mastic or drawbands (6 per unit) | 13 SEER   | 5,495                     | 15.0%                         | 0%  | 95%                                 | 30           | \$127        |
| New                  | Single Family    | Central Heat | Outlet Gasket   | Install Outlet Gasket (Reduce Air Leakage)                                  | No Outlet Gasket  | 5,495                     | 2.0%                          | 95%   | 40%                                 | 5            | \$7          |
| New                  | Single Family    | Central Heat | Radiant Barrier (Ceiling)                                 | Install Radiant Barrier   | No Radiant Barrier  | 5,495                     | 2.0%                          | 0%  | 97%                                 | 30           | \$305        |
| New                  | Single Family    | Central Heat | Spray in insulation 2*4 Wall                              | 2*4Wall - closed cell foam insulation R-23                                  | 2*6Wall R-21  | 5,495                     | 3.0%                          | 90%   | 90%                                 | 25           | \$6,935      |
| New                  | Single Family    | Central Heat | Spray in insulation 2*6 Wall                              | 2*6Wall - closed cell foam insulation R-37                                  | 2*6Wall R-21  | 5,495                     | 10.0%                         | 90%   | 90%                                 | 25           | \$9,954      |
| New                  | Single Family    | Central Heat | Thermostat - Clock/Programmable                           | Programmable Thermostat   | Manual Thermostat   | 5,495                     | 6.8%                          | 85%   | 33%                                 | 15           | \$27         |
| New                  | Single Family    | Central Heat | Thermostat - Multi-Zone                                   | Individual Room Temperature Control for Major Occupied Rooms                | Programmable Thermostat - Central Control Only            | 5,495                     | 7.0%                          | 65%   | 95%                                 | 12           | \$1,422      |
| New                  | Single Family    | Central Heat | Windows   | U = 0.19  | U=0.30  | 5,495                     | 16.0%                         | 85%   | 95%                                 | 25           | \$4,696      |
| New                  | Single Family    | Cooking Oven | Convection Oven   | Convection Oven (wall oven)   | Standard Oven (wall oven)                                 | 435                       | 23.0%                         | 85%   | 85%                                 | 15           | \$432        |
| New                  | Single Family    | Dryer        | Clothes Dryer With Moisture Sensor                        | High-Efficiency Clothes Dryer With Moisture Sensor                          | Standard Dryer Without Moisture Sensor                    | 858                       | 13.0%                         | NA  | NA                                  | 18           | \$58         |
| New                  | Single Family    | Freezer      | Freezer - Stand-Alone                                     | Energy Star 14.8 cu ft Chest Freezer  | Standard 14.8 cu ft Freezer                               | 553                       | 10.0%                         | NA  | NA                                  | 12           | \$26         |
| New                  | Single Family    | HVAC Aux     | Motor - ECM Motor   | ECM Motor for Forced Air Electric Furnace                                   | Standard Motor  | 477                       | 25.0%                         | 0%  | 95%                                 | 15           | \$368        |
| New                  | Single Family    | HVAC Aux     | Motor - ECM Motor   | ECM Motor for Forced Air Gas Furnace  | Standard Motor  | 477                       | 25.0%                         | 71%   | 95%                                 | 15           | \$368        |
| New                  | Single Family    | HVAC Aux     | VSD Fan   | Variable Speed Fan - Electric Furnace                                       | Constant Speed Fan  | 477                       | 75.0%                         | 7%  | 85%                                 | 20           | \$447        |
| New                  | Single Family    | HVAC Aux     | VSD Fan   | Variable Speed Fan - Gas Furnace  | Constant Speed Fan  | 477                       | 75.0%                         | 66%   | 85%                                 | 20           | \$447        |
| New                  | Single Family    | Heat Pump    | Air Source Heat_Pump                                      | 3 ton, 14 SEER, 8.5 HSPF  | 3 ton, 13 SEER, 7.7 HSPF                                  | 5,438                     | 4.9%                          | NA  | NA                                  | 15           | \$517        |
| New                  | Single Family    | Heat Pump    | Air Source Heat_Pump                                      | 3 ton, 16 SEER, 8.8 HSPF  | 3 ton, 13 SEER, 7.7 HSPF                                  | 5,438                     | 7.4%                          | NA  | NA                                  | 15           | \$660        |

| Construction Vintage | Customer Segment | End Use   | Measure Name   | Measure Description   | Base Equipment  | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|--|---|---|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Single Family    | Heat Pump | Air Source Heat_Pump   | 3 ton, 18 SEER, 9.0 HSPF  | 3 ton, 13 SEER, 7.7 HSPF  | 5,438                     | 9.2%                          | NA  | NA                                  | 15           | \$1,435      |
| New                  | Single Family    | Heat Pump | Advanced Cold-Climate Heat Pump                                  | 16 SEER, 9.6 HSPF   | 13 SEER, 7.7 HSPF, 3 ton  | 5,134                     | 14.0%                         | 20%   | 99%                                 | 20           | \$3,677      |
| New                  | Single Family    | Heat Pump | Air-to-Air Heat Exchangers                                       | Air-to-Air Heat Exchangers  | No Air to Air Heat Exchangers   | 5,134                     | 10.0%                         | 0%  | 95%                                 | 15           | \$990        |
| New                  | Single Family    | Heat Pump | Blinds - Fixed Angle/Automatic                                   | Install Blinds (Reduce Window SHGC by 50%)                                  | No Interior Shading Device  | 5,134                     | 4.4%                          | 65%   | 30%                                 | 10           | \$603        |
| New                  | Single Family    | Heat Pump | Canned Lighting Air Tight Sealing                                | Canned Lighting Air Tight Sealing   | No Air tight Sealing  | 5,134                     | 3.3%                          | 75%   | 25%                                 | 30           | \$3          |
| New                  | Single Family    | Heat Pump | Ceiling Fan  | Ceiling Fan   | No Ceiling Fan  | 5,134                     | 0.0%                          | 85%   | 20%                                 | 10           | \$104        |
| New                  | Single Family    | Heat Pump | Construction - ICF   | Concrete Framing  | Standard Wood Framing   | 5,134                     | 43.3%                         | 45%   | 95%                                 | 30           | \$11629      |
| New                  | Single Family    | Heat Pump | Construction - SIP   | Specialty Framing   | Standard Wood Framing   | 5,134                     | 14.0%                         | 45%   | 95%                                 | 30           | \$4,839      |
| New                  | Single Family    | Heat Pump | Cool Roofs   | Lighter Colored Shingles (White)  | Standard Roof Shingles  | 5,134                     | 2.8%                          | 0%  | 95%                                 | 20           | \$57         |
| New                  | Single Family    | Heat Pump | Doors  | R-11 (Steel Doors with foam core)   | Standard non-thermal wood door (R-2)  | 5,134                     | 3.0%                          | 85%   | 50%                                 | 30           | \$116        |
| New                  | Single Family    | Heat Pump | Doors  | R-5 (Composite Doors with foam core)  | Standard non-thermal wood door (R-2)  | 5,134                     | 2.0%                          | 85%   | 55%                                 | 12           | \$42         |
| New                  | Single Family    | Heat Pump | Duct Location  | Conditioned Space Design - Duct Loss Is Not A Concern                       | Ducts in Unconditioned Space (Duct loss)                                    | 5,134                     | 8.0%                          | 85%   | 15%                                 | 30           | \$210        |
| New                  | Single Family    | Heat Pump | Green Roof   | ecorooft  | Standard Roof   | 5,134                     | 6.5%                          | 0%  | 98%                                 | 40           | \$21956      |
| New                  | Single Family    | Heat Pump | Heat_Pump - Ground or Water-Source - Open Loop (Desuperheater)   | EER = 16.2, COP = 3.6   | Air Source Heat_Pump - 13 SEER, 7.7 HSPF (Federal Code) (11.3 EER, 3.2 COP) | 5,134                     | 16.8%                         | 15%   | 95%                                 | 18           | \$14703      |
| New                  | Single Family    | Heat Pump | Heat_Pump - Ground or Water-Source - Closed Loop (Desuperheater) | EER = 14.1, COP = 3.3   | Air Source Heat_Pump - 13 SEER, 7.7 HSPF (Federal Code) (11.3 EER, 3.2 COP) | 5,134                     | 6.2%                          | 30%   | 95%                                 | 18           | \$14703      |
| New                  | Single Family    | Heat Pump | Insulation (Basement - Wall) 2*4                                 | R-13 + R-5 sheathing  | R-13  | 5,134                     | 6.1%                          | 20%   | 95%                                 | 25           | \$474        |
| New                  | Single Family    | Heat Pump | Insulation (Basement - Wall) 2*4 - average existing value        | R-13  | Average Existing Insulation Value and/or Code Value (R-7)                   | 5,134                     | 6.9%                          | 20%   | 70%                                 | 25           | \$671        |
| New                  | Single Family    | Heat Pump | Insulation (Ceiling)   | R-49  | State Code (R-38)   | 5,134                     | 2.0%                          | 87%   | 85%                                 | 25           | \$390        |
| New                  | Single Family    | Heat Pump | Insulation (Floor)   | R-38  | State Code (R-30)   | 5,134                     | 1.0%                          | 75%   | 90%                                 | 25           | \$884        |
| New                  | Single Family    | Heat Pump | Insulation (Rim And Band Joist)                                  | R-10  | No Rim And Band Joist Insulation  | 5,134                     | 3.0%                          | 80%   | 45%                                 | 25           | \$130        |
| New                  | Single Family    | Heat Pump | Insulation (Rim And Band Joist)                                  | R-19  | R-10  | 5,134                     | 4.0%                          | 80%   | 75%                                 | 25           | \$84         |
| New                  | Single Family    | Heat Pump | Insulation (Slab)  | R-15  | State Code (R-10)   | 5,134                     | 1.4%                          | 32%   | 64%                                 | 25           | \$223        |
| New                  | Single Family    | Heat Pump | Insulation (wall) 2*6  | R-21 + R5 Sheathing   | State Code (R-21)   | 5,134                     | 2.1%                          | 95%   | 85%                                 | 25           | \$1,430      |
| New                  | Single Family    | Heat Pump | Leak Proof Duct Fittings   | Quick connect fittings that do not require mastic or drawbands (6 per unit) | 13 SEER   | 5,134                     | 15.0%                         | 0%  | 95%                                 | 30           | \$127        |
| New                  | Single Family    | Heat Pump | Micro Channel Heat Exchangers (Evaporator)                       | Micro Channel Heat Exchangers (5 ton unit)                                  | 13 SEER, 7.7 HSPF, 3 ton  | 5,134                     | 5.0%                          | 15%   | 99%                                 | 18           | \$3,732      |
| New                  | Single Family    | Heat Pump | Motor - ECM Motor  | ECM motor for Heat Pump   | Standard Motor  | 5,134                     | 1.3%                          | 65%   | 95%                                 | 15           | \$368        |
| New                  | Single Family    | Heat Pump | Outlet Gasket  | Install Outlet Gasket (Reduce Air Leakage)                                  | No Outlet Gasket  | 5,134                     | 2.0%                          | 95%   | 40%                                 | 5            | \$7          |

| Construction Vintage | Customer Segment | End Use   | Measure Name   | Measure Description  | Base Equipment                                 | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|--|--|--|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Single Family    | Heat Pump | PTCS Aerosol-Based Duct Sealing                        | Spray-in ductwork sealant to minimize duct leaks             | No Duct Sealing                                | 5,134                     | 19.0%                         | 60%   | 65%                                 | 25           | \$525        |
| New                  | Single Family    | Heat Pump | PTCS Duct Sealing                                      | PTCS Duct Sealing  | No Duct Sealing                                | 5,134                     | 15.0%                         | 60%   | 65%                                 | 20           | \$447        |
| New                  | Single Family    | Heat Pump | Proper Sizing - Heat Pump                              | Correctly Sized Heat_Pump (Cooling And Heating Unit)         | Oversized Heat_Pump                            | 5,134                     | 8.6%                          | 53%   | 85%                                 | 15           | \$1          |
| New                  | Single Family    | Heat Pump | Radiant Barrier (Ceiling)                              | Install Radiant Barrier                                      | No Radiant Barrier                             | 5,134                     | 2.7%                          | 0%  | 97%                                 | 30           | \$305        |
| New                  | Single Family    | Heat Pump | Small Scale Absorption Cooling                         | Small Scale Absorption Cooling (5 ton)                       | 13 SEER, 7.7 HSPF, 3 ton                       | 5,134                     | 9.0%                          | 0%  | 99%                                 | 20           | \$946        |
| New                  | Single Family    | Heat Pump | Solar Attic Fan  | Solar electric attic ventilation                             | Standard passive ventilation                   | 5,134                     | 0.8%                          | 70%   | 95%                                 | 10           | \$762        |
| New                  | Single Family    | Heat Pump | Solid state refrigeration (cool chips™) for heat pumps | Solid State Thermoelectric cooling system                    | 13 SEER, 7.7 HSPF, 3 ton                       | 5,134                     | 18.0%                         | 29%   | 99%                                 | 18           | \$2,101      |
| New                  | Single Family    | Heat Pump | Spray in insulation 2*4 Wall                           | 2*4Wall - closed cell foam insulation R-23                   | 2*6Wall R-21                                   | 5,134                     | 3.0%                          | 90%   | 90%                                 | 25           | \$6,935      |
| New                  | Single Family    | Heat Pump | Spray in insulation 2*6 Wall                           | 2*6Wall - closed cell foam insulation R-37                   | 2*6Wall R-21                                   | 5,134                     | 8.0%                          | 90%   | 90%                                 | 25           | \$9,954      |
| New                  | Single Family    | Heat Pump | Thermostat - Clock/Programmable                        | Programmable Thermostat                                      | Manual Thermostat                              | 5,134                     | 6.8%                          | 0%  | 27%                                 | 15           | \$27         |
| New                  | Single Family    | Heat Pump | Thermostat - Multi-Zone                                | Individual Room Temperature Control for Major Occupied Rooms | Programmable Thermostat - Central Control Only | 5,134                     | 7.0%                          | 65%   | 95%                                 | 12           | \$1,422      |
| New                  | Single Family    | Heat Pump | VSD Motor - ECM  | Variable Speed Motor (ECM) for Heat Pump                     | Constant Speed Motor                           | 5,134                     | 3.8%                          | 90%   | 85%                                 | 20           | \$341        |
| New                  | Single Family    | Heat Pump | Whole-House Fan  | Whole-House Fan  | No Whole-House Fan                             | 5,134                     | 3.3%                          | 50%   | 96%                                 | 15           | \$334        |
| New                  | Single Family    | Heat Pump | Windows  | U = 0.19   | U=0.30   | 5,134                     | 11.0%                         | 85%   | 95%                                 | 25           | \$4,696      |
| New                  | Single Family    | Lighting  | CFL Fixtures, High Use                                 | 2-15 W CFLs, 4.0 hr/day (37%)                                | 2-60 W Incandescent                            | 2,441                     | 4.7%                          | 98%   | 73%                                 | 20           | \$35         |
| New                  | Single Family    | Lighting  | CFL Fixtures, Low Use                                  | 2-15 W CFLs, 1.0 hr/day (32%)                                | 2-60 W Incandescent                            | 2,441                     | 4.0%                          | 98%   | 73%                                 | 20           | \$30         |
| New                  | Single Family    | Lighting  | CFL Fixtures, Medium Use                               | 2-15 W CFLs, 2.5 hr/day (33%)                                | 2-60 W Incandescent                            | 2,441                     | 4.2%                          | 98%   | 73%                                 | 20           | \$33         |
| New                  | Single Family    | Lighting  | CFL Lamps, High Use                                    | 1-15W, 4.0 hr/day (37%)                                      | Incandescent 60W                               | 2,441                     | 34.0%                         | 86%   | 73%                                 | 7            | \$2          |
| New                  | Single Family    | Lighting  | CFL Lamps, Low Use                                     | 1-15W, 1.0 hr/day (32%)                                      | Incandescent 60W                               | 2,441                     | 9.7%                          | 86%   | 73%                                 | 27           | \$2          |
| New                  | Single Family    | Lighting  | CFL Lamps, Medium Use                                  | 1-15W, 2.5 hr/day (33%)                                      | Incandescent 60W                               | 2,441                     | 14.0%                         | 86%   | 73%                                 | 11           | \$2          |
| New                  | Single Family    | Lighting  | CFL Lighting - 3-Way                                   | 13 W, 20W And 25W  | 30W, 75W, 100W                                 | 2,441                     | 1.8%                          | 75%   | 73%                                 | 7            | \$13         |
| New                  | Single Family    | Lighting  | CFL Torchieries, High Use                              | 55 W CFL, (20%)  | Incandescent Torchieries, 180W Halogen         | 2,441                     | 0.4%                          | 70%   | 35%                                 | 7            | \$7          |
| New                  | Single Family    | Lighting  | CFL Torchieries, Low Use                               | 55 W CFL, (20%)  | Incandescent Torchieries, 180W Halogen         | 2,441                     | 0.4%                          | 70%   | 35%                                 | 27           | \$7          |
| New                  | Single Family    | Lighting  | CFL Torchieries, Medium Use                            | 55 W CFL, (60%)  | Incandescent Torchieries, 180W Halogen         | 2,441                     | 1.3%                          | 70%   | 35%                                 | 11           | \$7          |
| New                  | Single Family    | Lighting  | Daylighting Controls (Photocell) - Indoor/Outdoors     | Install Photocell  | No Daylighting Controls                        | 2,441                     | 4.5%                          | 0%  | 95%                                 | 10           | \$110        |
| New                  | Single Family    | Lighting  | LED Christmas Lighting                                 | LED Christmas Lighting                                       | Incandescent Christmas Lighting                | 2,441                     | 0.4%                          | 40%   | 85%                                 | 13           | \$11         |
| New                  | Single Family    | Lighting  | LED Interior Lighting (White), High Use                | LED 4W   | Incandescent 60W                               | 2,441                     | 42.3%                         | 85%   | 98%                                 | 13           | \$31         |
| New                  | Single Family    | Lighting  | LED Interior Lighting (White), Low Use                 | LED 4W   | Incandescent 60W                               | 2,441                     | 12.1%                         | 85%   | 98%                                 | 13           | \$31         |

| Construction Vintage | Customer Segment | End Use      | Measure Name   | Measure Description  | Base Equipment                           | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------|--|--|--|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Single Family    | Lighting     | LED Interior Lighting (White), Medium Use                    | LED 4W   | Incandescent 60W                         | 2,441                     | 17.4%                         | 85%   | 98%                                 | 13           | \$31         |
| New                  | Single Family    | Lighting     | Occupancy Sensors  | Wall-Switch Occupancy Sensors  | No Occupancy Sensor                      | 2,441                     | 14.0%                         | 75%   | 85%                                 | 10           | \$64         |
| New                  | Single Family    | Lighting     | Time Clocks (Exterior Lighting)                              | Exterior Lighting on a Time Clock  | Exterior Lighting (Manual Control)       | 2,441                     | 1.9%                          | 75%   | 90%                                 | 10           | \$93         |
| New                  | Single Family    | Plug Load    | 1-Watt Standby Power   | 1W or less standby power use for small appliances                            | Standard plug load appliance.            | 2,128                     | 4.2%                          | 15%   | 85%                                 | 7            | \$32         |
| New                  | Single Family    | Plug Load    | Energy Star Battery Chargers                                 | Energy Star Battery Chargers   | Standard Battery Chargers                | 2,128                     | 0.2%                          | 55%   | 40%                                 | 7            | \$4          |
| New                  | Single Family    | Plug Load    | Energy Star DVD System                                       | Energy Star DVD System   | Standard DVD System                      | 2,128                     | 1.9%                          | 100%  | 24%                                 | 7            | \$12         |
| New                  | Single Family    | Plug Load    | Energy Star Dehumidifiers                                    | Energy Star Dehumidifiers  | Standard Dehumidifiers                   | 2,128                     | 0.4%                          | 15%   | 5%                                  | 10           | \$13         |
| New                  | Single Family    | Plug Load    | Energy Star Digital Set Top Receiver                         | Energy Star Digital Set Top Receiver   | Standard Digital Set Top Receiver        | 2,128                     | 1.7%                          | 81%   | 62%                                 | 6            | \$37         |
| New                  | Single Family    | Plug Load    | Energy Star HDTV   | Energy Star HDTV   | Standard HDTV                            | 2,128                     | 3.2%                          | 38%   | 70%                                 | 9            | \$105        |
| New                  | Single Family    | Plug Load    | Energy Star Home Audio System                                | Energy Star Home Audio System  | Standard Home Audio system               | 2,128                     | 2.5%                          | 91%   | 90%                                 | 7            | \$21         |
| New                  | Single Family    | Plug Load    | Energy Star Office Computer                                  | Energy Star Office Computer  | Standard Office Computer                 | 2,128                     | 13.7%                         | 100%  | 15%                                 | 4            | \$84         |
| New                  | Single Family    | Plug Load    | Energy Star Office Copiers                                   | Energy Star Office Copiers   | Standard Office Copiers                  | 2,128                     | 1.9%                          | 25%   | 55%                                 | 6            | \$53         |
| New                  | Single Family    | Plug Load    | Energy Star Office Monitor                                   | Energy Star Office Monitor   | Standard Office Monitor                  | 2,128                     | 4.1%                          | 100%  | 15%                                 | 4            | \$16         |
| New                  | Single Family    | Plug Load    | Energy Star Office Printer                                   | Energy Star Office Printer   | Standard Office Printer                  | 2,128                     | 0.0%                          | 75%   | 40%                                 | 5            | \$11         |
| New                  | Single Family    | Plug Load    | Energy Star TV   | Energy Star TV   | Standard TV                              | 2,128                     | 3.3%                          | 100%  | 38%                                 | 9            | \$32         |
| New                  | Single Family    | Plug Load    | Energy Star VCR  | Energy Star VCR/DVD Combo  | Standard Home VCR                        | 2,128                     | 0.6%                          | 100%  | 45%                                 | 4            | \$38         |
| New                  | Single Family    | Plug Load    | Power supply transformer/converter - External power adapters | Power supply transformer/converter - High efficiency External power adapters | Standard Efficiency                      | 2,128                     | 0.3%                          | 85%   | 40%                                 | 7            | \$8          |
| New                  | Single Family    | Plug Load    | Powerstrip with Occupancy Sensor                             | Powerstrip with Occupancy Sensor   | Powerstrip w/o Occupancy Sensor          | 2,128                     | 0.6%                          | 85%   | 90%                                 | 10           | \$88         |
| New                  | Single Family    | Pool Pump    | Pool Pump Timers   | Pool Pump Timers   | Pool Pump No Timers                      | 1,482                     | 50.0%                         | 3%  | 83%                                 | 10           | \$52         |
| New                  | Single Family    | Pool Pump    | Pool Pumps - VSD   | Pool Pumps (VSD)   | Pool Pumps constant speed                | 1,482                     | 85.0%                         | 3%  | 92%                                 | 10           | \$714        |
| New                  | Single Family    | Refrigerator | Refrigerator/Freezer - Energy Star                           | Energy Star Refrigerator   | Standard Refrigerator                    | 490                       | 20.0%                         | NA  | NA                                  | 18           | \$32         |
| New                  | Single Family    | Refrigerator | 1 kWh/day Refrigerator                                       | 20 cf top-freezer using no more than 1 kWh/day                               | Standard Refrigerator, 20cf, top-freezer | 416                       | 30.0%                         | 90%   | 97%                                 | 19           | \$74         |
| New                  | Single Family    | Refrigerator | Refrigerator eCube   | Refrigerator eCube   | No Refrigerator eCube                    | 416                       | 6.3%                          | 85%   | 95%                                 | 5            | \$236        |
| New                  | Single Family    | Refrigerator | Solid state refrigeration (cool chips™) for refrigerators    | Thermoelectric refrigerator, 1.7 cubic ft.                                   | Compact refrigerator, 1.7 cubic ft.      | 416                       | 4.0%                          | 75%   | 95%                                 | 19           | \$56         |
| New                  | Single Family    | Room AC      | Air Conditioner - Room (Individual Rooms) (10,000 BTU/HR)    | EER = 10.8   | EER = 9.8                                | 496                       | 8.4%                          | NA  | NA                                  | 10           | \$42         |
| New                  | Single Family    | Room AC      | Blinds - Fixed Angle/Automatic                               | Install Blinds (Reduce Window SHGC by 50%)                                   | No Interior Shading Device               | 468                       | 31.5%                         | 65%   | 30%                                 | 10           | \$603        |
| New                  | Single Family    | Room AC      | Canned Lighting Air Tight Sealing                            | Canned Lighting Air Tight Sealing  | No Air tight Sealing                     | 468                       | 3.3%                          | 75%   | 25%                                 | 30           | \$3          |

| Construction Vintage | Customer Segment | End Use   | Measure Name  | Measure Description                        | Base Equipment  | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|---|--|---|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Single Family    | Room AC   | Ceiling Fan   | Ceiling Fan                                | No Ceiling Fan  | 468                       | 0.3%                          | 85%   | 20%                                 | 10           | \$104        |
| New                  | Single Family    | Room AC   | Construction - ICF  | Concrete Framing                           | Standard Wood Framing                                     | 468                       | 32.0%                         | 45%   | 95%                                 | 30           | \$11629      |
| New                  | Single Family    | Room AC   | Construction - SIP  | Specialty Framing                          | Standard Wood Framing                                     | 468                       | 14.0%                         | 45%   | 95%                                 | 30           | \$4,839      |
| New                  | Single Family    | Room AC   | Cool Roofs  | Lighter Colored Shingles (White)           | Standard Roof Shingles                                    | 468                       | 20.0%                         | 0%  | 95%                                 | 20           | \$57         |
| New                  | Single Family    | Room AC   | Doors   | R-11 (Steel Doors with foam core)          | Standard non-thermal wood door (R-2)                      | 468                       | 0.1%                          | 85%   | 50%                                 | 30           | \$116        |
| New                  | Single Family    | Room AC   | Doors   | R-5 (Composite Doors with foam core)       | Standard non-thermal wood door (R-2)                      | 468                       | 0.1%                          | 85%   | 55%                                 | 12           | \$42         |
| New                  | Single Family    | Room AC   | Green Roof  | ecorooF                                    | Standard Roof   | 468                       | 6.5%                          | 0%  | 98%                                 | 40           | \$21956      |
| New                  | Single Family    | Room AC   | Insulation (Basement - Wall) 2'4                          | R-13 + R-5 sheathing                       | R-13  | 468                       | 6.1%                          | 20%   | 95%                                 | 25           | \$474        |
| New                  | Single Family    | Room AC   | Insulation (Basement - Wall) 2'4 - average existing value | R-13                                       | Average Existing Insulation Value and/or Code Value (R-7) | 468                       | 6.9%                          | 20%   | 70%                                 | 25           | \$671        |
| New                  | Single Family    | Room AC   | Insulation (Ceiling)                                      | R-49                                       | State Code (R-38)   | 468                       | 0.1%                          | 87%   | 85%                                 | 25           | \$390        |
| New                  | Single Family    | Room AC   | Insulation (Floor)  | R-38                                       | State Code (R-30)   | 468                       | 0.1%                          | 75%   | 90%                                 | 25           | \$884        |
| New                  | Single Family    | Room AC   | Insulation (Rim And Band Joist)                           | R-10                                       | No Rim And Band Joist Insulation                          | 468                       | 3.0%                          | 80%   | 45%                                 | 25           | \$130        |
| New                  | Single Family    | Room AC   | Insulation (Rim And Band Joist)                           | R-19                                       | R-10  | 468                       | 4.0%                          | 80%   | 75%                                 | 25           | \$84         |
| New                  | Single Family    | Room AC   | Insulation (Slab)   | R-15                                       | State Code (R-10)   | 468                       | 1.4%                          | 32%   | 64%                                 | 25           | \$223        |
| New                  | Single Family    | Room AC   | Insulation (wall) 2'6                                     | R-21 + R5 Sheathing                        | State Code (R-21)   | 468                       | 0.0%                          | 95%   | 85%                                 | 25           | \$2,363      |
| New                  | Single Family    | Room AC   | Outlet Gasket   | Install Outlet Gasket (Reduce Air Leakage) | No Outlet Gasket  | 468                       | 2.0%                          | 95%   | 40%                                 | 5            | \$7          |
| New                  | Single Family    | Room AC   | Radiant Barrier (Ceiling)                                 | Install Radiant Barrier                    | No Radiant Barrier  | 468                       | 6.7%                          | 0%  | 97%                                 | 30           | \$305        |
| New                  | Single Family    | Room AC   | Window Overhang   | Overhangs over windows for shading         | No window overhangs                                       | 468                       | 14.0%                         | 50%   | 80%                                 | 30           | \$905        |
| New                  | Single Family    | Room AC   | Windows   | U = 0.19                                   | U=0.30  | 468                       | 5.0%                          | 85%   | 95%                                 | 25           | \$4,696      |
| New                  | Single Family    | Room Heat | Canned Lighting Air Tight Sealing                         | Canned Lighting Air Tight Sealing          | No Air tight Sealing                                      | 4,231                     | 3.3%                          | 75%   | 25%                                 | 30           | \$3          |
| New                  | Single Family    | Room Heat | Construction - ICF  | Concrete Framing                           | Standard Wood Framing                                     | 4,231                     | 44.0%                         | 45%   | 95%                                 | 30           | \$11629      |
| New                  | Single Family    | Room Heat | Construction - SIP  | Specialty Framing                          | Standard Wood Framing                                     | 4,231                     | 14.0%                         | 45%   | 95%                                 | 30           | \$4,839      |
| New                  | Single Family    | Room Heat | Doors   | R-11 (Steel Doors with foam core)          | Standard non-thermal wood door (R-2)                      | 4,231                     | 5.0%                          | 85%   | 50%                                 | 30           | \$116        |
| New                  | Single Family    | Room Heat | Doors   | R-5 (Composite Doors with foam core)       | Standard non-thermal wood door (R-2)                      | 4,231                     | 3.0%                          | 85%   | 55%                                 | 12           | \$42         |
| New                  | Single Family    | Room Heat | Ductless Mini-Split REM                                   | 3 ton, SEER 15, HSPF 9.0                   | Electric Baseboard Heating HSPF=1                         | 4,231                     | 62.1%                         | 80%   | 95%                                 | 15           | \$5,700      |
| New                  | Single Family    | Room Heat | Green Roof  | ecorooF                                    | Standard Roof   | 4,231                     | 6.5%                          | 0%  | 98%                                 | 40           | \$21956      |
| New                  | Single Family    | Room Heat | Insulation (Basement - Wall) 2'4                          | R-13 + R-5 sheathing                       | R-13  | 4,231                     | 6.1%                          | 20%   | 95%                                 | 25           | \$474        |
| New                  | Single Family    | Room Heat | Insulation (Basement - Wall) 2'4 - average existing value | R-13                                       | Average Existing Insulation Value and/or Code Value (R-7) | 4,231                     | 6.9%                          | 20%   | 70%                                 | 25           | \$671        |



| Construction Vintage | Customer Segment | End Use    | Measure Name                         | Measure Description                                 | Base Equipment                    | Baseline kWh (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|--------------------------------------|---|-----------------------------------|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Single Family    | Room Heat  | Insulation (Ceiling)                 | R-49  | State Code (R-38)                 | 4,231                     | 3.0%                          | 87%   | 85%                                 | 25           | \$390        |
| New                  | Single Family    | Room Heat  | Insulation (Floor)                   | R-38  | State Code (R-30)                 | 4,231                     | 2.0%                          | 75%   | 90%                                 | 25           | \$884        |
| New                  | Single Family    | Room Heat  | Insulation (Rim And Band Joist)      | R-10  | No Rim And Band Joist Insulation  | 4,231                     | 3.0%                          | 80%   | 45%                                 | 25           | \$130        |
| New                  | Single Family    | Room Heat  | Insulation (Rim And Band Joist)      | R-19  | R-10                              | 4,231                     | 4.0%                          | 80%   | 75%                                 | 25           | \$84         |
| New                  | Single Family    | Room Heat  | Insulation (Slab)                    | R-15  | State Code (R-10)                 | 4,231                     | 1.4%                          | 32%   | 64%                                 | 25           | \$223        |
| New                  | Single Family    | Room Heat  | Insulation (wall) 2*6                | R-21 + R5 Sheathing                                 | State Code (R-21)                 | 4,231                     | 3.2%                          | 95%   | 85%                                 | 25           | \$2,363      |
| New                  | Single Family    | Room Heat  | Outlet Gasket                        | Install Outlet Gasket (Reduce Air Leakage)          | No Outlet Gasket                  | 4,231                     | 2.0%                          | 95%   | 40%                                 | 5            | \$7          |
| New                  | Single Family    | Room Heat  | Radiant Barrier (Ceiling)            | Install Radiant Barrier                             | No Radiant Barrier                | 4,231                     | 2.0%                          | 0%  | 97%                                 | 30           | \$305        |
| New                  | Single Family    | Room Heat  | Radiant Electric Ceiling Panels      | Radiant Electric Heating with Ceiling Panels        | Electric Baseboard Heating        | 4,231                     | 52.0%                         | 75%   | 98%                                 | 20           | \$4,238      |
| New                  | Single Family    | Room Heat  | Radiant Electric Floor Heating       | Radiant Heating with Electric Cables in Flooring    | Electric Baseboard Heating        | 4,231                     | 20.0%                         | 75%   | 95%                                 | 25           | \$25183      |
| New                  | Single Family    | Room Heat  | Spray in insulation 2*4 Wall         | 2*4Wall - closed cell foam insulation R-23          | 2*6Wall R-21                      | 4,231                     | 3.0%                          | 90%   | 90%                                 | 25           | \$6,935      |
| New                  | Single Family    | Room Heat  | Spray in insulation 2*6 Wall         | 2*6Wall - closed cell foam insulation R-37          | 2*6Wall R-21                      | 4,231                     | 10.0%                         | 90%   | 90%                                 | 25           | \$9,954      |
| New                  | Single Family    | Room Heat  | Windows                              | U = 0.19  | U=0.30                            | 4,231                     | 16.0%                         | 85%   | 95%                                 | 25           | \$4,696      |
| New                  | Single Family    | Water Heat | Water_Heater (40 Gallon Electric)    | EF = 0.95   | EF = 0.92                         | 2,865                     | 3.2%                          | NA  | NA                                  | 15           | \$129        |
| New                  | Single Family    | Water Heat | Clothes Washer                       | Energy Star MEF = 1.83 (top Load)                   | Standard Clothes Washer (1.26)    | 2,812                     | 9.3%                          | 35%   | 68%                                 | 14           | \$252        |
| New                  | Single Family    | Water Heat | Clothes Washer                       | Tier 2. MEF = 2.01 (front load)                     | Standard Clothes Washer (1.26)    | 2,812                     | 11.2%                         | 35%   | 77%                                 | 14           | \$312        |
| New                  | Single Family    | Water Heat | Clothes Washer                       | Tier 2. MEF = 2.2 (front load)                      | Standard Clothes Washer (1.26)    | 2,812                     | 12.8%                         | 35%   | 77%                                 | 14           | \$417        |
| New                  | Single Family    | Water Heat | Desuperheater (Ground-Source system) | Heat_Pump) Desuperheater with Standard Water_Heater | Standard Water_Heater - EF = 0.92 | 2,812                     | 55.2%                         | 5%  | 90%                                 | 10           | \$251        |
| New                  | Single Family    | Water Heat | Dishwasher                           | EF = 0.77   | EF = 0.65 (ENERGY STAR)           | 2,812                     | 1.1%                          | 30%   | 35%                                 | 13           | \$514        |
| New                  | Single Family    | Water Heat | Dishwasher - Existing                | EF = 0.65 (ENERGY STAR)                             | EF = 0.46 Existing Dishwasher     | 2,812                     | 2.1%                          | 30%   | 15%                                 | 13           | \$11         |
| New                  | Single Family    | Water Heat | Drain Water Heat Recovery            | Drain Water Heat Recovery (GFX or Power-Pipe)       | No Drain Water Heat Recovery      | 2,812                     | 18.5%                         | 50%   | 95%                                 | 30           | \$630        |
| New                  | Single Family    | Water Heat | Faucet Aerators                      | 0.5 GPM   | 2.2 GPM                           | 2,812                     | 8.5%                          | 95%   | 95%                                 | 9            | \$4          |
| New                  | Single Family    | Water Heat | Faucet Aerators                      | 1.5 GPM   | 2.2 GPM                           | 2,812                     | 3.5%                          | 95%   | 55%                                 | 9            | \$3          |
| New                  | Single Family    | Water Heat | Heat Pump Water Heater               | EF=2.9  | No Heat Pump Water Heater         | 2,812                     | 54.6%                         | 30%   | 95%                                 | 15           | \$2,322      |
| New                  | Single Family    | Water Heat | Hot Water Pipe Insulation            | R-4 Wrap  | No insulation                     | 2,812                     | 1.2%                          | 85%   | 38%                                 | 5            | \$8          |
| New                  | Single Family    | Water Heat | Low-Flow Showerheads                 | 1.75 GPM  | 2.5 GPM                           | 2,812                     | 19.3%                         | 95%   | 85%                                 | 10           | \$11         |
| New                  | Single Family    | Water Heat | Solar Hot Water (SHW)                | Solar thermal collector                             | Non-solar hot water heater        | 2,812                     | 45.5%                         | 20%   | 95%                                 | 20           | \$8,930      |
| New                  | Single Family    | Water Heat | Tankless Water_Heater                | EF = 0.95, 4.0 gpm                                  | EF = 0.92                         | 2,812                     | 3.2%                          | 85%   | 97%                                 | 20           | \$1,302      |



| Construction<br>Vintage | Customer<br>Segment | End Use    | Measure Name                         | Measure Description      | Base Equipment     | Baseline<br>kWh<br>(UEC or<br>EUI) | Savings<br>as<br>Percent<br>of<br>End<br>Use | Percent<br>of<br>Installations<br>Technically<br>Feasible | Percent<br>of<br>Installations<br>Incomplete | Measure<br>Life | Measure<br>Cost |
|-------------------------|---------------------|------------|--------------------------------------|--------------------------|--------------------|------------------------------------|--|---|--|-----------------|-----------------|
| New                     | Single Family       | Water Heat | Water_Heater Tank Blanket/Insulation | Install Insulation (R-5) | No Tank Insulation | 2,812                              | 6.5%   | 0%  | 65%  | 10              | \$19            |
| New                     | Single Family       | Water Heat | Water_Heater Thermostat Setback      | 120 degrees              | 135 degrees        | 2,812                              | 6.0%   | 95%   | 43%  | 4               | \$0             |

# Residential Gas Measures

| Construction Vintage | Customer Segment | End Use        | Measure Name  | Measure Description                     | Base Equipment                                      | Baseline therm (UEC or EUJ) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|----------------|---|---|---|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Manufactured     | Central Boiler | Heat Gas Boiler   | AFUE=90%                                | AFUE=82%  | 626                         | 9.0%                          | NA  | NA                                  | 18           | \$2,399      |
| Existing             | Manufactured     | Central Boiler | Heat Gas Boiler   | AFUE=94%                                | AFUE=82%  | 626                         | 12.7%                         | NA  | NA                                  | 18           | \$3,344      |
| Existing             | Manufactured     | Central Boiler | Heat Canned Lighting Air Tight Sealing                                  | Canned Lighting Air Tight Sealing       | No Air tight Sealing                                | 601                         | 3.3%                          | 60%   | 55%                                 | 30           | \$53         |
| Existing             | Manufactured     | Central Boiler | Heat Doors  | R-11 (Steel Doors with foam core)       | Standard non-thermal wood door (R-2)                | 601                         | 3.0%                          | 85%   | 50%                                 | 30           | \$116        |
| Existing             | Manufactured     | Central Boiler | Heat Doors  | R-5 (Composite Doors with foam core)    | Standard non-thermal wood door (R-2)                | 601                         | 2.0%                          | 85%   | 55%                                 | 12           | \$42         |
| Existing             | Manufactured     | Central Boiler | Heat Doors - Weatherization   | Weatherstripping And Adding Door Sweeps | Existing Non-Efficient door                         | 601                         | 1.3%                          | 80%   | 65%                                 | 3            | \$36         |
| Existing             | Manufactured     | Central Boiler | Heat Gas Boiler - Proper Sizing   | Proper Sizing of Gas Boiler             | Oversized Gas Boiler                                | 601                         | 5.0%                          | 53%   | 85%                                 | 30           | \$1          |
| Existing             | Manufactured     | Central Boiler | Heat Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test | Install Caulking And Weatherstripping   | Existing Infiltration Conditions                    | 601                         | 10.0%                         | 85%   | 85%                                 | 15           | \$435        |
| Existing             | Manufactured     | Central Boiler | Heat Insulation (Ceiling)   | R-49                                    | State Code (R-38)                                   | 601                         | 1.0%                          | 87%   | 85%                                 | 25           | \$471        |
| Existing             | Manufactured     | Central Boiler | Heat Insulation (Ceiling)   | State Code (R-38)                       | Average Existing Insulation Value (R-19)            | 601                         | 2.0%                          | 95%   | 40%                                 | 25           | \$674        |
| Existing             | Manufactured     | Central Boiler | Heat Insulation (Ceiling)   | State Code (R-38)                       | R-9   | 601                         | 10.5%                         | 95%   | 10%                                 | 25           | \$674        |
| Existing             | Manufactured     | Central Boiler | Heat Insulation (Duct)  | R-8                                     | R-4   | 601                         | 1.6%                          | 12%   | 95%                                 | 25           | \$103        |
| Existing             | Manufactured     | Central Boiler | Heat Insulation (Floor)   | R-38                                    | State Code (R-30)                                   | 601                         | 1.0%                          | 75%   | 90%                                 | 25           | \$1,061      |
| Existing             | Manufactured     | Central Boiler | Heat Insulation (Floor)   | State Code (R-30)                       | Average Existing Insulation Value and/or Code Value | 601                         | 2.0%                          | 30%   | 40%                                 | 25           | \$532        |
| Existing             | Manufactured     | Central Boiler | Heat Insulation (Floor)   | State Code (R-30)                       | R-0   | 601                         | 8.0%                          | 30%   | 10%                                 | 25           | \$532        |
| Existing             | Manufactured     | Central Boiler | Heat Insulation (Wall) 2*4  | R-13                                    | Average Existing Insulation Value and/or Code Value | 601                         | 4.0%                          | 75%   | 40%                                 | 25           | \$764        |
| Existing             | Manufactured     | Central Boiler | Heat Insulation (Wall) 2*4  | R-13                                    | R-0   | 601                         | 40.0%                         | 75%   | 10%                                 | 25           | \$764        |

| Construction Vintage | Customer Segment | End Use         | Measure Name                           | Measure Description  | Base Equipment                                      | Baseline therm (UEC or EUJ) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------------|--|--|---|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Manufactured     | Central Boiler  | Heat Insulation (Wall) 2*4             | R-13 + R5 Sheathing  | R-13  | 601                         | 1.8%                          | 10%   | 90%                                 | 25           | \$1,007      |
| Existing             | Manufactured     | Central Boiler  | Heat Insulation (wall) 2*6             | State Code (R-21)  | Average Existing Insulation Value and/or Code Value | 601                         | 11.0%                         | 0%  | 55%                                 | 25           | \$1,246      |
| Existing             | Manufactured     | Central Boiler  | Heat Insulation (wall) 2*6             | State Code (R-21)  | R-0   | 601                         | 45.0%                         | 0%  | 45%                                 | 25           | \$1,246      |
| Existing             | Manufactured     | Central Boiler  | Heat Outlet Gasket                     | Install Outlet Gasket (Reduce Air Leakage)                   | No Outlet Gasket                                    | 601                         | 2.0%                          | 95%   | 60%                                 | 5            | \$6          |
| Existing             | Manufactured     | Central Boiler  | Heat Radiant Barrier (Ceiling)         | Install Radiant Barrier                                      | No Radiant Barrier                                  | 601                         | 2.0%                          | 0%  | 97%                                 | 30           | \$365        |
| Existing             | Manufactured     | Central Boiler  | Heat Spray in insulation 2*4 Wall      | 2*4Wall - closed cell foam insulation R-23                   | 2*4Wall R-13  | 601                         | 14.0%                         | 0%  | 95%                                 | 25           | \$3,000      |
| Existing             | Manufactured     | Central Boiler  | Heat Thermostat - Clock/Programmable   | Programmable Thermostat                                      | Manual Thermostat                                   | 601                         | 6.8%                          | 85%   | 50%                                 | 15           | \$27         |
| Existing             | Manufactured     | Central Boiler  | Heat Thermostat - Multi-Zone           | Individual Room Temperature Control for Major Occupied Rooms | Programmable Thermostat - Central Control Only      | 601                         | 7.0%                          | 65%   | 95%                                 | 12           | \$1,150      |
| Existing             | Manufactured     | Central Boiler  | Heat Windows                           | U = 0.19   | U = 0.30  | 601                         | 8.0%                          | 65%   | 95%                                 | 25           | \$2,378      |
| Existing             | Manufactured     | Central Boiler  | Heat Windows                           | U = 0.30   | Existing Windows (U=0.65)                           | 601                         | 8.0%                          | 65%   | 15%                                 | 25           | \$5,656      |
| Existing             | Manufactured     | Central Furnace | Heat Gas Furnace                       | AFUE = 90% (Condensing Furnace)                              | AFUE = 80%  | 481                         | 11.0%                         | NA  | NA                                  | 18           | \$788        |
| Existing             | Manufactured     | Central Furnace | Heat Gas Furnace                       | AFUE = 95% (Condensing Furnace)                              | AFUE = 80%  | 481                         | 16.0%                         | NA  | NA                                  | 18           | \$1,103      |
| Existing             | Manufactured     | Central Furnace | Heat Canned Lighting Air Tight Sealing | Canned Lighting Air Tight Sealing                            | No Air tight Sealing                                | 457                         | 3.3%                          | 60%   | 55%                                 | 30           | \$53         |
| Existing             | Manufactured     | Central Furnace | Heat Doors                             | R-11 (Steel Doors with foam core)                            | Standard non-thermal wood door (R-2)                | 457                         | 3.0%                          | 85%   | 50%                                 | 30           | \$116        |
| Existing             | Manufactured     | Central Furnace | Heat Doors                             | R-5 (Composite Doors with foam core)                         | Standard non-thermal wood door (R-2)                | 457                         | 2.0%                          | 85%   | 55%                                 | 12           | \$42         |
| Existing             | Manufactured     | Central Furnace | Heat Doors - Weatherization            | Weatherstripping And Adding Door Sweeps                      | Existing Non-Efficient door                         | 457                         | 1.3%                          | 80%   | 65%                                 | 3            | \$36         |
| Existing             | Manufactured     | Central Furnace | Heat Duct Sealing                      | Duct Sealing   | No Duct Sealing                                     | 457                         | 6.0%                          | 60%   | 65%                                 | 20           | \$447        |
| Existing             | Manufactured     | Central Furnace | Heat Duct Sealing - Aerosol-Based      | Spray-in ductwork sealant to minimize duct leaks             | Older homes with AFUE HVAC, SEER 9                  | 457                         | 19.0%                         | 50%   | 95%                                 | 25           | \$946        |
| Existing             | Manufactured     | Central Furnace | Heat Gas Furnace - Maintenance         | Maintenance  | No Maintenance                                      | 457                         | 5.0%                          | 95%   | 75%                                 | 2            | \$105        |

| Construction Vintage | Customer Segment | End Use         | Measure Name                                   | Measure Description  | Base Equipment                                      | Baseline therm (UEC or EUJ) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------------|--|--|---|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Manufactured     | Central Furnace | Heat Gas Furnace - Maintenance - New Equipment | Maintenance  | No Maintenance                                      | 457                         | 5.0%                          | 6%  | 75%                                 | 1            | \$105        |
| Existing             | Manufactured     | Central Furnace | Heat Gas Furnace - Proper Sizing               | Proper Sizing of Gas Furnace                                   | Oversized Gas Furnace                               | 457                         | 5.0%                          | 53%   | 85%                                 | 18           | \$1          |
| Existing             | Manufactured     | Central Furnace | Heat Insulation (Ceiling)                      | R-49   | State Code (R-38)                                   | 457                         | 1.0%                          | 87%   | 85%                                 | 25           | \$471        |
| Existing             | Manufactured     | Central Furnace | Heat Insulation (Ceiling)                      | State Code (R-38)  | Average Existing Insulation Value (R-19)            | 457                         | 2.0%                          | 95%   | 40%                                 | 25           | \$674        |
| Existing             | Manufactured     | Central Furnace | Heat Insulation (Ceiling)                      | State Code (R-38)  | R-9   | 457                         | 10.5%                         | 95%   | 10%                                 | 25           | \$674        |
| Existing             | Manufactured     | Central Furnace | Heat Insulation (Duct)                         | R-8  | No Duct Insulation                                  | 457                         | 4.3%                          | 12%   | 75%                                 | 25           | \$201        |
| Existing             | Manufactured     | Central Furnace | Heat Insulation (Floor)                        | R-38   | State Code (R-30)                                   | 457                         | 1.0%                          | 75%   | 90%                                 | 25           | \$1,061      |
| Existing             | Manufactured     | Central Furnace | Heat Insulation (Floor)                        | State Code (R-30)  | Average Existing Insulation Value and/or Code Value | 457                         | 2.0%                          | 30%   | 40%                                 | 25           | \$532        |
| Existing             | Manufactured     | Central Furnace | Heat Insulation (Floor)                        | State Code (R-30)  | R-0   | 457                         | 9.0%                          | 30%   | 10%                                 | 25           | \$532        |
| Existing             | Manufactured     | Central Furnace | Heat Insulation (Wall) 2*4                     | R-13   | Average Existing Insulation Value and/or Code Value | 457                         | 5.0%                          | 75%   | 40%                                 | 25           | \$764        |
| Existing             | Manufactured     | Central Furnace | Heat Insulation (Wall) 2*4                     | R-13   | R-0   | 457                         | 43.0%                         | 75%   | 10%                                 | 25           | \$764        |
| Existing             | Manufactured     | Central Furnace | Heat Insulation (Wall) 2*4                     | R-13 + R5 Sheathing  | R-13  | 457                         | 2.2%                          | 10%   | 90%                                 | 25           | \$1,007      |
| Existing             | Manufactured     | Central Furnace | Heat Insulation (wall) 2*6                     | State Code (R-21)  | Average Existing Insulation Value and/or Code Value | 457                         | 10.0%                         | 0%  | 55%                                 | 25           | \$1,246      |
| Existing             | Manufactured     | Central Furnace | Heat Insulation (wall) 2*6                     | State Code (R-21)  | R-0   | 457                         | 48.0%                         | 0%  | 45%                                 | 25           | \$1,246      |
| Existing             | Manufactured     | Central Furnace | Heat Leak Proof Duct Fittings                  | Quick connect fittings that do not require mastic or drawbands | 3-ton AC/furnace, 13 SEER                           | 457                         | 15.0%                         | 10%   | 95%                                 | 30           | \$216        |
| Existing             | Manufactured     | Central Furnace | Heat Outlet Gasket                             | Install Outlet Gasket (Reduce Air Leakage)                     | No Outlet Gasket                                    | 457                         | 2.0%                          | 95%   | 60%                                 | 5            | \$6          |
| Existing             | Manufactured     | Central Furnace | Heat Radiant Barrier (Ceiling)                 | Install Radiant Barrier  | No Radiant Barrier                                  | 457                         | 2.0%                          | 0%  | 97%                                 | 30           | \$365        |
| Existing             | Manufactured     | Central Furnace | Heat Spray in insulation 2*4 Wall              | 2*4Wall - closed cell foam insulation R-23                     | 2*4Wall R-13  | 457                         | 14.0%                         | 0%  | 95%                                 | 25           | \$3,000      |
| Existing             | Manufactured     | Central Furnace | Heat Thermostat - Clock/Programmable           | Programmable Thermostat  | Manual Thermostat                                   | 457                         | 6.8%                          | 85%   | 60%                                 | 15           | \$27         |

| Construction Vintage | Customer Segment | End Use         | Measure Name | Measure Description                            | Base Equipment   | Baseline therm (UEC or EUJ)                        | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|-----------------|--------------|--|--|--|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| Existing             | Manufactured     | Central Furnace | Heat         | Thermostat - Multi-Zone                        | Individual Room Temperature Control for Major Occupied Rooms | Programmable Thermostat - Central Control Only     | 457                           | 7.0%  | 65%                                 | 95%          | 12           | \$1,150 |
| Existing             | Manufactured     | Central Furnace | Heat         | Windows  | U = 0.19   | U = 0.30   | 457                           | 9.0%  | 65%                                 | 95%          | 25           | \$2,378 |
| Existing             | Manufactured     | Central Furnace | Heat         | Windows  | U = 0.30   | Existing Windows (U=0.65)                          | 457                           | 10.0%   | 65%                                 | 15%          | 25           | \$5,656 |
| Existing             | Manufactured     | Cooking Oven    |              | Convection Oven                                | Convection Oven  | Standard Oven                                      | 19                            | 23.0%   | 85%                                 | 85%          | 15           | \$305   |
| Existing             | Manufactured     | Dryer           |              | Clothes Dryer w Moisture Sensor                | High-Efficiency Clothes Dryer w Moisture Sensor              | Standard Dryer without Moisture Sensor             | 36                            | 13.0%   | NA                                  | NA           | 18           | \$53    |
| Existing             | Manufactured     | Water Heat      |              | Water Heater (40 Gallon Gas)                   | EF=0.62  | EF = 0.59  | 156                           | 4.4%  | NA                                  | NA           | 13           | \$81    |
| Existing             | Manufactured     | Water Heat      |              | Water Heater (Gas)                             | EF=0.80 Condensing Water Heater                              | EF = 0.59  | 156                           | 26.4%   | NA                                  | NA           | 13           | \$1,212 |
| Existing             | Manufactured     | Water Heat      |              | Water Heater (Gas)                             | EF=0.86 Condensing Water Heater                              | EF = 0.59  | 156                           | 31.4%   | NA                                  | NA           | 13           | \$1,289 |
| Existing             | Manufactured     | Water Heat      |              | Clothes Washer                                 | Energy Star MEF = 1.83 (top Load)                            | Standard Clothes Washer (1.26)                     | 152                           | 9.3%  | 85%                                 | 68%          | 14           | \$252   |
| Existing             | Manufactured     | Water Heat      |              | Clothes Washer                                 | Tier 2. MEF = 2.01 (front load)                              | Standard Clothes Washer (1.26)                     | 152                           | 11.2%   | 85%                                 | 91%          | 14           | \$312   |
| Existing             | Manufactured     | Water Heat      |              | Clothes Washer                                 | Tier 2. MEF = 2.2 (front load)                               | Standard Clothes Washer (1.26)                     | 152                           | 12.8%   | 85%                                 | 91%          | 14           | \$417   |
| Existing             | Manufactured     | Water Heat      |              | Clothes Washer - Early Replacement             | Standard Clothes Washer (1.26)                               | Existing Clothes Washer (MEF = 1.1)                | 152                           | 12.7%   | 30%                                 | 25%          | 14           | \$378   |
| Existing             | Manufactured     | Water Heat      |              | Desuperheater (Ground-Source Heat Pump) system | Desuperheater  | Standard Water_Heater - EF = 0.59 (40 Gallon Tank) | 152                           | 30.0%   | 5%                                  | 90%          | 10           | \$251   |
| Existing             | Manufactured     | Water Heat      |              | Dishwasher                                     | EF = 0.77  | EF = 0.65 (ENERGY STAR)                            | 152                           | 2.2%  | 23%                                 | 35%          | 13           | \$514   |
| Existing             | Manufactured     | Water Heat      |              | Dishwasher - Existing                          | EF = 0.65 (ENERGY STAR)                                      | EF = 0.46 Existing Dishwasher                      | 152                           | 4.1%  | 23%                                 | 15%          | 13           | \$11    |
| Existing             | Manufactured     | Water Heat      |              | Drain Water Heat Recovery                      | Drain Water Heat Recovery (GFX or Power-Pipe)                | No Drain Water Heat Recovery                       | 152                           | 3.5%  | 0%                                  | 95%          | 30           | \$630   |
| Existing             | Manufactured     | Water Heat      |              | Faucet Aerators                                | 0.5 GPM  | 2.2 GPM  | 152                           | 5.6%  | 95%                                 | 95%          | 9            | \$3     |
| Existing             | Manufactured     | Water Heat      |              | Faucet Aerators                                | 1.5 GPM  | 2.2 GPM  | 152                           | 2.3%  | 95%                                 | 55%          | 9            | \$2     |
| Existing             | Manufactured     | Water Heat      |              | Faucet Aerators                                | 2.2 GPM  | Existing Faucet Aerator (3.0 GPM)                  | 152                           | 2.6%  | 95%                                 | 10%          | 9            | \$2     |
| Existing             | Manufactured     | Water Heat      |              | Hot Water Pipe Insulation                      | Install Insulation (R-4)                                     | No insulation                                      | 152                           | 1.2%  | 65%                                 | 25%          | 15           | \$8     |
| Existing             | Manufactured     | Water Heat      |              | Low-Flow Showerheads                           | 1.75 GPM   | 2.5 GPM  | 152                           | 9.5%  | 95%                                 | 85%          | 10           | \$5     |
| Existing             | Manufactured     | Water Heat      |              | Low-Flow Showerheads                           | 2.5 GPM  | 3.0 GPM  | 152                           | 6.4%  | 95%                                 | 33%          | 10           | \$12    |
| Existing             | Manufactured     | Water Heat      |              | Solar Hot Water (SHW)                          | Solar thermal collector                                      | Non-solar hot water heater                         | 152                           | 33.6%   | 20%                                 | 95%          | 20           | \$8,930 |
| Existing             | Manufactured     | Water Heat      |              | Tankless Water_Heater                          | EF = 0.78, 4.3 gpm   | EF = 0.59  | 152                           | 24.4%   | 75%                                 | 99%          | 20           | \$1,525 |
| Existing             | Manufactured     | Water Heat      |              | Water_Heater Tank Blanket/Insulation           | Install Insulation (R-5)                                     | No Tank Insulation                                 | 152                           | 6.5%  | 0%                                  | 75%          | 10           | \$19    |
| Existing             | Manufactured     | Water Heat      |              | Water_Heater Thermostat Setback                | 120 degrees  | 135 degrees  | 152                           | 6.0%  | 95%                                 | 43%          | 5            | \$0     |
| New                  | Manufactured     | Central Boiler  | Heat         | Gas Boiler                                     | AFUE=90%   | AFUE=82%   | 585                           | 8.9%  | NA                                  | NA           | 18           | \$2,399 |

| Construction Vintage | Customer Segment | End Use         | Measure Name                           | Measure Description  | Base Equipment                                 | Baseline therm (UEC or EUJ) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------------|--|--|--|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Manufactured     | Central Boiler  | Heat Gas Boiler                        | AFUE=94%   | AFUE=82%                                       | 585                         | 12.8%                         | NA  | NA                                  | 18           | \$3,344      |
| New                  | Manufactured     | Central Boiler  | Heat Canned Lighting Air Tight Sealing | Canned Lighting Air Tight Sealing                            | No Air tight Sealing                           | 529                         | 3.3%                          | 75%   | 25%                                 | 30           | \$3          |
| New                  | Manufactured     | Central Boiler  | Heat Construction - ICF                | Concrete Framing   | Standard Wood Framing                          | 529                         | 44.0%                         | 1%  | 95%                                 | 30           | \$6,442      |
| New                  | Manufactured     | Central Boiler  | Heat Construction - SIP                | Specialty Framing  | Standard Wood Framing                          | 529                         | 14.0%                         | 1%  | 95%                                 | 30           | \$5,680      |
| New                  | Manufactured     | Central Boiler  | Heat Doors                             | R-11 (Steel Doors with foam core)                            | Standard non-thermal wood door (R-2)           | 529                         | 4.0%                          | 85%   | 50%                                 | 30           | \$116        |
| New                  | Manufactured     | Central Boiler  | Heat Doors                             | R-5 (Composite Doors with foam core)                         | Standard non-thermal wood door (R-2)           | 529                         | 3.0%                          | 85%   | 55%                                 | 12           | \$42         |
| New                  | Manufactured     | Central Boiler  | Heat Gas Boiler - Proper Sizing        | Proper Sizing of Gas Boiler                                  | Oversized Gas Boiler                           | 529                         | 5.0%                          | 53%   | 85%                                 | 30           | \$1          |
| New                  | Manufactured     | Central Boiler  | Heat Green Roof                        | ecorooF  | Standard Roof                                  | 529                         | 6.5%                          | 0%  | 98%                                 | 40           | \$26327      |
| New                  | Manufactured     | Central Boiler  | Heat Insulation (Ceiling)              | R-49   | State Code (R-38)                              | 529                         | 2.0%                          | 87%   | 85%                                 | 25           | \$582        |
| New                  | Manufactured     | Central Boiler  | Heat Insulation (Floor)                | R-38   | State Code (R-30)                              | 529                         | 1.0%                          | 75%   | 90%                                 | 25           | \$1,061      |
| New                  | Manufactured     | Central Boiler  | Heat Insulation (wall) 2*6             | R-21 + R5 Sheathing  | State Code (R-21)                              | 529                         | 2.8%                          | 95%   | 50%                                 | 25           | \$812        |
| New                  | Manufactured     | Central Boiler  | Heat Outlet Gasket                     | Install Outlet Gasket (Reduce Air Leakage)                   | No Outlet Gasket                               | 529                         | 2.0%                          | 95%   | 40%                                 | 5            | \$6          |
| New                  | Manufactured     | Central Boiler  | Heat Radiant Barrier (Ceiling)         | Install Radiant Barrier                                      | No Radiant Barrier                             | 529                         | 2.0%                          | 0%  | 97%                                 | 30           | \$365        |
| New                  | Manufactured     | Central Boiler  | Heat Spray in insulation 2*4 Wall      | 2*4Wall - closed cell foam insulation R-23                   | 2*6Wall R-21                                   | 529                         | 3.0%                          | 95%   | 95%                                 | 25           | \$3,289      |
| New                  | Manufactured     | Central Boiler  | Heat Spray in insulation 2*6 Wall      | 2*6Wall - closed cell foam insulation R-37                   | 2*6Wall R-21                                   | 529                         | 11.0%                         | 95%   | 95%                                 | 25           | \$5,061      |
| New                  | Manufactured     | Central Boiler  | Heat Thermostat - Clock/Programmable   | Programmable Thermostat                                      | Manual Thermostat                              | 529                         | 6.8%                          | 85%   | 50%                                 | 15           | \$27         |
| New                  | Manufactured     | Central Boiler  | Heat Thermostat - Multi-Zone           | Individual Room Temperature Control for Major Occupied Rooms | Programmable Thermostat - Central Control Only | 529                         | 7.0%                          | 65%   | 95%                                 | 12           | \$1,150      |
| New                  | Manufactured     | Central Boiler  | Heat Windows                           | U = 0.19   | U = 0.30                                       | 529                         | 14.0%                         | 85%   | 95%                                 | 25           | \$2,757      |
| New                  | Manufactured     | Central Furnace | Heat Gas Furnace                       | AFUE = 90% (Condensing Furnace)                              | AFUE = 80%                                     | 441                         | 10.9%                         | NA  | NA                                  | 18           | \$788        |

| Construction Vintage | Customer Segment | End Use         | Measure Name                                   | Measure Description  | Base Equipment                                    | Baseline therm (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------------|--|--|---|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Manufactured     | Central Furnace | Heat Gas Furnace                               | AFUE = 95% (Condensing Furnace)                                | AFUE = 80%  | 441                         | 15.6%                         | NA  | NA                                  | 18           | \$1,103      |
| New                  | Manufactured     | Central Furnace | Heat Canned Lighting Air Tight Sealing         | Canned Lighting Air Tight Sealing                              | No Air tight Sealing                              | 389                         | 3.3%                          | 75%   | 25%                                 | 30           | \$3          |
| New                  | Manufactured     | Central Furnace | Heat Construction - ICF                        | Concrete Framing   | Standard Wood Framing                             | 389                         | 44.0%                         | 1%  | 95%                                 | 30           | \$6,442      |
| New                  | Manufactured     | Central Furnace | Heat Construction - SIP                        | Specialty Framing  | Standard Wood Framing                             | 389                         | 14.0%                         | 1%  | 95%                                 | 30           | \$5,680      |
| New                  | Manufactured     | Central Furnace | Heat Doors                                     | R-11 (Steel Doors with foam core)                              | Standard non-thermal wood door (R-2)              | 389                         | 5.0%                          | 85%   | 50%                                 | 30           | \$116        |
| New                  | Manufactured     | Central Furnace | Heat Doors                                     | R-5 (Composite Doors with foam core)                           | Standard non-thermal wood door (R-2)              | 389                         | 3.0%                          | 85%   | 55%                                 | 12           | \$42         |
| New                  | Manufactured     | Central Furnace | Heat Duct Location                             | Conditioned Space Design - Duct Loss Is Not A Concern          | Ducts in Unconditioned Space (Duct loss)          | 389                         | 8.0%                          | 85%   | 75%                                 | 30           | \$126        |
| New                  | Manufactured     | Central Furnace | Heat Duct Sealing                              | Duct Sealing   | No Duct Sealing                                   | 389                         | 6.0%                          | 0%  | 65%                                 | 20           | \$447        |
| New                  | Manufactured     | Central Furnace | Heat Duct Sealing - Aerosol-Based              | Spray-in ductwork sealant to minimize duct leaks               | New homes with AFUE HVAC, SEER 13                 | 389                         | 19.0%                         | 0%  | 95%                                 | 25           | \$525        |
| New                  | Manufactured     | Central Furnace | Heat Gas Furnace - Maintenance - New Equipment | Maintenance  | No Maintenance                                    | 389                         | 4.0%                          | 95%   | 75%                                 | 1            | \$105        |
| New                  | Manufactured     | Central Furnace | Heat Gas Furnace - Proper Sizing               | Proper Sizing of Gas Furnace                                   | Oversized Gas Furnace                             | 389                         | 5.0%                          | 53%   | 85%                                 | 18           | \$1          |
| New                  | Manufactured     | Central Furnace | Heat Green Roof                                | ecorroof   | Standard Roof                                     | 389                         | 6.5%                          | 0%  | 98%                                 | 40           | \$26327      |
| New                  | Manufactured     | Central Furnace | Heat Insulation (Ceiling)                      | R-49   | State Code (R-38)                                 | 389                         | 2.0%                          | 87%   | 85%                                 | 25           | \$582        |
| New                  | Manufactured     | Central Furnace | Heat Insulation (Floor)                        | R-38   | State Code (R-30)                                 | 389                         | 2.0%                          | 75%   | 90%                                 | 25           | \$1,061      |
| New                  | Manufactured     | Central Furnace | Heat Insulation (wall) 2*6                     | R-21 + R5 Sheathing  | State Code (R-21)                                 | 389                         | 2.8%                          | 95%   | 50%                                 | 25           | \$812        |
| New                  | Manufactured     | Central Furnace | Heat Integrated Space and Water Heating        | Premium Efficiency AFUE = 90 - Condensing Furnace              | Standard Efficiency AFUE = 78- Condensing Furnace | 389                         | 13.3%                         | 15%   | 95%                                 | 15           | \$184        |
| New                  | Manufactured     | Central Furnace | Heat Leak Proof Duct Fittings                  | Quick connect fittings that do not require mastic or drawbands | 3-ton AC/furnace, 13 SEER                         | 389                         | 15.0%                         | 0%  | 95%                                 | 30           | \$96         |
| New                  | Manufactured     | Central Furnace | Heat Outlet Gasket                             | Install Outlet Gasket (Reduce Air Leakage)                     | No Outlet Gasket                                  | 389                         | 2.0%                          | 95%   | 40%                                 | 5            | \$6          |
| New                  | Manufactured     | Central Furnace | Heat Radiant Barrier (Ceiling)                 | Install Radiant Barrier  | No Radiant Barrier                                | 389                         | 2.0%                          | 0%  | 97%                                 | 30           | \$365        |

| Construction Vintage | Customer Segment | End Use         | Measure Name                                   | Measure Description                             | Base Equipment   | Baseline therm (UEC or EUJ)                    | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|-----------------|--|---|--|--|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| New                  | Manufactured     | Central Furnace | Heat   | Spray in insulation 2*4 Wall                    | 2*4Wall - closed cell foam insulation R-23                   | 2*6Wall R-21                                   | 389                           | 3.0%  | 95%                                 | 95%          | 25           | \$3,289 |
| New                  | Manufactured     | Central Furnace | Heat   | Spray in insulation 2*6 Wall                    | 2*6Wall - closed cell foam insulation R-37                   | 2*6Wall R-21                                   | 389                           | 11.0%   | 95%                                 | 95%          | 25           | \$5,061 |
| New                  | Manufactured     | Central Furnace | Heat   | Thermostat - Clock/Programmable                 | Programmable Thermostat                                      | Manual Thermostat                              | 389                           | 6.8%  | 85%                                 | 60%          | 15           | \$27    |
| New                  | Manufactured     | Central Furnace | Heat   | Thermostat - Multi-Zone                         | Individual Room Temperature Control for Major Occupied Rooms | Programmable Thermostat - Central Control Only | 389                           | 7.0%  | 65%                                 | 95%          | 12           | \$1,150 |
| New                  | Manufactured     | Central Furnace | Heat   | Windows   | U = 0.19   | U = 0.30                                       | 389                           | 16.0%   | 85%                                 | 95%          | 25           | \$2,757 |
| New                  | Manufactured     | Cooking Oven    | Convection Oven                                | Convection Oven                                 | Standard Oven  |  | 19                            | 23.0%   | 85%                                 | 85%          | 15           | \$305   |
| New                  | Manufactured     | Dryer           | Clothes Dryer w Moisture Sensor                | High-Efficiency Clothes Dryer w Moisture Sensor | Standard Dryer without Moisture Sensor                       |  | 36                            | 13.0%   | NA                                  | NA           | 18           | \$53    |
| New                  | Manufactured     | Water Heat      | Water Heater (40 Gallon Gas)                   | EF=0.62   | EF = 0.59  |  | 193                           | 4.6%  | NA                                  | NA           | 13           | \$81    |
| New                  | Manufactured     | Water Heat      | Water Heater (Gas)                             | EF=0.80 Condensing Water Heater                 | EF = 0.59  |  | 193                           | 26.0%   | NA                                  | NA           | 13           | \$1,212 |
| New                  | Manufactured     | Water Heat      | Water Heater (Gas)                             | EF=0.86 Condensing Water Heater                 | EF = 0.59  |  | 193                           | 31.1%   | NA                                  | NA           | 13           | \$1,289 |
| New                  | Manufactured     | Water Heat      | Clothes Washer                                 | Energy Star MEF = 1.83 (top Load)               | Standard Clothes Washer (1.26)                               |  | 159                           | 9.3%  | 85%                                 | 68%          | 14           | \$252   |
| New                  | Manufactured     | Water Heat      | Clothes Washer                                 | Tier 2. MEF = 2.01 (front load)                 | Standard Clothes Washer (1.26)                               |  | 159                           | 11.2%   | 85%                                 | 91%          | 14           | \$312   |
| New                  | Manufactured     | Water Heat      | Clothes Washer                                 | Tier 2. MEF = 2.2 (front load)                  | Standard Clothes Washer (1.26)                               |  | 159                           | 12.8%   | 85%                                 | 91%          | 14           | \$417   |
| New                  | Manufactured     | Water Heat      | Desuperheater (Ground-Source Heat Pump) system | Desuperheater                                   | Standard Water_Heater - EF = 0.59 (40 Gallon Tank)           |  | 159                           | 30.0%   | 5%                                  | 90%          | 10           | \$251   |
| New                  | Manufactured     | Water Heat      | Dishwasher                                     | EF = 0.77                                       | EF = 0.65 (ENERGY STAR)                                      |  | 159                           | 2.2%  | 23%                                 | 35%          | 13           | \$514   |
| New                  | Manufactured     | Water Heat      | Dishwasher - Existing                          | EF = 0.65 (ENERGY STAR)                         | EF = 0.46 Existing Dishwasher                                |  | 159                           | 4.1%  | 23%                                 | 15%          | 13           | \$11    |
| New                  | Manufactured     | Water Heat      | Drain Water Heat Recovery                      | Drain Water Heat Recovery (GFX or Power-Pipe)   | No Drain Water Heat Recovery                                 |  | 159                           | 3.5%  | 50%                                 | 95%          | 30           | \$630   |
| New                  | Manufactured     | Water Heat      | Faucet Aerators                                | 0.5 GPM   | 2.2 GPM  |  | 159                           | 4.6%  | 95%                                 | 95%          | 9            | \$3     |
| New                  | Manufactured     | Water Heat      | Faucet Aerators                                | 1.5 GPM   | 2.2 GPM  |  | 159                           | 1.9%  | 95%                                 | 55%          | 9            | \$2     |
| New                  | Manufactured     | Water Heat      | Hot Water Pipe Insulation                      | Install Insulation (R-4)                        | No insulation  |  | 159                           | 1.2%  | 0%                                  | 75%          | 15           | \$8     |
| New                  | Manufactured     | Water Heat      | Integrated Space and Water Heating             | High Efficiency Water Heater EF =0.62           | Standard efficiency Water Heater EF = 0.59                   |  | 159                           | 4.8%  | 15%                                 | 95%          | 15           | \$71    |
| New                  | Manufactured     | Water Heat      | Low-Flow Showerheads                           | 1.75 GPM  | 2.5 GPM  |  | 159                           | 7.9%  | 95%                                 | 65%          | 10           | \$5     |
| New                  | Manufactured     | Water Heat      | Solar Hot Water (SHW)                          | Solar thermal collector                         | Non-solar hot water heater                                   |  | 159                           | 33.7%   | 20%                                 | 95%          | 20           | \$8,930 |
| New                  | Manufactured     | Water Heat      | Tankless Water_Heater                          | EF = 0.78, 4.3 gpm                              | EF = 0.59  |  | 159                           | 24.4%   | 75%                                 | 99%          | 20           | \$1,398 |
| New                  | Manufactured     | Water Heat      | Water_Heater Tank Blanket/Insulation           | Install Insulation (R-5)                        | No Tank Insulation   |  | 159                           | 6.5%  | 0%                                  | 75%          | 10           | \$19    |
| New                  | Manufactured     | Water Heat      | Water_Heater Thermostat Setback                | 120 degrees                                     | 135 degrees  |  | 159                           | 6.0%  | 95%                                 | 43%          | 5            | \$0     |



| Construction Vintage | Customer Segment | End Use        | Measure Name  | Measure Description                     | Base Equipment                                      | Baseline therm (UEC or EUJ) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|----------------|---|---|---|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Multi Family     | Central Boiler | Heat Gas Boiler   | AFUE=90%                                | AFUE=82%  | 453                         | 9.1%                          | NA  | NA                                  | 18           | \$2,399      |
| Existing             | Multi Family     | Central Boiler | Heat Gas Boiler   | AFUE=94%                                | AFUE=82%  | 453                         | 12.8%                         | NA  | NA                                  | 18           | \$3,344      |
| Existing             | Multi Family     | Central Boiler | Heat Canned Lighting Air Tight Sealing                                  | Canned Lighting Air Tight Sealing       | No Air tight Sealing                                | 435                         | 3.3%                          | 60%   | 55%                                 | 30           | \$53         |
| Existing             | Multi Family     | Central Boiler | Heat Doors  | R-11 (Steel Doors with foam core)       | Standard non-thermal wood door (R-2)                | 435                         | 3.0%                          | 85%   | 50%                                 | 30           | \$58         |
| Existing             | Multi Family     | Central Boiler | Heat Doors  | R-5 (Composite Doors with foam core)    | Standard non-thermal wood door (R-2)                | 435                         | 2.0%                          | 85%   | 55%                                 | 12           | \$21         |
| Existing             | Multi Family     | Central Boiler | Heat Doors - Weatherization   | Weatherstripping And Adding Door Sweeps | Existing Non-Efficient door                         | 435                         | 1.3%                          | 80%   | 55%                                 | 3            | \$36         |
| Existing             | Multi Family     | Central Boiler | Heat Gas Boiler - Proper Sizing   | Proper Sizing of Gas Boiler             | Oversized Gas Boiler                                | 435                         | 5.0%                          | 53%   | 85%                                 | 30           | \$1          |
| Existing             | Multi Family     | Central Boiler | Heat Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test | Install Caulking And Weatherstripping   | Existing Infiltration Conditions                    | 435                         | 10.0%                         | 85%   | 75%                                 | 15           | \$218        |
| Existing             | Multi Family     | Central Boiler | Heat Insulation (Ceiling)   | R-49                                    | State Code (R-38)                                   | 435                         | 1.0%                          | 87%   | 85%                                 | 25           | \$291        |
| Existing             | Multi Family     | Central Boiler | Heat Insulation (Ceiling)   | State Code (R-38)                       | Average Existing Insulation Value (R-19)            | 435                         | 2.0%                          | 95%   | 40%                                 | 25           | \$520        |
| Existing             | Multi Family     | Central Boiler | Heat Insulation (Ceiling)   | State Code (R-38)                       | R-9   | 435                         | 10.5%                         | 95%   | 10%                                 | 25           | \$520        |
| Existing             | Multi Family     | Central Boiler | Heat Insulation (Duct)  | R-8                                     | R-4   | 435                         | 1.6%                          | 12%   | 95%                                 | 25           | \$73         |
| Existing             | Multi Family     | Central Boiler | Heat Insulation (Floor)   | R-38                                    | State Code (R-30)                                   | 435                         | 1.0%                          | 75%   | 90%                                 | 25           | \$747        |
| Existing             | Multi Family     | Central Boiler | Heat Insulation (Floor)   | State Code (R-30)                       | Average Existing Insulation Value and/or Code Value | 435                         | 2.0%                          | 80%   | 40%                                 | 25           | \$375        |
| Existing             | Multi Family     | Central Boiler | Heat Insulation (Floor)   | State Code (R-30)                       | R-0   | 435                         | 8.0%                          | 80%   | 10%                                 | 25           | \$375        |
| Existing             | Multi Family     | Central Boiler | Heat Insulation (Slab)  | R-10                                    | Average Existing Insulation Value and/or Code Value | 435                         | 1.3%                          | 47%   | 65%                                 | 25           | \$994        |
| Existing             | Multi Family     | Central Boiler | Heat Insulation (Slab)  | R-10                                    | R-0   | 435                         | 4.3%                          | 47%   | 60%                                 | 25           | \$994        |
| Existing             | Multi Family     | Central Boiler | Heat Insulation (Slab)  | R-15                                    | R-10  | 435                         | 1.4%                          | 47%   | 87%                                 | 25           | \$221        |
| Existing             | Multi Family     | Central Boiler | Heat Insulation (Wall) 2*4  | R-13                                    | Average Existing Insulation Value and/or Code Value | 435                         | 4.0%                          | 75%   | 40%                                 | 25           | \$314        |

| Construction Vintage | Customer Segment | End Use         | Measure Name                           | Measure Description  | Base Equipment                                      | Baseline therm (UEC or EUJ) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------------|--|--|---|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Multi Family     | Central Boiler  | Heat Insulation (Wall) 2*4             | R-13   | R-0   | 435                         | 40.0%                         | 75%   | 10%                                 | 25           | \$314        |
| Existing             | Multi Family     | Central Boiler  | Heat Insulation (Wall) 2*4             | R-13 + R5 Sheathing  | R-13  | 435                         | 1.8%                          | 10%   | 90%                                 | 25           | \$452        |
| Existing             | Multi Family     | Central Boiler  | Heat Insulation (wall) 2*6             | State Code (R-21)  | Average Existing Insulation Value and/or Code Value | 435                         | 11.0%                         | 0%  | 40%                                 | 25           | \$513        |
| Existing             | Multi Family     | Central Boiler  | Heat Insulation (wall) 2*6             | State Code (R-21)  | R-0   | 435                         | 45.0%                         | 0%  | 35%                                 | 25           | \$513        |
| Existing             | Multi Family     | Central Boiler  | Heat Outlet Gasket                     | Install Outlet Gasket (Reduce Air Leakage)                   | No Outlet Gasket                                    | 435                         | 2.0%                          | 95%   | 60%                                 | 5            | \$4          |
| Existing             | Multi Family     | Central Boiler  | Heat Radiant Barrier (Ceiling)         | Install Radiant Barrier                                      | No Radiant Barrier                                  | 435                         | 2.0%                          | 0%  | 97%                                 | 30           | \$258        |
| Existing             | Multi Family     | Central Boiler  | Heat Spray in insulation 2*4 Wall      | 2*4Wall - closed cell foam insulation R-23                   | 2*4Wall R-13  | 435                         | 14.0%                         | 0%  | 95%                                 | 25           | \$1,125      |
| Existing             | Multi Family     | Central Boiler  | Heat Thermostat - Clock/Programmable   | Programmable Thermostat                                      | Manual Thermostat                                   | 435                         | 6.8%                          | 85%   | 75%                                 | 15           | \$27         |
| Existing             | Multi Family     | Central Boiler  | Heat Thermostat - Multi-Zone           | Individual Room Temperature Control for Major Occupied Rooms | Programmable Thermostat - Central Control Only      | 435                         | 7.0%                          | 65%   | 95%                                 | 12           | \$1,150      |
| Existing             | Multi Family     | Central Boiler  | Heat Windows                           | U = 0.19   | U = 0.30  | 435                         | 8.0%                          | 75%   | 95%                                 | 25           | \$815        |
| Existing             | Multi Family     | Central Boiler  | Heat Windows                           | U = 0.30   | Existing Windows (U=0.65)                           | 435                         | 8.0%                          | 75%   | 15%                                 | 25           | \$1,939      |
| Existing             | Multi Family     | Central Furnace | Heat Gas Furnace                       | AFUE = 90% (Condensing Furnace)                              | AFUE = 80%  | 364                         | 11.1%                         | NA  | NA                                  | 18           | \$788        |
| Existing             | Multi Family     | Central Furnace | Heat Gas Furnace                       | AFUE = 95% (Condensing Furnace)                              | AFUE = 80%  | 364                         | 15.9%                         | NA  | NA                                  | 18           | \$1,103      |
| Existing             | Multi Family     | Central Furnace | Heat Canned Lighting Air Tight Sealing | Canned Lighting Air Tight Sealing                            | No Air tight Sealing                                | 345                         | 3.3%                          | 60%   | 55%                                 | 30           | \$53         |
| Existing             | Multi Family     | Central Furnace | Heat Doors                             | R-11 (Steel Doors with foam core)                            | Standard non-thermal wood door (R-2)                | 345                         | 3.0%                          | 85%   | 50%                                 | 30           | \$58         |
| Existing             | Multi Family     | Central Furnace | Heat Doors                             | R-5 (Composite Doors with foam core)                         | Standard non-thermal wood door (R-2)                | 345                         | 2.0%                          | 85%   | 55%                                 | 12           | \$21         |
| Existing             | Multi Family     | Central Furnace | Heat Doors - Weatherization            | Weatherstripping And Adding Door Sweeps                      | Existing Non-Efficient door                         | 345                         | 1.3%                          | 80%   | 55%                                 | 3            | \$36         |
| Existing             | Multi Family     | Central Furnace | Heat Duct Sealing                      | Duct Sealing   | No Duct Sealing                                     | 345                         | 6.0%                          | 60%   | 65%                                 | 20           | \$447        |
| Existing             | Multi Family     | Central Furnace | Heat Duct Sealing - Aerosol-Based      | Spray-in ductwork sealant to minimize duct leaks             | Older homes with AFUE HVAC, SEER 9                  | 345                         | 19.0%                         | 50%   | 95%                                 | 25           | \$946        |

| Construction Vintage | Customer Segment | End Use         | Measure Name                                   | Measure Description  | Base Equipment                                      | Baseline therm (UEC or EUJ) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------------|--|--|---|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Multi Family     | Central Furnace | Heat Gas Furnace - Maintenance                 | Maintenance  | No Maintenance                                      | 345                         | 5.0%                          | 95%   | 75%                                 | 2            | \$105        |
| Existing             | Multi Family     | Central Furnace | Heat Gas Furnace - Maintenance - New Equipment | Maintenance  | No Maintenance                                      | 345                         | 5.0%                          | 6%  | 75%                                 | 1            | \$105        |
| Existing             | Multi Family     | Central Furnace | Heat Gas Furnace - Proper Sizing               | Proper Sizing of Gas Furnace                                   | Oversized Gas Furnace                               | 345                         | 5.0%                          | 53%   | 85%                                 | 18           | \$1          |
| Existing             | Multi Family     | Central Furnace | Heat Insulation (Ceiling)                      | R-49   | State Code (R-38)                                   | 345                         | 1.0%                          | 87%   | 85%                                 | 25           | \$291        |
| Existing             | Multi Family     | Central Furnace | Heat Insulation (Ceiling)                      | State Code (R-38)  | Average Existing Insulation Value (R-19)            | 345                         | 2.0%                          | 95%   | 40%                                 | 25           | \$520        |
| Existing             | Multi Family     | Central Furnace | Heat Insulation (Ceiling)                      | State Code (R-38)  | R-9   | 345                         | 10.5%                         | 95%   | 10%                                 | 25           | \$520        |
| Existing             | Multi Family     | Central Furnace | Heat Insulation (Duct)                         | R-8  | No Duct Insulation                                  | 345                         | 4.3%                          | 12%   | 75%                                 | 25           | \$141        |
| Existing             | Multi Family     | Central Furnace | Heat Insulation (Floor)                        | R-38   | State Code (R-30)                                   | 345                         | 1.0%                          | 75%   | 90%                                 | 25           | \$747        |
| Existing             | Multi Family     | Central Furnace | Heat Insulation (Floor)                        | State Code (R-30)  | Average Existing Insulation Value and/or Code Value | 345                         | 2.0%                          | 80%   | 40%                                 | 25           | \$375        |
| Existing             | Multi Family     | Central Furnace | Heat Insulation (Floor)                        | State Code (R-30)  | R-0   | 345                         | 9.0%                          | 80%   | 10%                                 | 25           | \$375        |
| Existing             | Multi Family     | Central Furnace | Heat Insulation (Slab)                         | R-10   | Average Existing Insulation Value and/or Code Value | 345                         | 1.3%                          | 47%   | 65%                                 | 25           | \$994        |
| Existing             | Multi Family     | Central Furnace | Heat Insulation (Slab)                         | R-10   | R-0   | 345                         | 4.3%                          | 47%   | 60%                                 | 25           | \$994        |
| Existing             | Multi Family     | Central Furnace | Heat Insulation (Slab)                         | R-15   | R-10  | 345                         | 1.4%                          | 47%   | 87%                                 | 25           | \$221        |
| Existing             | Multi Family     | Central Furnace | Heat Insulation (Wall) 2*4                     | R-13   | Average Existing Insulation Value and/or Code Value | 345                         | 5.0%                          | 75%   | 40%                                 | 25           | \$314        |
| Existing             | Multi Family     | Central Furnace | Heat Insulation (Wall) 2*4                     | R-13   | R-0   | 345                         | 43.0%                         | 75%   | 10%                                 | 25           | \$314        |
| Existing             | Multi Family     | Central Furnace | Heat Insulation (Wall) 2*4                     | R-13 + R5 Sheathing  | R-13  | 345                         | 2.2%                          | 10%   | 90%                                 | 25           | \$452        |
| Existing             | Multi Family     | Central Furnace | Heat Insulation (wall) 2*6                     | State Code (R-21)  | Average Existing Insulation Value and/or Code Value | 345                         | 10.0%                         | 0%  | 40%                                 | 25           | \$513        |
| Existing             | Multi Family     | Central Furnace | Heat Insulation (wall) 2*6                     | State Code (R-21)  | R-0   | 345                         | 48.0%                         | 0%  | 35%                                 | 25           | \$513        |
| Existing             | Multi Family     | Central Furnace | Heat Leak Proof Duct Fittings                  | Quick connect fittings that do not require mastic or drawbands | 3-ton AC/furnace, 13 SEER                           | 345                         | 15.0%                         | 10%   | 95%                                 | 30           | \$216        |

| Construction Vintage | Customer Segment | End Use         | Measure Name | Measure Description                            | Base Equipment   | Baseline therm (UEC or EUJ)                        | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|-----------------|--------------|--|--|--|---------------------------|---|-------------------------------------|--------------|--------------|---------|
| Existing             | Multi Family     | Central Furnace | Heat         | Outlet Gasket                                  | Install Outlet Gasket (Reduce Air Leakage)                   | No Outlet Gasket                                   | 345                       | 2.0%  | 95%                                 | 60%          | 5            | \$4     |
| Existing             | Multi Family     | Central Furnace | Heat         | Radiant Barrier (Ceiling)                      | Install Radiant Barrier                                      | No Radiant Barrier                                 | 345                       | 2.0%  | 0%                                  | 97%          | 30           | \$258   |
| Existing             | Multi Family     | Central Furnace | Heat         | Spray in insulation 2*4 Wall                   | 2*4Wall - closed cell foam insulation R-23                   | 2*4Wall R-13                                       | 345                       | 14.0%   | 0%                                  | 95%          | 25           | \$1,125 |
| Existing             | Multi Family     | Central Furnace | Heat         | Thermostat - Clock/Programmable                | Programmable Thermostat                                      | Manual Thermostat                                  | 345                       | 6.8%  | 85%                                 | 55%          | 15           | \$27    |
| Existing             | Multi Family     | Central Furnace | Heat         | Thermostat - Multi-Zone                        | Individual Room Temperature Control for Major Occupied Rooms | Programmable Thermostat - Central Control Only     | 345                       | 7.0%  | 65%                                 | 95%          | 12           | \$1,150 |
| Existing             | Multi Family     | Central Furnace | Heat         | Windows  | U = 0.19   | U = 0.30   | 345                       | 9.0%  | 75%                                 | 95%          | 25           | \$815   |
| Existing             | Multi Family     | Central Furnace | Heat         | Windows  | U = 0.30   | Existing Windows (U=0.65)                          | 345                       | 10.0%   | 75%                                 | 15%          | 25           | \$1,939 |
| Existing             | Multi Family     | Cooking Oven    |              | Convection Oven                                | Convection Oven  | Standard Oven                                      | 19                        | 23.0%   | 85%                                 | 85%          | 15           | \$305   |
| Existing             | Multi Family     | Dryer           |              | Clothes Dryer w Moisture Sensor                | High-Efficiency Clothes Dryer w Moisture Sensor              | Standard Dryer without Moisture Sensor             | 36                        | 13.0%   | NA                                  | NA           | 18           | \$53    |
| Existing             | Multi Family     | Water Heat      |              | Water Heater (40 Gallon Gas)                   | EF=0.62  | EF = 0.59  | 139                       | 5.0%  | NA                                  | NA           | 13           | \$81    |
| Existing             | Multi Family     | Water Heat      |              | Water Heater (Gas)                             | EF=0.80 Condensing Water Heater                              | EF = 0.59  | 139                       | 26.2%   | NA                                  | NA           | 13           | \$1,212 |
| Existing             | Multi Family     | Water Heat      |              | Water Heater (Gas)                             | EF=0.86 Condensing Water Heater                              | EF = 0.59  | 139                       | 31.2%   | NA                                  | NA           | 13           | \$1,289 |
| Existing             | Multi Family     | Water Heat      |              | Clothes Washer                                 | Energy Star MEF = 1.83 (top Load)                            | Standard Clothes Washer (1.26)                     | 135                       | 9.3%  | 67%                                 | 68%          | 14           | \$252   |
| Existing             | Multi Family     | Water Heat      |              | Clothes Washer                                 | Tier 2. MEF = 2.01 (front load)                              | Standard Clothes Washer (1.26)                     | 135                       | 11.2%   | 67%                                 | 85%          | 14           | \$312   |
| Existing             | Multi Family     | Water Heat      |              | Clothes Washer                                 | Tier 2. MEF = 2.2 (front load)                               | Standard Clothes Washer (1.26)                     | 135                       | 12.8%   | 67%                                 | 85%          | 14           | \$417   |
| Existing             | Multi Family     | Water Heat      |              | Clothes Washer - Early Replacement             | Standard Clothes Washer (1.26)                               | Existing Clothes Washer (MEF = 1.1)                | 135                       | 12.7%   | 25%                                 | 25%          | 14           | \$378   |
| Existing             | Multi Family     | Water Heat      |              | Desuperheater (Ground-Source Heat Pump) system | Desuperheater  | Standard Water_Heater - EF = 0.59 (40 Gallon Tank) | 135                       | 30.0%   | 5%                                  | 90%          | 10           | \$251   |
| Existing             | Multi Family     | Water Heat      |              | Dishwasher                                     | EF = 0.77  | EF = 0.65 (ENERGY STAR)                            | 135                       | 2.2%  | 27%                                 | 35%          | 13           | \$514   |
| Existing             | Multi Family     | Water Heat      |              | Dishwasher - Existing                          | EF = 0.65 (ENERGY STAR)                                      | EF = 0.46 Existing Dishwasher                      | 135                       | 4.1%  | 27%                                 | 15%          | 13           | \$11    |
| Existing             | Multi Family     | Water Heat      |              | Drain Water Heat Recovery                      | Drain Water Heat Recovery (GFX or Power-Pipe)                | No Drain Water Heat Recovery                       | 135                       | 3.5%  | 0%                                  | 95%          | 30           | \$630   |
| Existing             | Multi Family     | Water Heat      |              | Faucet Aerators                                | 0.5 GPM  | 2.2 GPM  | 135                       | 6.3%  | 95%                                 | 95%          | 9            | \$3     |
| Existing             | Multi Family     | Water Heat      |              | Faucet Aerators                                | 1.5 GPM  | 2.2 GPM  | 135                       | 2.6%  | 95%                                 | 55%          | 9            | \$2     |
| Existing             | Multi Family     | Water Heat      |              | Faucet Aerators                                | 2.2 GPM  | Existing Faucet Aerator (3.0 GPM)                  | 135                       | 3.0%  | 95%                                 | 10%          | 9            | \$2     |
| Existing             | Multi Family     | Water Heat      |              | Hot Water Pipe Insulation                      | Install Insulation (R-4)                                     | No insulation                                      | 135                       | 1.2%  | 65%                                 | 62%          | 15           | \$8     |
| Existing             | Multi Family     | Water Heat      |              | Low-Flow Showerheads                           | 1.75 GPM   | 2.5 GPM  | 135                       | 10.8%   | 95%                                 | 85%          | 10           | \$5     |

| Construction Vintage | Customer Segment | End Use        | Measure Name                           | Measure Description                        | Base Equipment                       | Baseline therm (UEC or EUJ) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|----------------|--|--|--------------------------------------|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Multi Family     | Water Heat     | Low-Flow Showerheads                   | 2.5 GPM                                    | 3.0 GPM                              | 135                         | 7.2%                          | 95%   | 33%                                 | 10           | \$12         |
| Existing             | Multi Family     | Water Heat     | Solar Hot Water (SHW)                  | Solar thermal collector                    | Non-solar hot water heater           | 135                         | 19.0%                         | 20%   | 95%                                 | 20           | \$4,465      |
| Existing             | Multi Family     | Water Heat     | Tankless Water_Heater                  | EF = 0.78, 4.3 gpm                         | EF = 0.59                            | 135                         | 24.4%                         | 75%   | 99%                                 | 20           | \$1,525      |
| Existing             | Multi Family     | Water Heat     | Water_Heater Tank Blanket/Insulation   | Install Insulation (R-5)                   | No Tank Insulation                   | 135                         | 6.5%                          | 0%  | 78%                                 | 10           | \$19         |
| Existing             | Multi Family     | Water Heat     | Water_Heater Thermostat Setback        | 120 degrees                                | 135 degrees                          | 135                         | 6.0%                          | 95%   | 64%                                 | 5            | \$0          |
| New                  | Multi Family     | Central Boiler | Heat Gas Boiler                        | AFUE=90%                                   | AFUE=82%                             | 391                         | 8.8%                          | NA  | NA                                  | 18           | \$2,399      |
| New                  | Multi Family     | Central Boiler | Heat Gas Boiler                        | AFUE=94%                                   | AFUE=82%                             | 391                         | 12.8%                         | NA  | NA                                  | 18           | \$3,344      |
| New                  | Multi Family     | Central Boiler | Heat Canned Lighting Air Tight Sealing | Canned Lighting Air Tight Sealing          | No Air tight Sealing                 | 353                         | 3.3%                          | 75%   | 25%                                 | 30           | \$3          |
| New                  | Multi Family     | Central Boiler | Heat Construction - ICF                | Concrete Framing                           | Standard Wood Framing                | 353                         | 44.0%                         | 45%   | 95%                                 | 30           | \$2,650      |
| New                  | Multi Family     | Central Boiler | Heat Construction - SIP                | Specialty Framing                          | Standard Wood Framing                | 353                         | 14.0%                         | 20%   | 95%                                 | 30           | \$1,984      |
| New                  | Multi Family     | Central Boiler | Heat Doors                             | R-11 (Steel Doors with foam core)          | Standard non-thermal wood door (R-2) | 353                         | 4.0%                          | 85%   | 50%                                 | 30           | \$58         |
| New                  | Multi Family     | Central Boiler | Heat Doors                             | R-5 (Composite Doors with foam core)       | Standard non-thermal wood door (R-2) | 353                         | 3.0%                          | 85%   | 55%                                 | 12           | \$68         |
| New                  | Multi Family     | Central Boiler | Heat Gas Boiler - Proper Sizing        | Proper Sizing of Gas Boiler                | Oversized Gas Boiler                 | 353                         | 5.0%                          | 53%   | 85%                                 | 30           | \$1          |
| New                  | Multi Family     | Central Boiler | Heat Green Roof                        | ecorroof                                   | Standard Roof                        | 353                         | 6.5%                          | 0%  | 98%                                 | 40           | \$11078      |
| New                  | Multi Family     | Central Boiler | Heat Insulation (Ceiling)              | R-49                                       | State Code (R-38)                    | 353                         | 2.0%                          | 87%   | 85%                                 | 25           | \$336        |
| New                  | Multi Family     | Central Boiler | Heat Insulation (Floor)                | R-38                                       | State Code (R-30)                    | 353                         | 1.0%                          | 75%   | 90%                                 | 25           | \$747        |
| New                  | Multi Family     | Central Boiler | Heat Insulation (Slab)                 | R-15                                       | R-10                                 | 353                         | 1.4%                          | 47%   | 64%                                 | 25           | \$221        |
| New                  | Multi Family     | Central Boiler | Heat Insulation (wall) 2*6             | R-21 + R5 Sheathing                        | State Code (R-21)                    | 353                         | 2.8%                          | 95%   | 90%                                 | 25           | \$372        |
| New                  | Multi Family     | Central Boiler | Heat Outlet Gasket                     | Install Outlet Gasket (Reduce Air Leakage) | No Outlet Gasket                     | 353                         | 2.0%                          | 95%   | 40%                                 | 5            | \$4          |
| New                  | Multi Family     | Central Boiler | Heat Radiant Barrier (Ceiling)         | Install Radiant Barrier                    | No Radiant Barrier                   | 353                         | 2.0%                          | 0%  | 97%                                 | 30           | \$258        |

| Construction Vintage | Customer Segment | End Use         | Measure Name | Measure Description                       | Base Equipment   | Baseline therm (UEC or EUJ)                    | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|-----------------|--------------|---|--|--|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| New                  | Multi Family     | Central Boiler  | Heat         | Spray in insulation 2*4 Wall              | 2*4Wall - closed cell foam insulation R-23                   | 2*6Wall R-21                                   | 353                           | 3.0%  | 95%                                 | 95%          | 25           | \$1,149 |
| New                  | Multi Family     | Central Boiler  | Heat         | Spray in insulation 2*6 Wall              | 2*6Wall - closed cell foam insulation R-37                   | 2*6Wall R-21                                   | 353                           | 11.0%   | 95%                                 | 95%          | 25           | \$1,767 |
| New                  | Multi Family     | Central Boiler  | Heat         | Thermostat - Clock/Programmable           | Programmable Thermostat                                      | Manual Thermostat                              | 353                           | 6.8%  | 85%                                 | 75%          | 15           | \$27    |
| New                  | Multi Family     | Central Boiler  | Heat         | Thermostat - Multi-Zone                   | Individual Room Temperature Control for Major Occupied Rooms | Programmable Thermostat - Central Control Only | 353                           | 7.0%  | 65%                                 | 95%          | 12           | \$1,150 |
| New                  | Multi Family     | Central Boiler  | Heat         | Windows                                   | U = 0.19   | U = 0.30                                       | 353                           | 14.0%   | 85%                                 | 95%          | 25           | \$1,155 |
| New                  | Multi Family     | Central Furnace | Heat         | Gas Furnace                               | AFUE = 90% (Condensing Furnace)                              | AFUE = 80%                                     | 331                           | 11.0%   | NA                                  | NA           | 18           | \$788   |
| New                  | Multi Family     | Central Furnace | Heat         | Gas Furnace                               | AFUE = 95% (Condensing Furnace)                              | AFUE = 80%                                     | 331                           | 15.8%   | NA                                  | NA           | 18           | \$1,103 |
| New                  | Multi Family     | Central Furnace | Heat         | Canned Lighting Air Tight Sealing         | Canned Lighting Air Tight Sealing                            | No Air tight Sealing                           | 291                           | 3.3%  | 75%                                 | 25%          | 30           | \$3     |
| New                  | Multi Family     | Central Furnace | Heat         | Construction - ICF                        | Concrete Framing   | Standard Wood Framing                          | 291                           | 44.0%   | 45%                                 | 95%          | 30           | \$2,650 |
| New                  | Multi Family     | Central Furnace | Heat         | Construction - SIP                        | Specialty Framing  | Standard Wood Framing                          | 291                           | 14.0%   | 20%                                 | 95%          | 30           | \$1,984 |
| New                  | Multi Family     | Central Furnace | Heat         | Doors                                     | R-11 (Steel Doors with foam core)                            | Standard non-thermal wood door (R-2)           | 291                           | 5.0%  | 85%                                 | 50%          | 30           | \$58    |
| New                  | Multi Family     | Central Furnace | Heat         | Doors                                     | R-5 (Composite Doors with foam core)                         | Standard non-thermal wood door (R-2)           | 291                           | 3.0%  | 85%                                 | 55%          | 12           | \$21    |
| New                  | Multi Family     | Central Furnace | Heat         | Duct Location                             | Conditioned Space Design - Duct Loss Is Not A Concern        | Ducts in Unconditioned Space (Duct loss)       | 291                           | 8.0%  | 85%                                 | 10%          | 30           | \$106   |
| New                  | Multi Family     | Central Furnace | Heat         | Duct Sealing                              | Duct Sealing   | No Duct Sealing                                | 291                           | 6.0%  | 0%                                  | 65%          | 20           | \$447   |
| New                  | Multi Family     | Central Furnace | Heat         | Duct Sealing - Aerosol-Based              | Spray-in ductwork sealant to minimize duct leaks             | New homes with AFUE HVAC, SEER 13              | 291                           | 19.0%   | 0%                                  | 95%          | 25           | \$525   |
| New                  | Multi Family     | Central Furnace | Heat         | Gas Furnace - Maintenance - New Equipment | Maintenance  | No Maintenance                                 | 291                           | 4.0%  | 95%                                 | 75%          | 1            | \$105   |
| New                  | Multi Family     | Central Furnace | Heat         | Gas Furnace - Proper Sizing               | Proper Sizing of Gas Furnace                                 | Oversized Gas Furnace                          | 291                           | 5.0%  | 53%                                 | 85%          | 18           | \$1     |
| New                  | Multi Family     | Central Furnace | Heat         | Green Roof                                | ecorroof   | Standard Roof                                  | 291                           | 6.5%  | 0%                                  | 98%          | 40           | \$11078 |
| New                  | Multi Family     | Central Furnace | Heat         | Insulation (Ceiling)                      | R-49   | State Code (R-38)                              | 291                           | 2.0%  | 87%                                 | 85%          | 25           | \$336   |

| Construction Vintage | Customer Segment | End Use         | Measure Name                                   | Measure Description  | Base Equipment                                     | Baseline therm (UEC or EUJ) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------------|--|--|--|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Multi Family     | Central Furnace | Heat Insulation (Floor)                        | R-38   | State Code (R-30)                                  | 291                         | 2.0%                          | 75%   | 90%                                 | 25           | \$747        |
| New                  | Multi Family     | Central Furnace | Heat Insulation (Slab)                         | R-15   | R-10   | 291                         | 1.4%                          | 47%   | 64%                                 | 25           | \$221        |
| New                  | Multi Family     | Central Furnace | Heat Insulation (wall) 2*6                     | R-21 + R5 Sheathing  | State Code (R-21)                                  | 291                         | 2.8%                          | 95%   | 90%                                 | 25           | \$372        |
| New                  | Multi Family     | Central Furnace | Heat Integrated Space and Water Heating        | Premium Efficiency AFUE = 90 - Condensing Furnace              | Standard Efficiency AFUE = 78- Condensing Furnace  | 291                         | 13.3%                         | 25%   | 95%                                 | 15           | \$184        |
| New                  | Multi Family     | Central Furnace | Heat Leak Proof Duct Fittings                  | Quick connect fittings that do not require mastic or drawbands | 3-ton AC/furnace, 13 SEER                          | 291                         | 15.0%                         | 0%  | 95%                                 | 30           | \$96         |
| New                  | Multi Family     | Central Furnace | Heat Outlet Gasket                             | Install Outlet Gasket (Reduce Air Leakage)                     | No Outlet Gasket                                   | 291                         | 2.0%                          | 95%   | 40%                                 | 5            | \$4          |
| New                  | Multi Family     | Central Furnace | Heat Radiant Barrier (Ceiling)                 | Install Radiant Barrier  | No Radiant Barrier                                 | 291                         | 2.0%                          | 0%  | 97%                                 | 30           | \$258        |
| New                  | Multi Family     | Central Furnace | Heat Spray in insulation 2*4 Wall              | 2*4Wall - closed cell foam insulation R-23                     | 2*6Wall R-21                                       | 291                         | 3.0%                          | 95%   | 95%                                 | 25           | \$1,149      |
| New                  | Multi Family     | Central Furnace | Heat Spray in insulation 2*6 Wall              | 2*6Wall - closed cell foam insulation R-37                     | 2*6Wall R-21                                       | 291                         | 11.0%                         | 95%   | 95%                                 | 25           | \$1,767      |
| New                  | Multi Family     | Central Furnace | Heat Thermostat - Clock/Programmable           | Programmable Thermostat  | Manual Thermostat                                  | 291                         | 6.8%                          | 85%   | 55%                                 | 15           | \$27         |
| New                  | Multi Family     | Central Furnace | Heat Thermostat - Multi-Zone                   | Individual Room Temperature Control for Major Occupied Rooms   | Programmable Thermostat - Central Control Only     | 291                         | 7.0%                          | 65%   | 95%                                 | 12           | \$1,150      |
| New                  | Multi Family     | Central Furnace | Heat Windows                                   | U = 0.19   | U = 0.30   | 291                         | 16.0%                         | 85%   | 95%                                 | 25           | \$1,155      |
| New                  | Multi Family     | Cooking Oven    | Convection Oven                                | Convection Oven  | Standard Oven                                      | 19                          | 23.0%                         | 85%   | 85%                                 | 15           | \$305        |
| New                  | Multi Family     | Dryer           | Clothes Dryer w Moisture Sensor                | High-Efficiency Clothes Dryer w Moisture Sensor                | Standard Dryer without Moisture Sensor             | 36                          | 13.0%                         | NA  | NA                                  | 18           | \$53         |
| New                  | Multi Family     | Water Heat      | Water Heater (40 Gallon Gas)                   | EF=0.62  | EF = 0.59  | 171                         | 5.2%                          | NA  | NA                                  | 13           | \$81         |
| New                  | Multi Family     | Water Heat      | Water Heater (Gas)                             | EF=0.80 Condensing Water Heater                                | EF = 0.59  | 171                         | 26.4%                         | NA  | NA                                  | 13           | \$1,212      |
| New                  | Multi Family     | Water Heat      | Water Heater (Gas)                             | EF=0.86 Condensing Water Heater                                | EF = 0.59  | 171                         | 31.6%                         | NA  | NA                                  | 13           | \$1,289      |
| New                  | Multi Family     | Water Heat      | Clothes Washer                                 | Energy Star MEF = 1.83 (top Load)                              | Standard Clothes Washer (1.26)                     | 141                         | 9.3%                          | 67%   | 68%                                 | 14           | \$252        |
| New                  | Multi Family     | Water Heat      | Clothes Washer                                 | Tier 2. MEF = 2.01 (front load)                                | Standard Clothes Washer (1.26)                     | 141                         | 11.2%                         | 67%   | 85%                                 | 14           | \$312        |
| New                  | Multi Family     | Water Heat      | Clothes Washer                                 | Tier 2. MEF = 2.2 (front load)                                 | Standard Clothes Washer (1.26)                     | 141                         | 12.8%                         | 67%   | 85%                                 | 14           | \$417        |
| New                  | Multi Family     | Water Heat      | Desuperheater (Ground-Source Heat Pump) system | Desuperheater  | Standard Water_Heater - EF = 0.59 (40 Gallon Tank) | 141                         | 30.0%                         | 5%  | 90%                                 | 10           | \$251        |
| New                  | Multi Family     | Water Heat      | Dishwasher                                     | EF = 0.77  | EF = 0.65 (ENERGY STAR)                            | 141                         | 2.2%                          | 27%   | 35%                                 | 13           | \$514        |

| Construction Vintage | Customer Segment | End Use        | Measure Name  | Measure Description                           | Base Equipment                                      | Baseline therm (UEC or EUJ) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|----------------|---|---|---|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Multi Family     | Water Heat     | Dishwasher - Existing   | EF = 0.65 (ENERGY STAR)                       | EF = 0.46 Existing Dishwasher                       | 141                         | 4.1%                          | 27%   | 15%                                 | 13           | \$11         |
| New                  | Multi Family     | Water Heat     | Drain Water Heat Recovery   | Drain Water Heat Recovery (GFX or Power-Pipe) | No Drain Water Heat Recovery                        | 141                         | 3.5%                          | 50%   | 95%                                 | 30           | \$630        |
| New                  | Multi Family     | Water Heat     | Faucet Aerators   | 0.5 GPM                                       | 2.2 GPM   | 141                         | 5.2%                          | 95%   | 95%                                 | 9            | \$3          |
| New                  | Multi Family     | Water Heat     | Faucet Aerators   | 1.5 GPM                                       | 2.2 GPM   | 141                         | 2.1%                          | 95%   | 55%                                 | 9            | \$2          |
| New                  | Multi Family     | Water Heat     | Hot Water Pipe Insulation   | Install Insulation (R-4)                      | No insulation                                       | 141                         | 1.2%                          | 0%  | 67%                                 | 15           | \$8          |
| New                  | Multi Family     | Water Heat     | Integrated Space and Water Heating                                      | High Efficiency Water Heater EF =0.62         | Standard efficiency Water Heater EF = 0.59          | 141                         | 4.8%                          | 25%   | 95%                                 | 15           | \$71         |
| New                  | Multi Family     | Water Heat     | Low-Flow Showerheads  | 1.75 GPM                                      | 2.5 GPM   | 141                         | 8.9%                          | 95%   | 65%                                 | 10           | \$5          |
| New                  | Multi Family     | Water Heat     | Solar Hot Water (SHW)   | Solar thermal collector                       | Non-solar hot water heater                          | 141                         | 19.1%                         | 20%   | 95%                                 | 20           | \$4,465      |
| New                  | Multi Family     | Water Heat     | Tankless Water_Heater   | EF = 0.78, 4.3 gpm                            | EF = 0.59   | 141                         | 24.4%                         | 75%   | 99%                                 | 20           | \$1,398      |
| New                  | Multi Family     | Water Heat     | Water_Heater Tank Blanket/Insulation                                    | Install Insulation (R-5)                      | No Tank Insulation                                  | 141                         | 6.5%                          | 0%  | 78%                                 | 10           | \$19         |
| New                  | Multi Family     | Water Heat     | Water_Heater Thermostat Setback   | 120 degrees                                   | 135 degrees   | 141                         | 6.0%                          | 95%   | 64%                                 | 5            | \$0          |
| Existing             | Single Family    | Central Boiler | Heat Gas Boiler   | AFUE=90%                                      | AFUE=82%  | 772                         | 8.9%                          | NA  | NA                                  | 18           | \$2,399      |
| Existing             | Single Family    | Central Boiler | Heat Gas Boiler   | AFUE=94%                                      | AFUE=82%  | 772                         | 12.9%                         | NA  | NA                                  | 18           | \$3,344      |
| Existing             | Single Family    | Central Boiler | Heat Canned Lighting Air Tight Sealing                                  | Canned Lighting Air Tight Sealing             | No Air tight Sealing                                | 742                         | 3.3%                          | 60%   | 55%                                 | 30           | \$53         |
| Existing             | Single Family    | Central Boiler | Heat Doors  | R-11 (Steel Doors with foam core)             | Standard non-thermal wood door (R-2)                | 742                         | 3.0%                          | 85%   | 50%                                 | 30           | \$116        |
| Existing             | Single Family    | Central Boiler | Heat Doors  | R-5 (Composite Doors with foam core)          | Standard non-thermal wood door (R-2)                | 742                         | 2.0%                          | 85%   | 55%                                 | 12           | \$42         |
| Existing             | Single Family    | Central Boiler | Heat Doors - Weatherization   | Weatherstripping And Adding Door Sweeps       | Existing Non-Efficient door                         | 742                         | 1.3%                          | 80%   | 45%                                 | 3            | \$36         |
| Existing             | Single Family    | Central Boiler | Heat Gas Boiler - Proper Sizing   | Proper Sizing of Gas Boiler                   | Oversized Gas Boiler                                | 742                         | 5.0%                          | 53%   | 85%                                 | 30           | \$1          |
| Existing             | Single Family    | Central Boiler | Heat Infiltration Control (Caulk, Weather Strip, etc.) Blower-Door test | Install Caulking And Weatherstripping         | Existing Infiltration Conditions                    | 742                         | 10.0%                         | 85%   | 75%                                 | 15           | \$435        |
| Existing             | Single Family    | Central Boiler | Heat Insulation (Basement - Wall) 2*4                                   | R-13  | Average Existing Insulation Value and/or Code Value | 742                         | 6.9%                          | 14%   | 70%                                 | 25           | \$906        |
| Existing             | Single Family    | Central Boiler | Heat Insulation (Basement - Wall) 2*4                                   | R-13  | R-0   | 742                         | 14.9%                         | 14%   | 70%                                 | 25           | \$906        |
| Existing             | Single Family    | Central Boiler | Heat Insulation (Basement - Wall) 2*4                                   | R-13 + R-5 sheathing                          | R-13  | 742                         | 6.1%                          | 14%   | 95%                                 | 25           | \$708        |
| Existing             | Single Family    | Central Boiler | Heat Insulation (Ceiling)   | R-49  | State Code (R-38)                                   | 742                         | 1.0%                          | 87%   | 85%                                 | 25           | \$344        |



| Construction Vintage | Customer Segment | End Use        | Measure Name                         | Measure Description                        | Base Equipment                                      | Baseline therm (UEC or EUJ) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|----------------|--------------------------------------|--|---|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Single Family    | Central Boiler | Heat Insulation (Ceiling)            | State Code (R-38)                          | Average Existing Insulation Value (R-19)            | 742                         | 2.0%                          | 95%   | 40%                                 | 25           | \$562        |
| Existing             | Single Family    | Central Boiler | Heat Insulation (Ceiling)            | State Code (R-38)                          | R-9   | 742                         | 10.5%                         | 95%   | 10%                                 | 25           | \$562        |
| Existing             | Single Family    | Central Boiler | Heat Insulation (Duct)               | R-8  | R-4   | 742                         | 1.6%                          | 12%   | 95%                                 | 25           | \$172        |
| Existing             | Single Family    | Central Boiler | Heat Insulation (Floor)              | R-38                                       | State Code (R-30)                                   | 742                         | 1.0%                          | 75%   | 90%                                 | 25           | \$884        |
| Existing             | Single Family    | Central Boiler | Heat Insulation (Floor)              | State Code (R-30)                          | Average Existing Insulation Value and/or Code Value | 742                         | 2.0%                          | 55%   | 40%                                 | 25           | \$443        |
| Existing             | Single Family    | Central Boiler | Heat Insulation (Floor)              | State Code (R-30)                          | R-0   | 742                         | 8.0%                          | 55%   | 10%                                 | 25           | \$443        |
| Existing             | Single Family    | Central Boiler | Heat Insulation (Rim And Band Joist) | R-10                                       | No Rim And Band Joist Insulation                    | 742                         | 3.0%                          | 60%   | 45%                                 | 25           | \$130        |
| Existing             | Single Family    | Central Boiler | Heat Insulation (Rim And Band Joist) | R-19                                       | R-10  | 742                         | 4.0%                          | 60%   | 75%                                 | 25           | \$84         |
| Existing             | Single Family    | Central Boiler | Heat Insulation (Slab)               | R-10                                       | Average Existing Insulation Value and/or Code Value | 742                         | 1.3%                          | 28%   | 65%                                 | 25           | \$1,049      |
| Existing             | Single Family    | Central Boiler | Heat Insulation (Slab)               | R-10                                       | R-0   | 742                         | 4.3%                          | 28%   | 60%                                 | 25           | \$1,049      |
| Existing             | Single Family    | Central Boiler | Heat Insulation (Slab)               | R-15                                       | R-10  | 742                         | 1.4%                          | 28%   | 87%                                 | 25           | \$223        |
| Existing             | Single Family    | Central Boiler | Heat Insulation (Wall) 2*4           | R-13                                       | Average Existing Insulation Value and/or Code Value | 742                         | 4.0%                          | 75%   | 40%                                 | 25           | \$1,396      |
| Existing             | Single Family    | Central Boiler | Heat Insulation (Wall) 2*4           | R-13                                       | R-0   | 742                         | 40.0%                         | 75%   | 10%                                 | 25           | \$1,396      |
| Existing             | Single Family    | Central Boiler | Heat Insulation (Wall) 2*4           | R-13 + R5 Sheathing                        | R-13  | 742                         | 1.8%                          | 10%   | 90%                                 | 25           | \$1,786      |
| Existing             | Single Family    | Central Boiler | Heat Insulation (wall) 2*6           | State Code (R-21)                          | Average Existing Insulation Value and/or Code Value | 742                         | 11.0%                         | 0%  | 60%                                 | 25           | \$2,276      |
| Existing             | Single Family    | Central Boiler | Heat Insulation (wall) 2*6           | State Code (R-21)                          | R-0   | 742                         | 45.0%                         | 0%  | 50%                                 | 25           | \$2,276      |
| Existing             | Single Family    | Central Boiler | Heat Outlet Gasket                   | Install Outlet Gasket (Reduce Air Leakage) | No Outlet Gasket                                    | 742                         | 2.0%                          | 95%   | 60%                                 | 5            | \$7          |
| Existing             | Single Family    | Central Boiler | Heat Radiant Barrier (Ceiling)       | Install Radiant Barrier                    | No Radiant Barrier                                  | 742                         | 2.0%                          | 0%  | 97%                                 | 30           | \$305        |
| Existing             | Single Family    | Central Boiler | Heat Spray in insulation 2*4 Wall    | 2*4Wall - closed cell foam insulation R-23 | 2*4Wall R-13  | 742                         | 14.0%                         | 0%  | 95%                                 | 25           | \$7,750      |

| Construction Vintage | Customer Segment | End Use         | Measure Name | Measure Description                       | Base Equipment   | Baseline therm (UEC or EUJ)                         | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|-----------------|--------------|---|--|---|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| Existing             | Single Family    | Central Boiler  | Heat         | Thermostat - Clock/Programmable           | Programmable Thermostat                                      | Manual Thermostat                                   | 742                           | 6.8%  | 85%                                 | 37%          | 15           | \$27    |
| Existing             | Single Family    | Central Boiler  | Heat         | Thermostat - Multi-Zone                   | Individual Room Temperature Control for Major Occupied Rooms | Programmable Thermostat - Central Control Only      | 742                           | 7.0%  | 65%                                 | 95%          | 12           | \$1,422 |
| Existing             | Single Family    | Central Boiler  | Heat         | Windows                                   | U = 0.19   | U = 0.30  | 742                           | 8.0%  | 75%                                 | 95%          | 25           | \$4,343 |
| Existing             | Single Family    | Central Boiler  | Heat         | Windows                                   | U = 0.30   | Existing Windows (U=0.65)                           | 742                           | 8.0%  | 75%                                 | 15%          | 25           | \$10331 |
| Existing             | Single Family    | Central Furnace | Heat         | Gas Furnace                               | AFUE = 90% (Condensing Furnace)                              | AFUE = 80%  | 634                           | 11.0%   | NA                                  | NA           | 18           | \$788   |
| Existing             | Single Family    | Central Furnace | Heat         | Gas Furnace                               | AFUE = 95% (Condensing Furnace)                              | AFUE = 80%  | 634                           | 15.8%   | NA                                  | NA           | 18           | \$1,103 |
| Existing             | Single Family    | Central Furnace | Heat         | Canned Lighting Air Tight Sealing         | Canned Lighting Air Tight Sealing                            | No Air tight Sealing                                | 602                           | 3.3%  | 60%                                 | 55%          | 30           | \$53    |
| Existing             | Single Family    | Central Furnace | Heat         | Doors                                     | R-11 (Steel Doors with foam core)                            | Standard non-thermal wood door (R-2)                | 602                           | 3.0%  | 85%                                 | 50%          | 30           | \$116   |
| Existing             | Single Family    | Central Furnace | Heat         | Doors                                     | R-5 (Composite Doors with foam core)                         | Standard non-thermal wood door (R-2)                | 602                           | 2.0%  | 85%                                 | 55%          | 12           | \$42    |
| Existing             | Single Family    | Central Furnace | Heat         | Doors - Weatherization                    | Weatherstripping And Adding Door Sweeps                      | Existing Non-Efficient door                         | 602                           | 1.3%  | 80%                                 | 45%          | 3            | \$36    |
| Existing             | Single Family    | Central Furnace | Heat         | Duct Sealing                              | Duct Sealing   | No Duct Sealing                                     | 602                           | 6.0%  | 60%                                 | 65%          | 20           | \$447   |
| Existing             | Single Family    | Central Furnace | Heat         | Duct Sealing - Aerosol-Based              | Spray-in ductwork sealant to minimize duct leaks             | Older homes with AFUE HVAC, SEER 9                  | 602                           | 19.0%   | 50%                                 | 95%          | 25           | \$946   |
| Existing             | Single Family    | Central Furnace | Heat         | Gas Furnace - Maintenance                 | Maintenance  | No Maintenance                                      | 602                           | 5.0%  | 95%                                 | 75%          | 2            | \$105   |
| Existing             | Single Family    | Central Furnace | Heat         | Gas Furnace - Maintenance - New Equipment | Maintenance  | No Maintenance                                      | 602                           | 5.0%  | 6%                                  | 75%          | 1            | \$105   |
| Existing             | Single Family    | Central Furnace | Heat         | Gas Furnace - Proper Sizing               | Proper Sizing of Gas Furnace                                 | Oversized Gas Furnace                               | 602                           | 5.0%  | 53%                                 | 85%          | 18           | \$1     |
| Existing             | Single Family    | Central Furnace | Heat         | Insulation (Basement - Wall) 2*4          | R-13   | Average Existing Insulation Value and/or Code Value | 602                           | 6.9%  | 14%                                 | 70%          | 25           | \$906   |
| Existing             | Single Family    | Central Furnace | Heat         | Insulation (Basement - Wall) 2*4          | R-13   | R-0   | 602                           | 14.9%   | 14%                                 | 70%          | 25           | \$906   |
| Existing             | Single Family    | Central Furnace | Heat         | Insulation (Basement - Wall) 2*4          | R-13 + R-5 sheathing   | R-13  | 602                           | 6.1%  | 14%                                 | 95%          | 25           | \$708   |
| Existing             | Single Family    | Central Furnace | Heat         | Insulation (Ceiling)                      | R-49   | State Code (R-38)                                   | 602                           | 1.0%  | 87%                                 | 85%          | 25           | \$344   |

| Construction Vintage | Customer Segment | End Use         | Measure Name                         | Measure Description  | Base Equipment                                      | Baseline therm (UEC or EUJ) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------------|--------------------------------------|--|---|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Single Family    | Central Furnace | Heat Insulation (Ceiling)            | State Code (R-38)  | Average Existing Insulation Value (R-19)            | 602                         | 2.0%                          | 95%   | 40%                                 | 25           | \$562        |
| Existing             | Single Family    | Central Furnace | Heat Insulation (Ceiling)            | State Code (R-38)  | R-9   | 602                         | 10.5%                         | 95%   | 10%                                 | 25           | \$562        |
| Existing             | Single Family    | Central Furnace | Heat Insulation (Duct)               | R-8  | No Duct Insulation                                  | 602                         | 4.3%                          | 12%   | 75%                                 | 25           | \$335        |
| Existing             | Single Family    | Central Furnace | Heat Insulation (Floor)              | R-38   | State Code (R-30)                                   | 602                         | 1.0%                          | 75%   | 90%                                 | 25           | \$884        |
| Existing             | Single Family    | Central Furnace | Heat Insulation (Floor)              | State Code (R-30)  | Average Existing Insulation Value and/or Code Value | 602                         | 2.0%                          | 55%   | 40%                                 | 25           | \$443        |
| Existing             | Single Family    | Central Furnace | Heat Insulation (Floor)              | State Code (R-30)  | R-0   | 602                         | 9.0%                          | 55%   | 10%                                 | 25           | \$443        |
| Existing             | Single Family    | Central Furnace | Heat Insulation (Rim And Band Joist) | R-10   | No Rim And Band Joist Insulation                    | 602                         | 3.0%                          | 60%   | 45%                                 | 25           | \$130        |
| Existing             | Single Family    | Central Furnace | Heat Insulation (Rim And Band Joist) | R-19   | R-10  | 602                         | 4.0%                          | 60%   | 75%                                 | 25           | \$84         |
| Existing             | Single Family    | Central Furnace | Heat Insulation (Slab)               | R-10   | Average Existing Insulation Value and/or Code Value | 602                         | 1.3%                          | 28%   | 65%                                 | 25           | \$1,049      |
| Existing             | Single Family    | Central Furnace | Heat Insulation (Slab)               | R-10   | R-0   | 602                         | 4.3%                          | 28%   | 60%                                 | 25           | \$1,049      |
| Existing             | Single Family    | Central Furnace | Heat Insulation (Slab)               | R-15   | R-10  | 602                         | 1.4%                          | 28%   | 87%                                 | 25           | \$223        |
| Existing             | Single Family    | Central Furnace | Heat Insulation (Wall) 2*4           | R-13   | Average Existing Insulation Value and/or Code Value | 602                         | 5.0%                          | 75%   | 40%                                 | 25           | \$1,396      |
| Existing             | Single Family    | Central Furnace | Heat Insulation (Wall) 2*4           | R-13   | R-0   | 602                         | 43.0%                         | 75%   | 10%                                 | 25           | \$1,396      |
| Existing             | Single Family    | Central Furnace | Heat Insulation (Wall) 2*4           | R-13 + R5 Sheathing  | R-13  | 602                         | 2.2%                          | 10%   | 90%                                 | 25           | \$1,786      |
| Existing             | Single Family    | Central Furnace | Heat Insulation (wall) 2*6           | State Code (R-21)  | Average Existing Insulation Value and/or Code Value | 602                         | 10.0%                         | 0%  | 60%                                 | 25           | \$2,276      |
| Existing             | Single Family    | Central Furnace | Heat Insulation (wall) 2*6           | State Code (R-21)  | R-0   | 602                         | 48.0%                         | 0%  | 50%                                 | 25           | \$2,276      |
| Existing             | Single Family    | Central Furnace | Heat Leak Proof Duct Fittings        | Quick connect fittings that do not require mastic or drawbands | 3-ton AC/furnace, 13 SEER                           | 602                         | 15.0%                         | 10%   | 95%                                 | 30           | \$288        |
| Existing             | Single Family    | Central Furnace | Heat Outlet Gasket                   | Install Outlet Gasket (Reduce Air Leakage)                     | No Outlet Gasket                                    | 602                         | 2.0%                          | 95%   | 60%                                 | 5            | \$7          |
| Existing             | Single Family    | Central Furnace | Heat Radiant Barrier (Ceiling)       | Install Radiant Barrier  | No Radiant Barrier                                  | 602                         | 2.0%                          | 0%  | 97%                                 | 30           | \$305        |

| Construction Vintage | Customer Segment | End Use         | Measure Name                                   | Measure Description                             | Base Equipment   | Baseline therm (UEC or EUJ)                    | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|-----------------|--|---|--|--|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| Existing             | Single Family    | Central Furnace | Heat   | Spray in insulation 2*4 Wall                    | 2*4Wall - closed cell foam insulation R-23                   | 2*4Wall R-13                                   | 602                           | 14.0%   | 0%                                  | 95%          | 25           | \$7,750 |
| Existing             | Single Family    | Central Furnace | Heat   | Thermostat - Clock/Programmable                 | Programmable Thermostat                                      | Manual Thermostat                              | 602                           | 6.8%  | 85%                                 | 32%          | 15           | \$27    |
| Existing             | Single Family    | Central Furnace | Heat   | Thermostat - Multi-Zone                         | Individual Room Temperature Control for Major Occupied Rooms | Programmable Thermostat - Central Control Only | 602                           | 7.0%  | 65%                                 | 95%          | 12           | \$1,422 |
| Existing             | Single Family    | Central Furnace | Heat   | Windows   | U = 0.19   | U = 0.30                                       | 602                           | 9.0%  | 75%                                 | 95%          | 25           | \$4,343 |
| Existing             | Single Family    | Central Furnace | Heat   | Windows   | U = 0.30   | Existing Windows (U=0.65)                      | 602                           | 10.0%   | 75%                                 | 15%          | 25           | \$10331 |
| Existing             | Single Family    | Cooking Oven    | Convection Oven                                | Convection Oven                                 | Standard Oven  |  | 19                            | 23.0%   | 85%                                 | 85%          | 15           | \$305   |
| Existing             | Single Family    | Dryer           | Clothes Dryer w Moisture Sensor                | High-Efficiency Clothes Dryer w Moisture Sensor | Standard Dryer without Moisture Sensor                       |  | 36                            | 13.0%   | NA                                  | NA           | 18           | \$53    |
| Existing             | Single Family    | Pool Heat       | Pool Heaters                                   | Energy Efficient Heaters - 88% efficiency       | Standard Heaters - 83% efficiency                            |  | 253                           | 5.7%  | 85%                                 | 65%          | 8            | \$483   |
| Existing             | Single Family    | Water Heat      | Water Heater (40 Gallon Gas)                   | EF=0.62   | EF = 0.59  |  | 238                           | 5.0%  | NA                                  | NA           | 13           | \$81    |
| Existing             | Single Family    | Water Heat      | Water Heater (Gas)                             | EF=0.80 Condensing Water Heater                 | EF = 0.59  |  | 238                           | 26.4%   | NA                                  | NA           | 13           | \$1,212 |
| Existing             | Single Family    | Water Heat      | Water Heater (Gas)                             | EF=0.86 Condensing Water Heater                 | EF = 0.59  |  | 238                           | 31.4%   | NA                                  | NA           | 13           | \$1,289 |
| Existing             | Single Family    | Water Heat      | Clothes Washer                                 | Energy Star MEF = 1.83 (top Load)               | Standard Clothes Washer (1.26)                               |  | 231                           | 9.3%  | 99%                                 | 68%          | 14           | \$252   |
| Existing             | Single Family    | Water Heat      | Clothes Washer                                 | Tier 2. MEF = 2.01 (front load)                 | Standard Clothes Washer (1.26)                               |  | 231                           | 11.2%   | 99%                                 | 77%          | 14           | \$312   |
| Existing             | Single Family    | Water Heat      | Clothes Washer                                 | Tier 2. MEF = 2.2 (front load)                  | Standard Clothes Washer (1.26)                               |  | 231                           | 12.8%   | 99%                                 | 77%          | 14           | \$417   |
| Existing             | Single Family    | Water Heat      | Clothes Washer - Early Replacement             | Standard Clothes Washer (1.26)                  | Existing Clothes Washer (MEF = 1.1)                          |  | 231                           | 12.7%   | 35%                                 | 25%          | 14           | \$378   |
| Existing             | Single Family    | Water Heat      | Desuperheater (Ground-Source Heat Pump) system | Desuperheater                                   | Standard Water_Heater - EF = 0.59 (40 Gallon Tank)           |  | 231                           | 30.0%   | 5%                                  | 90%          | 10           | \$251   |
| Existing             | Single Family    | Water Heat      | Dishwasher                                     | EF = 0.77                                       | EF = 0.65 (ENERGY STAR)                                      |  | 231                           | 2.2%  | 30%                                 | 35%          | 13           | \$514   |
| Existing             | Single Family    | Water Heat      | Dishwasher - Existing                          | EF = 0.65 (ENERGY STAR)                         | EF = 0.46 Existing Dishwasher                                |  | 231                           | 4.1%  | 30%                                 | 15%          | 13           | \$11    |
| Existing             | Single Family    | Water Heat      | Drain Water Heat Recovery                      | Drain Water Heat Recovery (GFX or Power-Pipe)   | No Drain Water Heat Recovery                                 |  | 231                           | 3.5%  | 0%                                  | 95%          | 30           | \$630   |
| Existing             | Single Family    | Water Heat      | Faucet Aerators                                | 0.5 GPM   | 2.2 GPM  |  | 231                           | 5.5%  | 95%                                 | 95%          | 9            | \$4     |
| Existing             | Single Family    | Water Heat      | Faucet Aerators                                | 1.5 GPM   | 2.2 GPM  |  | 231                           | 2.3%  | 95%                                 | 55%          | 9            | \$3     |
| Existing             | Single Family    | Water Heat      | Faucet Aerators                                | 2.2 GPM   | Existing Faucet Aerator (3.0 GPM)                            |  | 231                           | 2.6%  | 95%                                 | 10%          | 9            | \$2     |
| Existing             | Single Family    | Water Heat      | Hot Water Pipe Insulation                      | Install Insulation (R-4)                        | No insulation  |  | 231                           | 1.2%  | 65%                                 | 38%          | 15           | \$8     |
| Existing             | Single Family    | Water Heat      | Low-Flow Showerheads                           | 1.75 GPM  | 2.5 GPM  |  | 231                           | 12.5%   | 95%                                 | 85%          | 10           | \$11    |
| Existing             | Single Family    | Water Heat      | Low-Flow Showerheads                           | 2.5 GPM   | 3.0 GPM  |  | 231                           | 8.4%  | 95%                                 | 33%          | 10           | \$25    |
| Existing             | Single Family    | Water Heat      | Solar Hot Water (SHW)                          | Solar thermal collector                         | Non-solar hot water heater                                   |  | 231                           | 22.2%   | 20%                                 | 95%          | 20           | \$8,930 |

| Construction Vintage | Customer Segment | End Use        | Measure Name                           | Measure Description                  | Base Equipment                                      | Baseline therm (UEC or EUJ) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|----------------|--|--------------------------------------|---|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Single Family    | Water Heat     | Tankless Water_Heater                  | EF = 0.78, 4.3 gpm                   | EF = 0.59   | 231                         | 24.4%                         | 75%   | 97%                                 | 20           | \$1,525      |
| Existing             | Single Family    | Water Heat     | Water_Heater Tank Blanket/Insulation   | Install Insulation (R-5)             | No Tank Insulation                                  | 231                         | 6.5%                          | 0%  | 63%                                 | 10           | \$19         |
| Existing             | Single Family    | Water Heat     | Water_Heater Thermostat Setback        | 120 degrees                          | 135 degrees   | 231                         | 6.0%                          | 95%   | 43%                                 | 5            | \$0          |
| New                  | Single Family    | Central Boiler | Heat Gas Boiler                        | AFUE=90%                             | AFUE=82%  | 621                         | 9.0%                          | NA  | NA                                  | 18           | \$2,399      |
| New                  | Single Family    | Central Boiler | Heat Gas Boiler                        | AFUE=94%                             | AFUE=82%  | 621                         | 12.7%                         | NA  | NA                                  | 18           | \$3,344      |
| New                  | Single Family    | Central Boiler | Heat Canned Lighting Air Tight Sealing | Canned Lighting Air Tight Sealing    | No Air tight Sealing                                | 561                         | 3.3%                          | 75%   | 25%                                 | 30           | \$3          |
| New                  | Single Family    | Central Boiler | Heat Construction - ICF                | Concrete Framing                     | Standard Wood Framing                               | 561                         | 44.0%                         | 45%   | 95%                                 | 30           | \$11629      |
| New                  | Single Family    | Central Boiler | Heat Construction - SIP                | Specialty Framing                    | Standard Wood Framing                               | 561                         | 14.0%                         | 45%   | 95%                                 | 30           | \$6,564      |
| New                  | Single Family    | Central Boiler | Heat Doors                             | R-11 (Steel Doors with foam core)    | Standard non-thermal wood door (R-2)                | 561                         | 4.0%                          | 85%   | 50%                                 | 30           | \$116        |
| New                  | Single Family    | Central Boiler | Heat Doors                             | R-5 (Composite Doors with foam core) | Standard non-thermal wood door (R-2)                | 561                         | 3.0%                          | 85%   | 55%                                 | 12           | \$42         |
| New                  | Single Family    | Central Boiler | Heat Gas Boiler - Proper Sizing        | Proper Sizing of Gas Boiler          | Oversized Gas Boiler                                | 561                         | 5.0%                          | 53%   | 85%                                 | 30           | \$1          |
| New                  | Single Family    | Central Boiler | Heat Green Roof                        | ecorroof                             | Standard Roof                                       | 561                         | 6.5%                          | 0%  | 98%                                 | 40           | \$21956      |
| New                  | Single Family    | Central Boiler | Heat Insulation (Basement - Wall) 2*4  | R-13                                 | Average Existing Insulation Value and/or Code Value | 561                         | 6.9%                          | 14%   | 70%                                 | 25           | \$671        |
| New                  | Single Family    | Central Boiler | Heat Insulation (Basement - Wall) 2*4  | R-13 + R-5 sheathing                 | R-13  | 561                         | 6.1%                          | 14%   | 95%                                 | 25           | \$474        |
| New                  | Single Family    | Central Boiler | Heat Insulation (Ceiling)              | R-49                                 | State Code (R-38)                                   | 561                         | 2.0%                          | 87%   | 85%                                 | 25           | \$365        |
| New                  | Single Family    | Central Boiler | Heat Insulation (Floor)                | R-38                                 | State Code (R-30)                                   | 561                         | 1.0%                          | 75%   | 90%                                 | 25           | \$884        |
| New                  | Single Family    | Central Boiler | Heat Insulation (Rim And Band Joist)   | R-10                                 | No Rim And Band Joist Insulation                    | 561                         | 3.0%                          | 80%   | 45%                                 | 25           | \$130        |
| New                  | Single Family    | Central Boiler | Heat Insulation (Rim And Band Joist)   | R-19                                 | R-10  | 561                         | 4.0%                          | 80%   | 75%                                 | 25           | \$84         |
| New                  | Single Family    | Central Boiler | Heat Insulation (Slab)                 | R-15                                 | R-10  | 561                         | 1.4%                          | 28%   | 64%                                 | 25           | \$223        |
| New                  | Single Family    | Central Boiler | Heat Insulation (wall) 2*6             | R-21 + R5 Sheathing                  | State Code (R-21)                                   | 561                         | 2.8%                          | 95%   | 85%                                 | 25           | \$2,363      |

| Construction Vintage | Customer Segment | End Use         | Measure Name | Measure Description                       | Base Equipment   | Baseline therm (UEC or EUJ)                    | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|-----------------|--------------|---|--|--|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| New                  | Single Family    | Central Boiler  | Heat         | Outlet Gasket                             | Install Outlet Gasket (Reduce Air Leakage)                   | No Outlet Gasket                               | 561                           | 2.0%  | 95%                                 | 40%          | 5            | \$7     |
| New                  | Single Family    | Central Boiler  | Heat         | Radiant Barrier (Ceiling)                 | Install Radiant Barrier                                      | No Radiant Barrier                             | 561                           | 2.0%  | 0%                                  | 97%          | 30           | \$305   |
| New                  | Single Family    | Central Boiler  | Heat         | Spray in insulation 2*4 Wall              | 2*4Wall - closed cell foam insulation R-23                   | 2*6Wall R-21                                   | 561                           | 3.0%  | 95%                                 | 95%          | 25           | \$7,602 |
| New                  | Single Family    | Central Boiler  | Heat         | Spray in insulation 2*6 Wall              | 2*6Wall - closed cell foam insulation R-37                   | 2*6Wall R-21                                   | 561                           | 11.0%   | 95%                                 | 95%          | 25           | \$11697 |
| New                  | Single Family    | Central Boiler  | Heat         | Thermostat - Clock/Programmable           | Programmable Thermostat                                      | Manual Thermostat                              | 561                           | 6.8%  | 85%                                 | 37%          | 15           | \$27    |
| New                  | Single Family    | Central Boiler  | Heat         | Thermostat - Multi-Zone                   | Individual Room Temperature Control for Major Occupied Rooms | Programmable Thermostat - Central Control Only | 561                           | 7.0%  | 65%                                 | 95%          | 12           | \$1,422 |
| New                  | Single Family    | Central Boiler  | Heat         | Windows                                   | U = 0.19   | U = 0.30                                       | 561                           | 14.0%   | 85%                                 | 95%          | 25           | \$4,696 |
| New                  | Single Family    | Central Furnace | Heat         | Gas Furnace                               | AFUE = 90% (Condensing Furnace)                              | AFUE = 80%                                     | 480                           | 11.1%   | NA                                  | NA           | 18           | \$788   |
| New                  | Single Family    | Central Furnace | Heat         | Gas Furnace                               | AFUE = 95% (Condensing Furnace)                              | AFUE = 80%                                     | 480                           | 15.8%   | NA                                  | NA           | 18           | \$1,103 |
| New                  | Single Family    | Central Furnace | Heat         | Canned Lighting Air Tight Sealing         | Canned Lighting Air Tight Sealing                            | No Air tight Sealing                           | 423                           | 3.3%  | 75%                                 | 25%          | 30           | \$3     |
| New                  | Single Family    | Central Furnace | Heat         | Construction - ICF                        | Concrete Framing   | Standard Wood Framing                          | 423                           | 44.0%   | 45%                                 | 95%          | 30           | \$11629 |
| New                  | Single Family    | Central Furnace | Heat         | Construction - SIP                        | Specialty Framing  | Standard Wood Framing                          | 423                           | 14.0%   | 45%                                 | 95%          | 30           | \$6,564 |
| New                  | Single Family    | Central Furnace | Heat         | Doors                                     | R-11 (Steel Doors with foam core)                            | Standard non-thermal wood door (R-2)           | 423                           | 5.0%  | 85%                                 | 50%          | 30           | \$116   |
| New                  | Single Family    | Central Furnace | Heat         | Doors                                     | R-5 (Composite Doors with foam core)                         | Standard non-thermal wood door (R-2)           | 423                           | 3.0%  | 85%                                 | 55%          | 12           | \$42    |
| New                  | Single Family    | Central Furnace | Heat         | Duct Location                             | Conditioned Space Design - Duct Loss Is Not A Concern        | Ducts in Unconditioned Space (Duct loss)       | 423                           | 8.0%  | 85%                                 | 15%          | 30           | \$210   |
| New                  | Single Family    | Central Furnace | Heat         | Duct Sealing                              | Duct Sealing   | No Duct Sealing                                | 423                           | 6.0%  | 0%                                  | 65%          | 20           | \$447   |
| New                  | Single Family    | Central Furnace | Heat         | Duct Sealing - Aerosol-Based              | Spray-in ductwork sealant to minimize duct leaks             | New homes with AFUE HVAC, SEER 13              | 423                           | 19.0%   | 0%                                  | 95%          | 25           | \$525   |
| New                  | Single Family    | Central Furnace | Heat         | Gas Furnace - Maintenance - New Equipment | Maintenance  | No Maintenance                                 | 423                           | 4.0%  | 95%                                 | 75%          | 1            | \$105   |
| New                  | Single Family    | Central Furnace | Heat         | Gas Furnace - Proper Sizing               | Proper Sizing of Gas Furnace                                 | Oversized Gas Furnace                          | 423                           | 5.0%  | 53%                                 | 85%          | 18           | \$1     |

| Construction Vintage | Customer Segment | End Use         | Measure Name    | Measure Description                | Base Equipment   | Baseline therm (UEC or EUJ)                         | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|-----------------|-----------------|------------------------------------|--|---|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| New                  | Single Family    | Central Furnace | Heat            | Green Roof                         | ecorooft   | Standard Roof                                       | 423                           | 6.5%  | 0%                                  | 98%          | 40           | \$21956 |
| New                  | Single Family    | Central Furnace | Heat            | Insulation (Basement - Wall) 2*4   | R-13   | Average Existing Insulation Value and/or Code Value | 423                           | 6.9%  | 14%                                 | 70%          | 25           | \$671   |
| New                  | Single Family    | Central Furnace | Heat            | Insulation (Basement - Wall) 2*4   | R-13 + R-5 sheathing   | R-13  | 423                           | 6.1%  | 14%                                 | 95%          | 25           | \$474   |
| New                  | Single Family    | Central Furnace | Heat            | Insulation (Ceiling)               | R-49   | State Code (R-38)                                   | 423                           | 2.0%  | 87%                                 | 85%          | 25           | \$365   |
| New                  | Single Family    | Central Furnace | Heat            | Insulation (Floor)                 | R-38   | State Code (R-30)                                   | 423                           | 2.0%  | 75%                                 | 90%          | 25           | \$884   |
| New                  | Single Family    | Central Furnace | Heat            | Insulation (Rim And Band Joist)    | R-10   | No Rim And Band Joist Insulation                    | 423                           | 3.0%  | 80%                                 | 45%          | 25           | \$130   |
| New                  | Single Family    | Central Furnace | Heat            | Insulation (Rim And Band Joist)    | R-19   | R-10  | 423                           | 4.0%  | 80%                                 | 75%          | 25           | \$84    |
| New                  | Single Family    | Central Furnace | Heat            | Insulation (Slab)                  | R-15   | R-10  | 423                           | 1.4%  | 28%                                 | 64%          | 25           | \$223   |
| New                  | Single Family    | Central Furnace | Heat            | Insulation (wall) 2*6              | R-21 + R5 Sheathing  | State Code (R-21)                                   | 423                           | 2.8%  | 95%                                 | 85%          | 25           | \$2,363 |
| New                  | Single Family    | Central Furnace | Heat            | Integrated Space and Water Heating | Premium Efficiency AFUE = 90 - Condensing Furnace              | Standard Efficiency AFUE = 78- Condensing Furnace   | 423                           | 13.3%   | 60%                                 | 95%          | 15           | \$184   |
| New                  | Single Family    | Central Furnace | Heat            | Leak Proof Duct Fittings           | Quick connect fittings that do not require mastic or drawbands | 3-ton AC/furnace, 13 SEER                           | 423                           | 15.0%   | 0%                                  | 95%          | 30           | \$127   |
| New                  | Single Family    | Central Furnace | Heat            | Outlet Gasket                      | Install Outlet Gasket (Reduce Air Leakage)                     | No Outlet Gasket                                    | 423                           | 2.0%  | 95%                                 | 40%          | 5            | \$7     |
| New                  | Single Family    | Central Furnace | Heat            | Radiant Barrier (Ceiling)          | Install Radiant Barrier  | No Radiant Barrier                                  | 423                           | 2.0%  | 0%                                  | 97%          | 30           | \$305   |
| New                  | Single Family    | Central Furnace | Heat            | Spray in insulation 2*4 Wall       | 2*4Wall - closed cell foam insulation R-23                     | 2*6Wall R-21  | 423                           | 3.0%  | 95%                                 | 95%          | 25           | \$7,602 |
| New                  | Single Family    | Central Furnace | Heat            | Spray in insulation 2*6 Wall       | 2*6Wall - closed cell foam insulation R-37                     | 2*6Wall R-21  | 423                           | 11.0%   | 95%                                 | 95%          | 25           | \$11697 |
| New                  | Single Family    | Central Furnace | Heat            | Thermostat - Clock/Programmable    | Programmable Thermostat  | Manual Thermostat                                   | 423                           | 6.8%  | 85%                                 | 32%          | 15           | \$27    |
| New                  | Single Family    | Central Furnace | Heat            | Thermostat - Multi-Zone            | Individual Room Temperature Control for Major Occupied Rooms   | Programmable Thermostat - Central Control Only      | 423                           | 7.0%  | 65%                                 | 95%          | 12           | \$1,422 |
| New                  | Single Family    | Central Furnace | Heat            | Windows                            | U = 0.19   | U = 0.30  | 423                           | 16.0%   | 85%                                 | 95%          | 25           | \$4,696 |
| New                  | Single Family    | Cooking Oven    | Convection Oven | Convection Oven                    | Standard Oven  |   | 19                            | 23.0%   | 85%                                 | 85%          | 15           | \$305   |

| Construction Vintage | Customer Segment | End Use    | Measure Name                                   | Measure Description                             | Base Equipment                                     | Baseline therm (UEC or EUJ) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|--|---|--|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Single Family    | Dryer      | Clothes Dryer w Moisture Sensor                | High-Efficiency Clothes Dryer w Moisture Sensor | Standard Dryer without Moisture Sensor             | 36                          | 13.0%                         | NA  | NA                                  | 18           | \$53         |
| New                  | Single Family    | Pool Heat  | Pool Heaters                                   | Energy Efficient Heaters - 88% efficiency       | Standard Heaters - 83% efficiency                  | 253                         | 5.7%                          | 85%   | 65%                                 | 8            | \$483        |
| New                  | Single Family    | Water Heat | Water Heater (40 Gallon Gas)                   | EF=0.62   | EF = 0.59  | 295                         | 5.0%                          | NA  | NA                                  | 13           | \$81         |
| New                  | Single Family    | Water Heat | Water Heater (Gas)                             | EF=0.80 Condensing Water Heater                 | EF = 0.59  | 295                         | 26.3%                         | NA  | NA                                  | 13           | \$1,212      |
| New                  | Single Family    | Water Heat | Water Heater (Gas)                             | EF=0.86 Condensing Water Heater                 | EF = 0.59  | 295                         | 31.3%                         | NA  | NA                                  | 13           | \$1,289      |
| New                  | Single Family    | Water Heat | Clothes Washer                                 | Energy Star MEF = 1.83 (top Load)               | Standard Clothes Washer (1.26)                     | 243                         | 9.3%                          | 99%   | 68%                                 | 14           | \$252        |
| New                  | Single Family    | Water Heat | Clothes Washer                                 | Tier 2. MEF = 2.01 (front load)                 | Standard Clothes Washer (1.26)                     | 243                         | 11.2%                         | 99%   | 77%                                 | 14           | \$312        |
| New                  | Single Family    | Water Heat | Clothes Washer                                 | Tier 2. MEF = 2.2 (front load)                  | Standard Clothes Washer (1.26)                     | 243                         | 12.8%                         | 99%   | 77%                                 | 14           | \$417        |
| New                  | Single Family    | Water Heat | Desuperheater (Ground-Source Heat Pump) system | Desuperheater                                   | Standard Water_Heater - EF = 0.59 (40 Gallon Tank) | 243                         | 30.0%                         | 5%  | 90%                                 | 10           | \$251        |
| New                  | Single Family    | Water Heat | Dishwasher                                     | EF = 0.77                                       | EF = 0.65 (ENERGY STAR)                            | 243                         | 2.2%                          | 30%   | 35%                                 | 13           | \$514        |
| New                  | Single Family    | Water Heat | Dishwasher - Existing                          | EF = 0.65 (ENERGY STAR)                         | EF = 0.46 Existing Dishwasher                      | 243                         | 4.1%                          | 30%   | 15%                                 | 13           | \$11         |
| New                  | Single Family    | Water Heat | Drain Water Heat Recovery                      | Drain Water Heat Recovery (GFX or Power-Pipe)   | No Drain Water Heat Recovery                       | 243                         | 3.5%                          | 50%   | 95%                                 | 30           | \$630        |
| New                  | Single Family    | Water Heat | Faucet Aerators                                | 0.5 GPM   | 2.2 GPM  | 243                         | 4.5%                          | 95%   | 95%                                 | 9            | \$4          |
| New                  | Single Family    | Water Heat | Faucet Aerators                                | 1.5 GPM   | 2.2 GPM  | 243                         | 1.9%                          | 95%   | 55%                                 | 9            | \$3          |
| New                  | Single Family    | Water Heat | Hot Water Pipe Insulation                      | Install Insulation (R-4)                        | No insulation                                      | 243                         | 1.2%                          | 0%  | 37%                                 | 15           | \$8          |
| New                  | Single Family    | Water Heat | Integrated Space and Water Heating             | High Efficiency Water Heater EF =0.62           | Standard efficiency Water Heater EF = 0.59         | 243                         | 4.8%                          | 60%   | 95%                                 | 15           | \$71         |
| New                  | Single Family    | Water Heat | Low-Flow Showerheads                           | 1.75 GPM  | 2.5 GPM  | 243                         | 10.3%                         | 95%   | 65%                                 | 10           | \$11         |
| New                  | Single Family    | Water Heat | Solar Hot Water (SHW)                          | Solar thermal collector                         | Non-solar hot water heater                         | 243                         | 22.1%                         | 20%   | 95%                                 | 20           | \$8,930      |
| New                  | Single Family    | Water Heat | Tankless Water_Heater                          | EF = 0.78, 4.3 gpm                              | EF = 0.59  | 243                         | 24.4%                         | 75%   | 97%                                 | 20           | \$1,398      |
| New                  | Single Family    | Water Heat | Water_Heater Tank Blanket/Insulation           | Install Insulation (R-5)                        | No Tank Insulation                                 | 243                         | 6.5%                          | 0%  | 63%                                 | 10           | \$19         |
| New                  | Single Family    | Water Heat | Water_Heater Thermostat Setback                | 120 degrees                                     | 135 degrees  | 243                         | 6.0%                          | 95%   | 43%                                 | 5            | \$0          |



# Commercial Electric Measures

| Construction Vintage | Customer Segment | End Use | Measure Name     | Measure Description   | Base Equipment  | Baseline kWh (UEC or EU)                 | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|---------|------------------|---|---|--|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Chiller - Premium Efficiency                                  | 0.507 kW/ton  | 0.634 kW/ton                             | 1.82                          | 20.0%   | NA                                  | NA           | 20           | \$3,334 |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Chiller - Advanced Technology                                 | 0.461 kW/ton  | 0.634 kW/ton                             | 1.82                          | 27.3%   | NA                                  | NA           | 20           | \$4,156 |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Chiller - High Efficiency                                     | 0.574 kW/ton  | 0.634 kW/ton                             | 1.82                          | 9.5%  | NA                                  | NA           | 20           | \$1,196 |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Centrifugal Chiller - VSD Remodel for Existing                | VSD motor   | Constant Speed Motor                     | 1.87                          | 40.0%   | 43%                                 | 45%          | 10           | \$6,220 |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Chilled Water Piping Loop w/ VSD Control                      | VSD for Secondary Chilled Water Loop                                    | Primary Loop Only w/ Constant Speed Pump | 1.87                          | 7.6%  | 25%                                 | 70%          | 10           | \$7,543 |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Chilled Water Reset   | Install Chilled Water Reset   | No Chilled Water Reset                   | 1.87                          | 5.0%  | 95%                                 | 95%          | 10           | \$7,158 |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Chiller-Water Side Economizer                                 | Install Economizer  | No Economizer                            | 1.87                          | 5.0%  | 45%                                 | 90%          | 10           | \$17517 |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Commissioning - Retro Building Commissioning                  | Commissioning - Retro Building Commissioning                            | No Commissioning                         | 1.87                          | 12.5%   | 90%                                 | 40%          | 3            | \$2,071 |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Cooling Tower-Decrease Temperature                            | Approach 6 Deg F  | 10 Deg F                                 | 1.87                          | 8.0%  | 50%                                 | 94%          | 15           | \$746   |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Cooling Tower-Two-Speed Fan Motor                             | Two-Speed Tower Fans replace Single-Speed                               | Cooling Tower-One-Speed Fan Motor        | 1.87                          | 14.0%   | 95%                                 | 35%          | 10           | \$83    |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Cooling Tower-VSD Fan Control                                 | Variable-Speed Tower Fans replace Two-Speed                             | Cooling Tower-Two-Speed Fan Motor        | 1.87                          | 4.0%  | 95%                                 | 75%          | 10           | \$675   |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Direct Digital Control System-Installation                    | DDC Retrofit  | Pnuematic                                | 1.87                          | 15.0%   | 75%                                 | 59%          | 5            | \$10103 |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Direct Digital Control System-Optimization                    | DDC System (Optimized)  | DDC System (Basic)                       | 1.87                          | 10.0%   | 75%                                 | 80%          | 5            | \$5,658 |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control | Pnuematic                                | 1.87                          | 15.0%   | 50%                                 | 80%          | 5            | \$4,083 |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Duct Repair And Sealing                                       | Reduction In Duct Losses to 5%  | No Repair or Sealing, 15% duct losses    | 1.87                          | 2.5%  | 45%                                 | 45%          | 18           | \$4,203 |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Green Roof  | Vegetation on Roof  | Standard roofing techniques              | 1.87                          | 10.0%   | 15%                                 | 98%          | 30           | 106431  |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Infiltration Control (Caulking, Weather Stripping, etc.)      | Install Caulking And Weatherstripping (ACH 0.65)                        | Infiltration Conditions (ACH 1.0)        | 1.87                          | 5.0%  | 40%                                 | 10%          | 10           | \$2,460 |

| Construction Vintage | Customer Segment | End Use | Measure Name     | Measure Description                                    | Base Equipment   | Baseline kWh (UEC or EU)                  | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------|------------------|--|--|---|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Insulation (Ceiling)                                   | R-38   | R-21 (Code)                               | 1.87 2.0%                     | 75%   | 95%                                 | 25           | \$5,463      |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Insulation (Ceiling)                                   | R-49   | R-21 (Code)                               | 1.87 3.0%                     | 75%   | 98%                                 | 25           | \$7,249      |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Insulation (Ceiling) - Existing to Code                | R-21 (Code)  | Existing Ceiling Insulation (Average R-9) | 1.87 2.4%                     | 75%   | 85%                                 | 25           | \$6,409      |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Insulation (Ceiling) - Zero to Code                    | R-21 (Code)  | R-0                                       | 1.87 6.0%                     | 75%   | 0%                                  | 25           | \$6,409      |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Insulation (Duct) (Unconditioned Spaces)               | Install New Duct Insulation (R-8)  | R-0                                       | 1.87 4.4%                     | 10%   | 15%                                 | 25           | \$1,175      |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Insulation (Duct) (Unconditioned Spaces)               | R-4  | R-0                                       | 1.87 2.4%                     | 10%   | 15%                                 | 25           | \$1,224      |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Insulation (Wall)                                      | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)               | 1.87 3.0%                     | 10%   | 95%                                 | 25           | \$2,479      |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Insulation (Wall) - Zero to Code                       | R-19 (2x6 Framing) - (Code)  | R-0                                       | 1.87 10.0%                    | 10%   | 0%                                  | 25           | \$2,685      |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Insulation - Floor (Non-Slab)                          | R-19   | R-10 (Code)                               | 1.87 1.0%                     | 35%   | 90%                                 | 25           | \$946        |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Insulation - Floor (Non-Slab) - Existing to Code       | R-10 (Code)  | R-0                                       | 1.87 3.0%                     | 35%   | 90%                                 | 25           | \$5,463      |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Pipe Insulation  | R-4  | R-0                                       | 1.87 1.0%                     | 65%   | 45%                                 | 15           | \$215        |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Sensible And Total Heat Recovery Devices               | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery                          | 1.87 25.0%                    | 25%   | 98%                                 | 10           | \$22168      |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Turbocor Compressor                                    | 0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)                                 | 0.634 kW/ton (Code) chiller water cooled  | 1.87 44.8%                    | 60%   | 99%                                 | 20           | \$20427      |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Windows  | U = 0.35   | U = 0.55 (Code)                           | 1.87 0.9%                     | 80%   | 80%                                 | 25           | \$9,436      |
| Existing             | Dry Retail       | Goods   | Cooling Chillers | Windows - Existing to Code                             | U = 0.55 (Code)  | Existing Windows (U=0.65)                 | 1.87 0.5%                     | 10%   | 80%                                 | 25           | \$26640      |
| Existing             | Dry Retail       | Goods   | Cooling DX       | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3) | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)   | 10.3 EER Rooftop Unit (State Code)        | 1.98 14.2%                    | NA  | NA                                  | 15           | \$7,460      |
| Existing             | Dry Retail       | Goods   | Cooling DX       | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)    | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)  | 10.3 EER Rooftop Unit (State Code)        | 1.98 6.4%                     | NA  | NA                                  | 15           | \$3,971      |
| Existing             | Dry Retail       | Goods   | Cooling DX       | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)  | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)  | 10.3 EER Rooftop Unit (State Code)        | 1.98 10.4%                    | NA  | NA                                  | 15           | \$6,156      |

| Construction Vintage | Customer Segment | End Use | Measure Name | Measure Description   | Base Equipment  | Baseline kWh (UEC or EU)                  | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|---------|--------------|---|---|---|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| Existing             | Dry Retail       | Goods   | Cooling DX   | Commissioning - Retro Building Commissioning                  | Commissioning - Retro Building Commissioning                            | No Commissioning                          | 2.03                          | 12.5%   | 90%                                 | 40%          | 3            | \$2,071 |
| Existing             | Dry Retail       | Goods   | Cooling DX   | Cooling DX Package-Air Side Economizer                        | Air-Side Economizer   | No Economizer                             | 2.03                          | 15.0%   | 10%                                 | 80%          | 15           | \$6,043 |
| Existing             | Dry Retail       | Goods   | Cooling DX   | Direct / Indirect Evaporative Cooling, Pre-Cooling            | Direct / Indirect Evaporative Cooling, Pre-Cooling                      | No modification to DX system              | 2.03                          | 25.0%   | 50%                                 | 85%          | 15           | \$21889 |
| Existing             | Dry Retail       | Goods   | Cooling DX   | Direct Digital Control System-Installation                    | DDC Retrofit  | Pneumatic                                 | 2.03                          | 15.0%   | 75%                                 | 59%          | 5            | \$10103 |
| Existing             | Dry Retail       | Goods   | Cooling DX   | Direct Digital Control System-Optimization                    | DDC System (Optimized)  | DDC System (Basic)                        | 2.03                          | 10.0%   | 75%                                 | 80%          | 5            | \$5,658 |
| Existing             | Dry Retail       | Goods   | Cooling DX   | Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control | Pneumatic                                 | 2.03                          | 15.0%   | 50%                                 | 80%          | 5            | \$4,083 |
| Existing             | Dry Retail       | Goods   | Cooling DX   | Duct Repair And Sealing                                       | Reduction In Duct Losses to 5%  | No Repair or Sealing, 15% duct losses     | 2.03                          | 2.5%  | 45%                                 | 45%          | 18           | \$4,203 |
| Existing             | Dry Retail       | Goods   | Cooling DX   | Green Roof  | Vegetation on Roof  | Standard roofing techniques               | 2.03                          | 10.0%   | 15%                                 | 98%          | 30           | 106431  |
| Existing             | Dry Retail       | Goods   | Cooling DX   | Infiltration Control (Caulking, Weather Stripping, etc.)      | Install Caulking And Weatherstripping (ACH 0.65)                        | Infiltration Conditions (ACH 1.0)         | 2.03                          | 5.0%  | 40%                                 | 10%          | 10           | \$2,460 |
| Existing             | Dry Retail       | Goods   | Cooling DX   | Insulation (Ceiling)  | R-38  | R-21 (Code)                               | 2.03                          | 2.0%  | 75%                                 | 95%          | 25           | \$5,463 |
| Existing             | Dry Retail       | Goods   | Cooling DX   | Insulation (Ceiling)  | R-49  | R-21 (Code)                               | 2.03                          | 3.0%  | 75%                                 | 98%          | 25           | \$7,249 |
| Existing             | Dry Retail       | Goods   | Cooling DX   | Insulation (Ceiling) - Existing to Code                       | R-21 (Code)   | Existing Ceiling Insulation (Average R-9) | 2.03                          | 2.4%  | 75%                                 | 85%          | 25           | \$6,409 |
| Existing             | Dry Retail       | Goods   | Cooling DX   | Insulation (Ceiling) - Zero to Code                           | R-21 (Code)   | R-0                                       | 2.03                          | 6.0%  | 75%                                 | 0%           | 25           | \$6,409 |
| Existing             | Dry Retail       | Goods   | Cooling DX   | Insulation (Duct) (Unconditioned Spaces)                      | Install New Duct Insulation (R-8)                                       | R-0                                       | 2.03                          | 4.4%  | 10%                                 | 15%          | 25           | \$1,175 |
| Existing             | Dry Retail       | Goods   | Cooling DX   | Insulation (Duct) (Unconditioned Spaces)                      | R-4   | R-0                                       | 2.03                          | 2.4%  | 10%                                 | 15%          | 25           | \$1,224 |
| Existing             | Dry Retail       | Goods   | Cooling DX   | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced   | R-19 (2x6 Framing) - (Code)               | 2.03                          | 3.0%  | 10%                                 | 95%          | 25           | \$2,479 |
| Existing             | Dry Retail       | Goods   | Cooling DX   | Insulation (Wall) - Existing to Code                          | R-19 (2x6 Framing) - (Code)   | Existing R-value (Average R-3)            | 2.03                          | 8.4%  | 10%                                 | 35%          | 25           | \$2,716 |
| Existing             | Dry Retail       | Goods   | Cooling DX   | Insulation (Wall) - Zero to Code                              | R-19 (2x6 Framing) - (Code)   | R-0                                       | 2.03                          | 10.0%   | 10%                                 | 0%           | 25           | \$2,685 |
| Existing             | Dry Retail       | Goods   | Cooling DX   | Insulation - Floor (Non-Slab)                                 | R-19  | R-10 (Code)                               | 2.03                          | 1.0%  | 35%                                 | 90%          | 25           | \$946   |

| Construction Vintage | Customer Segment | End Use | Measure Name | Measure Description   | Base Equipment  | Baseline kWh (UEC or EU)   | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|---------|--------------|---|---|--|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| Existing             | Dry Retail       | Goods   | Cooling DX   | Insulation - Floor (Non-Slab) - Existing to Code              | R-10 (Code)   | R-0  | 2.03                          | 3.0%  | 35%                                 | 90%          | 25           | \$5,463 |
| Existing             | Dry Retail       | Goods   | Cooling DX   | Thermostat - Programmable                                     | Energy Star Programmable Thermostat   | Manual Thermostat  | 2.03                          | 3.0%  | 95%                                 | 54%          | 15           | \$145   |
| Existing             | Dry Retail       | Goods   | Cooling DX   | Windows   | U = 0.35  | U = 0.55 (Code)  | 2.03                          | 0.9%  | 80%                                 | 80%          | 25           | \$9,436 |
| Existing             | Dry Retail       | Goods   | Cooling DX   | Windows - Existing to Code                                    | U = 0.55 (Code)   | Existing Windows (U=0.65)  | 2.03                          | 0.5%  | 10%                                 | 80%          | 25           | \$26640 |
| Existing             | Dry Retail       | Goods   | HVAC Aux     | Automated Exhaust VFD Control - Parking Garage CO sensor      | CO Sensors  | No CO Sensors  | 2.74                          | 20.0%   | 1%                                  | 85%          | 10           | \$2,147 |
| Existing             | Dry Retail       | Goods   | HVAC Aux     | Cooking Hood Controls   | Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air | No Cooking Hood Controls   | 2.74                          | 7.5%  | 25%                                 | 65%          | 10           | \$13133 |
| Existing             | Dry Retail       | Goods   | HVAC Aux     | Motor - Premium-Efficiency                                    | PE Motors for HVAC Applications   | Standard Efficiency Motors   | 2.74                          | 3.8%  | 85%                                 | 81%          | 10           | \$274   |
| Existing             | Dry Retail       | Goods   | HVAC Aux     | Motor - Pump & Fan System - Variable Speed Control            | Pump And Fan System Optimization w/ VSD   | No Pump And Fan System VSD Optimization  | 2.74                          | 33.8%   | 85%                                 | 75%          | 20           | \$2,132 |
| Existing             | Dry Retail       | Goods   | HVAC Aux     | Motor - VAV Box High-Efficiency                               | ECM Motors  | Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control | 2.74                          | 8.8%  | 10%                                 | 77%          | 10           | \$3,837 |
| Existing             | Dry Retail       | Goods   | HVAC Aux     | Optimized Variable Volume Lab Hood Design                     | Optimized Variable Volume Lab Hood Design   | Constant Volume Lab Hood Design  | 2.74                          | 1.6%  | 5%                                  | 94%          | 10           | \$1,791 |
| Existing             | Dry Retail       | Goods   | Heat Pump    | High-Efficiency EER=11.0, COP=3.5                             | High-Efficiency EER=11.0, COP=3.5   | EER=10.1, COP=3.2  | 2.90                          | 16.8%   | NA                                  | NA           | 15           | \$5,288 |
| Existing             | Dry Retail       | Goods   | Heat Pump    | Premium-Efficiency EER=11.8, COP=3.8                          | Premium-Efficiency EER=11.8, COP=3.8  | EER=10.1, COP=3.2  | 2.90                          | 30.2%   | NA                                  | NA           | 15           | \$11323 |
| Existing             | Dry Retail       | Goods   | Heat Pump    | Commissioning - Retro Building Commissioning                  | Commissioning - Retro Building Commissioning  | No Commissioning   | 3.02                          | 12.5%   | 90%                                 | 40%          | 3            | \$2,071 |
| Existing             | Dry Retail       | Goods   | Heat Pump    | Direct Digital Control System-Installation                    | DDC Retrofit  | Pneumatic  | 3.02                          | 15.0%   | 75%                                 | 59%          | 5            | \$10103 |
| Existing             | Dry Retail       | Goods   | Heat Pump    | Direct Digital Control System-Optimization                    | DDC System (Optimized)  | DDC System (Basic)   | 3.02                          | 10.0%   | 75%                                 | 80%          | 5            | \$5,658 |
| Existing             | Dry Retail       | Goods   | Heat Pump    | Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control   | Pneumatic  | 3.02                          | 15.0%   | 50%                                 | 80%          | 5            | \$4,083 |
| Existing             | Dry Retail       | Goods   | Heat Pump    | Duct Repair And Sealing                                       | Reduction In Duct Losses to 5%  | No Repair or Sealing, 15% duct losses  | 3.02                          | 2.5%  | 45%                                 | 45%          | 18           | \$4,203 |
| Existing             | Dry Retail       | Goods   | Heat Pump    | Exhaust Air to Ventilation Air Heat Recovery                  | Exhaust Air Heat Recovery   | No Heat Recovery   | 3.02                          | 4.8%  | 5%                                  | 94%          | 10           | \$9,529 |

| Construction Vintage | Customer Segment | End Use | Measure Name | Measure Description                                      | Base Equipment                                   | Baseline kWh (UEC or EU)                     | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|---------|--------------|--|--|--|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| Existing             | Dry Retail       | Goods   | Heat Pump    | Green Roof   | Vegetation on Roof                               | Standard roofing techniques                  | 3.02                          | 2.0%  | 15%                                 | 98%          | 30           | 106431  |
| Existing             | Dry Retail       | Goods   | Heat Pump    | Heat Pump - Ground Source (Closed Loop)                  | GSHP: COP=3.1, EER=13.4                          | Stnd. Air Source HP 'EER=10.1, COP=3.2       | 3.02                          | 17.8%   | 5%                                  | 92%          | 20           | \$61334 |
| Existing             | Dry Retail       | Goods   | Heat Pump    | Heat Pump - Ground Source (Closed Loop)                  | GSHP: COP=4.0, EER=20                            | Stnd. Air Source HP 'EER=10.1, COP=3.2       | 3.02                          | 40.9%   | 5%                                  | 92%          | 20           | 115230  |
| Existing             | Dry Retail       | Goods   | Heat Pump    | Heat Pump - Water Source (Closed Loop)                   | WSHP: COP=4.2, EER=12.0                          | Stnd. Air Source Heat Pump'EER=10.1, COP=3.2 | 3.02                          | 19.1%   | 5%                                  | 90%          | 20           | \$12337 |
| Existing             | Dry Retail       | Goods   | Heat Pump    | Heat Pump - Water Source (Closed Loop)                   | WSHP: COP=4.8, EER=14.5                          | Stnd. Air Source Heat Pump'EER=10.1, COP=3.2 | 3.02                          | 32.0%   | 5%                                  | 90%          | 20           | \$16294 |
| Existing             | Dry Retail       | Goods   | Heat Pump    | Infiltration Control (Caulking, Weather Stripping, etc.) | Install Caulking And Weatherstripping (ACH 0.65) | Infiltration Conditions (ACH 1.0)            | 3.02                          | 8.3%  | 40%                                 | 10%          | 10           | \$2,460 |
| Existing             | Dry Retail       | Goods   | Heat Pump    | Insulation (Ceiling)                                     | R-38   | R-21 (Code)                                  | 3.02                          | 5.9%  | 75%                                 | 95%          | 25           | \$5,463 |
| Existing             | Dry Retail       | Goods   | Heat Pump    | Insulation (Ceiling)                                     | R-49   | R-21 (Code)                                  | 3.02                          | 8.9%  | 75%                                 | 98%          | 25           | \$7,249 |
| Existing             | Dry Retail       | Goods   | Heat Pump    | Insulation (Ceiling) - Existing to Code                  | R-21 (Code)                                      | Existing Ceiling Insulation (Average R-9)    | 3.02                          | 5.5%  | 75%                                 | 85%          | 25           | \$6,409 |
| Existing             | Dry Retail       | Goods   | Heat Pump    | Insulation (Ceiling) - Zero to Code                      | R-21 (Code)                                      | R-0  | 3.02                          | 13.8%   | 75%                                 | 0%           | 25           | \$6,409 |
| Existing             | Dry Retail       | Goods   | Heat Pump    | Insulation (Duct) (Unconditioned Spaces)                 | Install New Duct Insulation (R-8)                | R-0  | 3.02                          | 4.4%  | 10%                                 | 15%          | 25           | \$1,175 |
| Existing             | Dry Retail       | Goods   | Heat Pump    | Insulation (Duct) (Unconditioned Spaces)                 | R-4  | R-0  | 3.02                          | 2.4%  | 10%                                 | 15%          | 25           | \$1,224 |
| Existing             | Dry Retail       | Goods   | Heat Pump    | Insulation (Wall)  | R-25 (2x6 Framing) - Advanced                    | R-19 (2x6 Framing) - (Code)                  | 3.02                          | 5.0%  | 10%                                 | 95%          | 25           | \$2,479 |
| Existing             | Dry Retail       | Goods   | Heat Pump    | Insulation (Wall) - Existing to Code                     | R-19 (2x6 Framing) - (Code)                      | Existing R-value (Average R-3)               | 3.02                          | 16.6%   | 10%                                 | 35%          | 25           | \$2,716 |
| Existing             | Dry Retail       | Goods   | Heat Pump    | Insulation (Wall) - Zero to Code                         | R-19 (2x6 Framing) - (Code)                      | R-0  | 3.02                          | 19.8%   | 10%                                 | 0%           | 25           | \$2,685 |
| Existing             | Dry Retail       | Goods   | Heat Pump    | Insulation - Floor (Non-Slab)                            | R-19   | R-10 (Code)                                  | 3.02                          | 3.7%  | 35%                                 | 90%          | 25           | \$946   |
| Existing             | Dry Retail       | Goods   | Heat Pump    | Insulation - Floor (Non-Slab) - Existing to Code         | R-10 (Code)                                      | R-0  | 3.02                          | 11.1%   | 35%                                 | 90%          | 25           | \$5,463 |
| Existing             | Dry Retail       | Goods   | Heat Pump    | Thermostat - Programmable                                | Energy Star Programmable Thermostat              | Manual Thermostat                            | 3.02                          | 3.0%  | 95%                                 | 54%          | 15           | \$145   |
| Existing             | Dry Retail       | Goods   | Heat Pump    | Windows  | U = 0.35   | U = 0.55 (Code)                              | 3.02                          | 6.4%  | 80%                                 | 80%          | 25           | \$9,436 |

| Construction Vintage | Customer Segment | End Use | Measure Name | Measure Description   | Base Equipment  | Baseline kWh (UEC or EU)                            | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|---------|--------------|---|---|---|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| Existing             | Dry Retail       | Goods   | Heat Pump    | Windows - Existing to Code                                      | U = 0.55 (Code)   | Existing Windows (U=0.65)                           | 3.02                          | 4.2%  | 10%                                 | 80%          | 25           | \$26640 |
| Existing             | Dry Retail       | Goods   | Lighting     | Bi-Level Control, Stairwell Lighting                            | Occupancy Sensor Control, 50% Lighting Power during unoccupied Time | Continuous Full Power Lighting in Stairways         | 5.39                          | 2.0%  | 10%                                 | 75%          | 9            | \$828   |
| Existing             | Dry Retail       | Goods   | Lighting     | Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures | Continuous Dimming, Fluorescent Fixtures (Day-Lighting)             | No Dimming Controls                                 | 5.39                          | 6.0%  | 30%                                 | 84%          | 9            | \$1,261 |
| Existing             | Dry Retail       | Goods   | Lighting     | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 15%             | Code Required LPD And Control Strategies: LPD = 1.5 | 5.39                          | 15.0%   | 90%                                 | 70%          | 14           | \$2,566 |
| Existing             | Dry Retail       | Goods   | Lighting     | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 20%             | Code Required LPD And Control Strategies: LPD = 1.5 | 5.39                          | 20.0%   | 75%                                 | 85%          | 14           | \$5,686 |
| Existing             | Dry Retail       | Goods   | Lighting     | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 25%             | Code Required LPD And Control Strategies: LPD = 1.5 | 5.39                          | 25.0%   | 70%                                 | 90%          | 14           | \$8,876 |
| Existing             | Dry Retail       | Goods   | Lighting     | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 30%             | Code Required LPD And Control Strategies: LPD = 1.5 | 5.39                          | 31.5%   | 50%                                 | 95%          | 14           | \$3,675 |
| Existing             | Dry Retail       | Goods   | Lighting     | HE Fixtures/Design - Existing to Code                           | Code Required LPD And Control Strategies: LPD = 1.5                 | Existing Lighting Design                            | 5.39                          | 38.5%   | 95%                                 | 45%          | 14           | \$12250 |
| Existing             | Dry Retail       | Goods   | Lighting     | LED Exit Lighting   | 5 Watts   | CFL Exit Sign (26 Watts)                            | 5.39                          | 1.6%  | 95%                                 | 65%          | 11           | \$53    |
| Existing             | Dry Retail       | Goods   | Lighting     | LED Refrigeration Case Lights                                   | LED Refrigeration Case Lights (28W)                                 | Fluorescent Refrigeration Case Lights (60W)         | 5.39                          | 0.4%  | 10%                                 | 80%          | 13           | \$630   |
| Existing             | Dry Retail       | Goods   | Lighting     | LED Solid State White Lighting Package                          | Landscape, merchandise, signage, structure & task lighting          | 50W 10hrs/day, 365 day/yr                           | 5.39                          | 2.3%  | 10%                                 | 95%          | 14           | \$37    |
| Existing             | Dry Retail       | Goods   | Lighting     | Occupancy Sensor Control, Fluorescent                           | Occupancy Sensor Control, Fluorescent                               | No Occupancy Sensor                                 | 5.39                          | 4.0%  | 45%                                 | 88%          | 9            | \$196   |
| Existing             | Dry Retail       | Goods   | Lighting     | Time Clocks And Timers  | Install Time Clock Lighting   | No Time Clock                                       | 5.39                          | 4.9%  | 85%                                 | 86%          | 9            | \$215   |
| Existing             | Dry Retail       | Goods   | Plug Load    | Energy Star - Battery Charging System                           | Energy Star Battery Charging System                                 | Non-Energy Star Battery Chargers                    | 2.78                          | 0.4%  | 95%                                 | 90%          | 7            | \$2     |
| Existing             | Dry Retail       | Goods   | Plug Load    | Energy Star - Computer  | Energy Star Features Enabled  | Non-Energy Star Features                            | 2.78                          | 13.6%   | 64%                                 | 25%          | 4            | \$1     |
| Existing             | Dry Retail       | Goods   | Plug Load    | Energy Star - Copiers   | Energy Star or Better Office Equipment: Copiers,                    | Office Equipment: Copiers, Standard                 | 2.78                          | 4.3%  | 20%                                 | 45%          | 6            | \$165   |
| Existing             | Dry Retail       | Goods   | Plug Load    | Energy Star - Fax   | Energy Star Features Enabled  | Non-Energy Star Features                            | 2.78                          | 1.8%  | 75%                                 | 55%          | 4            | \$1     |
| Existing             | Dry Retail       | Goods   | Plug Load    | Energy Star - Monitors  | Energy Star Features Enabled  | Non-Energy Star Features                            | 2.78                          | 18.4%   | 64%                                 | 15%          | 4            | \$158   |
| Existing             | Dry Retail       | Goods   | Plug Load    | Energy Star - Printers  | Energy Star Features Enabled  | Non-Energy Star Features                            | 2.78                          | 1.3%  | 75%                                 | 40%          | 5            | \$16    |

| Construction Vintage | Customer Segment | End Use | Measure Name | Measure Description   | Base Equipment   | Baseline kWh (UEC or EU)                  | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|---------|--------------|---|--|---|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| Existing             | Dry Retail       | Goods   | Plug Load    | Energy Star - Scanners  | Energy Star Features Enabled   | Non-Energy Star Features                  | 2.78                          | 0.9%  | 75%                                 | 45%          | 4            | \$1     |
| Existing             | Dry Retail       | Goods   | Plug Load    | Energy Star - Water Cooler                                    | Energy Star Water Cooler (Hot/Cold Water)  | Non-Energy Star Water Cooler              | 2.78                          | 1.4%  | 15%                                 | 75%          | 10           | \$1     |
| Existing             | Dry Retail       | Goods   | Plug Load    | Office Computer Network Management                            | Office Computer Network Energy Management  | No Network Management                     | 2.78                          | 1.8%  | 95%                                 | 30%          | 3            | \$310   |
| Existing             | Dry Retail       | Goods   | Plug Load    | Power Supply 80+ Office Measure                               | 80% Efficient Power supply   | No 80+                                    | 2.78                          | 1.0%  | 95%                                 | 86%          | 7            | \$0     |
| Existing             | Dry Retail       | Goods   | Plug Load    | Refrigerator eCube  | Refrigerator eCube   | No Refrigerator eCube                     | 2.78                          | 1.2%  | 75%                                 | 95%          | 10           | \$86    |
| Existing             | Dry Retail       | Goods   | Plug Load    | Residential-Size Refrigerator                                 | Energy Star Residential-Size Refrigerator  | Residential-Size Refrigerator - Standard  | 2.78                          | 0.3%  | 5%                                  | 65%          | 13           | \$126   |
| Existing             | Dry Retail       | Goods   | Plug Load    | Residential-Size Refrigerator/Freezer - Early Replacement     | Energy Star Refrigerator/Freezer   | Baseline Refrigerator/Freezer             | 2.78                          | 3.6%  | 25%                                 | 35%          | 7            | \$578   |
| Existing             | Dry Retail       | Goods   | Plug Load    | Vending Machine   | Energy Star Vending Machines - High-Efficiency   | Vending Machines - Standard               | 2.78                          | 6.6%  | 5%                                  | 80%          | 14           | \$189   |
| Existing             | Dry Retail       | Goods   | Plug Load    | Vending Miser   | Passive Infrared Sensor on Vending Machine Monitoring<br>Vacancy of Area And Cycles Cooling - Controls | No Vending Miser - No controls            | 2.78                          | 6.8%  | 5%                                  | 25%          | 3            | \$297   |
| Existing             | Dry Retail       | Goods   | Space Heat   | Commissioning - Retro Building Commissioning                  | Commissioning - Retro Building Commissioning   | No Commissioning                          | 2.04                          | 12.5%   | 90%                                 | 40%          | 3            | \$2,071 |
| Existing             | Dry Retail       | Goods   | Space Heat   | Direct Digital Control System-Installation                    | DDC Retrofit   | Pneumatic                                 | 2.04                          | 15.0%   | 75%                                 | 59%          | 5            | \$10103 |
| Existing             | Dry Retail       | Goods   | Space Heat   | Direct Digital Control System-Optimization                    | DDC System (Optimized)   | DDC System (Basic)                        | 2.04                          | 10.0%   | 75%                                 | 80%          | 5            | \$5,658 |
| Existing             | Dry Retail       | Goods   | Space Heat   | Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control                                | Pneumatic                                 | 2.04                          | 15.0%   | 50%                                 | 80%          | 5            | \$4,083 |
| Existing             | Dry Retail       | Goods   | Space Heat   | Duct Repair And Sealing                                       | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses     | 2.04                          | 2.5%  | 45%                                 | 45%          | 18           | \$4,203 |
| Existing             | Dry Retail       | Goods   | Space Heat   | Exhaust Air to Ventilation Air Heat Recovery                  | Exhaust Air Heat Recovery  | No Heat Recovery                          | 2.04                          | 15.0%   | 5%                                  | 94%          | 10           | \$9,529 |
| Existing             | Dry Retail       | Goods   | Space Heat   | Infiltration Control (Caulking, Weather Stripping, etc.)      | Install Caulking And Weatherstripping (ACH 0.65)   | Infiltration Conditions (ACH 1.0)         | 2.04                          | 10.0%   | 40%                                 | 10%          | 10           | \$2,460 |
| Existing             | Dry Retail       | Goods   | Space Heat   | Insulation (Ceiling)  | R-49   | R-30                                      | 2.04                          | 8.0%  | 75%                                 | 98%          | 25           | \$5,463 |
| Existing             | Dry Retail       | Goods   | Space Heat   | Insulation (Ceiling) - Existing to Code                       | R-30   | Existing Ceiling Insulation (Average R-9) | 2.04                          | 12.5%   | 75%                                 | 85%          | 25           | \$6,409 |
| Existing             | Dry Retail       | Goods   | Space Heat   | Insulation (Ceiling) - Zero to Code                           | R-30   | R-0                                       | 2.04                          | 25.0%   | 75%                                 | 0%           | 25           | \$6,409 |



| Construction Vintage | Customer Segment | End Use | Measure Name | Measure Description                                   | Base Equipment   | Baseline kWh (UEC or EU)                                   | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------|--------------|---|--|--|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Dry Retail       | Goods   | Space Heat   | Insulation (Duct) (Unconditioned Spaces)              | Install New Duct Insulation (R-8)  | R-0  | 2.04 4.4%                     | 10%   | 15%                                 | 25           | \$1,175      |
| Existing             | Dry Retail       | Goods   | Space Heat   | Insulation (Duct) (Unconditioned Spaces)              | R-4  | R-0  | 2.04 2.4%                     | 10%   | 15%                                 | 25           | \$1,224      |
| Existing             | Dry Retail       | Goods   | Space Heat   | Insulation (Wall)                                     | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                                | 2.04 6.0%                     | 10%   | 95%                                 | 25           | \$2,479      |
| Existing             | Dry Retail       | Goods   | Space Heat   | Insulation (Wall) - Existing to Code                  | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)                             | 2.04 21.1%                    | 10%   | 35%                                 | 25           | \$2,716      |
| Existing             | Dry Retail       | Goods   | Space Heat   | Insulation (Wall) - Zero to Code                      | R-19 (2x6 Framing) - (Code)  | R-0  | 2.04 25.0%                    | 10%   | 0%                                  | 25           | \$2,685      |
| Existing             | Dry Retail       | Goods   | Space Heat   | Insulation - Floor (Non-Slab)                         | R-19   | R-10 (Code)  | 2.04 5.0%                     | 35%   | 90%                                 | 25           | \$946        |
| Existing             | Dry Retail       | Goods   | Space Heat   | Insulation - Floor (Non-Slab) - Existing to Code      | R-10 (Code)  | R-0  | 2.04 15.0%                    | 35%   | 90%                                 | 25           | \$5,463      |
| Existing             | Dry Retail       | Goods   | Space Heat   | Sensible And Total Heat Recovery Devices              | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery   | 2.04 25.0%                    | 25%   | 98%                                 | 10           | \$22168      |
| Existing             | Dry Retail       | Goods   | Space Heat   | Thermostat - Programmable                             | Energy Star Programmable Thermostat  | Manual Thermostat  | 2.04 3.0%                     | 95%   | 54%                                 | 15           | \$145        |
| Existing             | Dry Retail       | Goods   | Space Heat   | Windows   | U = 0.35   | U = 0.40   | 2.04 3.1%                     | 80%   | 80%                                 | 25           | \$2,359      |
| Existing             | Dry Retail       | Goods   | Space Heat   | Windows - Existing to Code                            | U = 0.40   | Existing Windows (U=0.65)                                  | 2.04 9.3%                     | 10%   | 80%                                 | 25           | \$33717      |
| Existing             | Dry Retail       | Goods   | Water Heat   | Water_Heater (40 Gallon Electric) - Residential Sized | EF = 0.95  | EF = 0.92  | 0.27 3.3%                     | NA  | NA                                  | 20           | \$162        |
| Existing             | Dry Retail       | Goods   | Water Heat   | Clothes Washer - Ozonating                            | Ozonating Clothes Washer   | Standard Commercial Clothes Washer                         | 0.28 15.1%                    | 5%  | 95%                                 | 10           | \$8,704      |
| Existing             | Dry Retail       | Goods   | Water Heat   | Clothes Washer Commercial                             | Energy Star Commercial Clothes Washer MEF=1.72   | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.28 9.1%                     | 5%  | 80%                                 | 11           | \$305        |
| Existing             | Dry Retail       | Goods   | Water Heat   | Demand controlled Circulating Systems                 | Install demand-based control system (VFD Control by Demand)  | No demand control systems in place                         | 0.28 5.0%                     | 75%   | 94%                                 | 15           | \$2,919      |
| Existing             | Dry Retail       | Goods   | Water Heat   | Dishwashing - Residential Sized System                | EF = 0.65 (ENERGY STAR)  | Standard Dishwasher (FED Std. EF=0.46)                     | 0.28 4.8%                     | 45%   | 25%                                 | 13           | \$32         |
| Existing             | Dry Retail       | Goods   | Water Heat   | Dishwashing - Residential Sized System                | EF = 0.77  | Standard Dishwasher (FED Std. EF=0.46)                     | 0.28 6.7%                     | 45%   | 55%                                 | 13           | \$630        |
| Existing             | Dry Retail       | Goods   | Water Heat   | Drainwater Heat Recovery Water Heater                 | Install (Power-Pipe or GFX) - Heat Recovery Water Heater   | No Heat Recovery System                                    | 0.28 20.0%                    | 5%  | 92%                                 | 25           | \$875        |



| Construction Vintage | Customer Segment | End Use | Measure Name     | Measure Description                        | Base Equipment                                  | Baseline kWh (UEC or EU)                 | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------|------------------|--|---|--|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Dry Retail       | Goods   | Water Heat       | Faucet Aerators                            | 1.5 GPM Aerator                                 | 2.5 GPM Aerator (Federal Code)           | 0.28 4.0%                     | 95%   | 25%                                 | 10           | \$0          |
| Existing             | Dry Retail       | Goods   | Water Heat       | Faucet Aerators - Existing to Code         | 2.5 GPM Aerator (Federal Code)                  | 4.0 GPM Aerator                          | 0.28 3.8%                     | 95%   | 15%                                 | 10           | \$2          |
| Existing             | Dry Retail       | Goods   | Water Heat       | Heat Pump Water Heater                     | EF = 2.9  | EF=0.93 Baseline Electric Water Heater   | 0.28 58.9%                    | 40%   | 94%                                 | 15           | \$9,627      |
| Existing             | Dry Retail       | Goods   | Water Heat       | Hot Water (SHW) Pipe Insulation            | Install Insulation (R-4)                        | No Pipe Insulation                       | 0.28 1.0%                     | 80%   | 90%                                 | 15           | \$111        |
| Existing             | Dry Retail       | Goods   | Water Heat       | Low Flow Spray Heads                       | 1.6 GPM   | 3.0 GPM                                  | 0.28 2.3%                     | 10%   | 45%                                 | 5            | \$5          |
| Existing             | Dry Retail       | Goods   | Water Heat       | Low-Flow Showerheads                       | 2.0 GPM Showerhead                              | 2.5 GPM Showerhead (Federal Code)        | 0.28 1.1%                     | 15%   | 75%                                 | 10           | \$6          |
| Existing             | Dry Retail       | Goods   | Water Heat       | Low-Flow Showerheads - Existing to Code    | 2.5 GPM Showerhead (Federal Code)               | 4.5 GPM Showerhead                       | 0.28 2.5%                     | 15%   | 20%                                 | 10           | \$12         |
| Existing             | Dry Retail       | Goods   | Water Heat       | Solar RE - Solar Water Heater              | Passive solar water heating                     | Non-solar hot water heater               | 0.28 55.6%                    | 20%   | 95%                                 | 20           | \$8,930      |
| Existing             | Dry Retail       | Goods   | Water Heat       | Ultrasonic Faucet Control                  | Install Ultrasonic Motion Faucet Control        | No Faucet Control                        | 0.28 3.3%                     | 95%   | 95%                                 | 10           | \$207        |
| Existing             | Dry Retail       | Goods   | Water Heat       | Water Heater Thermostat Setback            | Thermostat Setback and Replcement (120 Degrees) | No Thermostat Setback (130 Degrees)      | 0.28 7.7%                     | 75%   | 45%                                 | 11           | \$107        |
| New                  | Dry Retail       | Goods   | Cooling Chillers | Chiller - Premium Efficiency               | 0.507 kW/ton                                    | 0.634 kW/ton                             | 0.99 20.0%                    | NA  | NA                                  | 20           | \$3,334      |
| New                  | Dry Retail       | Goods   | Cooling Chillers | Chiller - Advanced Technology              | 0.461 kW/ton                                    | 0.634 kW/ton                             | 0.99 27.3%                    | NA  | NA                                  | 20           | \$4,156      |
| New                  | Dry Retail       | Goods   | Cooling Chillers | Chiller - High Efficiency                  | 0.574 kW/ton                                    | 0.634 kW/ton                             | 0.99 9.5%                     | NA  | NA                                  | 20           | \$1,196      |
| New                  | Dry Retail       | Goods   | Cooling Chillers | Chilled Water Piping Loop w/ VSD Control   | VSD for Secondary Chilled Water Loop            | Primary Loop Only w/ Constant Speed Pump | 0.91 7.6%                     | 25%   | 70%                                 | 10           | \$7,543      |
| New                  | Dry Retail       | Goods   | Cooling Chillers | Chilled Water Reset                        | Install Chilled Water Reset                     | No Chilled Water Reset                   | 0.91 5.0%                     | 95%   | 95%                                 | 10           | \$7,158      |
| New                  | Dry Retail       | Goods   | Cooling Chillers | Commissioning - New Building Commissioning | Commissioning - New Building Commissioning      | No Commissioning                         | 0.91 12.5%                    | 90%   | 80%                                 | 3            | \$7,670      |
| New                  | Dry Retail       | Goods   | Cooling Chillers | Cooling Tower-Decrease Temperature         | Approach 6 Deg F                                | 10 Deg F                                 | 0.91 8.0%                     | 50%   | 94%                                 | 15           | \$746        |
| New                  | Dry Retail       | Goods   | Cooling Chillers | Direct Digital Control System-Optimization | DDC System (Optimized)                          | DDC System (Basic)                       | 0.91 10.0%                    | 75%   | 80%                                 | 5            | \$5,658      |
| New                  | Dry Retail       | Goods   | Cooling Chillers | Green Roof                                 | Vegetation on Roof                              | Standard roofing techniques              | 0.91 10.0%                    | 15%   | 98%                                 | 30           | 106431       |



| Construction Vintage | Customer Segment | End Use | Measure Name     | Measure Description                                    | Base Equipment   | Baseline kWh (UEC or EU)                 | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|---------|------------------|--|--|--|---------------------------|---|-------------------------------------|--------------|--------------|---------|
| New                  | Dry Retail       | Goods   | Cooling Chillers | Insulation (Ceiling)                                   | R-38   | R-21 (Code)                              | 0.91                      | 2.0%  | 75%                                 | 95%          | 25           | \$5,463 |
| New                  | Dry Retail       | Goods   | Cooling Chillers | Insulation (Ceiling)                                   | R-49   | R-21 (Code)                              | 0.91                      | 3.0%  | 75%                                 | 98%          | 25           | \$7,249 |
| New                  | Dry Retail       | Goods   | Cooling Chillers | Insulation (Wall)                                      | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)              | 0.91                      | 3.0%  | 95%                                 | 95%          | 25           | \$2,479 |
| New                  | Dry Retail       | Goods   | Cooling Chillers | Insulation - Floor (Non-Slab)                          | R-19   | R-10 (Code)                              | 0.91                      | 1.0%  | 35%                                 | 90%          | 25           | \$946   |
| New                  | Dry Retail       | Goods   | Cooling Chillers | Leak Proof Duct Fittings                               | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                     | 0.91                      | 10.0%   | 40%                                 | 98%          | 25           | \$1,628 |
| New                  | Dry Retail       | Goods   | Cooling Chillers | Sensible And Total Heat Recovery Devices               | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery                         | 0.91                      | 25.0%   | 50%                                 | 98%          | 10           | \$22168 |
| New                  | Dry Retail       | Goods   | Cooling Chillers | Turbocor Compressor                                    | 0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)                                 | 0.634 kW/ton (Code) chiller water cooled | 0.91                      | 44.8%   | 95%                                 | 99%          | 20           | \$16350 |
| New                  | Dry Retail       | Goods   | Cooling Chillers | Window RE - Window Overhangs                           | Overhangs over windows for shading   | No window overhangs                      | 0.91                      | 1.9%  | 75%                                 | 75%          | 30           | \$2,960 |
| New                  | Dry Retail       | Goods   | Cooling Chillers | Windows  | U = 0.35   | U = 0.55 (Code)                          | 0.91                      | 0.9%  | 80%                                 | 80%          | 25           | \$9,436 |
| New                  | Dry Retail       | Goods   | Cooling DX       | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3) | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)   | 10.3 EER Rooftop Unit (State Code)       | 1.08                      | 14.2%   | NA                                  | NA           | 15           | \$7,460 |
| New                  | Dry Retail       | Goods   | Cooling DX       | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)    | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)  | 10.3 EER Rooftop Unit (State Code)       | 1.08                      | 6.4%  | NA                                  | NA           | 15           | \$3,971 |
| New                  | Dry Retail       | Goods   | Cooling DX       | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)  | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)  | 10.3 EER Rooftop Unit (State Code)       | 1.08                      | 10.4%   | NA                                  | NA           | 15           | \$6,156 |
| New                  | Dry Retail       | Goods   | Cooling DX       | Commissioning - New Building Commissioning             | Commissioning - New Building Commissioning   | No Commissioning                         | 0.99                      | 12.5%   | 90%                                 | 80%          | 3            | \$7,670 |
| New                  | Dry Retail       | Goods   | Cooling DX       | Direct / Indirect Evaporative Cooling, Pre-Cooling     | Direct / Indirect Evaporative Cooling, Pre-Cooling   | No modification to DX system             | 0.99                      | 25.0%   | 50%                                 | 85%          | 15           | \$21889 |
| New                  | Dry Retail       | Goods   | Cooling DX       | Direct Digital Control System-Optimization             | DDC System (Optimized)   | DDC System (Basic)                       | 0.99                      | 10.0%   | 75%                                 | 80%          | 5            | \$5,658 |
| New                  | Dry Retail       | Goods   | Cooling DX       | Green Roof   | Vegetation on Roof   | Standard roofing techniques              | 0.99                      | 10.0%   | 15%                                 | 98%          | 30           | 106431  |
| New                  | Dry Retail       | Goods   | Cooling DX       | Insulation (Ceiling)                                   | R-38   | R-21 (Code)                              | 0.99                      | 2.0%  | 75%                                 | 95%          | 25           | \$5,463 |
| New                  | Dry Retail       | Goods   | Cooling DX       | Insulation (Ceiling)                                   | R-49   | R-21 (Code)                              | 0.99                      | 3.0%  | 75%                                 | 98%          | 25           | \$7,249 |

| Construction Vintage | Customer Segment | End Use | Measure Name | Measure Description                                      | Base Equipment  | Baseline kWh (UEC or EU)   | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |          |
|----------------------|------------------|---------|--------------|--|---|--|---------------------------|---|-------------------------------------|--------------|--------------|----------|
| New                  | Dry Retail       | Goods   | Cooling DX   | Insulation (Wall)  | R-25 (2x6 Framing) - Advanced   | R-19 (2x6 Framing) - (Code)  | 0.99                      | 3.0%  | 95%                                 | 95%          | 25           | \$2,479  |
| New                  | Dry Retail       | Goods   | Cooling DX   | Insulation - Floor (Non-Slab)                            | R-19  | R-10 (Code)  | 0.99                      | 1.0%  | 35%                                 | 90%          | 25           | \$946    |
| New                  | Dry Retail       | Goods   | Cooling DX   | Leak Proof Duct Fittings                                 | Quick connect fittings that do not require mastic or drawbands  | Std duct workmanship   | 0.99                      | 10.0%   | 40%                                 | 98%          | 25           | \$1,628  |
| New                  | Dry Retail       | Goods   | Cooling DX   | Window RE - Window Overhangs                             | Overhangs over windows for shading  | No window overhangs  | 0.99                      | 1.9%  | 75%                                 | 75%          | 30           | \$2,960  |
| New                  | Dry Retail       | Goods   | Cooling DX   | Windows  | U = 0.35  | U = 0.55 (Code)  | 0.99                      | 0.9%  | 80%                                 | 80%          | 25           | \$9,436  |
| New                  | Dry Retail       | Goods   | HVAC Aux     | Automated Exhaust VFD Control - Parking Garage CO sensor | CO Sensors  | No CO Sensors  | 2.23                      | 20.0%   | 1%                                  | 75%          | 10           | \$2,147  |
| New                  | Dry Retail       | Goods   | HVAC Aux     | Cooking Hood Controls                                    | Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air | No Cooking Hood Controls   | 2.23                      | 7.5%  | 25%                                 | 65%          | 10           | \$6,829  |
| New                  | Dry Retail       | Goods   | HVAC Aux     | Motor - Premium-Efficiency                               | PE Motors for HVAC Applications   | Standard Efficiency Motors   | 2.23                      | 3.8%  | 85%                                 | 81%          | 10           | \$274    |
| New                  | Dry Retail       | Goods   | HVAC Aux     | Motor - Pump & Fan System - Variable Speed Control       | Pump And Fan System Optimization w/ VSD   | No Pump And Fan System VSD Optimization  | 2.23                      | 33.8%   | 85%                                 | 75%          | 20           | \$2,132  |
| New                  | Dry Retail       | Goods   | HVAC Aux     | Motor - VAV Box High-Efficiency                          | ECM Motors  | Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control | 2.23                      | 8.8%  | 20%                                 | 77%          | 10           | \$3,837  |
| New                  | Dry Retail       | Goods   | HVAC Aux     | Optimized Variable Volume Lab Hood Design                | Optimized Variable Volume Lab Hood Design   | Constant Volume Lab Hood Design  | 2.23                      | 1.6%  | 5%                                  | 94%          | 10           | \$1,791  |
| New                  | Dry Retail       | Goods   | Heat Pump    | High-Efficiency EER=11.0, COP=3.5                        | High-Efficiency EER=11.0, COP=3.5   | EER=10.1, COP=3.2  | 1.58                      | 16.8%   | NA                                  | NA           | 15           | \$5,288  |
| New                  | Dry Retail       | Goods   | Heat Pump    | Premium-Efficiency EER=11.8, COP=3.8                     | Premium-Efficiency EER=11.8, COP=3.8  | EER=10.1, COP=3.2  | 1.58                      | 30.2%   | NA                                  | NA           | 15           | \$11,323 |
| New                  | Dry Retail       | Goods   | Heat Pump    | Commissioning - New Building Commissioning               | Commissioning - New Building Commissioning  | No Commissioning   | 1.42                      | 12.5%   | 90%                                 | 80%          | 3            | \$7,670  |
| New                  | Dry Retail       | Goods   | Heat Pump    | Direct Digital Control System-Optimization               | DDC System (Optimized)  | DDC System (Basic)   | 1.42                      | 10.0%   | 75%                                 | 80%          | 5            | \$5,658  |
| New                  | Dry Retail       | Goods   | Heat Pump    | Exhaust Air to Ventilation Air Heat Recovery             | Exhaust Air Heat Recovery   | No Heat Recovery   | 1.42                      | 4.8%  | 5%                                  | 94%          | 10           | \$9,529  |
| New                  | Dry Retail       | Goods   | Heat Pump    | Green Roof   | Vegetation on Roof  | Standard roofing techniques  | 1.42                      | 2.0%  | 15%                                 | 98%          | 30           | 106,431  |
| New                  | Dry Retail       | Goods   | Heat Pump    | Heat Pump - Ground Source (Closed Loop)                  | GSHP: COP=3.1, EER=13.4   | Std. Air Source HP 'EER=10.1, COP=3.2  | 1.42                      | 17.8%   | 45%                                 | 92%          | 20           | \$61,334 |

| Construction Vintage | Customer Segment | End Use | Measure Name | Measure Description   | Base Equipment   | Baseline kWh (UEC or EU)                            | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------|--------------|---|--|---|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Dry Retail       | Goods   | Heat Pump    | Heat Pump - Ground Source (Closed Loop)                         | GSHP: COP=4.0, EER=20  | Std. Air Source HP 'EER=10.1, COP=3.2               | 1.42 40.9%                    | 45%   | 92%                                 | 20           | 115230       |
| New                  | Dry Retail       | Goods   | Heat Pump    | Heat Pump - Water Source (Closed Loop)                          | WSHP: COP=4.2, EER=12.0  | Std. Air Source Heat Pump'EER=10.1, COP=3.2         | 1.42 19.1%                    | 10%   | 90%                                 | 20           | \$12337      |
| New                  | Dry Retail       | Goods   | Heat Pump    | Heat Pump - Water Source (Closed Loop)                          | WSHP: COP=4.8, EER=14.5  | Std. Air Source Heat Pump'EER=10.1, COP=3.2         | 1.42 32.0%                    | 10%   | 90%                                 | 20           | \$16294      |
| New                  | Dry Retail       | Goods   | Heat Pump    | Insulation (Ceiling)  | R-38   | R-21 (Code)   | 1.42 5.9%                     | 75%   | 95%                                 | 25           | \$5,463      |
| New                  | Dry Retail       | Goods   | Heat Pump    | Insulation (Ceiling)  | R-49   | R-21 (Code)   | 1.42 8.9%                     | 75%   | 98%                                 | 25           | \$7,249      |
| New                  | Dry Retail       | Goods   | Heat Pump    | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                         | 1.42 5.0%                     | 95%   | 95%                                 | 25           | \$2,479      |
| New                  | Dry Retail       | Goods   | Heat Pump    | Insulation - Floor (Non-Slab)                                   | R-19   | R-10 (Code)   | 1.42 3.7%                     | 35%   | 90%                                 | 25           | \$946        |
| New                  | Dry Retail       | Goods   | Heat Pump    | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands                       | Std duct workmanship                                | 1.42 10.0%                    | 40%   | 98%                                 | 25           | \$1,628      |
| New                  | Dry Retail       | Goods   | Heat Pump    | Windows   | U = 0.35   | U = 0.55 (Code)                                     | 1.42 6.4%                     | 80%   | 80%                                 | 25           | \$9,436      |
| New                  | Dry Retail       | Goods   | Lighting     | Bi-Level Control, Stairwell Lighting                            | Occupancy Sensor Control, 50% Lighting Power during unoccupied Time                  | Continuous Full Power Lighting in Stairways         | 4.23 2.0%                     | 10%   | 75%                                 | 9            | \$828        |
| New                  | Dry Retail       | Goods   | Lighting     | Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures | Continuous Dimming, Fluorescent Fixtures (Day-Lighting)                              | No Dimming Controls                                 | 4.23 6.0%                     | 60%   | 84%                                 | 9            | \$1,261      |
| New                  | Dry Retail       | Goods   | Lighting     | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 15%                              | Code Required LPD And Control Strategies: LPD = 1.5 | 4.23 15.0%                    | 90%   | 70%                                 | 14           | \$1,702      |
| New                  | Dry Retail       | Goods   | Lighting     | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 20%                              | Code Required LPD And Control Strategies: LPD = 1.5 | 4.23 20.0%                    | 75%   | 85%                                 | 14           | \$4,539      |
| New                  | Dry Retail       | Goods   | Lighting     | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 25%                              | Code Required LPD And Control Strategies: LPD = 1.5 | 4.23 25.0%                    | 70%   | 90%                                 | 14           | \$7,438      |
| New                  | Dry Retail       | Goods   | Lighting     | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 35% - Only High Bay Applications | Code Required LPD And Control Strategies: LPD = 1.5 | 4.23 31.5%                    | 50%   | 95%                                 | 14           | \$2,711      |
| New                  | Dry Retail       | Goods   | Lighting     | LED Refrigeration Case Lights                                   | LED Refrigeration Case Lights (28W)  | Fluorescent Refrigeration Case Lights (60W)         | 4.23 0.5%                     | 10%   | 80%                                 | 13           | \$630        |
| New                  | Dry Retail       | Goods   | Lighting     | LED Solid State White Lighting Package                          | Landscape, merchandise, signage, structure & task lighting                           | 50W 10hrs/day, 365 day/yr                           | 4.23 2.3%                     | 10%   | 95%                                 | 14           | \$37         |
| New                  | Dry Retail       | Goods   | Lighting     | Occupancy Sensor Control, Fluorescent                           | Occupancy Sensor Control, Fluorescent  | No Occupancy Sensor                                 | 4.23 4.0%                     | 45%   | 88%                                 | 10           | \$196        |
| New                  | Dry Retail       | Goods   | Plug Load    | Energy Star - Battery Charging System                           | Energy Star Battery Charging System  | Non-Energy Star Battery Chargers                    | 2.78 0.4%                     | 95%   | 90%                                 | 7            | \$2          |

| Construction Vintage | Customer Segment | End Use | Measure Name | Measure Description                                       | Base Equipment                                   | Baseline kWh (UEC or EU)                 | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|---------|--------------|---|--|--|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| New                  | Dry Retail       | Goods   | Plug Load    | Energy Star - Computer                                    | Energy Star Features Enabled                     | Non-Energy Star Features                 | 2.78                          | 13.6%   | 64%                                 | 25%          | 4            | \$1     |
| New                  | Dry Retail       | Goods   | Plug Load    | Energy Star - Copiers                                     | Energy Star or Better Office Equipment: Copiers, | Office Equipment: Copiers, Standard      | 2.78                          | 4.2%  | 20%                                 | 45%          | 6            | \$165   |
| New                  | Dry Retail       | Goods   | Plug Load    | Energy Star - Fax   | Energy Star Features Enabled                     | Non-Energy Star Features                 | 2.78                          | 1.8%  | 75%                                 | 55%          | 4            | \$1     |
| New                  | Dry Retail       | Goods   | Plug Load    | Energy Star - Monitors                                    | Energy Star Features Enabled                     | Non-Energy Star Features                 | 2.78                          | 18.4%   | 64%                                 | 15%          | 4            | \$158   |
| New                  | Dry Retail       | Goods   | Plug Load    | Energy Star - Printers                                    | Energy Star Features Enabled                     | Non-Energy Star Features                 | 2.78                          | 1.3%  | 75%                                 | 40%          | 5            | \$16    |
| New                  | Dry Retail       | Goods   | Plug Load    | Energy Star - Scanners                                    | Energy Star Features Enabled                     | Non-Energy Star Features                 | 2.78                          | 0.9%  | 75%                                 | 45%          | 4            | \$1     |
| New                  | Dry Retail       | Goods   | Plug Load    | Energy Star - Water Cooler                                | Energy Star Water Cooler (Hot/Cold Water)        | Non-Energy Star Water Cooler             | 2.78                          | 1.3%  | 15%                                 | 75%          | 10           | \$1     |
| New                  | Dry Retail       | Goods   | Plug Load    | Office Computer Network Management                        | Office Computer Network Energy Management        | No Network Management                    | 2.78                          | 1.8%  | 95%                                 | 30%          | 3            | \$310   |
| New                  | Dry Retail       | Goods   | Plug Load    | Power Supply 80+ Office Measure                           | 80% Efficient Power supply                       | No 80+                                   | 2.78                          | 1.0%  | 95%                                 | 86%          | 7            | \$0     |
| New                  | Dry Retail       | Goods   | Plug Load    | Refrigerator eCube  | Refrigerator eCube                               | No Refrigerator eCube                    | 2.78                          | 1.2%  | 75%                                 | 95%          | 10           | \$86    |
| New                  | Dry Retail       | Goods   | Plug Load    | Residential-Size Refrigerator                             | Energy Star Residential-Size Refrigerator        | Residential-Size Refrigerator - Standard | 2.78                          | 0.3%  | 5%                                  | 65%          | 13           | \$126   |
| New                  | Dry Retail       | Goods   | Plug Load    | Residential-Size Refrigerator/Freezer - Early Replacement | Energy Star Refrigerator/Freezer                 | Baseline Refrigerator/Freezer            | 2.78                          | 3.5%  | 25%                                 | 35%          | 7            | \$578   |
| New                  | Dry Retail       | Goods   | Plug Load    | Vending Machine   | Energy Star Vending Machines - High-Efficiency   | Vending Machines - Standard              | 2.78                          | 6.4%  | 5%                                  | 80%          | 14           | \$189   |
| New                  | Dry Retail       | Goods   | Space Heat   | Commissioning - New Building Commissioning                | Commissioning - New Building Commissioning       | No Commissioning                         | 0.45                          | 12.5%   | 90%                                 | 80%          | 3            | \$7,670 |
| New                  | Dry Retail       | Goods   | Space Heat   | Direct Digital Control System-Optimization                | DDC System (Optimized)                           | DDC System (Basic)                       | 0.45                          | 10.0%   | 75%                                 | 80%          | 5            | \$5,658 |
| New                  | Dry Retail       | Goods   | Space Heat   | Exhaust Air to Ventilation Air Heat Recovery              | Exhaust Air Heat Recovery                        | No Heat Recovery                         | 0.45                          | 15.0%   | 5%                                  | 94%          | 10           | \$9,529 |
| New                  | Dry Retail       | Goods   | Space Heat   | Insulation (Ceiling)                                      | R-49   | R-30                                     | 0.45                          | 8.0%  | 75%                                 | 98%          | 25           | \$5,463 |
| New                  | Dry Retail       | Goods   | Space Heat   | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced                    | R-19 (2x6 Framing) - (Code)              | 0.45                          | 6.0%  | 95%                                 | 95%          | 25           | \$2,479 |
| New                  | Dry Retail       | Goods   | Space Heat   | Insulation - Floor (Non-Slab)                             | R-19   | R-10 (Code)                              | 0.45                          | 5.0%  | 35%                                 | 90%          | 25           | \$946   |



| Construction Vintage | Customer Segment | End Use | Measure Name | Measure Description                                 | Base Equipment   | Baseline kWh (UEC or EU)                                   | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|---------|--------------|---|--|--|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| New                  | Dry Retail       | Goods   | Space Heat   | Leak Proof Duct Fittings                            | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                                       | 0.45                          | 10.0%   | 40%                                 | 98%          | 25           | \$1,628 |
| New                  | Dry Retail       | Goods   | Space Heat   | Sensible And Total Heat Recovery Devices            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery   | 0.45                          | 25.0%   | 50%                                 | 98%          | 10           | \$22168 |
| New                  | Dry Retail       | Goods   | Space Heat   | Windows   | U = 0.35   | U = 0.40   | 0.45                          | 3.1%  | 80%                                 | 80%          | 25           | \$2,359 |
| New                  | Dry Retail       | Goods   | Water Heat   | Water_Heater (40 Gallon Electric) Residential Sized | EF = 0.95  | EF = 0.92  | 0.28                          | 3.3%  | NA                                  | NA           | 20           | \$162   |
| New                  | Dry Retail       | Goods   | Water Heat   | Clothes Washer - Ozonating                          | Ozonating Clothes Washer   | Standard Commercial Clothes Washer                         | 0.28                          | 15.1%   | 5%                                  | 95%          | 10           | \$8,704 |
| New                  | Dry Retail       | Goods   | Water Heat   | Clothes Washer Commercial                           | Energy Star Commercial Clothes Washer MEF=1.72   | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.28                          | 9.2%  | 5%                                  | 80%          | 11           | \$305   |
| New                  | Dry Retail       | Goods   | Water Heat   | Demand controlled Circulating Systems               | Install demand-based control system (VFD Control by Demand)  | No demand control systems in place                         | 0.28                          | 5.0%  | 90%                                 | 94%          | 15           | \$2,919 |
| New                  | Dry Retail       | Goods   | Water Heat   | Dishwashing - Residential Sized System              | EF = 0.65 (ENERGY STAR)  | Standard Dishwasher (FED Std. EF=0.46)                     | 0.28                          | 4.9%  | 45%                                 | 25%          | 13           | \$32    |
| New                  | Dry Retail       | Goods   | Water Heat   | Dishwashing - Residential Sized System              | EF = 0.77  | Standard Dishwasher (FED Std. EF=0.46)                     | 0.28                          | 6.7%  | 45%                                 | 55%          | 13           | \$630   |
| New                  | Dry Retail       | Goods   | Water Heat   | Drainwater Heat Recovery Water Heater               | Install (Power-Pipe or GFX) - Heat Recovery Water Heater   | No Heat Recovery System                                    | 0.28                          | 20.0%   | 25%                                 | 92%          | 25           | \$875   |
| New                  | Dry Retail       | Goods   | Water Heat   | Faucet Aerators                                     | 1.5 GPM Aerator  | 2.5 GPM Aerator (Federal Code)                             | 0.28                          | 4.0%  | 95%                                 | 25%          | 10           | \$0     |
| New                  | Dry Retail       | Goods   | Water Heat   | Heat Pump Water Heater                              | EF = 2.9   | EF=0.93 Baseline Electric Water Heater                     | 0.28                          | 58.9%   | 50%                                 | 94%          | 15           | \$9,627 |
| New                  | Dry Retail       | Goods   | Water Heat   | Low Flow Spray Heads                                | 1.6 GPM  | 3.0 GPM  | 0.28                          | 2.3%  | 10%                                 | 45%          | 5            | \$5     |
| New                  | Dry Retail       | Goods   | Water Heat   | Low-Flow Showerheads                                | 2.0 GPM Showerhead   | 2.5 GPM Showerhead (Federal Code)                          | 0.28                          | 1.1%  | 15%                                 | 75%          | 10           | \$6     |
| New                  | Dry Retail       | Goods   | Water Heat   | Solar RE - Solar Water Heater                       | Passive solar water heating  | Non-solar hot water heater                                 | 0.28                          | 55.6%   | 20%                                 | 95%          | 20           | \$8,930 |
| New                  | Dry Retail       | Goods   | Water Heat   | Ultrasonic Faucet Control                           | Install Ultrasonic Motion Faucet Control   | No Faucet Control  | 0.28                          | 3.3%  | 95%                                 | 95%          | 10           | \$207   |
| New                  | Dry Retail       | Goods   | Water Heat   | Water Heater Thermostat Setback                     | Thermostat Setback and Replcement (120 Degrees)  | No Thermostat Setback (130 Degrees)                        | 0.28                          | 7.7%  | 75%                                 | 45%          | 11           | \$107   |
| Existing             | Grocery          | Cooking |              | Cooking Fryers - Commercial                         | Energy Star Commercial Fryer   | Non-Energy Star Fryer                                      | 2.69                          | 2.5%  | 35%                                 | 70%          | 12           | \$4,946 |
| Existing             | Grocery          | Cooking |              | Hot Food Holding Cabinets - Commercial              | Energy Star Commercial Hot Food Holding Cabinets   | Non-Energy Star Commercial Hot Food Holding Cabinets       | 2.69                          | 8.4%  | 55%                                 | 85%          | 12           | \$1,800 |

| Construction Vintage | Customer Segment | End Use          | Measure Name  | Measure Description  | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|--|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Grocery          | Cooking          | Oven - Convection   | Convection Oven  | Standard Oven  | 2.69                     | 3.4%                          | 85%   | 85%                                 | 15           | \$1,734      |
| Existing             | Grocery          | Cooking          | Steam Cookers - Commercial                                    | Energy Star Commercial Steam Cookers (50% efficiency)                          | Non-Energy Star Commercial Steam Cooker (35% efficiency) | 2.69                     | 2.3%                          | 25%   | 75%                                 | 10           | \$1          |
| Existing             | Grocery          | Cooling Chillers | Chiller - Premium Efficiency                                  | 0.507 kW/ton   | 0.634 kW/ton   | 1.51                     | 20.0%                         | NA  | NA                                  | 20           | \$2,218      |
| Existing             | Grocery          | Cooling Chillers | Chiller - Advanced Technology                                 | 0.461 kW/ton   | 0.634 kW/ton   | 1.51                     | 27.3%                         | NA  | NA                                  | 20           | \$2,765      |
| Existing             | Grocery          | Cooling Chillers | Chiller - High Efficiency                                     | 0.574 kW/ton   | 0.634 kW/ton   | 1.51                     | 9.5%                          | NA  | NA                                  | 20           | \$795        |
| Existing             | Grocery          | Cooling Chillers | Centrifugal Chiller - VSD Remodel for Existing                | VSD motor  | Constant Speed Motor                                     | 1.58                     | 40.0%                         | 43%   | 45%                                 | 10           | \$4,139      |
| Existing             | Grocery          | Cooling Chillers | Chilled Water Piping Loop w/ VSD Control                      | VSD for Secondary Chilled Water Loop   | Primary Loop Only w/ Constant Speed Pump                 | 1.58                     | 7.6%                          | 25%   | 70%                                 | 10           | \$5,019      |
| Existing             | Grocery          | Cooling Chillers | Chilled Water Reset   | Install Chilled Water Reset  | No Chilled Water Reset                                   | 1.58                     | 5.0%                          | 48%   | 95%                                 | 10           | \$5,726      |
| Existing             | Grocery          | Cooling Chillers | Chiller-Water Side Economizer                                 | Install Economizer   | No Economizer  | 1.58                     | 5.0%                          | 23%   | 90%                                 | 10           | \$11656      |
| Existing             | Grocery          | Cooling Chillers | Commissioning - Retro Building Commissioning                  | Commissioning - Retro Building Commissioning                                   | No Commissioning   | 1.58                     | 12.5%                         | 45%   | 40%                                 | 3            | \$1,657      |
| Existing             | Grocery          | Cooling Chillers | Cooling Tower-Decrease Temperature                            | Approach 6 Deg F   | 10 Deg F   | 1.58                     | 8.0%                          | 25%   | 94%                                 | 15           | \$497        |
| Existing             | Grocery          | Cooling Chillers | Cooling Tower-Two-Speed Fan Motor                             | Two-Speed Tower Fans replace Single-Speed                                      | Cooling Tower-One-Speed Fan Motor                        | 1.58                     | 14.0%                         | 48%   | 35%                                 | 10           | \$55         |
| Existing             | Grocery          | Cooling Chillers | Cooling Tower-VSD Fan Control                                 | Variable-Speed Tower Fans replace Two-Speed                                    | Cooling Tower-Two-Speed Fan Motor                        | 1.58                     | 4.0%                          | 48%   | 75%                                 | 10           | \$449        |
| Existing             | Grocery          | Cooling Chillers | Direct Digital Control System-Installation                    | DDC Retrofit   | Pneumatic  | 1.58                     | 15.0%                         | 75%   | 61%                                 | 5            | \$8,082      |
| Existing             | Grocery          | Cooling Chillers | Direct Digital Control System-Optimization                    | DDC System (Optimized)   | DDC System (Basic)                                       | 1.58                     | 10.0%                         | 75%   | 80%                                 | 5            | \$4,526      |
| Existing             | Grocery          | Cooling Chillers | Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control        | Pneumatic  | 1.58                     | 15.0%                         | 50%   | 80%                                 | 5            | \$3,266      |
| Existing             | Grocery          | Cooling Chillers | Duct Repair And Sealing                                       | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses                    | 1.58                     | 2.5%                          | 45%   | 45%                                 | 18           | \$3,362      |
| Existing             | Grocery          | Cooling Chillers | Exhaust Hood Makeup Air                                       | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air)              | 1.58                     | 4.5%                          | 64%   | 85%                                 | 10           | \$5,726      |
| Existing             | Grocery          | Cooling Chillers | Green Roof  | Vegetation on Roof   | Standard roofing techniques                              | 1.58                     | 5.0%                          | 15%   | 98%                                 | 30           | \$85145      |



| Construction Vintage | Customer Segment | End Use          | Measure Name   | Measure Description  | Base Equipment                            | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|--|--|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Grocery          | Cooling Chillers | Infiltration Control (Caulking, Weather Stripping, etc.) | Install Caulking And Weatherstripping (ACH 0.65)   | Infiltration Conditions (ACH 1.0)         | 1.58                     | 5.0%                          | 40%   | 10%                                 | 10           | \$1,968      |
| Existing             | Grocery          | Cooling Chillers | Insulation (Ceiling)                                     | R-38   | R-21 (Code)                               | 1.58                     | 2.0%                          | 75%   | 45%                                 | 25           | \$4,371      |
| Existing             | Grocery          | Cooling Chillers | Insulation (Ceiling)                                     | R-49   | R-21 (Code)                               | 1.58                     | 3.0%                          | 75%   | 85%                                 | 25           | \$5,799      |
| Existing             | Grocery          | Cooling Chillers | Insulation (Ceiling) - Existing to Code                  | R-21 (Code)  | Existing Ceiling Insulation (Average R-9) | 1.58                     | 2.4%                          | 75%   | 10%                                 | 25           | \$5,127      |
| Existing             | Grocery          | Cooling Chillers | Insulation (Ceiling) - Zero to Code                      | R-21 (Code)  | R-0                                       | 1.58                     | 6.0%                          | 75%   | 0%                                  | 25           | \$5,127      |
| Existing             | Grocery          | Cooling Chillers | Insulation (Duct) (Unconditioned Spaces)                 | Install New Duct Insulation (R-8)  | R-0                                       | 1.58                     | 4.4%                          | 10%   | 15%                                 | 25           | \$940        |
| Existing             | Grocery          | Cooling Chillers | Insulation (Duct) (Unconditioned Spaces)                 | R-4  | R-0                                       | 1.58                     | 2.4%                          | 10%   | 15%                                 | 25           | \$979        |
| Existing             | Grocery          | Cooling Chillers | Insulation (Wall)  | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)               | 1.58                     | 3.0%                          | 10%   | 95%                                 | 25           | \$2,218      |
| Existing             | Grocery          | Cooling Chillers | Insulation (Wall) - Existing to Code                     | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)            | 1.58                     | 8.4%                          | 10%   | 35%                                 | 25           | \$2,430      |
| Existing             | Grocery          | Cooling Chillers | Insulation (Wall) - Zero to Code                         | R-19 (2x6 Framing) - (Code)  | R-0                                       | 1.58                     | 10.0%                         | 10%   | 0%                                  | 25           | \$2,402      |
| Existing             | Grocery          | Cooling Chillers | Insulation - Floor (Non-Slab)                            | R-19   | R-10 (Code)                               | 1.58                     | 1.0%                          | 35%   | 45%                                 | 25           | \$756        |
| Existing             | Grocery          | Cooling Chillers | Insulation - Floor (Non-Slab) - Existing to Code         | R-10 (Code)  | R-0                                       | 1.58                     | 3.0%                          | 35%   | 45%                                 | 25           | \$4,371      |
| Existing             | Grocery          | Cooling Chillers | Pipe Insulation  | R-4  | R-0                                       | 1.58                     | 1.0%                          | 65%   | 45%                                 | 15           | \$172        |
| Existing             | Grocery          | Cooling Chillers | Sensible And Total Heat Recovery Devices                 | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery                          | 1.58                     | 25.0%                         | 25%   | 98%                                 | 10           | \$17735      |
| Existing             | Grocery          | Cooling Chillers | Turbocor Compressor                                      | 0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)                                 | 0.634 kW/ton (Code) chiller water cooled  | 1.58                     | 44.8%                         | 60%   | 99%                                 | 20           | \$13592      |
| Existing             | Grocery          | Cooling Chillers | Windows  | U = 0.35   | U = 0.55 (Code)                           | 1.58                     | 0.7%                          | 80%   | 85%                                 | 25           | \$5,361      |
| Existing             | Grocery          | Cooling Chillers | Windows - Existing to Code                               | U = 0.55 (Code)  | Existing Windows (U=0.65)                 | 1.58                     | 0.4%                          | 10%   | 85%                                 | 25           | \$15137      |
| Existing             | Grocery          | Cooling DX       | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)   | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)   | 10.3 EER Rooftop Unit (State Code)        | 1.65                     | 14.2%                         | NA  | NA                                  | 15           | \$5,386      |



| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description  | Base Equipment                              | Baseline kWh (UEC or EU) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|--|---|--------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Grocery          | Cooling DX | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)           | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)                            | 10.3 EER Rooftop Unit (State Code)          | 1.65                     | 6.4%                      | NA  | NA                                  | 15           | \$2,867      |
| Existing             | Grocery          | Cooling DX | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)         | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)                          | 10.3 EER Rooftop Unit (State Code)          | 1.65                     | 10.4%                     | NA  | NA                                  | 15           | \$4,444      |
| Existing             | Grocery          | Cooling DX | Commissioning - Retro Building Commissioning                  | Commissioning - Retro Building Commissioning                                   | No Commissioning                            | 1.71                     | 12.5%                     | 90%   | 40%                                 | 3            | \$1,657      |
| Existing             | Grocery          | Cooling DX | Cooling DX Package-Air Side Economizer                        | Air-Side Economizer  | No Economizer                               | 1.71                     | 15.0%                     | 10%   | 90%                                 | 15           | \$4,021      |
| Existing             | Grocery          | Cooling DX | Direct / Indirect Evaporative Cooling, Pre-Cooling            | Direct / Indirect Evaporative Cooling, Pre-Cooling                             | No modification to DX system                | 1.71                     | 25.0%                     | 50%   | 85%                                 | 15           | \$17511      |
| Existing             | Grocery          | Cooling DX | Direct Digital Control System-Installation                    | DDC Retrofit   | Pneumatic                                   | 1.71                     | 15.0%                     | 75%   | 61%                                 | 5            | \$8,082      |
| Existing             | Grocery          | Cooling DX | Direct Digital Control System-Optimization                    | DDC System (Optimized)   | DDC System (Basic)                          | 1.71                     | 10.0%                     | 75%   | 80%                                 | 5            | \$4,526      |
| Existing             | Grocery          | Cooling DX | Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control        | Pneumatic                                   | 1.71                     | 15.0%                     | 50%   | 80%                                 | 5            | \$3,266      |
| Existing             | Grocery          | Cooling DX | Duct Repair And Sealing                                       | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 1.71                     | 2.5%                      | 45%   | 45%                                 | 18           | \$3,362      |
| Existing             | Grocery          | Cooling DX | Exhaust Hood Makeup Air                                       | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air) | 1.71                     | 4.5%                      | 64%   | 85%                                 | 10           | \$5,726      |
| Existing             | Grocery          | Cooling DX | Green Roof  | Vegetation on Roof   | Standard roofing techniques                 | 1.71                     | 5.0%                      | 15%   | 98%                                 | 30           | \$85145      |
| Existing             | Grocery          | Cooling DX | Infiltration Control (Caulking, Weather Stripping, etc.)      | Install Caulking And Weatherstripping (ACH 0.65)                               | Infiltration Conditions (ACH 1.0)           | 1.71                     | 5.0%                      | 40%   | 10%                                 | 10           | \$1,968      |
| Existing             | Grocery          | Cooling DX | Insulation (Ceiling)  | R-38   | R-21 (Code)                                 | 1.71                     | 2.0%                      | 75%   | 45%                                 | 25           | \$4,371      |
| Existing             | Grocery          | Cooling DX | Insulation (Ceiling)  | R-49   | R-21 (Code)                                 | 1.71                     | 3.0%                      | 75%   | 85%                                 | 25           | \$5,799      |
| Existing             | Grocery          | Cooling DX | Insulation (Ceiling) - Existing to Code                       | R-21 (Code)  | Existing Ceiling Insulation (Average R-9)   | 1.71                     | 2.4%                      | 75%   | 10%                                 | 25           | \$5,127      |
| Existing             | Grocery          | Cooling DX | Insulation (Ceiling) - Zero to Code                           | R-21 (Code)  | R-0   | 1.71                     | 6.0%                      | 75%   | 0%                                  | 25           | \$5,127      |
| Existing             | Grocery          | Cooling DX | Insulation (Duct) (Unconditioned Spaces)                      | Install New Duct Insulation (R-8)  | R-0   | 1.71                     | 4.4%                      | 10%   | 15%                                 | 25           | \$940        |
| Existing             | Grocery          | Cooling DX | Insulation (Duct) (Unconditioned Spaces)                      | R-4  | R-0   | 1.71                     | 2.4%                      | 10%   | 15%                                 | 25           | \$979        |
| Existing             | Grocery          | Cooling DX | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 1.71                     | 3.0%                      | 10%   | 95%                                 | 25           | \$2,218      |
| Existing             | Grocery          | Cooling DX | Insulation (Wall) - Existing to Code                          | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)              | 1.71                     | 8.4%                      | 10%   | 35%                                 | 25           | \$2,430      |
| Existing             | Grocery          | Cooling DX | Insulation (Wall) - Zero to Code                              | R-19 (2x6 Framing) - (Code)  | R-0   | 1.71                     | 10.0%                     | 10%   | 0%                                  | 25           | \$2,402      |
| Existing             | Grocery          | Cooling DX | Insulation - Floor (Non-Slab)                                 | R-19   | R-10 (Code)                                 | 1.71                     | 1.0%                      | 35%   | 45%                                 | 25           | \$756        |
| Existing             | Grocery          | Cooling DX | Insulation - Floor (Non-Slab) - Existing to Code              | R-10 (Code)  | R-0   | 1.71                     | 3.0%                      | 35%   | 45%                                 | 25           | \$4,371      |
| Existing             | Grocery          | Cooling DX | Thermostat - Programmable                                     | Energy Star Programmable Thermostat  | Manual Thermostat                           | 1.71                     | 3.0%                      | 95%   | 46%                                 | 15           | \$145        |
| Existing             | Grocery          | Cooling DX | Windows   | U = 0.35   | U = 0.55 (Code)                             | 1.71                     | 0.7%                      | 80%   | 85%                                 | 25           | \$5,361      |

| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description   | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|---|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Grocery          | Cooling DX | Windows - Existing to Code                                    | U = 0.55 (Code)   | Existing Windows (U=0.65)  | 1.71                     | 0.4%                          | 10%   | 85%                                 | 25           | \$15137      |
| Existing             | Grocery          | HVAC Aux   | Automated Exhaust VFD Control - Parking Garage CO sensor      | CO Sensors  | No CO Sensors  | 2.15                     | 20.0%                         | 5%  | 85%                                 | 10           | \$1,718      |
| Existing             | Grocery          | HVAC Aux   | Cooking Hood Controls   | Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air | No Cooking Hood Controls   | 2.15                     | 7.5%                          | 60%   | 65%                                 | 10           | \$13133      |
| Existing             | Grocery          | HVAC Aux   | Motor - Premium-Efficiency                                    | PE Motors for HVAC Applications   | Standard Efficiency Motors   | 2.15                     | 3.8%                          | 85%   | 81%                                 | 10           | \$395        |
| Existing             | Grocery          | HVAC Aux   | Motor - Pump & Fan System - Variable Speed Control            | Pump And Fan System Optimization w/ VSD   | No Pump And Fan System VSD Optimization  | 2.15                     | 33.8%                         | 85%   | 75%                                 | 20           | \$1,705      |
| Existing             | Grocery          | HVAC Aux   | Motor - VAV Box High-Efficiency                               | ECM Motors  | Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control | 2.15                     | 8.8%                          | 10%   | 77%                                 | 10           | \$3,070      |
| Existing             | Grocery          | HVAC Aux   | Optimized Variable Volume Lab Hood Design                     | Optimized Variable Volume Lab Hood Design   | Constant Volume Lab Hood Design  | 2.15                     | 1.6%                          | 0%  | 94%                                 | 10           | \$1,791      |
| Existing             | Grocery          | Heat Pump  | High-Efficiency EER=11.0, COP=3.5                             | High-Efficiency EER=11.0, COP=3.5   | EER=10.1, COP=3.2  | 4.53                     | 16.8%                         | NA  | NA                                  | 15           | \$3,818      |
| Existing             | Grocery          | Heat Pump  | Premium-Efficiency EER=11.8, COP=3.8                          | Premium-Efficiency EER=11.8, COP=3.8  | EER=10.1, COP=3.2  | 4.53                     | 30.2%                         | NA  | NA                                  | 15           | \$8,175      |
| Existing             | Grocery          | Heat Pump  | Commissioning - Retro Building Commissioning                  | Commissioning - Retro Building Commissioning  | No Commissioning   | 4.70                     | 12.5%                         | 90%   | 40%                                 | 3            | \$1,657      |
| Existing             | Grocery          | Heat Pump  | Direct Digital Control System-Installation                    | DDC Retrofit  | Pneumatic  | 4.70                     | 15.0%                         | 75%   | 61%                                 | 5            | \$8,082      |
| Existing             | Grocery          | Heat Pump  | Direct Digital Control System-Optimization                    | DDC System (Optimized)  | DDC System (Basic)   | 4.70                     | 10.0%                         | 75%   | 80%                                 | 5            | \$4,526      |
| Existing             | Grocery          | Heat Pump  | Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control   | Pneumatic  | 4.70                     | 15.0%                         | 50%   | 80%                                 | 5            | \$3,266      |
| Existing             | Grocery          | Heat Pump  | Duct Repair And Sealing                                       | Reduction In Duct Losses to 5%  | No Repair or Sealing, 15% duct losses  | 4.70                     | 2.5%                          | 45%   | 45%                                 | 18           | \$3,362      |
| Existing             | Grocery          | Heat Pump  | Exhaust Air to Ventilation Air Heat Recovery                  | Exhaust Air Heat Recovery   | No Heat Recovery   | 4.70                     | 10.0%                         | 5%  | 94%                                 | 10           | \$14457      |
| Existing             | Grocery          | Heat Pump  | Exhaust Hood Makeup Air                                       | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air                                      | Hood Pulls Conditioned Air (No Make-up Air)  | 4.70                     | 4.5%                          | 64%   | 85%                                 | 10           | \$5,726      |
| Existing             | Grocery          | Heat Pump  | Green Roof  | Vegetation on Roof  | Standard roofing techniques  | 4.70                     | 0.5%                          | 15%   | 98%                                 | 30           | \$85145      |
| Existing             | Grocery          | Heat Pump  | Heat Pump - Ground Source (Closed Loop)                       | GSHP: COP=3.1, EER=13.4   | Std. Air Source HP 'EER=10.1, COP=3.2  | 4.70                     | 10.3%                         | 5%  | 92%                                 | 20           | \$44280      |
| Existing             | Grocery          | Heat Pump  | Heat Pump - Ground Source (Closed Loop)                       | GSHP: COP=4.0, EER=20   | Std. Air Source HP 'EER=10.1, COP=3.2  | 4.70                     | 31.5%                         | 5%  | 92%                                 | 20           | \$83190      |
| Existing             | Grocery          | Heat Pump  | Heat Pump - Water Source (Closed Loop)                        | WSHP: COP=4.2, EER=12.0   | Std. Air Source Heat Pump'EER=10.1, COP=3.2  | 4.70                     | 22.7%                         | 5%  | 90%                                 | 20           | \$8,907      |
| Existing             | Grocery          | Heat Pump  | Heat Pump - Water Source (Closed Loop)                        | WSHP: COP=4.8, EER=14.5   | Std. Air Source Heat Pump'EER=10.1, COP=3.2  | 4.70                     | 33.7%                         | 5%  | 90%                                 | 20           | \$11764      |
| Existing             | Grocery          | Heat Pump  | Infiltration Control (Caulking, Weather Stripping, etc.)      | Install Caulking And Weatherstripping (ACH 0.65)  | Infiltration Conditions (ACH 1.0)  | 4.70                     | 8.3%                          | 40%   | 10%                                 | 10           | \$1,968      |
| Existing             | Grocery          | Heat Pump  | Insulation (Ceiling)  | R-38  | R-21 (Code)  | 4.70                     | 5.9%                          | 75%   | 45%                                 | 25           | \$4,371      |

| Construction Vintage | Customer Segment | End Use   | Measure Name  | Measure Description  | Base Equipment                                      | Savings                  |                   | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|---|--|---|--------------------------|-------------------|---|-------------------------------------|--------------|--------------|
|                      |                  |           |   |  |   | Baseline kWh (UEC or EU) | as Percent of Use |   |                                     |              |              |
| Existing             | Grocery          | Heat Pump | Insulation (Ceiling)  | R-49   | R-21 (Code)   | 4.70                     | 8.9%              | 75%   | 85%                                 | 25           | \$5,799      |
| Existing             | Grocery          | Heat Pump | Insulation (Ceiling) - Existing to Code                         | R-21 (Code)  | Existing Ceiling Insulation (Average R-9)           | 4.70                     | 5.5%              | 75%   | 10%                                 | 25           | \$5,127      |
| Existing             | Grocery          | Heat Pump | Insulation (Ceiling) - Zero to Code                             | R-21 (Code)  | R-0   | 4.70                     | 13.8%             | 75%   | 0%                                  | 25           | \$5,127      |
| Existing             | Grocery          | Heat Pump | Insulation (Duct) (Unconditioned Spaces)                        | Install New Duct Insulation (R-8)  | R-0   | 4.70                     | 4.4%              | 10%   | 15%                                 | 25           | \$940        |
| Existing             | Grocery          | Heat Pump | Insulation (Duct) (Unconditioned Spaces)                        | R-4  | R-0   | 4.70                     | 2.4%              | 10%   | 15%                                 | 25           | \$979        |
| Existing             | Grocery          | Heat Pump | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                         | 4.70                     | 5.0%              | 10%   | 95%                                 | 25           | \$2,218      |
| Existing             | Grocery          | Heat Pump | Insulation (Wall) - Existing to Code                            | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)                      | 4.70                     | 16.6%             | 10%   | 35%                                 | 25           | \$2,430      |
| Existing             | Grocery          | Heat Pump | Insulation (Wall) - Zero to Code                                | R-19 (2x6 Framing) - (Code)  | R-0   | 4.70                     | 19.8%             | 10%   | 0%                                  | 25           | \$2,402      |
| Existing             | Grocery          | Heat Pump | Insulation - Floor (Non-Slab)                                   | R-19   | R-10 (Code)   | 4.70                     | 3.7%              | 35%   | 45%                                 | 25           | \$756        |
| Existing             | Grocery          | Heat Pump | Insulation - Floor (Non-Slab) - Existing to Code                | R-10 (Code)  | R-0   | 4.70                     | 11.1%             | 35%   | 45%                                 | 25           | \$4,371      |
| Existing             | Grocery          | Heat Pump | Thermostat - Programmable                                       | Energy Star Programmable Thermostat  | Manual Thermostat                                   | 4.70                     | 3.0%              | 95%   | 46%                                 | 15           | \$145        |
| Existing             | Grocery          | Heat Pump | Windows   | U = 0.35   | U = 0.55 (Code)                                     | 4.70                     | 5.0%              | 80%   | 85%                                 | 25           | \$5,361      |
| Existing             | Grocery          | Heat Pump | Windows - Existing to Code                                      | U = 0.55 (Code)  | Existing Windows (U=0.65)                           | 4.70                     | 3.3%              | 10%   | 85%                                 | 25           | \$15137      |
| Existing             | Grocery          | Lighting  | Bi-Level Control, Stairwell Lighting                            | Occupancy Sensor Control, 50% Lighting Power during unoccupied Time                  | Continuous Full Power Lighting in Stairways         | 8.15                     | 2.0%              | 75%   | 75%                                 | 9            | \$662        |
| Existing             | Grocery          | Lighting  | Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures | Continuous Dimming, Fluorescent Fixtures (Day-Lighting)                              | No Dimming Controls                                 | 8.15                     | 6.0%              | 30%   | 96%                                 | 9            | \$1,009      |
| Existing             | Grocery          | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 15%                              | Code Required LPD And Control Strategies: LPD = 1.5 | 8.15                     | 15.0%             | 90%   | 70%                                 | 14           | \$2,053      |
| Existing             | Grocery          | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 20%                              | Code Required LPD And Control Strategies: LPD = 1.5 | 8.15                     | 20.0%             | 75%   | 85%                                 | 14           | \$4,549      |
| Existing             | Grocery          | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 25%                              | Code Required LPD And Control Strategies: LPD = 1.5 | 8.15                     | 25.0%             | 70%   | 90%                                 | 14           | \$7,101      |
| Existing             | Grocery          | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 35% - Only High Bay Applications | Code Required LPD And Control Strategies: LPD = 1.5 | 8.15                     | 31.5%             | 65%   | 95%                                 | 14           | \$2,940      |
| Existing             | Grocery          | Lighting  | HE Fixtures/Design - Existing to Code                           | Code Required LPD And Control Strategies: LPD = 1.5                                  | Existing Lighting Design                            | 8.15                     | 35.0%             | 95%   | 45%                                 | 14           | \$9,800      |
| Existing             | Grocery          | Lighting  | LED Exit Lighting   | 5 Watts  | CFL Exit Sign (26 Watts)                            | 8.15                     | 1.6%              | 95%   | 65%                                 | 11           | \$53         |
| Existing             | Grocery          | Lighting  | LED Refrigeration Case Lights                                   | LED Refrigeration Case Lights (28W)  | Fluorescent Refrigeration Case Lights (60W)         | 8.15                     | 0.7%              | 90%   | 80%                                 | 13           | \$630        |
| Existing             | Grocery          | Lighting  | LED Solid State White Lighting Package                          | Landscape, merchandise, signage, structure & task lighting                           | 50W 10hrs/day, 365 day/yr                           | 8.15                     | 0.8%              | 10%   | 95%                                 | 14           | \$36         |
| Existing             | Grocery          | Lighting  | Occupancy Sensor Control, Fluorescent                           | Occupancy Sensor Control, Fluorescent  | No Occupancy Sensor                                 | 8.15                     | 4.0%              | 45%   | 90%                                 | 9            | \$157        |
| Existing             | Grocery          | Lighting  | Time Clocks And Timers  | Install Time Clock Lighting  | No Time Clock                                       | 8.15                     | 4.9%              | 85%   | 81%                                 | 9            | \$215        |

| Construction Vintage | Customer Segment | End Use       | Measure Name  | Measure Description   | Base Equipment                                | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|---|---|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Grocery          | Plug Load     | Energy Star - Battery Charging System                     | Energy Star Battery Charging System   | Non-Energy Star Battery Chargers              | 2.51                     | 0.4%                          | 95%   | 90%                                 | 7            | \$2          |
| Existing             | Grocery          | Plug Load     | Energy Star - Computer                                    | Energy Star Features Enabled  | Non-Energy Star Features                      | 2.51                     | 13.6%                         | 64%   | 25%                                 | 4            | \$1          |
| Existing             | Grocery          | Plug Load     | Energy Star - Copiers                                     | Energy Star or Better Office Equipment: Copiers,  | Office Equipment: Copiers, Standard           | 2.51                     | 5.9%                          | 35%   | 45%                                 | 6            | \$165        |
| Existing             | Grocery          | Plug Load     | Energy Star - Fax   | Energy Star Features Enabled  | Non-Energy Star Features                      | 2.51                     | 1.8%                          | 75%   | 55%                                 | 4            | \$1          |
| Existing             | Grocery          | Plug Load     | Energy Star - Monitors                                    | Energy Star Features Enabled  | Non-Energy Star Features                      | 2.51                     | 18.4%                         | 64%   | 15%                                 | 4            | \$157        |
| Existing             | Grocery          | Plug Load     | Energy Star - Printers                                    | Energy Star Features Enabled  | Non-Energy Star Features                      | 2.51                     | 1.3%                          | 75%   | 40%                                 | 5            | \$16         |
| Existing             | Grocery          | Plug Load     | Energy Star - Scanners                                    | Energy Star Features Enabled  | Non-Energy Star Features                      | 2.51                     | 0.9%                          | 75%   | 45%                                 | 4            | \$1          |
| Existing             | Grocery          | Plug Load     | Energy Star - Water Cooler                                | Energy Star Water Cooler (Hot/Cold Water)   | Non-Energy Star Water Cooler                  | 2.51                     | 1.9%                          | 15%   | 75%                                 | 10           | \$1          |
| Existing             | Grocery          | Plug Load     | Office Computer Network Management                        | Office Computer Network Energy Management   | No Network Management                         | 2.51                     | 1.8%                          | 95%   | 30%                                 | 3            | \$310        |
| Existing             | Grocery          | Plug Load     | Power Supply 80+ Office Measure                           | 80% Efficient Power supply  | No 80+  | 2.51                     | 1.0%                          | 95%   | 86%                                 | 7            | \$0          |
| Existing             | Grocery          | Plug Load     | Refrigerator eCube  | Refrigerator eCube  | No Refrigerator eCube                         | 2.51                     | 1.2%                          | 75%   | 95%                                 | 10           | \$86         |
| Existing             | Grocery          | Plug Load     | Residential-Size Refrigerator                             | Energy Star Residential-Size Refrigerator   | Residential-Size Refrigerator - Standard      | 2.51                     | 0.4%                          | 5%  | 65%                                 | 13           | \$126        |
| Existing             | Grocery          | Plug Load     | Residential-Size Refrigerator/Freezer - Early Replacement | Energy Star Refrigerator/Freezer  | Baseline Refrigerator/Freezer                 | 2.51                     | 5.0%                          | 25%   | 35%                                 | 7            | \$578        |
| Existing             | Grocery          | Plug Load     | Vending Machine   | Energy Star Vending Machines - High-Efficiency  | Vending Machines - Standard                   | 2.51                     | 9.1%                          | 75%   | 80%                                 | 14           | \$189        |
| Existing             | Grocery          | Plug Load     | Vending Miser   | Passive Infrared Sensor on Vending Machine Monitoring Vacancy of Area And Cycles Cooling - Controls | No Vending Miser - No controls                | 2.51                     | 9.4%                          | 75%   | 25%                                 | 3            | \$298        |
| Existing             | Grocery          | Refrigeration | Anti-Sweat (Humidistat) Controls                          | Variable Temp. Controls (Humidistat)  | Constant Controls                             | 21                       | 35.8%                         | 90%   | 45%                                 | 12           | \$5,634      |
| Existing             | Grocery          | Refrigeration | Commercial Reach-In Refrigerator                          | Energy Star Commercial Reach-In Refrigerator  | Commercial-Size Refrigerator - Standard       | 21                       | 3.0%                          | 95%   | 100%                                | 12           | \$345        |
| Existing             | Grocery          | Refrigeration | Compressor VSD Retrofit                                   | Compressor VSD Retrofit   | Standard Compressor                           | 21                       | 16.8%                         | 60%   | 77%                                 | 10           | \$11,556     |
| Existing             | Grocery          | Refrigeration | Custom Refrigeration System                               | High-Efficiency Custom Refrigeration System (Walk-in) includes compressors                          | Custom Refrigeration System - Standard        | 21                       | 3.6%                          | 85%   | 65%                                 | 10           | \$9,595      |
| Existing             | Grocery          | Refrigeration | Defrost Demand Control - Hot Gas                          | Refrigerant Defrost w/ Hot Gas  | No Defrost Demand Control - Hot Gas           | 21                       | 2.6%                          | 95%   | 68%                                 | 10           | \$5,559      |
| Existing             | Grocery          | Refrigeration | Display Cases   | High-Efficiency Display Cases   | Display Cases - Standard                      | 21                       | 3.6%                          | 100%  | 90%                                 | 15           | \$7,543      |
| Existing             | Grocery          | Refrigeration | Evaporative Condenser - High-Efficiency                   | High-Efficiency Evaporative Condenser   | Air-Cooled Condenser                          | 21                       | 0.7%                          | 90%   | 65%                                 | 15           | \$9,744      |
| Existing             | Grocery          | Refrigeration | Floating Head Pressure Control                            | Install Floating Head Pressure Control  | No Floating Head Pressure Control             | 21                       | 3.0%                          | 50%   | 81%                                 | 14           | \$698        |
| Existing             | Grocery          | Refrigeration | High-Efficiency Compressor                                | High-Efficiency Compressor (15% More Efficient)   | Standard Compressor, 40% Efficiency           | 21                       | 8.4%                          | 85%   | 72%                                 | 10           | \$9,308      |
| Existing             | Grocery          | Refrigeration | High-Efficiency Evaporator Fans - Walk-ins                | High-Efficiency Evaporator Fans, Walk-in Refrigerators  | Standard Evaporator Fans                      | 21                       | 1.0%                          | 92%   | 75%                                 | 15           | \$1,195      |
| Existing             | Grocery          | Refrigeration | Ice Maker   | Energy Star Ice Maker - High-Efficiency   | Standard Ice Maker                            | 21                       | 1.0%                          | 90%   | 86%                                 | 9            | \$376        |
| Existing             | Grocery          | Refrigeration | Motor - Case Fans with ECM motors                         | ECM motors on evaporator fan, on display cases  | 48 cf 2-door reach-in commercial refrigerator | 21                       | 0.5%                          | 80%   | 50%                                 | 20           | \$1,350      |

| Construction Vintage | Customer Segment | End Use       | Measure Name  | Measure Description   | Base Equipment                              | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|---|---|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Grocery          | Refrigeration | Night Covers for Display Cases                                | Night Covers for Display Cases  | No Night Covers                             | 21                       | 1.4%                          | 95%   | 85%                                 | 10           | \$3,110      |
| Existing             | Grocery          | Refrigeration | Reduced Speed or Cycling of Evaporator Fans                   | VFD on Evaporator Fans (Evap Fan Control on Walk-In)  | Constant Speed Evaporator Fans              | 21                       | 6.0%                          | 75%   | 70%                                 | 10           | \$449        |
| Existing             | Grocery          | Refrigeration | Refrigeration - Retro Commissioning                           | Refrigeration Retro Commissioning (Refrigeration System Diagnostics / Operations And Maintenance) | No Re-commissioning                         | 21                       | 5.0%                          | 80%   | 90%                                 | 3            | \$556        |
| Existing             | Grocery          | Refrigeration | Refrigeration with Heat Recovery                              | Heat Recovery from Refrigeration System. Applied to Water Heating                                 | No Heat Recovery                            | 21                       | 28.0%                         | 75%   | 55%                                 | 16           | \$7,649      |
| Existing             | Grocery          | Refrigeration | Special Glass Doors for Refrigerated Reach-in Cases           | Do Not Require Anti-Sweat Heating   | Standard Glass Doors                        | 21                       | 3.2%                          | 95%   | 77%                                 | 16           | \$1,856      |
| Existing             | Grocery          | Refrigeration | Strip Curtains for Walk-Ins                                   | Strip Curtains for Walk-Ins   | No Strip Curtains for Walk-Ins              | 21                       | 2.0%                          | 95%   | 20%                                 | 4            | \$189        |
| Existing             | Grocery          | Space Heat    | Commissioning - Retro Building Commissioning                  | Commissioning - Retro Building Commissioning  | No Commissioning                            | 2.16                     | 12.5%                         | 90%   | 40%                                 | 3            | \$1,657      |
| Existing             | Grocery          | Space Heat    | Direct Digital Control System-Installation                    | DDC Retrofit  | Pneumatic                                   | 2.16                     | 15.0%                         | 75%   | 61%                                 | 5            | \$8,082      |
| Existing             | Grocery          | Space Heat    | Direct Digital Control System-Optimization                    | DDC System (Optimized)  | DDC System (Basic)                          | 2.16                     | 10.0%                         | 75%   | 80%                                 | 5            | \$4,526      |
| Existing             | Grocery          | Space Heat    | Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control                           | Pneumatic                                   | 2.16                     | 15.0%                         | 50%   | 80%                                 | 5            | \$3,266      |
| Existing             | Grocery          | Space Heat    | Duct Repair And Sealing                                       | Reduction In Duct Losses to 5%  | No Repair or Sealing, 15% duct losses       | 2.16                     | 2.5%                          | 45%   | 45%                                 | 18           | \$3,362      |
| Existing             | Grocery          | Space Heat    | Exhaust Air to Ventilation Air Heat Recovery                  | Exhaust Air Heat Recovery   | No Heat Recovery                            | 2.16                     | 15.0%                         | 5%  | 94%                                 | 10           | \$14457      |
| Existing             | Grocery          | Space Heat    | Exhaust Hood Makeup Air                                       | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air                    | Hood Pulls Conditioned Air (No Make-up Air) | 2.16                     | 4.5%                          | 64%   | 85%                                 | 10           | \$5,726      |
| Existing             | Grocery          | Space Heat    | Infiltration Control (Caulking, Weather Stripping, etc.)      | Install Caulking And Weatherstripping (ACH 0.65)  | Infiltration Conditions (ACH 1.0)           | 2.16                     | 10.0%                         | 40%   | 10%                                 | 10           | \$1,968      |
| Existing             | Grocery          | Space Heat    | Insulation (Ceiling)  | R-49  | R-30  | 2.16                     | 8.0%                          | 75%   | 85%                                 | 25           | \$4,371      |
| Existing             | Grocery          | Space Heat    | Insulation (Ceiling) - Existing to Code                       | R-30  | Existing Ceiling Insulation (Average R-9)   | 2.16                     | 12.5%                         | 75%   | 10%                                 | 25           | \$5,127      |
| Existing             | Grocery          | Space Heat    | Insulation (Ceiling) - Zero to Code                           | R-30  | R-0   | 2.16                     | 25.0%                         | 75%   | 0%                                  | 25           | \$5,127      |
| Existing             | Grocery          | Space Heat    | Insulation (Duct) (Unconditioned Spaces)                      | Install New Duct Insulation (R-8)   | R-0   | 2.16                     | 4.4%                          | 10%   | 15%                                 | 25           | \$940        |
| Existing             | Grocery          | Space Heat    | Insulation (Duct) (Unconditioned Spaces)                      | R-4   | R-0   | 2.16                     | 2.4%                          | 10%   | 15%                                 | 25           | \$979        |
| Existing             | Grocery          | Space Heat    | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced   | R-19 (2x6 Framing) - (Code)                 | 2.16                     | 6.0%                          | 10%   | 95%                                 | 25           | \$2,218      |
| Existing             | Grocery          | Space Heat    | Insulation (Wall) - Existing to Code                          | R-19 (2x6 Framing) - (Code)   | Existing R-value (Average R-3)              | 2.16                     | 21.1%                         | 10%   | 35%                                 | 25           | \$2,430      |
| Existing             | Grocery          | Space Heat    | Insulation (Wall) - Zero to Code                              | R-19 (2x6 Framing) - (Code)   | R-0   | 2.16                     | 25.0%                         | 10%   | 0%                                  | 25           | \$2,402      |
| Existing             | Grocery          | Space Heat    | Insulation - Floor (Non-Slab)                                 | R-19  | R-10 (Code)                                 | 2.16                     | 5.0%                          | 35%   | 45%                                 | 25           | \$756        |
| Existing             | Grocery          | Space Heat    | Insulation - Floor (Non-Slab) - Existing to Code              | R-10 (Code)   | R-0   | 2.16                     | 15.0%                         | 35%   | 45%                                 | 25           | \$4,371      |

| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description  | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|--|--|--------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Grocery          | Space Heat | Sensible And Total Heat Recovery Devices              | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery   | 2.16                     | 25.0%                     | 25%   | 98%                                 | 10           | \$17735      |
| Existing             | Grocery          | Space Heat | Thermostat - Programmable                             | Energy Star Programmable Thermostat  | Manual Thermostat  | 2.16                     | 3.0%                      | 95%   | 46%                                 | 15           | \$145        |
| Existing             | Grocery          | Space Heat | Windows   | U = 0.35   | U = 0.40   | 2.16                     | 2.4%                      | 80%   | 85%                                 | 25           | \$1,341      |
| Existing             | Grocery          | Space Heat | Windows - Existing to Code                            | U = 0.40   | Existing Windows (U=0.65)                                  | 2.16                     | 7.3%                      | 10%   | 85%                                 | 25           | \$19158      |
| Existing             | Grocery          | Water Heat | Water_Heater (40 Gallon Electric) - Residential Sized | EF = 0.95  | EF = 0.92  | 0.29                     | 3.3%                      | NA  | NA                                  | 20           | \$323        |
| Existing             | Grocery          | Water Heat | Clothes Washer - Ozonating                            | Ozonating Clothes Washer   | Standard Commercial Clothes Washer                         | 0.30                     | 15.1%                     | 5%  | 95%                                 | 10           | \$8,704      |
| Existing             | Grocery          | Water Heat | Clothes Washer Commercial                             | Energy Star Commercial Clothes Washer MEF=1.72   | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.30                     | 10.7%                     | 5%  | 80%                                 | 11           | \$304        |
| Existing             | Grocery          | Water Heat | Demand controlled Circulating Systems                 | Install demand-based control system (VFD Control by Demand)  | No demand control systems in place                         | 0.30                     | 5.0%                      | 75%   | 94%                                 | 15           | \$2,335      |
| Existing             | Grocery          | Water Heat | Dishwashing - Commercial - High Efficiency            | High Efficiency Dishwasher   | Standard Dishwasher  | 0.30                     | 2.1%                      | 75%   | 80%                                 | 10           | \$2,700      |
| Existing             | Grocery          | Water Heat | Dishwashing - Commercial Chemical System              | Low-Temp Commercial Dishwasher (Includes Extra Chemmical Cost)   | High Temp Commercial Dishwasher                            | 0.30                     | 5.6%                      | 75%   | 95%                                 | 10           | \$841        |
| Existing             | Grocery          | Water Heat | Dishwashing - Residential Sized System                | EF = 0.65 (ENERGY STAR)  | Standard Dishwasher (FED Std. EF=0.46)                     | 0.30                     | 5.7%                      | 45%   | 25%                                 | 13           | \$32         |
| Existing             | Grocery          | Water Heat | Dishwashing - Residential Sized System                | EF = 0.77  | Standard Dishwasher (FED Std. EF=0.46)                     | 0.30                     | 7.8%                      | 45%   | 55%                                 | 13           | \$630        |
| Existing             | Grocery          | Water Heat | Drainwater Heat Recovery Water Heater                 | Install (Power-Pipe or GFX) - Heat Recovery Water Heater   | No Heat Recovery System                                    | 0.30                     | 20.0%                     | 5%  | 92%                                 | 25           | \$1,751      |
| Existing             | Grocery          | Water Heat | Faucet Aerators                                       | 1.5 GPM Aerator  | 2.5 GPM Aerator (Federal Code)                             | 0.30                     | 4.0%                      | 95%   | 25%                                 | 10           | \$0          |
| Existing             | Grocery          | Water Heat | Faucet Aerators - Existing to Code                    | 2.5 GPM Aerator (Federal Code)   | 4.0 GPM Aerator  | 0.30                     | 3.8%                      | 95%   | 15%                                 | 10           | \$2          |
| Existing             | Grocery          | Water Heat | Heat Pump Water Heater                                | EF = 2.9   | EF=0.93 Baseline Electric Water Heater                     | 0.30                     | 58.9%                     | 40%   | 94%                                 | 15           | \$9,272      |
| Existing             | Grocery          | Water Heat | Hot Water (SHW) Pipe Insulation                       | Install Insulation (R-4)   | No Pipe Insulation   | 0.30                     | 1.0%                      | 80%   | 90%                                 | 15           | \$89         |
| Existing             | Grocery          | Water Heat | Low Flow Spray Heads                                  | 1.6 GPM  | 3.0 GPM  | 0.30                     | 2.3%                      | 95%   | 40%                                 | 5            | \$5          |
| Existing             | Grocery          | Water Heat | Low-Flow Showerheads                                  | 2.0 GPM Showerhead   | 2.5 GPM Showerhead (Federal Code)                          | 0.30                     | 1.1%                      | 15%   | 75%                                 | 10           | \$6          |
| Existing             | Grocery          | Water Heat | Low-Flow Showerheads - Existing to Code               | 2.5 GPM Showerhead (Federal Code)  | 4.5 GPM Showerhead   | 0.30                     | 2.5%                      | 15%   | 20%                                 | 10           | \$12         |
| Existing             | Grocery          | Water Heat | Solar RE - Solar Water Heater                         | Passive solar water heating  | Non-solar hot water heater                                 | 0.30                     | 38.6%                     | 20%   | 95%                                 | 20           | \$8,930      |
| Existing             | Grocery          | Water Heat | Ultrasonic Faucet Control                             | Install Ultrasonic Motion Faucet Control   | No Faucet Control  | 0.30                     | 3.3%                      | 95%   | 95%                                 | 10           | \$207        |
| Existing             | Grocery          | Water Heat | Water Heater Thermostat Setback                       | Thermostat Setback and Replcement (120 Degrees)  | No Thermostat Setback (130 Degrees)                        | 0.30                     | 7.7%                      | 75%   | 50%                                 | 11           | \$108        |
| New                  | Grocery          | Cooking    | Cooking Fryers - Commercial                           | Energy Star Commercial Fryer   | Non-Energy Star Fryer                                      | 2.69                     | 2.5%                      | 35%   | 70%                                 | 12           | \$4,946      |
| New                  | Grocery          | Cooking    | Hot Food Holding Cabinets - Commercial                | Energy Star Commercial Hot Food Holding Cabinets   | Non-Energy Star Commercial Hot Food Holding Cabinets       | 2.69                     | 8.3%                      | 55%   | 85%                                 | 12           | \$1,800      |

| Construction Vintage | Customer Segment | End Use          | Measure Name                                | Measure Description  | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|--|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Grocery          | Cooking          | Oven - Convection                           | Convection Oven  | Standard Oven  | 2.69                     | 3.4%                          | 85%   | 85%                                 | 15           | \$1,734      |
| New                  | Grocery          | Cooking          | Steam Cookers - Commercial                  | Energy Star Commercial Steam Cookers (50% efficiency)  | Non-Energy Star Commercial Steam Cooker (35% efficiency) | 2.69                     | 2.3%                          | 25%   | 75%                                 | 10           | \$1          |
| New                  | Grocery          | Cooling Chillers | Chiller - Premium Efficiency                | 0.507 kW/ton   | 0.634 kW/ton   | 1.37                     | 20.0%                         | NA  | NA                                  | 20           | \$2,218      |
| New                  | Grocery          | Cooling Chillers | Chiller - Advanced Technology               | 0.461 kW/ton   | 0.634 kW/ton   | 1.37                     | 27.3%                         | NA  | NA                                  | 20           | \$2,765      |
| New                  | Grocery          | Cooling Chillers | Chiller - High Efficiency                   | 0.574 kW/ton   | 0.634 kW/ton   | 1.37                     | 9.5%                          | NA  | NA                                  | 20           | \$795        |
| New                  | Grocery          | Cooling Chillers | Chilled Water Piping Loop w/ VSD Control    | VSD for Secondary Chilled Water Loop   | Primary Loop Only w/ Constant Speed Pump                 | 1.25                     | 7.6%                          | 25%   | 70%                                 | 10           | \$5,019      |
| New                  | Grocery          | Cooling Chillers | Chilled Water Reset                         | Install Chilled Water Reset  | No Chilled Water Reset                                   | 1.25                     | 5.0%                          | 48%   | 95%                                 | 10           | \$5,726      |
| New                  | Grocery          | Cooling Chillers | Commissioning - New Building Commissioning  | Commissioning - New Building Commissioning   | No Commissioning   | 1.25                     | 12.5%                         | 45%   | 80%                                 | 3            | \$6,136      |
| New                  | Grocery          | Cooling Chillers | Cooling Tower-Decrease Temperature Approach | 6 Deg F  | 10 Deg F   | 1.25                     | 8.0%                          | 25%   | 94%                                 | 15           | \$497        |
| New                  | Grocery          | Cooling Chillers | Direct Digital Control System-Optimization  | DDC System (Optimized)   | DDC System (Basic)                                       | 1.25                     | 10.0%                         | 75%   | 80%                                 | 5            | \$4,526      |
| New                  | Grocery          | Cooling Chillers | Exhaust Hood Makeup Air                     | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air)              | 1.25                     | 4.5%                          | 64%   | 85%                                 | 10           | \$5,726      |
| New                  | Grocery          | Cooling Chillers | Green Roof                                  | Vegetation on Roof   | Standard roofing techniques                              | 1.25                     | 5.0%                          | 15%   | 98%                                 | 30           | \$85145      |
| New                  | Grocery          | Cooling Chillers | Insulation (Ceiling)                        | R-38   | R-21 (Code)  | 1.25                     | 2.0%                          | 75%   | 45%                                 | 25           | \$4,371      |
| New                  | Grocery          | Cooling Chillers | Insulation (Ceiling)                        | R-49   | R-21 (Code)  | 1.25                     | 3.0%                          | 75%   | 85%                                 | 25           | \$5,799      |
| New                  | Grocery          | Cooling Chillers | Insulation (Wall)                           | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                              | 1.25                     | 3.0%                          | 95%   | 95%                                 | 25           | \$2,218      |
| New                  | Grocery          | Cooling Chillers | Insulation - Floor (Non-Slab)               | R-19   | R-10 (Code)  | 1.25                     | 1.0%                          | 35%   | 45%                                 | 25           | \$756        |
| New                  | Grocery          | Cooling Chillers | Leak Proof Duct Fittings                    | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                                     | 1.25                     | 10.0%                         | 40%   | 98%                                 | 25           | \$1,303      |
| New                  | Grocery          | Cooling Chillers | Sensible And Total Heat Recovery Devices    | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery   | 1.25                     | 25.0%                         | 50%   | 98%                                 | 10           | \$17735      |
| New                  | Grocery          | Cooling Chillers | Turbocor Compressor                         | 0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)                                 | 0.634 kW/ton (Code) chiller water cooled                 | 1.25                     | 44.8%                         | 95%   | 99%                                 | 20           | \$11709      |

| Construction Vintage | Customer Segment | End Use          | Measure Name   | Measure Description   | Base Equipment                              | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|--|---|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Grocery          | Cooling Chillers | Window RE - Window Overhangs                             | Overhangs over windows for shading  | No window overhangs                         | 1.25                     | 0.5%                          | 75%   | 75%                                 | 30           | \$1,681      |
| New                  | Grocery          | Cooling Chillers | Windows  | U = 0.35  | U = 0.55 (Code)                             | 1.25                     | 0.7%                          | 80%   | 85%                                 | 25           | \$5,361      |
| New                  | Grocery          | Cooling DX       | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)   | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)  | 10.3 EER Rooftop Unit (State Code)          | 1.49                     | 14.2%                         | NA  | NA                                  | 15           | \$5,386      |
| New                  | Grocery          | Cooling DX       | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)      | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)   | 10.3 EER Rooftop Unit (State Code)          | 1.49                     | 6.4%                          | NA  | NA                                  | 15           | \$2,867      |
| New                  | Grocery          | Cooling DX       | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)    | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)   | 10.3 EER Rooftop Unit (State Code)          | 1.49                     | 10.4%                         | NA  | NA                                  | 15           | \$4,444      |
| New                  | Grocery          | Cooling DX       | Commissioning - New Building Commissioning               | Commissioning - New Building Commissioning  | No Commissioning                            | 1.36                     | 12.5%                         | 90%   | 80%                                 | 3            | \$6,136      |
| New                  | Grocery          | Cooling DX       | Direct / Indirect Evaporative Cooling, Pre-Cooling       | Direct / Indirect Evaporative Cooling, Pre-Cooling  | No modification to DX system                | 1.36                     | 25.0%                         | 50%   | 85%                                 | 15           | \$17,511     |
| New                  | Grocery          | Cooling DX       | Direct Digital Control System-Optimization               | DDC System (Optimized)  | DDC System (Basic)                          | 1.36                     | 10.0%                         | 75%   | 80%                                 | 5            | \$4,526      |
| New                  | Grocery          | Cooling DX       | Exhaust Hood Makeup Air                                  | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air                                      | Hood Pulls Conditioned Air (No Make-up Air) | 1.36                     | 4.5%                          | 64%   | 85%                                 | 10           | \$5,726      |
| New                  | Grocery          | Cooling DX       | Green Roof   | Vegetation on Roof  | Standard roofing techniques                 | 1.36                     | 5.0%                          | 15%   | 98%                                 | 30           | \$85,145     |
| New                  | Grocery          | Cooling DX       | Insulation (Ceiling)                                     | R-38  | R-21 (Code)                                 | 1.36                     | 2.0%                          | 75%   | 45%                                 | 25           | \$4,371      |
| New                  | Grocery          | Cooling DX       | Insulation (Ceiling)                                     | R-49  | R-21 (Code)                                 | 1.36                     | 3.0%                          | 75%   | 85%                                 | 25           | \$5,799      |
| New                  | Grocery          | Cooling DX       | Insulation (Wall)  | R-25 (2x6 Framing) - Advanced   | R-19 (2x6 Framing) - (Code)                 | 1.36                     | 3.0%                          | 95%   | 95%                                 | 25           | \$2,218      |
| New                  | Grocery          | Cooling DX       | Insulation - Floor (Non-Slab)                            | R-19  | R-10 (Code)                                 | 1.36                     | 1.0%                          | 35%   | 45%                                 | 25           | \$756        |
| New                  | Grocery          | Cooling DX       | Leak Proof Duct Fittings                                 | Quick connect fittings that do not require mastic or drawbands  | Std duct workmanship                        | 1.36                     | 10.0%                         | 40%   | 98%                                 | 25           | \$1,303      |
| New                  | Grocery          | Cooling DX       | Window RE - Window Overhangs                             | Overhangs over windows for shading  | No window overhangs                         | 1.36                     | 0.5%                          | 75%   | 75%                                 | 30           | \$1,681      |
| New                  | Grocery          | Cooling DX       | Windows  | U = 0.35  | U = 0.55 (Code)                             | 1.36                     | 0.7%                          | 80%   | 85%                                 | 25           | \$5,361      |
| New                  | Grocery          | HVAC Aux         | Automated Exhaust VFD Control - Parking Garage CO sensor | CO Sensors  | No CO Sensors                               | 2.58                     | 20.0%                         | 5%  | 75%                                 | 10           | \$1,718      |
| New                  | Grocery          | HVAC Aux         | Cooking Hood Controls                                    | Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air | No Cooking Hood Controls                    | 2.58                     | 7.5%                          | 60%   | 65%                                 | 10           | \$6,829      |
| New                  | Grocery          | HVAC Aux         | Motor - Premium-Efficiency                               | PE Motors for HVAC Applications   | Standard Efficiency Motors                  | 2.58                     | 3.8%                          | 85%   | 81%                                 | 10           | \$395        |
| New                  | Grocery          | HVAC Aux         | Motor - Pump & Fan System - Variable Speed Control       | Pump And Fan System Optimization w/ VSD   | No Pump And Fan System VSD Optimization     | 2.58                     | 33.8%                         | 85%   | 75%                                 | 20           | \$1,705      |



| Construction Vintage | Customer Segment | End Use   | Measure Name  | Measure Description  | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|---|--|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Grocery          | HVAC Aux  | Motor - VAV Box High-Efficiency                                 | ECM Motors   | Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control | 2.58                     | 8.8%                          | 20%   | 77%                                 | 10           | \$3,070      |
| New                  | Grocery          | HVAC Aux  | Optimized Variable Volume Lab Hood Design                       | Optimized Variable Volume Lab Hood Design                                      | Constant Volume Lab Hood Design  | 2.58                     | 1.6%                          | 0%  | 94%                                 | 10           | \$1,791      |
| New                  | Grocery          | Heat Pump | High-Efficiency EER=11.0, COP=3.5                               | High-Efficiency EER=11.0, COP=3.5  | EER=10.1, COP=3.2  | 1.78                     | 16.8%                         | NA  | NA                                  | 15           | \$3,818      |
| New                  | Grocery          | Heat Pump | Premium-Efficiency EER=11.8, COP=3.8                            | Premium-Efficiency EER=11.8, COP=3.8   | EER=10.1, COP=3.2  | 1.78                     | 30.2%                         | NA  | NA                                  | 15           | \$8,175      |
| New                  | Grocery          | Heat Pump | Commissioning - New Building Commissioning                      | Commissioning - New Building Commissioning                                     | No Commissioning   | 1.62                     | 12.5%                         | 90%   | 80%                                 | 3            | \$6,136      |
| New                  | Grocery          | Heat Pump | Direct Digital Control System-Optimization                      | DDC System (Optimized)   | DDC System (Basic)   | 1.62                     | 10.0%                         | 75%   | 80%                                 | 5            | \$4,526      |
| New                  | Grocery          | Heat Pump | Exhaust Air to Ventilation Air Heat Recovery                    | Exhaust Air Heat Recovery  | No Heat Recovery   | 1.62                     | 10.0%                         | 5%  | 94%                                 | 10           | \$14,457     |
| New                  | Grocery          | Heat Pump | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air)  | 1.62                     | 4.5%                          | 64%   | 85%                                 | 10           | \$5,726      |
| New                  | Grocery          | Heat Pump | Green Roof  | Vegetation on Roof   | Standard roofing techniques  | 1.62                     | 0.5%                          | 15%   | 98%                                 | 30           | \$85,145     |
| New                  | Grocery          | Heat Pump | Heat Pump - Ground Source (Closed Loop)                         | GSHP: COP=3.1, EER=13.4  | Std. Air Source HP 'EER=10.1, COP=3.2  | 1.62                     | 10.3%                         | 45%   | 92%                                 | 20           | \$44,280     |
| New                  | Grocery          | Heat Pump | Heat Pump - Ground Source (Closed Loop)                         | GSHP: COP=4.0, EER=20  | Std. Air Source HP 'EER=10.1, COP=3.2  | 1.62                     | 31.5%                         | 45%   | 92%                                 | 20           | \$83,190     |
| New                  | Grocery          | Heat Pump | Heat Pump - Water Source (Closed Loop)                          | WSHP: COP=4.2, EER=12.0  | Std. Air Source Heat Pump'EER=10.1, COP=3.2  | 1.62                     | 22.7%                         | 10%   | 90%                                 | 20           | \$8,907      |
| New                  | Grocery          | Heat Pump | Heat Pump - Water Source (Closed Loop)                          | WSHP: COP=4.8, EER=14.5  | Std. Air Source Heat Pump'EER=10.1, COP=3.2  | 1.62                     | 33.7%                         | 10%   | 90%                                 | 20           | \$11,764     |
| New                  | Grocery          | Heat Pump | Insulation (Ceiling)  | R-38   | R-21 (Code)  | 1.62                     | 5.9%                          | 75%   | 45%                                 | 25           | \$4,371      |
| New                  | Grocery          | Heat Pump | Insulation (Ceiling)  | R-49   | R-21 (Code)  | 1.62                     | 8.9%                          | 75%   | 85%                                 | 25           | \$5,799      |
| New                  | Grocery          | Heat Pump | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)  | 1.62                     | 5.0%                          | 95%   | 95%                                 | 25           | \$2,218      |
| New                  | Grocery          | Heat Pump | Insulation - Floor (Non-Slab)                                   | R-19   | R-10 (Code)  | 1.62                     | 3.7%                          | 35%   | 45%                                 | 25           | \$756        |
| New                  | Grocery          | Heat Pump | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands                 | Std duct workmanship   | 1.62                     | 10.0%                         | 40%   | 98%                                 | 25           | \$1,303      |
| New                  | Grocery          | Heat Pump | Windows   | U = 0.35   | U = 0.55 (Code)  | 1.62                     | 5.0%                          | 80%   | 85%                                 | 25           | \$5,361      |
| New                  | Grocery          | Lighting  | Bi-Level Control, Stairwell Lighting                            | Occupancy Sensor Control, 50% Lighting Power during unoccupied Time            | Continuous Full Power Lighting in Stairways  | 6.49                     | 2.0%                          | 75%   | 75%                                 | 9            | \$662        |
| New                  | Grocery          | Lighting  | Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures | Continuous Dimming, Fluorescent Fixtures (Day-Lighting)                        | No Dimming Controls  | 6.49                     | 6.0%                          | 60%   | 96%                                 | 9            | \$1,009      |
| New                  | Grocery          | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 15%                        | Code Required LPD And Control Strategies: LPD = 1.5  | 6.49                     | 15.0%                         | 90%   | 70%                                 | 14           | \$1,362      |
| New                  | Grocery          | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 20%                        | Code Required LPD And Control Strategies: LPD = 1.5  | 6.49                     | 20.0%                         | 75%   | 85%                                 | 14           | \$3,631      |

| Construction Vintage | Customer Segment | End Use       | Measure Name  | Measure Description  | Base Equipment                                      | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|---|--|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Grocery          | Lighting      | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 25%                              | Code Required LPD And Control Strategies: LPD = 1.5 | 6.49                     | 25.0%                         | 70%   | 90%                                 | 14           | \$5,951      |
| New                  | Grocery          | Lighting      | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 35% - Only High Bay Applications | Code Required LPD And Control Strategies: LPD = 1.5 | 6.49                     | 31.5%                         | 65%   | 95%                                 | 14           | \$2,168      |
| New                  | Grocery          | Lighting      | LED Refrigeration Case Lights                             | LED Refrigeration Case Lights (28W)  | Fluorescent Refrigeration Case Lights (60W)         | 6.49                     | 0.9%                          | 90%   | 80%                                 | 13           | \$630        |
| New                  | Grocery          | Lighting      | LED Solid State White Lighting Package                    | Landscape, merchandise, signage, structure & task lighting                           | 50W 10hrs/day, 365 day/yr                           | 6.49                     | 0.8%                          | 10%   | 95%                                 | 14           | \$36         |
| New                  | Grocery          | Lighting      | Occupancy Sensor Control, Fluorescent                     | Occupancy Sensor Control, Fluorescent  | No Occupancy Sensor                                 | 6.49                     | 4.0%                          | 45%   | 90%                                 | 10           | \$157        |
| New                  | Grocery          | Plug Load     | Energy Star - Battery Charging System                     | Energy Star Battery Charging System  | Non-Energy Star Battery Chargers                    | 2.51                     | 0.4%                          | 95%   | 90%                                 | 7            | \$3          |
| New                  | Grocery          | Plug Load     | Energy Star - Computer                                    | Energy Star Features Enabled   | Non-Energy Star Features                            | 2.51                     | 13.6%                         | 64%   | 25%                                 | 4            | \$1          |
| New                  | Grocery          | Plug Load     | Energy Star - Copiers                                     | Energy Star or Better Office Equipment: Copiers,                                     | Office Equipment: Copiers, Standard                 | 2.51                     | 5.7%                          | 35%   | 45%                                 | 6            | \$165        |
| New                  | Grocery          | Plug Load     | Energy Star - Fax   | Energy Star Features Enabled   | Non-Energy Star Features                            | 2.51                     | 1.8%                          | 75%   | 55%                                 | 4            | \$1          |
| New                  | Grocery          | Plug Load     | Energy Star - Monitors                                    | Energy Star Features Enabled   | Non-Energy Star Features                            | 2.51                     | 18.4%                         | 64%   | 15%                                 | 4            | \$157        |
| New                  | Grocery          | Plug Load     | Energy Star - Printers                                    | Energy Star Features Enabled   | Non-Energy Star Features                            | 2.51                     | 1.3%                          | 75%   | 40%                                 | 5            | \$16         |
| New                  | Grocery          | Plug Load     | Energy Star - Scanners                                    | Energy Star Features Enabled   | Non-Energy Star Features                            | 2.51                     | 0.9%                          | 75%   | 45%                                 | 4            | \$1          |
| New                  | Grocery          | Plug Load     | Energy Star - Water Cooler                                | Energy Star Water Cooler (Hot/Cold Water)  | Non-Energy Star Water Cooler                        | 2.51                     | 1.8%                          | 15%   | 75%                                 | 10           | \$1          |
| New                  | Grocery          | Plug Load     | Office Computer Network Management                        | Office Computer Network Energy Management  | No Network Management                               | 2.51                     | 1.8%                          | 95%   | 30%                                 | 3            | \$310        |
| New                  | Grocery          | Plug Load     | Power Supply 80+ Office Measure                           | 80% Efficient Power supply   | No 80+  | 2.51                     | 1.0%                          | 95%   | 86%                                 | 7            | \$0          |
| New                  | Grocery          | Plug Load     | Refrigerator eCube  | Refrigerator eCube   | No Refrigerator eCube                               | 2.51                     | 1.2%                          | 75%   | 95%                                 | 10           | \$86         |
| New                  | Grocery          | Plug Load     | Residential-Size Refrigerator                             | Energy Star Residential-Size Refrigerator  | Residential-Size Refrigerator - Standard            | 2.51                     | 0.4%                          | 5%  | 65%                                 | 13           | \$126        |
| New                  | Grocery          | Plug Load     | Residential-Size Refrigerator/Freezer - Early Replacement | Energy Star Refrigerator/Freezer   | Baseline Refrigerator/Freezer                       | 2.51                     | 4.8%                          | 25%   | 35%                                 | 7            | \$578        |
| New                  | Grocery          | Plug Load     | Vending Machine   | Energy Star Vending Machines - High-Efficiency                                       | Vending Machines - Standard                         | 2.51                     | 8.9%                          | 75%   | 80%                                 | 14           | \$189        |
| New                  | Grocery          | Refrigeration | Anti-Sweat (Humidistat) Controls                          | Variable Temp. Controls (Humidistat)   | Constant Controls                                   | 21                       | 35.6%                         | 90%   | 45%                                 | 12           | \$5,634      |
| New                  | Grocery          | Refrigeration | Commercial Reach-In Refrigerator                          | Energy Star Commercial Reach-In Refrigerator   | Commercial-Size Refrigerator - Standard             | 21                       | 2.9%                          | 95%   | 100%                                | 12           | \$345        |
| New                  | Grocery          | Refrigeration | Compressor VSD Retrofit                                   | Compressor VSD Retrofit  | Standard Compressor                                 | 21                       | 16.8%                         | 60%   | 77%                                 | 10           | \$11,556     |
| New                  | Grocery          | Refrigeration | Custom Refrigeration System                               | High-Efficiency Custom Refrigeration System (Walk-in) includes compressors           | Custom Refrigeration System - Standard              | 21                       | 3.6%                          | 85%   | 65%                                 | 10           | \$9,595      |
| New                  | Grocery          | Refrigeration | Defrost Demand Control - Hot Gas                          | Refrigerant Defrost w/ Hot Gas   | No Defrost Demand Control - Hot Gas                 | 21                       | 2.6%                          | 95%   | 68%                                 | 10           | \$5,559      |
| New                  | Grocery          | Refrigeration | Display Cases   | High-Efficiency Display Cases  | Display Cases - Standard                            | 21                       | 3.6%                          | 100%  | 90%                                 | 15           | \$7,543      |
| New                  | Grocery          | Refrigeration | Evaporative Condenser - High-Efficiency                   | High-Efficiency Evaporative Condenser  | Air-Cooled Condenser                                | 21                       | 0.7%                          | 90%   | 65%                                 | 15           | \$9,744      |
| New                  | Grocery          | Refrigeration | High-Efficiency Compressor                                | High-Efficiency Compressor (15% More Efficient)                                      | Standard Compressor, 40% Efficiency                 | 21                       | 8.4%                          | 85%   | 72%                                 | 10           | \$9,308      |

| Construction Vintage | Customer Segment | End Use       | Measure Name  | Measure Description  | Base Equipment   | Baseline kWh (UEC or EUJ) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|---|--|--|---------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Grocery          | Refrigeration | High-Efficiency Evaporator Fans - Walk-ins            | High-Efficiency Evaporator Fans, Walk-in Refrigerators   | Standard Evaporator Fans                                   | 21                        | 1.0%                      | 92%   | 75%                                 | 15           | \$1,195      |
| New                  | Grocery          | Refrigeration | Ice Maker   | Energy Star Ice Maker - High-Efficiency  | Standard Ice Maker   | 21                        | 1.0%                      | 90%   | 86%                                 | 9            | \$376        |
| New                  | Grocery          | Refrigeration | Motor - Case Fans with ECM motors                     | ECM motors on evaporator fan, on display cases   | 48 cf 2-door reach-in commercial refrigerator              | 21                        | 0.5%                      | 95%   | 50%                                 | 20           | \$1,350      |
| New                  | Grocery          | Refrigeration | Night Covers for Display Cases                        | Night Covers for Display Cases   | No Night Covers  | 21                        | 1.4%                      | 95%   | 85%                                 | 10           | \$3,110      |
| New                  | Grocery          | Refrigeration | Reduced Speed or Cycling of Evaporator Fans           | VFD on Evaporator Fans (Evap Fan Control on Walk-In)   | Constant Speed Evaporator Fans                             | 21                        | 6.0%                      | 75%   | 70%                                 | 10           | \$449        |
| New                  | Grocery          | Refrigeration | Refrigeration - Commissioning                         | Commissioning (Refrigeration System Diagnostics / Operations and Maintenance for a new unit)                             | No Commissioning   | 21                        | 5.0%                      | 80%   | 90%                                 | 3            | \$556        |
| New                  | Grocery          | Refrigeration | Refrigeration with Heat Recovery                      | Heat Recovery from Refrigeration System. Applied to Water Heating  | No Heat Recovery   | 21                        | 28.0%                     | 75%   | 55%                                 | 16           | \$4,287      |
| New                  | Grocery          | Refrigeration | Special Glass Doors for Refrigerated Reach-in Cases   | Do Not Require Anti-Sweat Heating  | Standard Glass Doors                                       | 21                        | 3.2%                      | 95%   | 77%                                 | 16           | \$1,856      |
| New                  | Grocery          | Refrigeration | Strip Curtains for Walk-Ins                           | Strip Curtains for Walk-Ins  | No Strip Curtains for Walk-Ins                             | 21                        | 2.0%                      | 95%   | 20%                                 | 4            | \$189        |
| New                  | Grocery          | Space Heat    | Commissioning - New Building Commissioning            | Commissioning - New Building Commissioning   | No Commissioning   | 0.19                      | 12.5%                     | 90%   | 80%                                 | 3            | \$6,136      |
| New                  | Grocery          | Space Heat    | Direct Digital Control System-Optimization            | DDC System (Optimized)   | DDC System (Basic)   | 0.19                      | 10.0%                     | 75%   | 80%                                 | 5            | \$4,526      |
| New                  | Grocery          | Space Heat    | Exhaust Air to Ventilation Air Heat Recovery          | Exhaust Air Heat Recovery  | No Heat Recovery   | 0.19                      | 15.0%                     | 5%  | 94%                                 | 10           | \$14457      |
| New                  | Grocery          | Space Heat    | Exhaust Hood Makeup Air                               | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air)                | 0.19                      | 4.5%                      | 64%   | 85%                                 | 10           | \$5,726      |
| New                  | Grocery          | Space Heat    | Insulation (Ceiling)                                  | R-49   | R-30   | 0.19                      | 8.0%                      | 75%   | 85%                                 | 25           | \$4,371      |
| New                  | Grocery          | Space Heat    | Insulation (Wall)                                     | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                                | 0.19                      | 6.0%                      | 95%   | 95%                                 | 25           | \$2,218      |
| New                  | Grocery          | Space Heat    | Insulation - Floor (Non-Slab)                         | R-19   | R-10 (Code)  | 0.19                      | 5.0%                      | 35%   | 45%                                 | 25           | \$756        |
| New                  | Grocery          | Space Heat    | Leak Proof Duct Fittings                              | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                                       | 0.19                      | 10.0%                     | 40%   | 98%                                 | 25           | \$1,303      |
| New                  | Grocery          | Space Heat    | Sensible And Total Heat Recovery Devices              | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery   | 0.19                      | 25.0%                     | 50%   | 98%                                 | 10           | \$17735      |
| New                  | Grocery          | Space Heat    | Windows   | U = 0.35   | U = 0.40   | 0.19                      | 2.4%                      | 80%   | 85%                                 | 25           | \$1,341      |
| New                  | Grocery          | Water Heat    | Water_Heater (40 Gallon Electric) - Residential Sized | EF = 0.95  | EF = 0.92  | 0.30                      | 3.3%                      | NA  | NA                                  | 20           | \$323        |
| New                  | Grocery          | Water Heat    | Clothes Washer - Ozonating                            | Ozonating Clothes Washer   | Standard Commercial Clothes Washer                         | 0.30                      | 15.1%                     | 5%  | 95%                                 | 10           | \$8,704      |
| New                  | Grocery          | Water Heat    | Clothes Washer Commercial                             | Energy Star Commercial Clothes Washer MEF=1.72   | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.30                      | 10.7%                     | 5%  | 80%                                 | 11           | \$304        |
| New                  | Grocery          | Water Heat    | Demand controlled Circulating Systems                 | Install demand-based control system (VFD Control by Demand)  | No demand control systems in place                         | 0.30                      | 5.0%                      | 90%   | 94%                                 | 15           | \$2,335      |
| New                  | Grocery          | Water Heat    | Dishwashing - Commercial - High Efficiency            | High Efficiency Dishwasher   | Standard Dishwasher  | 0.30                      | 2.1%                      | 75%   | 80%                                 | 10           | \$2,700      |

| Construction Vintage | Customer Segment | End Use          | Measure Name  | Measure Description                                      | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|--|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Grocery          | Water Heat       | Dishwashing - Commercial Chemical System                            | Low-Temp Commercial Dishwasher (Includes Chemical Cost)  | High Temp Commercial Dishwasher                          | 0.30                     | 5.6%                          | 75%   | 95%                                 | 10           | \$841        |
| New                  | Grocery          | Water Heat       | Dishwashing - Residential Sized System                              | EF = 0.65 (ENERGY STAR)                                  | Standard Dishwasher (FED Std. EF=0.46)                   | 0.30                     | 5.7%                          | 45%   | 25%                                 | 13           | \$32         |
| New                  | Grocery          | Water Heat       | Dishwashing - Residential Sized System                              | EF = 0.77  | Standard Dishwasher (FED Std. EF=0.46)                   | 0.30                     | 7.8%                          | 45%   | 55%                                 | 13           | \$630        |
| New                  | Grocery          | Water Heat       | Drainwater Heat Recovery Water Heater                               | Install (Power-Pipe or GFX) - Heat Recovery Water Heater | No Heat Recovery System                                  | 0.30                     | 20.0%                         | 25%   | 92%                                 | 25           | \$1,751      |
| New                  | Grocery          | Water Heat       | Faucet Aerators   | 1.5 GPM Aerator  | 2.5 GPM Aerator (Federal Code)                           | 0.30                     | 4.0%                          | 95%   | 25%                                 | 10           | \$0          |
| New                  | Grocery          | Water Heat       | Heat Pump Water Heater  | EF = 2.9   | EF=0.93 Baseline Electric Water Heater                   | 0.30                     | 58.9%                         | 50%   | 94%                                 | 15           | \$9,272      |
| New                  | Grocery          | Water Heat       | Low Flow Spray Heads  | 1.6 GPM  | 3.0 GPM  | 0.30                     | 2.3%                          | 95%   | 40%                                 | 5            | \$5          |
| New                  | Grocery          | Water Heat       | Low-Flow Showerheads  | 2.0 GPM Showerhead                                       | 2.5 GPM Showerhead (Federal Code)                        | 0.30                     | 1.1%                          | 15%   | 75%                                 | 10           | \$6          |
| New                  | Grocery          | Water Heat       | Solar RE - Solar Water Heater                                       | Passive solar water heating                              | Non-solar hot water heater                               | 0.30                     | 38.6%                         | 20%   | 95%                                 | 20           | \$8,930      |
| New                  | Grocery          | Water Heat       | Ultrasonic Faucet Control   | Install Ultrasonic Motion Faucet Control                 | No Faucet Control  | 0.30                     | 3.3%                          | 95%   | 95%                                 | 10           | \$207        |
| New                  | Grocery          | Water Heat       | Water Heater Thermostat Setback                                     | Thermostat Setback and Replcement (120 Degrees)          | No Thermostat Setback (130 Degrees)                      | 0.30                     | 7.7%                          | 75%   | 50%                                 | 11           | \$108        |
| Existing             | Hospital         | Cooking          | Cooking Fryers - Commercial   | Energy Star Commercial Fryer                             | Non-Energy Star Fryer                                    | 0.55                     | 2.5%                          | 35%   | 70%                                 | 12           | \$4,946      |
| Existing             | Hospital         | Cooking          | Hot Food Holding Cabinets - Commercial                              | Energy Star Commercial Hot Food Holding Cabinets         | Non-Energy Star Commercial Hot Food Holding Cabinets     | 0.55                     | 8.4%                          | 75%   | 85%                                 | 12           | \$1,800      |
| Existing             | Hospital         | Cooking          | Oven - Convection   | Convection Oven  | Standard Oven  | 0.55                     | 3.4%                          | 85%   | 55%                                 | 15           | \$1,734      |
| Existing             | Hospital         | Cooking          | Steam Cookers - Commercial  | Energy Star Commercial Steam Cookers (50% efficiency)    | Non-Energy Star Commercial Steam Cooker (35% efficiency) | 0.55                     | 2.3%                          | 25%   | 75%                                 | 10           | \$2          |
| Existing             | Hospital         | Cooling Chillers | Chiller - Premium Efficiency  | 0.507 kW/ton   | 0.634 kW/ton   | 1.67                     | 20.0%                         | NA  | NA                                  | 20           | \$3,708      |
| Existing             | Hospital         | Cooling Chillers | Chiller - Advanced Technology                                       | 0.461 kW/ton   | 0.634 kW/ton   | 1.67                     | 27.3%                         | NA  | NA                                  | 20           | \$4,624      |
| Existing             | Hospital         | Cooling Chillers | Chiller - High Efficiency   | 0.574 kW/ton   | 0.634 kW/ton   | 1.67                     | 9.5%                          | NA  | NA                                  | 20           | \$1,329      |
| Existing             | Hospital         | Cooling Chillers | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)              | Constant Ventilation                                     | 1.75                     | 10.0%                         | 5%  | 94%                                 | 15           | \$11583      |
| Existing             | Hospital         | Cooling Chillers | Centrifugal Chiller - VSD Remodel for Existing                      | VSD motor  | Constant Speed Motor                                     | 1.75                     | 40.0%                         | 43%   | 45%                                 | 10           | \$6,919      |
| Existing             | Hospital         | Cooling Chillers | Chilled Water Piping Loop w/ VSD Control                            | VSD for Secondary Chilled Water Loop                     | Primary Loop Only w/ Constant Speed Pump                 | 1.75                     | 7.6%                          | 25%   | 70%                                 | 10           | \$8,391      |
| Existing             | Hospital         | Cooling Chillers | Chilled Water Reset   | Install Chilled Water Reset                              | No Chilled Water Reset                                   | 1.75                     | 5.0%                          | 95%   | 75%                                 | 10           | \$12526      |
| Existing             | Hospital         | Cooling Chillers | Chiller-Water Side Economizer                                       | Install Economizer                                       | No Economizer  | 1.75                     | 5.0%                          | 45%   | 90%                                 | 10           | \$19485      |

| Construction Vintage | Customer Segment | End Use          | Measure Name  | Measure Description  | Base Equipment                              | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|--|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Hospital         | Cooling Chillers | Commissioning - Retro Building Commissioning                  | Commissioning - Retro Building Commissioning                                   | No Commissioning                            | 1.75                     | 12.5%                         | 90%   | 40%                                 | 3            | \$3,624      |
| Existing             | Hospital         | Cooling Chillers | Cooling Tower-Decrease Temperature                            | Approach 6 Deg F   | 10 Deg F                                    | 1.75                     | 8.0%                          | 50%   | 94%                                 | 15           | \$829        |
| Existing             | Hospital         | Cooling Chillers | Cooling Tower-Two-Speed Fan Motor                             | Two-Speed Tower Fans replace Single-Speed                                      | Cooling Tower-One-Speed Fan Motor           | 1.75                     | 14.0%                         | 95%   | 35%                                 | 10           | \$94         |
| Existing             | Hospital         | Cooling Chillers | Cooling Tower-VSD Fan Control                                 | Variable-Speed Tower Fans replace Two-Speed                                    | Cooling Tower-Two-Speed Fan Motor           | 1.75                     | 4.0%                          | 95%   | 75%                                 | 10           | \$750        |
| Existing             | Hospital         | Cooling Chillers | Direct Digital Control System-Installation                    | DDC Retrofit   | Pneumatic                                   | 1.75                     | 15.0%                         | 35%   | 26%                                 | 5            | \$17680      |
| Existing             | Hospital         | Cooling Chillers | Direct Digital Control System-Optimization                    | DDC System (Optimized)   | DDC System (Basic)                          | 1.75                     | 10.0%                         | 75%   | 80%                                 | 5            | \$9,901      |
| Existing             | Hospital         | Cooling Chillers | Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control        | Pneumatic                                   | 1.75                     | 15.0%                         | 75%   | 80%                                 | 5            | \$7,145      |
| Existing             | Hospital         | Cooling Chillers | Duct Repair And Sealing                                       | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 1.75                     | 2.5%                          | 45%   | 45%                                 | 18           | \$7,354      |
| Existing             | Hospital         | Cooling Chillers | Exhaust Hood Makeup Air                                       | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air) | 1.75                     | 4.5%                          | 62%   | 85%                                 | 10           | \$5,725      |
| Existing             | Hospital         | Cooling Chillers | Green Roof  | Vegetation on Roof   | Standard roofing techniques                 | 1.75                     | 5.0%                          | 15%   | 98%                                 | 30           | \$93127      |
| Existing             | Hospital         | Cooling Chillers | Insulation (Ceiling)  | R-38   | R-21 (Code)                                 | 1.75                     | 1.0%                          | 75%   | 45%                                 | 25           | \$4,780      |
| Existing             | Hospital         | Cooling Chillers | Insulation (Ceiling)  | R-49   | R-21 (Code)                                 | 1.75                     | 1.5%                          | 75%   | 85%                                 | 25           | \$6,343      |
| Existing             | Hospital         | Cooling Chillers | Insulation (Ceiling) - Existing to Code                       | R-21 (Code)  | Existing Ceiling Insulation (Average R-9)   | 1.75                     | 1.2%                          | 75%   | 13%                                 | 25           | \$5,608      |
| Existing             | Hospital         | Cooling Chillers | Insulation (Ceiling) - Zero to Code                           | R-21 (Code)  | R-0   | 1.75                     | 3.0%                          | 75%   | 0%                                  | 25           | \$5,608      |
| Existing             | Hospital         | Cooling Chillers | Insulation (Duct) (Unconditioned Spaces)                      | Install New Duct Insulation (R-8)  | R-0   | 1.75                     | 4.4%                          | 10%   | 15%                                 | 25           | \$2,056      |
| Existing             | Hospital         | Cooling Chillers | Insulation (Duct) (Unconditioned Spaces)                      | R-4  | R-0   | 1.75                     | 2.4%                          | 10%   | 15%                                 | 25           | \$2,142      |
| Existing             | Hospital         | Cooling Chillers | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 1.75                     | 3.0%                          | 10%   | 95%                                 | 25           | \$4,639      |
| Existing             | Hospital         | Cooling Chillers | Insulation (Wall) - Existing to Code                          | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)              | 1.75                     | 8.4%                          | 10%   | 35%                                 | 25           | \$5,082      |
| Existing             | Hospital         | Cooling Chillers | Insulation (Wall) - Zero to Code                              | R-19 (2x6 Framing) - (Code)  | R-0   | 1.75                     | 10.0%                         | 10%   | 0%                                  | 25           | \$5,025      |



| Construction Vintage | Customer Segment | End Use          | Measure Name  | Measure Description  | Base Equipment                              | Baseline kWh (UEC or EU) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|--|---|--------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Hospital         | Cooling Chillers | Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)                                 | 1.75                     | 0.5%                      | 35%   | 35%                                 | 25           | \$827        |
| Existing             | Hospital         | Cooling Chillers | Insulation - Floor (Non-Slab) - Existing to Code                    | R-10 (Code)  | R-0   | 1.75                     | 1.5%                      | 35%   | 35%                                 | 25           | \$4,780      |
| Existing             | Hospital         | Cooling Chillers | Pipe Insulation   | R-4  | R-0   | 1.75                     | 1.0%                      | 65%   | 45%                                 | 15           | \$379        |
| Existing             | Hospital         | Cooling Chillers | Sensible And Total Heat Recovery Devices                            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery                            | 1.75                     | 25.0%                     | 25%   | 98%                                 | 10           | \$38794      |
| Existing             | Hospital         | Cooling Chillers | Turbocor Compressor   | 0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)                                 | 0.634 kW/ton (Code) chiller water cooled    | 1.75                     | 44.8%                     | 60%   | 99%                                 | 20           | \$22721      |
| Existing             | Hospital         | Cooling Chillers | Windows   | U = 0.35   | U = 0.55 (Code)                             | 1.75                     | 1.2%                      | 80%   | 60%                                 | 25           | \$15284      |
| Existing             | Hospital         | Cooling Chillers | Windows - Existing to Code  | U = 0.55 (Code)  | Existing Windows (U=0.65)                   | 1.75                     | 0.6%                      | 10%   | 60%                                 | 25           | \$43155      |
| Existing             | Hospital         | Cooling DX       | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)              | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)   | 10.3 EER Rooftop Unit (State Code)          | 1.82                     | 14.2%                     | NA  | NA                                  | 15           | \$7,943      |
| Existing             | Hospital         | Cooling DX       | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)                 | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)  | 10.3 EER Rooftop Unit (State Code)          | 1.82                     | 6.4%                      | NA  | NA                                  | 15           | \$4,229      |
| Existing             | Hospital         | Cooling DX       | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)               | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)  | 10.3 EER Rooftop Unit (State Code)          | 1.82                     | 10.4%                     | NA  | NA                                  | 15           | \$6,555      |
| Existing             | Hospital         | Cooling DX       | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)  | Constant Ventilation                        | 1.90                     | 10.0%                     | 5%  | 94%                                 | 15           | \$11583      |
| Existing             | Hospital         | Cooling DX       | Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning   | No Commissioning                            | 1.90                     | 12.5%                     | 90%   | 40%                                 | 3            | \$3,624      |
| Existing             | Hospital         | Cooling DX       | Cooling DX Package-Air Side Economizer                              | Air-Side Economizer  | No Economizer                               | 1.90                     | 15.0%                     | 10%   | 30%                                 | 15           | \$6,722      |
| Existing             | Hospital         | Cooling DX       | Direct / Indirect Evaporative Cooling, Pre-Cooling                  | Direct / Indirect Evaporative Cooling, Pre-Cooling   | No modification to DX system                | 1.90                     | 25.0%                     | 50%   | 85%                                 | 15           | \$38305      |
| Existing             | Hospital         | Cooling DX       | Direct Digital Control System-Installation                          | DDC Retrofit   | Pneumatic                                   | 1.90                     | 15.0%                     | 35%   | 26%                                 | 5            | \$17680      |
| Existing             | Hospital         | Cooling DX       | Direct Digital Control System-Optimization                          | DDC System (Optimized)   | DDC System (Basic)                          | 1.90                     | 10.0%                     | 75%   | 80%                                 | 5            | \$9,901      |
| Existing             | Hospital         | Cooling DX       | Direct Digital Control System-Wireless Performance Monitoring       | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control  | Pneumatic                                   | 1.90                     | 15.0%                     | 75%   | 80%                                 | 5            | \$7,145      |
| Existing             | Hospital         | Cooling DX       | Duct Repair And Sealing   | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 1.90                     | 2.5%                      | 45%   | 45%                                 | 18           | \$7,354      |
| Existing             | Hospital         | Cooling DX       | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air) | 1.90                     | 4.5%                      | 62%   | 85%                                 | 10           | \$5,725      |
| Existing             | Hospital         | Cooling DX       | Green Roof  | Vegetation on Roof   | Standard roofing techniques                 | 1.90                     | 5.0%                      | 15%   | 98%                                 | 30           | \$93127      |

| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description   | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|---|--|--------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Hospital         | Cooling DX | Insulation (Ceiling)  | R-38  | R-21 (Code)  | 1.90                     | 1.0%                      | 75%   | 45%                                 | 25           | \$4,780      |
| Existing             | Hospital         | Cooling DX | Insulation (Ceiling)  | R-49  | R-21 (Code)  | 1.90                     | 1.5%                      | 75%   | 85%                                 | 25           | \$6,343      |
| Existing             | Hospital         | Cooling DX | Insulation (Ceiling) - Existing to Code                             | R-21 (Code)   | Existing Ceiling Insulation (Average R-9)  | 1.90                     | 1.2%                      | 75%   | 13%                                 | 25           | \$5,608      |
| Existing             | Hospital         | Cooling DX | Insulation (Ceiling) - Zero to Code                                 | R-21 (Code)   | R-0  | 1.90                     | 3.0%                      | 75%   | 0%                                  | 25           | \$5,608      |
| Existing             | Hospital         | Cooling DX | Insulation (Duct) (Unconditioned Spaces)                            | Install New Duct Insulation (R-8)   | R-0  | 1.90                     | 4.4%                      | 10%   | 15%                                 | 25           | \$2,056      |
| Existing             | Hospital         | Cooling DX | Insulation (Duct) (Unconditioned Spaces)                            | R-4   | R-0  | 1.90                     | 2.4%                      | 10%   | 15%                                 | 25           | \$2,142      |
| Existing             | Hospital         | Cooling DX | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced   | R-19 (2x6 Framing) - (Code)  | 1.90                     | 3.0%                      | 10%   | 95%                                 | 25           | \$4,639      |
| Existing             | Hospital         | Cooling DX | Insulation (Wall) - Existing to Code                                | R-19 (2x6 Framing) - (Code)   | Existing R-value (Average R-3)   | 1.90                     | 8.4%                      | 10%   | 35%                                 | 25           | \$5,082      |
| Existing             | Hospital         | Cooling DX | Insulation (Wall) - Zero to Code                                    | R-19 (2x6 Framing) - (Code)   | R-0  | 1.90                     | 10.0%                     | 10%   | 0%                                  | 25           | \$5,025      |
| Existing             | Hospital         | Cooling DX | Insulation - Floor (Non-Slab)                                       | R-19  | R-10 (Code)  | 1.90                     | 0.5%                      | 35%   | 35%                                 | 25           | \$827        |
| Existing             | Hospital         | Cooling DX | Insulation - Floor (Non-Slab) - Existing to Code                    | R-10 (Code)   | R-0  | 1.90                     | 1.5%                      | 35%   | 35%                                 | 25           | \$4,780      |
| Existing             | Hospital         | Cooling DX | Thermostat - Programmable   | Energy Star Programmable Thermostat   | Manual Thermostat  | 1.90                     | 3.0%                      | 95%   | 71%                                 | 15           | \$145        |
| Existing             | Hospital         | Cooling DX | Windows   | U = 0.35  | U = 0.55 (Code)  | 1.90                     | 1.2%                      | 80%   | 60%                                 | 25           | \$15284      |
| Existing             | Hospital         | Cooling DX | Windows - Existing to Code  | U = 0.55 (Code)   | Existing Windows (U=0.65)  | 1.90                     | 0.6%                      | 10%   | 60%                                 | 25           | \$43155      |
| Existing             | Hospital         | HVAC Aux   | Automated Exhaust VFD Control - Parking Garage CO sensor            | CO Sensors  | No CO Sensors  | 5.44                     | 20.0%                     | 20%   | 85%                                 | 10           | \$3,758      |
| Existing             | Hospital         | HVAC Aux   | Cooking Hood Controls   | Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air | No Cooking Hood Controls   | 5.44                     | 7.5%                      | 35%   | 85%                                 | 10           | \$13133      |
| Existing             | Hospital         | HVAC Aux   | Motor - Premium-Efficiency  | PE Motors for HVAC Applications   | Standard Efficiency Motors   | 5.44                     | 3.8%                      | 85%   | 81%                                 | 10           | \$480        |
| Existing             | Hospital         | HVAC Aux   | Motor - Pump & Fan System - Variable Speed Control                  | Pump And Fan System Optimization w/ VSD   | No Pump And Fan System VSD Optimization  | 5.44                     | 33.8%                     | 85%   | 75%                                 | 20           | \$3,731      |
| Existing             | Hospital         | HVAC Aux   | Motor - VAV Box High-Efficiency                                     | ECM Motors  | Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control | 5.44                     | 8.8%                      | 50%   | 77%                                 | 10           | \$6,715      |
| Existing             | Hospital         | HVAC Aux   | Optimized Variable Volume Lab Hood Design                           | Optimized Variable Volume Lab Hood Design   | Constant Volume Lab Hood Design  | 5.44                     | 1.6%                      | 65%   | 94%                                 | 10           | \$1,791      |
| Existing             | Hospital         | Heat Pump  | High-Efficiency EER=11.0, COP=3.5                                   | High-Efficiency EER=11.0, COP=3.5   | EER=10.1, COP=3.2  | 3.55                     | 16.8%                     | NA  | NA                                  | 15           | \$5,630      |
| Existing             | Hospital         | Heat Pump  | Premium-Efficiency EER=11.8, COP=3.8                                | Premium-Efficiency EER=11.8, COP=3.8  | EER=10.1, COP=3.2  | 3.55                     | 30.2%                     | NA  | NA                                  | 15           | \$12056      |
| Existing             | Hospital         | Heat Pump  | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)   | Constant Ventilation   | 3.71                     | 10.0%                     | 5%  | 94%                                 | 15           | \$11583      |
| Existing             | Hospital         | Heat Pump  | Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning  | No Commissioning   | 3.71                     | 12.5%                     | 90%   | 40%                                 | 3            | \$3,624      |



| Construction Vintage | Customer Segment | End Use   | Measure Name  | Measure Description  | Base Equipment                              | Baseline kWh (UEC or EU) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|---|--|---|--------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Hospital         | Heat Pump | Direct Digital Control System-Installation                    | DDC Retrofit   | Pneumatic                                   | 3.71                     | 15.0%                     | 35%   | 26%                                 | 5            | \$17680      |
| Existing             | Hospital         | Heat Pump | Direct Digital Control System-Optimization                    | DDC System (Optimized)   | DDC System (Basic)                          | 3.71                     | 10.0%                     | 75%   | 80%                                 | 5            | \$9,901      |
| Existing             | Hospital         | Heat Pump | Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control        | Pneumatic                                   | 3.71                     | 15.0%                     | 75%   | 80%                                 | 5            | \$7,145      |
| Existing             | Hospital         | Heat Pump | Duct Repair And Sealing                                       | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 3.71                     | 2.5%                      | 45%   | 45%                                 | 18           | \$7,354      |
| Existing             | Hospital         | Heat Pump | Exhaust Air to Ventilation Air Heat Recovery                  | Exhaust Air Heat Recovery  | No Heat Recovery                            | 3.71                     | 7.3%                      | 5%  | 94%                                 | 10           | \$16676      |
| Existing             | Hospital         | Heat Pump | Exhaust Hood Makeup Air                                       | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air) | 3.71                     | 4.5%                      | 62%   | 85%                                 | 10           | \$5,725      |
| Existing             | Hospital         | Heat Pump | Green Roof  | Vegetation on Roof   | Standard roofing techniques                 | 3.71                     | 0.8%                      | 15%   | 98%                                 | 30           | \$93127      |
| Existing             | Hospital         | Heat Pump | Heat Pump - Ground Source (Closed Loop)                       | GSHP: COP=3.1, EER=13.4  | Std. Air Source HP 'EER=10.1, COP=3.2       | 3.71                     | 14.2%                     | 5%  | 92%                                 | 20           | \$65303      |
| Existing             | Hospital         | Heat Pump | Heat Pump - Ground Source (Closed Loop)                       | GSHP: COP=4.0, EER=20  | Std. Air Source HP 'EER=10.1, COP=3.2       | 3.71                     | 36.4%                     | 5%  | 92%                                 | 20           | 122688       |
| Existing             | Hospital         | Heat Pump | Heat Pump - Water Source (Closed Loop)                        | WSHP: COP=4.2, EER=12.0  | Std. Air Source Heat Pump'EER=10.1, COP=3.2 | 3.71                     | 20.9%                     | 5%  | 90%                                 | 20           | \$13135      |
| Existing             | Hospital         | Heat Pump | Heat Pump - Water Source (Closed Loop)                        | WSHP: COP=4.8, EER=14.5  | Std. Air Source Heat Pump'EER=10.1, COP=3.2 | 3.71                     | 32.8%                     | 5%  | 90%                                 | 20           | \$17349      |
| Existing             | Hospital         | Heat Pump | Insulation (Ceiling)  | R-38   | R-21 (Code)                                 | 3.71                     | 3.0%                      | 75%   | 45%                                 | 25           | \$4,780      |
| Existing             | Hospital         | Heat Pump | Insulation (Ceiling)  | R-49   | R-21 (Code)                                 | 3.71                     | 4.4%                      | 75%   | 85%                                 | 25           | \$6,343      |
| Existing             | Hospital         | Heat Pump | Insulation (Ceiling) - Existing to Code                       | R-21 (Code)  | Existing Ceiling Insulation (Average R-9)   | 3.71                     | 2.8%                      | 75%   | 13%                                 | 25           | \$5,608      |
| Existing             | Hospital         | Heat Pump | Insulation (Ceiling) - Zero to Code                           | R-21 (Code)  | R-0   | 3.71                     | 6.9%                      | 75%   | 0%                                  | 25           | \$5,608      |
| Existing             | Hospital         | Heat Pump | Insulation (Duct) (Unconditioned Spaces)                      | Install New Duct Insulation (R-8)  | R-0   | 3.71                     | 4.4%                      | 10%   | 15%                                 | 25           | \$2,056      |
| Existing             | Hospital         | Heat Pump | Insulation (Duct) (Unconditioned Spaces)                      | R-4  | R-0   | 3.71                     | 2.4%                      | 10%   | 15%                                 | 25           | \$2,142      |
| Existing             | Hospital         | Heat Pump | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 3.71                     | 5.0%                      | 10%   | 95%                                 | 25           | \$4,639      |
| Existing             | Hospital         | Heat Pump | Insulation (Wall) - Existing to Code                          | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)              | 3.71                     | 16.6%                     | 10%   | 35%                                 | 25           | \$5,082      |
| Existing             | Hospital         | Heat Pump | Insulation (Wall) - Zero to Code                              | R-19 (2x6 Framing) - (Code)  | R-0   | 3.71                     | 19.8%                     | 10%   | 0%                                  | 25           | \$5,025      |
| Existing             | Hospital         | Heat Pump | Insulation - Floor (Non-Slab)                                 | R-19   | R-10 (Code)                                 | 3.71                     | 1.9%                      | 35%   | 35%                                 | 25           | \$827        |
| Existing             | Hospital         | Heat Pump | Insulation - Floor (Non-Slab) - Existing to Code              | R-10 (Code)  | R-0   | 3.71                     | 5.6%                      | 35%   | 35%                                 | 25           | \$4,780      |
| Existing             | Hospital         | Heat Pump | Thermostat - Programmable                                     | Energy Star Programmable Thermostat  | Manual Thermostat                           | 3.71                     | 3.0%                      | 95%   | 71%                                 | 15           | \$145        |
| Existing             | Hospital         | Heat Pump | Windows   | U = 0.35   | U = 0.55 (Code)                             | 3.71                     | 8.5%                      | 80%   | 60%                                 | 25           | \$15284      |
| Existing             | Hospital         | Heat Pump | Windows - Existing to Code                                    | U = 0.55 (Code)  | Existing Windows (U=0.65)                   | 3.71                     | 5.6%                      | 10%   | 60%                                 | 25           | \$43155      |
| Existing             | Hospital         | Lighting  | Bi-Level Control, Stairwell Lighting                          | Occupancy Sensor Control, 50% Lighting Power during unoccupied Time            | Continuous Full Power Lighting in Stairways | 4.60                     | 2.0%                      | 85%   | 75%                                 | 9            | \$1,449      |



| Construction Vintage | Customer Segment | End Use   | Measure Name  | Measure Description   | Base Equipment                                      | Baseline kWh (UEC or EUJ) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|---|---|---|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Hospital         | Lighting  | Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures | Continuous Dimming, Fluorescent Fixtures (Day-Lighting)   | No Dimming Controls                                 | 4.60                      | 6.0%                          | 30%   | 51%                                 | 9            | \$2,206      |
| Existing             | Hospital         | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 15%   | Code Required LPD And Control Strategies: LPD = 1.1 | 4.60                      | 15.0%                         | 90%   | 70%                                 | 14           | \$2,791      |
| Existing             | Hospital         | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 20%   | Code Required LPD And Control Strategies: LPD = 1.1 | 4.60                      | 20.0%                         | 75%   | 85%                                 | 14           | \$7,038      |
| Existing             | Hospital         | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 25%   | Code Required LPD And Control Strategies: LPD = 1.1 | 4.60                      | 25.0%                         | 70%   | 90%                                 | 14           | \$11,164     |
| Existing             | Hospital         | Lighting  | HE Fixtures/Design - Existing to Code                           | Code Required LPD And Control Strategies: LPD = 1.1   | Existing Lighting Design                            | 4.60                      | 15.0%                         | 95%   | 45%                                 | 14           | \$17,150     |
| Existing             | Hospital         | Lighting  | LED Exit Lighting   | 5 Watts   | CFL Exit Sign (26 Watts)                            | 4.60                      | 1.6%                          | 95%   | 65%                                 | 11           | \$53         |
| Existing             | Hospital         | Lighting  | LED Refrigeration Case Lights                                   | LED Refrigeration Case Lights (28W)   | Fluorescent Refrigeration Case Lights (60W)         | 4.60                      | 0.5%                          | 50%   | 80%                                 | 13           | \$631        |
| Existing             | Hospital         | Lighting  | LED Solid State White Lighting Package                          | Landscape, merchandise, signage, structure & task lighting  | 50W 10hrs/day, 365 day/yr                           | 4.60                      | 2.3%                          | 10%   | 95%                                 | 14           | \$37         |
| Existing             | Hospital         | Lighting  | Occupancy Sensor Control, Fluorescent                           | Occupancy Sensor Control, Fluorescent   | No Occupancy Sensor                                 | 4.60                      | 4.0%                          | 90%   | 70%                                 | 9            | \$344        |
| Existing             | Hospital         | Lighting  | Time Clocks And Timers  | Install Time Clock Lighting   | No Time Clock                                       | 4.60                      | 4.9%                          | 85%   | 100%                                | 9            | \$215        |
| Existing             | Hospital         | Plug Load | Energy Star - Battery Charging System                           | Energy Star Battery Charging System   | Non-Energy Star Battery Chargers                    | 3.94                      | 0.4%                          | 95%   | 90%                                 | 7            | \$2          |
| Existing             | Hospital         | Plug Load | Energy Star - Computer  | Energy Star Features Enabled  | Non-Energy Star Features                            | 3.94                      | 13.6%                         | 64%   | 25%                                 | 4            | \$2          |
| Existing             | Hospital         | Plug Load | Energy Star - Copiers   | Energy Star or Better Office Equipment: Copiers,  | Office Equipment: Copiers, Standard                 | 3.94                      | 1.7%                          | 90%   | 45%                                 | 6            | \$165        |
| Existing             | Hospital         | Plug Load | Energy Star - Fax   | Energy Star Features Enabled  | Non-Energy Star Features                            | 3.94                      | 1.8%                          | 75%   | 55%                                 | 4            | \$2          |
| Existing             | Hospital         | Plug Load | Energy Star - Monitors  | Energy Star Features Enabled  | Non-Energy Star Features                            | 3.94                      | 18.4%                         | 64%   | 15%                                 | 4            | \$158        |
| Existing             | Hospital         | Plug Load | Energy Star - Printers  | Energy Star Features Enabled  | Non-Energy Star Features                            | 3.94                      | 1.3%                          | 75%   | 40%                                 | 5            | \$17         |
| Existing             | Hospital         | Plug Load | Energy Star - Scanners  | Energy Star Features Enabled  | Non-Energy Star Features                            | 3.94                      | 0.9%                          | 75%   | 45%                                 | 4            | \$2          |
| Existing             | Hospital         | Plug Load | Energy Star - Water Cooler                                      | Energy Star Water Cooler (Hot/Cold Water)   | Non-Energy Star Water Cooler                        | 3.94                      | 0.6%                          | 45%   | 75%                                 | 10           | \$2          |
| Existing             | Hospital         | Plug Load | Office Computer Network Energy Management                       | Office Computer Network Energy Management   | No Network Management                               | 3.94                      | 1.8%                          | 95%   | 30%                                 | 3            | \$311        |
| Existing             | Hospital         | Plug Load | Power Supply 80+ Office Measure                                 | 80% Efficient Power supply  | No 80+  | 3.94                      | 1.0%                          | 95%   | 86%                                 | 7            | \$0          |
| Existing             | Hospital         | Plug Load | Refrigerator eCube  | Refrigerator eCube  | No Refrigerator eCube                               | 3.94                      | 1.2%                          | 75%   | 95%                                 | 10           | \$171        |
| Existing             | Hospital         | Plug Load | Residential-Size Refrigerator                                   | Energy Star Residential-Size Refrigerator   | Residential-Size Refrigerator - Standard            | 3.94                      | 0.1%                          | 25%   | 65%                                 | 13           | \$127        |
| Existing             | Hospital         | Plug Load | Residential-Size Refrigerator/Freezer - Early Replacement       | Energy Star Refrigerator/Freezer  | Baseline Refrigerator/Freezer                       | 3.94                      | 1.4%                          | 25%   | 35%                                 | 7            | \$577        |
| Existing             | Hospital         | Plug Load | Vending Machine   | Energy Star Vending Machines - High-Efficiency  | Vending Machines - Standard                         | 3.94                      | 2.7%                          | 50%   | 80%                                 | 14           | \$189        |
| Existing             | Hospital         | Plug Load | Vending Miser   | Passive Infrared Sensor on Vending Machine Monitoring Vacancy of Area And Cycles Cooling - Controls | No Vending Miser - No controls                      | 3.94                      | 2.7%                          | 50%   | 25%                                 | 3            | \$298        |

| Construction Vintage | Customer Segment | End Use       | Measure Name  | Measure Description   | Base Equipment                              | Baseline kWh (UEC or EU) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|---|---|---|--------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Hospital         | Refrigeration | Commercial Reach-In Refrigerator                                    | Energy Star Commercial Reach-In Refrigerator  | Commercial-Size Refrigerator - Standard     | 0.51                     | 27.4%                     | 95%   | 95%                                 | 12           | \$344        |
| Existing             | Hospital         | Refrigeration | Custom Refrigeration System   | High-Efficiency Custom Refrigeration System (Walk-in) includes compressors                        | Custom Refrigeration System - Standard      | 0.51                     | 3.6%                      | 85%   | 65%                                 | 10           | \$9,596      |
| Existing             | Hospital         | Refrigeration | Ice Maker   | Energy Star Ice Maker - High-Efficiency   | Standard Ice Maker                          | 0.51                     | 1.1%                      | 90%   | 86%                                 | 9            | \$375        |
| Existing             | Hospital         | Refrigeration | Reduced Speed or Cycling of Evaporator Fans                         | VFD on Evaporator Fans (Evap Fan Control on Walk-In)  | Constant Speed Evaporator Fans              | 0.51                     | 6.0%                      | 75%   | 70%                                 | 10           | \$24         |
| Existing             | Hospital         | Refrigeration | Refrigeration - Retro Commissioning                                 | Refrigeration Retro Commissioning (Refrigeration System Diagnostics / Operations And Maintenance) | No Re-commissioning                         | 0.51                     | 5.0%                      | 80%   | 90%                                 | 3            | \$29         |
| Existing             | Hospital         | Refrigeration | Special Glass Doors for Refrigerated Reach-in Cases                 | Do Not Require Anti-Sweat Heating   | Standard Glass Doors                        | 0.51                     | 3.2%                      | 95%   | 77%                                 | 16           | \$99         |
| Existing             | Hospital         | Refrigeration | Strip Curtains for Walk-Ins   | Strip Curtains for Walk-Ins   | No Strip Curtains for Walk-Ins              | 0.51                     | 2.0%                      | 95%   | 20%                                 | 4            | \$189        |
| Existing             | Hospital         | Space Heat    | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)   | Constant Ventilation                        | 1.28                     | 10.0%                     | 5%  | 94%                                 | 15           | \$11583      |
| Existing             | Hospital         | Space Heat    | Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning  | No Commissioning                            | 1.28                     | 12.5%                     | 90%   | 40%                                 | 3            | \$3,624      |
| Existing             | Hospital         | Space Heat    | Direct Digital Control System-Installation                          | DDC Retrofit  | Pneumatic                                   | 1.28                     | 15.0%                     | 35%   | 26%                                 | 5            | \$17680      |
| Existing             | Hospital         | Space Heat    | Direct Digital Control System-Optimization                          | DDC System (Optimized)  | DDC System (Basic)                          | 1.28                     | 10.0%                     | 75%   | 80%                                 | 5            | \$9,901      |
| Existing             | Hospital         | Space Heat    | Direct Digital Control System-Wireless Performance Monitoring       | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control                           | Pneumatic                                   | 1.28                     | 15.0%                     | 75%   | 80%                                 | 5            | \$7,145      |
| Existing             | Hospital         | Space Heat    | Duct Repair And Sealing   | Reduction In Duct Losses to 5%  | No Repair or Sealing, 15% duct losses       | 1.28                     | 2.5%                      | 45%   | 45%                                 | 18           | \$7,354      |
| Existing             | Hospital         | Space Heat    | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery   | No Heat Recovery                            | 1.28                     | 15.0%                     | 5%  | 94%                                 | 10           | \$16676      |
| Existing             | Hospital         | Space Heat    | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air                    | Hood Pulls Conditioned Air (No Make-up Air) | 1.28                     | 4.5%                      | 62%   | 85%                                 | 10           | \$5,725      |
| Existing             | Hospital         | Space Heat    | Insulation (Ceiling)  | R-49  | R-30  | 1.28                     | 4.0%                      | 75%   | 85%                                 | 25           | \$4,780      |
| Existing             | Hospital         | Space Heat    | Insulation (Ceiling) - Existing to Code                             | R-30  | Existing Ceiling Insulation (Average R-9)   | 1.28                     | 6.3%                      | 75%   | 13%                                 | 25           | \$5,608      |
| Existing             | Hospital         | Space Heat    | Insulation (Ceiling) - Zero to Code                                 | R-30  | R-0   | 1.28                     | 12.5%                     | 75%   | 0%                                  | 25           | \$5,608      |
| Existing             | Hospital         | Space Heat    | Insulation (Duct) (Unconditioned Spaces)                            | Install New Duct Insulation (R-8)   | R-0   | 1.28                     | 4.4%                      | 10%   | 15%                                 | 25           | \$2,056      |
| Existing             | Hospital         | Space Heat    | Insulation (Duct) (Unconditioned Spaces)                            | R-4   | R-0   | 1.28                     | 2.4%                      | 10%   | 15%                                 | 25           | \$2,142      |
| Existing             | Hospital         | Space Heat    | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced   | R-19 (2x6 Framing) - (Code)                 | 1.28                     | 6.0%                      | 10%   | 95%                                 | 25           | \$4,639      |
| Existing             | Hospital         | Space Heat    | Insulation (Wall) - Existing to Code                                | R-19 (2x6 Framing) - (Code)   | Existing R-value (Average R-3)              | 1.28                     | 21.1%                     | 10%   | 35%                                 | 25           | \$5,082      |
| Existing             | Hospital         | Space Heat    | Insulation (Wall) - Zero to Code                                    | R-19 (2x6 Framing) - (Code)   | R-0   | 1.28                     | 25.0%                     | 10%   | 0%                                  | 25           | \$5,025      |
| Existing             | Hospital         | Space Heat    | Insulation - Floor (Non-Slab)                                       | R-19  | R-10 (Code)                                 | 1.28                     | 2.5%                      | 35%   | 35%                                 | 25           | \$827        |
| Existing             | Hospital         | Space Heat    | Insulation - Floor (Non-Slab) - Existing to Code                    | R-10 (Code)   | R-0   | 1.28                     | 7.5%                      | 35%   | 35%                                 | 25           | \$4,780      |

| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description  | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|--|--|--------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Hospital         | Space Heat | Sensible And Total Heat Recovery Devices              | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery   | 1.28                     | 25.0%                     | 25%   | 98%                                 | 10           | \$38794      |
| Existing             | Hospital         | Space Heat | Thermostat - Programmable                             | Energy Star Programmable Thermostat  | Manual Thermostat  | 1.28                     | 3.0%                      | 95%   | 71%                                 | 15           | \$145        |
| Existing             | Hospital         | Space Heat | Windows   | U = 0.35   | U = 0.40   | 1.28                     | 4.1%                      | 80%   | 60%                                 | 25           | \$3,821      |
| Existing             | Hospital         | Space Heat | Windows - Existing to Code                            | U = 0.40   | Existing Windows (U=0.65)                                  | 1.28                     | 12.3%                     | 10%   | 60%                                 | 25           | \$54619      |
| Existing             | Hospital         | Water Heat | Water_Heater (40 Gallon Electric) - Residential Sized | EF = 0.95  | EF = 0.92  | 1.34                     | 3.3%                      | NA  | NA                                  | 20           | \$1,938      |
| Existing             | Hospital         | Water Heat | Clothes Washer - Ozonating                            | Ozonating Clothes Washer   | Standard Commercial Clothes Washer                         | 1.38                     | 15.1%                     | 15%   | 95%                                 | 10           | \$8,704      |
| Existing             | Hospital         | Water Heat | Clothes Washer Commercial                             | Energy Star Commercial Clothes Washer MEF=1.72   | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 1.38                     | 2.6%                      | 15%   | 80%                                 | 11           | \$305        |
| Existing             | Hospital         | Water Heat | Demand controlled Circulating Systems                 | Install demand-based control system (VFD Control by Demand)  | No demand control systems in place                         | 1.38                     | 5.0%                      | 55%   | 94%                                 | 15           | \$5,108      |
| Existing             | Hospital         | Water Heat | Dishwashing - Commercial - High Efficiency            | High Efficiency Dishwasher   | Standard Dishwasher  | 1.38                     | 2.1%                      | 25%   | 80%                                 | 10           | \$2,701      |
| Existing             | Hospital         | Water Heat | Dishwashing - Commercial Chemical System              | Low-Temp Commercial Dishwasher (Includes Extra Chemmical Cost)   | High Temp Commercial Dishwasher                            | 1.38                     | 5.6%                      | 25%   | 95%                                 | 10           | \$840        |
| Existing             | Hospital         | Water Heat | Dishwashing - Residential Sized System                | EF = 0.65 (ENERGY STAR)  | Standard Dishwasher (FED Std. EF=0.46)                     | 1.38                     | 0.6%                      | 20%   | 25%                                 | 13           | \$31         |
| Existing             | Hospital         | Water Heat | Dishwashing - Residential Sized System                | EF = 0.77  | Standard Dishwasher (FED Std. EF=0.46)                     | 1.38                     | 0.8%                      | 20%   | 55%                                 | 13           | \$631        |
| Existing             | Hospital         | Water Heat | Drainwater Heat Recovery Water Heater                 | Install (Power-Pipe or GFX) - Heat Recovery Water Heater   | No Heat Recovery System                                    | 1.38                     | 20.0%                     | 5%  | 92%                                 | 25           | \$10506      |
| Existing             | Hospital         | Water Heat | Faucet Aerators                                       | 1.5 GPM Aerator  | 2.5 GPM Aerator (Federal Code)                             | 1.38                     | 4.0%                      | 95%   | 25%                                 | 10           | \$0          |
| Existing             | Hospital         | Water Heat | Faucet Aerators - Existing to Code                    | 2.5 GPM Aerator (Federal Code)   | 4.0 GPM Aerator  | 1.38                     | 3.8%                      | 95%   | 15%                                 | 10           | \$2          |
| Existing             | Hospital         | Water Heat | Heat Pump Water Heater                                | EF = 2.9   | EF=0.93 Baseline Electric Water Heater                     | 1.38                     | 58.9%                     | 40%   | 94%                                 | 15           | \$5,725      |
| Existing             | Hospital         | Water Heat | Hot Water (SHW) Pipe Insulation                       | Install Insulation (R-4)   | No Pipe Insulation   | 1.38                     | 1.0%                      | 80%   | 70%                                 | 15           | \$195        |
| Existing             | Hospital         | Water Heat | Low Flow Spray Heads                                  | 1.6 GPM  | 3.0 GPM  | 1.38                     | 2.3%                      | 50%   | 45%                                 | 5            | \$6          |
| Existing             | Hospital         | Water Heat | Low-Flow Showerheads                                  | 2.0 GPM Showerhead   | 2.5 GPM Showerhead (Federal Code)                          | 1.38                     | 2.6%                      | 35%   | 75%                                 | 10           | \$6          |
| Existing             | Hospital         | Water Heat | Low-Flow Showerheads - Existing to Code               | 2.5 GPM Showerhead (Federal Code)  | 4.5 GPM Showerhead   | 1.38                     | 5.8%                      | 35%   | 20%                                 | 10           | \$11         |
| Existing             | Hospital         | Water Heat | Solar RE - Solar Water Heater                         | Passive solar water heating  | Non-solar hot water heater                                 | 1.38                     | 66.6%                     | 20%   | 95%                                 | 20           | \$89302      |
| Existing             | Hospital         | Water Heat | Ultrasonic Faucet Control                             | Install Ultrasonic Motion Faucet Control   | No Faucet Control  | 1.38                     | 3.3%                      | 95%   | 90%                                 | 10           | \$206        |
| Existing             | Hospital         | Water Heat | Water Heater Thermostat Setback                       | Thermostat Setback and Replcement (120 Degrees)  | No Thermostat Setback (130 Degrees)                        | 1.38                     | 7.7%                      | 75%   | 80%                                 | 11           | \$107        |
| New                  | Hospital         | Cooking    | Cooking Fryers - Commercial                           | Energy Star Commercial Fryer   | Non-Energy Star Fryer                                      | 0.55                     | 2.5%                      | 35%   | 70%                                 | 12           | \$4,946      |
| New                  | Hospital         | Cooking    | Hot Food Holding Cabinets - Commercial                | Energy Star Commercial Hot Food Holding Cabinets   | Non-Energy Star Commercial Hot Food Holding Cabinets       | 0.55                     | 8.3%                      | 75%   | 85%                                 | 12           | \$1,800      |

| Construction Vintage | Customer Segment | End Use          | Measure Name  | Measure Description  | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|--|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Hospital         | Cooking          | Oven - Convection   | Convection Oven  | Standard Oven  | 0.55                     | 3.4%                          | 85%   | 55%                                 | 15           | \$1,734      |
| New                  | Hospital         | Cooking          | Steam Cookers - Commercial  | Energy Star Commercial Steam Cookers (50% efficiency)  | Non-Energy Star Commercial Steam Cooker (35% efficiency) | 0.55                     | 2.3%                          | 25%   | 75%                                 | 10           | \$2          |
| New                  | Hospital         | Cooling Chillers | Chiller - Premium Efficiency  | 0.507 kW/ton   | 0.634 kW/ton   | 0.47                     | 20.0%                         | NA  | NA                                  | 20           | \$3,708      |
| New                  | Hospital         | Cooling Chillers | Chiller - Advanced Technology                                       | 0.461 kW/ton   | 0.634 kW/ton   | 0.47                     | 27.3%                         | NA  | NA                                  | 20           | \$4,624      |
| New                  | Hospital         | Cooling Chillers | Chiller - High Efficiency   | 0.574 kW/ton   | 0.634 kW/ton   | 0.47                     | 9.5%                          | NA  | NA                                  | 20           | \$1,329      |
| New                  | Hospital         | Cooling Chillers | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)  | Constant Ventilation                                     | 0.43                     | 10.0%                         | 5%  | 94%                                 | 15           | \$11583      |
| New                  | Hospital         | Cooling Chillers | Chilled Water Piping Loop w/ VSD Control                            | VSD for Secondary Chilled Water Loop   | Primary Loop Only w/ Constant Speed Pump                 | 0.43                     | 7.6%                          | 25%   | 70%                                 | 10           | \$8,391      |
| New                  | Hospital         | Cooling Chillers | Chilled Water Reset   | Install Chilled Water Reset  | No Chilled Water Reset                                   | 0.43                     | 5.0%                          | 95%   | 75%                                 | 10           | \$12526      |
| New                  | Hospital         | Cooling Chillers | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning   | No Commissioning   | 0.43                     | 12.5%                         | 90%   | 80%                                 | 3            | \$13422      |
| New                  | Hospital         | Cooling Chillers | Cooling Tower-Decrease Approach Temperature                         | 6 Deg F  | 10 Deg F   | 0.43                     | 8.0%                          | 50%   | 94%                                 | 15           | \$829        |
| New                  | Hospital         | Cooling Chillers | Direct Digital Control System-Optimization                          | DDC System (Optimized)   | DDC System (Basic)                                       | 0.43                     | 10.0%                         | 75%   | 80%                                 | 5            | \$9,901      |
| New                  | Hospital         | Cooling Chillers | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air)              | 0.43                     | 4.5%                          | 62%   | 85%                                 | 10           | \$5,725      |
| New                  | Hospital         | Cooling Chillers | Green Roof  | Vegetation on Roof   | Standard roofing techniques                              | 0.43                     | 5.0%                          | 15%   | 98%                                 | 30           | \$93127      |
| New                  | Hospital         | Cooling Chillers | Insulation (Ceiling)  | R-38   | R-21 (Code)  | 0.43                     | 1.0%                          | 75%   | 45%                                 | 25           | \$4,780      |
| New                  | Hospital         | Cooling Chillers | Insulation (Ceiling)  | R-49   | R-21 (Code)  | 0.43                     | 1.5%                          | 75%   | 85%                                 | 25           | \$6,343      |
| New                  | Hospital         | Cooling Chillers | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                              | 0.43                     | 3.0%                          | 95%   | 95%                                 | 25           | \$4,639      |
| New                  | Hospital         | Cooling Chillers | Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)  | 0.43                     | 0.5%                          | 35%   | 35%                                 | 25           | \$827        |
| New                  | Hospital         | Cooling Chillers | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                                     | 0.43                     | 10.0%                         | 40%   | 98%                                 | 25           | \$2,850      |
| New                  | Hospital         | Cooling Chillers | Sensible And Total Heat Recovery Devices                            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery   | 0.43                     | 25.0%                         | 50%   | 98%                                 | 10           | \$38794      |

| Construction Vintage | Customer Segment | End Use          | Measure Name  | Measure Description   | Base Equipment                              | Baseline kWh (UEC or EUJ) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|---|---|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Hospital         | Cooling Chillers | Turbocor Compressor   | 0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)                            | 0.634 kW/ton (Code) chiller water cooled    | 0.43                      | 44.8%                         | 95%   | 99%                                 | 20           | \$18743      |
| New                  | Hospital         | Cooling Chillers | Windows   | U = 0.35  | U = 0.55 (Code)                             | 0.43                      | 1.2%                          | 80%   | 60%                                 | 25           | \$15284      |
| New                  | Hospital         | Cooling DX       | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)              | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)  | 10.3 EER Rooftop Unit (State Code)          | 0.51                      | 14.2%                         | NA  | NA                                  | 15           | \$7,943      |
| New                  | Hospital         | Cooling DX       | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)                 | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)   | 10.3 EER Rooftop Unit (State Code)          | 0.51                      | 6.4%                          | NA  | NA                                  | 15           | \$4,229      |
| New                  | Hospital         | Cooling DX       | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)               | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)   | 10.3 EER Rooftop Unit (State Code)          | 0.51                      | 10.4%                         | NA  | NA                                  | 15           | \$6,555      |
| New                  | Hospital         | Cooling DX       | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)   | Constant Ventilation                        | 0.47                      | 10.0%                         | 5%  | 94%                                 | 15           | \$11583      |
| New                  | Hospital         | Cooling DX       | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning  | No Commissioning                            | 0.47                      | 12.5%                         | 90%   | 80%                                 | 3            | \$13422      |
| New                  | Hospital         | Cooling DX       | Direct / Indirect Evaporative Cooling, Pre-Cooling                  | Direct / Indirect Evaporative Cooling, Pre-Cooling  | No modification to DX system                | 0.47                      | 25.0%                         | 50%   | 85%                                 | 15           | \$38305      |
| New                  | Hospital         | Cooling DX       | Direct Digital Control System-Optimization                          | DDC System (Optimized)  | DDC System (Basic)                          | 0.47                      | 10.0%                         | 75%   | 80%                                 | 5            | \$9,901      |
| New                  | Hospital         | Cooling DX       | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air                                      | Hood Pulls Conditioned Air (No Make-up Air) | 0.47                      | 4.5%                          | 62%   | 85%                                 | 10           | \$5,725      |
| New                  | Hospital         | Cooling DX       | Green Roof  | Vegetation on Roof  | Standard roofing techniques                 | 0.47                      | 5.0%                          | 15%   | 98%                                 | 30           | \$93127      |
| New                  | Hospital         | Cooling DX       | Insulation (Ceiling)  | R-38  | R-21 (Code)                                 | 0.47                      | 1.0%                          | 75%   | 45%                                 | 25           | \$4,780      |
| New                  | Hospital         | Cooling DX       | Insulation (Ceiling)  | R-49  | R-21 (Code)                                 | 0.47                      | 1.5%                          | 75%   | 85%                                 | 25           | \$6,343      |
| New                  | Hospital         | Cooling DX       | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced   | R-19 (2x6 Framing) - (Code)                 | 0.47                      | 3.0%                          | 95%   | 95%                                 | 25           | \$4,639      |
| New                  | Hospital         | Cooling DX       | Insulation - Floor (Non-Slab)                                       | R-19  | R-10 (Code)                                 | 0.47                      | 0.5%                          | 35%   | 35%                                 | 25           | \$827        |
| New                  | Hospital         | Cooling DX       | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands  | Std duct workmanship                        | 0.47                      | 10.0%                         | 40%   | 98%                                 | 25           | \$2,850      |
| New                  | Hospital         | Cooling DX       | Windows   | U = 0.35  | U = 0.55 (Code)                             | 0.47                      | 1.2%                          | 80%   | 60%                                 | 25           | \$15284      |
| New                  | Hospital         | HVAC Aux         | Automated Exhaust VFD Control - Parking Garage CO sensor            | CO Sensors  | No CO Sensors                               | 4.24                      | 20.0%                         | 20%   | 75%                                 | 10           | \$3,758      |
| New                  | Hospital         | HVAC Aux         | Cooking Hood Controls   | Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air | No Cooking Hood Controls                    | 4.24                      | 7.5%                          | 35%   | 85%                                 | 10           | \$6,829      |
| New                  | Hospital         | HVAC Aux         | Motor - Premium-Efficiency  | PE Motors for HVAC Applications   | Standard Efficiency Motors                  | 4.24                      | 3.8%                          | 85%   | 81%                                 | 10           | \$480        |
| New                  | Hospital         | HVAC Aux         | Motor - Pump & Fan System - Variable Speed Control                  | Pump And Fan System Optimization w/ VSD   | No Pump And Fan System VSD Optimization     | 4.24                      | 33.8%                         | 85%   | 75%                                 | 20           | \$3,731      |

| Construction Vintage | Customer Segment | End Use   | Measure Name  | Measure Description  | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|---|--|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Hospital         | HVAC Aux  | Motor - VAV Box High-Efficiency                                     | ECM Motors   | Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control | 4.24                     | 8.8%                          | 65%   | 77%                                 | 10           | \$6,715      |
| New                  | Hospital         | HVAC Aux  | Optimized Variable Volume Lab Hood Design                           | Optimized Variable Volume Lab Hood Design                                      | Constant Volume Lab Hood Design  | 4.24                     | 1.6%                          | 65%   | 94%                                 | 10           | \$1,791      |
| New                  | Hospital         | Heat Pump | High-Efficiency EER=11.0, COP=3.5                                   | High-Efficiency EER=11.0, COP=3.5  | EER=10.1, COP=3.2  | 1.67                     | 16.8%                         | NA  | NA                                  | 15           | \$5,630      |
| New                  | Hospital         | Heat Pump | Premium-Efficiency EER=11.8, COP=3.8                                | Premium-Efficiency EER=11.8, COP=3.8   | EER=10.1, COP=3.2  | 1.67                     | 30.2%                         | NA  | NA                                  | 15           | \$12056      |
| New                  | Hospital         | Heat Pump | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)                                    | Constant Ventilation   | 1.52                     | 10.0%                         | 5%  | 94%                                 | 15           | \$11583      |
| New                  | Hospital         | Heat Pump | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning                                     | No Commissioning   | 1.52                     | 12.5%                         | 90%   | 80%                                 | 3            | \$13422      |
| New                  | Hospital         | Heat Pump | Direct Digital Control System-Optimization                          | DDC System (Optimized)   | DDC System (Basic)   | 1.52                     | 10.0%                         | 75%   | 80%                                 | 5            | \$9,901      |
| New                  | Hospital         | Heat Pump | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery  | No Heat Recovery   | 1.52                     | 7.3%                          | 5%  | 94%                                 | 10           | \$16676      |
| New                  | Hospital         | Heat Pump | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air)  | 1.52                     | 4.5%                          | 62%   | 85%                                 | 10           | \$5,725      |
| New                  | Hospital         | Heat Pump | Green Roof  | Vegetation on Roof   | Standard roofing techniques  | 1.52                     | 0.8%                          | 15%   | 98%                                 | 30           | \$93127      |
| New                  | Hospital         | Heat Pump | Heat Pump - Ground Source (Closed Loop)                             | GSHP: COP=3.1, EER=13.4  | Std. Air Source HP 'EER=10.1, COP=3.2  | 1.52                     | 14.2%                         | 45%   | 92%                                 | 20           | \$65303      |
| New                  | Hospital         | Heat Pump | Heat Pump - Ground Source (Closed Loop)                             | GSHP: COP=4.0, EER=20  | Std. Air Source HP 'EER=10.1, COP=3.2  | 1.52                     | 36.4%                         | 45%   | 92%                                 | 20           | 122688       |
| New                  | Hospital         | Heat Pump | Heat Pump - Water Source (Closed Loop)                              | WSHP: COP=4.2, EER=12.0  | Std. Air Source Heat Pump'EER=10.1, COP=3.2  | 1.52                     | 20.9%                         | 10%   | 90%                                 | 20           | \$13135      |
| New                  | Hospital         | Heat Pump | Heat Pump - Water Source (Closed Loop)                              | WSHP: COP=4.8, EER=14.5  | Std. Air Source Heat Pump'EER=10.1, COP=3.2  | 1.52                     | 32.8%                         | 10%   | 90%                                 | 20           | \$17349      |
| New                  | Hospital         | Heat Pump | Insulation (Ceiling)  | R-38   | R-21 (Code)  | 1.52                     | 3.0%                          | 75%   | 45%                                 | 25           | \$4,780      |
| New                  | Hospital         | Heat Pump | Insulation (Ceiling)  | R-49   | R-21 (Code)  | 1.52                     | 4.4%                          | 75%   | 85%                                 | 25           | \$6,343      |
| New                  | Hospital         | Heat Pump | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)  | 1.52                     | 5.0%                          | 95%   | 95%                                 | 25           | \$4,639      |
| New                  | Hospital         | Heat Pump | Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)  | 1.52                     | 1.9%                          | 35%   | 35%                                 | 25           | \$827        |
| New                  | Hospital         | Heat Pump | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands                 | Std duct workmanship   | 1.52                     | 10.0%                         | 40%   | 98%                                 | 25           | \$2,850      |
| New                  | Hospital         | Heat Pump | Windows   | U = 0.35   | U = 0.55 (Code)  | 1.52                     | 8.5%                          | 80%   | 60%                                 | 25           | \$15284      |
| New                  | Hospital         | Lighting  | Bi-Level Control, Stairwell Lighting                                | Occupancy Sensor Control, 50% Lighting Power during unoccupied Time            | Continuous Full Power Lighting in Stairways  | 2.89                     | 2.0%                          | 85%   | 75%                                 | 9            | \$1,449      |
| New                  | Hospital         | Lighting  | Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures     | Continuous Dimming, Fluorescent Fixtures (Day-Lighting)                        | No Dimming Controls  | 2.89                     | 6.0%                          | 60%   | 51%                                 | 9            | \$2,206      |
| New                  | Hospital         | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 15%                        | Code Required LPD And Control Strategies: LPD = 1.1  | 2.89                     | 15.0%                         | 90%   | 70%                                 | 14           | \$1,655      |

| Construction Vintage | Customer Segment | End Use       | Measure Name  | Measure Description  | Base Equipment                                      | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|---|--|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Hospital         | Lighting      | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 20%                                      | Code Required LPD And Control Strategies: LPD = 1.1 | 2.89                     | 20.0%                         | 75%   | 85%                                 | 14           | \$5,516      |
| New                  | Hospital         | Lighting      | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 25%                                      | Code Required LPD And Control Strategies: LPD = 1.1 | 2.89                     | 25.0%                         | 70%   | 90%                                 | 14           | \$9,267      |
| New                  | Hospital         | Lighting      | LED Refrigeration Case Lights                             | LED Refrigeration Case Lights (28W)  | Fluorescent Refrigeration Case Lights (60W)         | 2.89                     | 0.8%                          | 50%   | 80%                                 | 13           | \$631        |
| New                  | Hospital         | Lighting      | LED Solid State White Lighting Package                    | Landscape, merchandise, signage, structure & task lighting                                   | 50W 10hrs/day, 365 day/yr                           | 2.89                     | 2.3%                          | 10%   | 95%                                 | 14           | \$37         |
| New                  | Hospital         | Lighting      | Occupancy Sensor Control, Fluorescent                     | Occupancy Sensor Control, Fluorescent  | No Occupancy Sensor                                 | 2.89                     | 4.0%                          | 90%   | 70%                                 | 10           | \$344        |
| New                  | Hospital         | Plug Load     | Energy Star - Battery Charging System                     | Energy Star Battery Charging System  | Non-Energy Star Battery Chargers                    | 3.94                     | 0.4%                          | 95%   | 90%                                 | 7            | \$2          |
| New                  | Hospital         | Plug Load     | Energy Star - Computer                                    | Energy Star Features Enabled   | Non-Energy Star Features                            | 3.94                     | 13.6%                         | 64%   | 25%                                 | 4            | \$2          |
| New                  | Hospital         | Plug Load     | Energy Star - Copiers                                     | Energy Star or Better Office Equipment: Copiers,   | Office Equipment: Copiers, Standard                 | 3.94                     | 1.7%                          | 90%   | 45%                                 | 6            | \$165        |
| New                  | Hospital         | Plug Load     | Energy Star - Fax   | Energy Star Features Enabled   | Non-Energy Star Features                            | 3.94                     | 1.8%                          | 75%   | 55%                                 | 4            | \$2          |
| New                  | Hospital         | Plug Load     | Energy Star - Monitors                                    | Energy Star Features Enabled   | Non-Energy Star Features                            | 3.94                     | 18.4%                         | 64%   | 15%                                 | 4            | \$158        |
| New                  | Hospital         | Plug Load     | Energy Star - Printers                                    | Energy Star Features Enabled   | Non-Energy Star Features                            | 3.94                     | 1.3%                          | 75%   | 40%                                 | 5            | \$17         |
| New                  | Hospital         | Plug Load     | Energy Star - Scanners                                    | Energy Star Features Enabled   | Non-Energy Star Features                            | 3.94                     | 0.9%                          | 75%   | 45%                                 | 4            | \$2          |
| New                  | Hospital         | Plug Load     | Energy Star - Water Cooler                                | Energy Star Water Cooler (Hot/Cold Water)  | Non-Energy Star Water Cooler                        | 3.94                     | 0.5%                          | 45%   | 75%                                 | 10           | \$2          |
| New                  | Hospital         | Plug Load     | Office Computer Network Management                        | Office Computer Network Energy Management  | No Network Management                               | 3.94                     | 1.8%                          | 95%   | 30%                                 | 3            | \$311        |
| New                  | Hospital         | Plug Load     | Power Supply 80+ Office Measure                           | 80% Efficient Power supply   | No 80+  | 3.94                     | 1.0%                          | 95%   | 86%                                 | 7            | \$0          |
| New                  | Hospital         | Plug Load     | Refrigerator eCube  | Refrigerator eCube   | No Refrigerator eCube                               | 3.94                     | 1.2%                          | 75%   | 95%                                 | 10           | \$171        |
| New                  | Hospital         | Plug Load     | Residential-Size Refrigerator                             | Energy Star Residential-Size Refrigerator  | Residential-Size Refrigerator - Standard            | 3.94                     | 0.1%                          | 25%   | 65%                                 | 13           | \$127        |
| New                  | Hospital         | Plug Load     | Residential-Size Refrigerator/Freezer - Early Replacement | Energy Star Refrigerator/Freezer   | Baseline Refrigerator/Freezer                       | 3.94                     | 1.4%                          | 25%   | 35%                                 | 7            | \$577        |
| New                  | Hospital         | Plug Load     | Vending Machine   | Energy Star Vending Machines - High-Efficiency   | Vending Machines - Standard                         | 3.94                     | 2.6%                          | 50%   | 80%                                 | 14           | \$189        |
| New                  | Hospital         | Refrigeration | Commercial Reach-In Refrigerator                          | Energy Star Commercial Reach-In Refrigerator   | Commercial-Size Refrigerator - Standard             | 0.51                     | 27.2%                         | 95%   | 95%                                 | 12           | \$344        |
| New                  | Hospital         | Refrigeration | Custom Refrigeration System                               | High-Efficiency Custom Refrigeration System (Walk-In) includes compressors                   | Custom Refrigeration System - Standard              | 0.51                     | 3.6%                          | 85%   | 65%                                 | 10           | \$9,596      |
| New                  | Hospital         | Refrigeration | Ice Maker   | Energy Star Ice Maker - High-Efficiency  | Standard Ice Maker                                  | 0.51                     | 1.1%                          | 90%   | 86%                                 | 9            | \$375        |
| New                  | Hospital         | Refrigeration | Reduced Speed or Cycling of Evaporator Fans               | VFD on Evaporator Fans (Evap Fan Control on Walk-In)   | Constant Speed Evaporator Fans                      | 0.51                     | 6.0%                          | 75%   | 70%                                 | 10           | \$24         |
| New                  | Hospital         | Refrigeration | Refrigeration - Commissioning                             | Commissioning (Refrigeration System Diagnostics / Operations and Maintenance for a new unit) | No Commissioning                                    | 0.51                     | 5.0%                          | 80%   | 90%                                 | 3            | \$29         |
| New                  | Hospital         | Refrigeration | Special Glass Doors for Refrigerated Reach-in Cases       | Do Not Require Anti-Sweat Heating  | Standard Glass Doors                                | 0.51                     | 3.2%                          | 95%   | 77%                                 | 16           | \$99         |

| Construction Vintage | Customer Segment | End Use       | Measure Name  | Measure Description  | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|---|--|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Hospital         | Refrigeration | Strip Curtains for Walk-Ins   | Strip Curtains for Walk-Ins  | No Strip Curtains for Walk-Ins                             | 0.51                     | 2.0%                          | 95%   | 20%                                 | 4            | \$189        |
| New                  | Hospital         | Space Heat    | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)  | Constant Ventilation                                       | 0.70                     | 10.0%                         | 5%  | 94%                                 | 15           | \$11583      |
| New                  | Hospital         | Space Heat    | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning   | No Commissioning   | 0.70                     | 12.5%                         | 90%   | 80%                                 | 3            | \$13422      |
| New                  | Hospital         | Space Heat    | Direct Digital Control System-Optimization                          | DDC System (Optimized)   | DDC System (Basic)   | 0.70                     | 10.0%                         | 75%   | 80%                                 | 5            | \$9,901      |
| New                  | Hospital         | Space Heat    | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery  | No Heat Recovery   | 0.70                     | 15.0%                         | 5%  | 94%                                 | 10           | \$16676      |
| New                  | Hospital         | Space Heat    | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air)                | 0.70                     | 4.5%                          | 62%   | 85%                                 | 10           | \$5,725      |
| New                  | Hospital         | Space Heat    | Insulation (Ceiling)  | R-49   | R-30   | 0.70                     | 4.0%                          | 75%   | 85%                                 | 25           | \$4,780      |
| New                  | Hospital         | Space Heat    | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                                | 0.70                     | 6.0%                          | 95%   | 95%                                 | 25           | \$4,639      |
| New                  | Hospital         | Space Heat    | Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)  | 0.70                     | 2.5%                          | 35%   | 35%                                 | 25           | \$827        |
| New                  | Hospital         | Space Heat    | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                                       | 0.70                     | 10.0%                         | 40%   | 98%                                 | 25           | \$2,850      |
| New                  | Hospital         | Space Heat    | Sensible And Total Heat Recovery Devices                            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery   | 0.70                     | 25.0%                         | 50%   | 98%                                 | 10           | \$38794      |
| New                  | Hospital         | Space Heat    | Windows   | U = 0.35   | U = 0.40   | 0.70                     | 4.1%                          | 80%   | 60%                                 | 25           | \$3,821      |
| New                  | Hospital         | Water Heat    | Water_Heater (40 Gallon Electric) - Residential Sized               | EF = 0.95  | EF = 0.92  | 1.40                     | 3.3%                          | NA  | NA                                  | 20           | \$1,938      |
| New                  | Hospital         | Water Heat    | Clothes Washer - Ozonating  | Ozonating Clothes Washer   | Standard Commercial Clothes Washer                         | 1.38                     | 15.1%                         | 15%   | 95%                                 | 10           | \$8,704      |
| New                  | Hospital         | Water Heat    | Clothes Washer Commercial   | Energy Star Commercial Clothes Washer MEF=1.72   | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 1.38                     | 2.6%                          | 15%   | 80%                                 | 11           | \$305        |
| New                  | Hospital         | Water Heat    | Demand controlled Circulating Systems                               | Install demand-based control system (VFD Control by Demand)  | No demand control systems in place                         | 1.38                     | 5.0%                          | 55%   | 94%                                 | 15           | \$5,108      |
| New                  | Hospital         | Water Heat    | Dishwashing - Commercial - High Efficiency                          | High Efficiency Dishwasher   | Standard Dishwasher  | 1.38                     | 2.1%                          | 25%   | 80%                                 | 10           | \$2,701      |
| New                  | Hospital         | Water Heat    | Dishwashing - Commercial Chemical System                            | Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)  | High Temp Commercial Dishwasher                            | 1.38                     | 5.6%                          | 25%   | 95%                                 | 10           | \$840        |
| New                  | Hospital         | Water Heat    | Dishwashing - Residential Sized System                              | EF = 0.65 (ENERGY STAR)  | Standard Dishwasher (FED Std. EF=0.46)                     | 1.38                     | 0.6%                          | 20%   | 25%                                 | 13           | \$31         |
| New                  | Hospital         | Water Heat    | Dishwashing - Residential Sized System                              | EF = 0.77  | Standard Dishwasher (FED Std. EF=0.46)                     | 1.38                     | 0.8%                          | 20%   | 55%                                 | 13           | \$631        |
| New                  | Hospital         | Water Heat    | Drainwater Heat Recovery Water Heater                               | Install (Power-Pipe or GFX) - Heat Recovery Water Heater   | No Heat Recovery System                                    | 1.38                     | 20.0%                         | 25%   | 92%                                 | 25           | \$10506      |
| New                  | Hospital         | Water Heat    | Faucet Aerators   | 1.5 GPM Aerator  | 2.5 GPM Aerator (Federal Code)                             | 1.38                     | 4.0%                          | 95%   | 25%                                 | 10           | \$0          |
| New                  | Hospital         | Water Heat    | Heat Pump Water Heater  | EF = 2.9   | EF=0.93 Baseline Electric Water Heater                     | 1.38                     | 58.9%                         | 50%   | 94%                                 | 15           | \$5,725      |
| New                  | Hospital         | Water Heat    | Low Flow Spray Heads  | 1.6 GPM  | 3.0 GPM  | 1.38                     | 2.3%                          | 50%   | 45%                                 | 5            | \$6          |



| Construction Vintage | Customer Segment | End Use          | Measure Name  | Measure Description   | Base Equipment   | Baseline kWh (UEC or EUJ) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|---|--|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Hospital         | Water Heat       | Low-Flow Showerheads  | 2.0 GPM Showerhead  | 2.5 GPM Showerhead (Federal Code)                        | 1.38                      | 2.6%                          | 35%   | 75%                                 | 10           | \$6          |
| New                  | Hospital         | Water Heat       | Solar RE - Solar Water Heater                                       | Passive solar water heating   | Non-solar hot water heater                               | 1.38                      | 66.1%                         | 20%   | 95%                                 | 20           | \$89302      |
| New                  | Hospital         | Water Heat       | Ultrasonic Faucet Control   | Install Ultrasonic Motion Faucet Control                                | No Faucet Control  | 1.38                      | 3.3%                          | 95%   | 90%                                 | 10           | \$206        |
| New                  | Hospital         | Water Heat       | Water Heater Thermostat Setback                                     | Thermostat Setback and Replcement (120 Degrees)                         | No Thermostat Setback (130 Degrees)                      | 1.38                      | 7.7%                          | 75%   | 80%                                 | 11           | \$107        |
| Existing             | Hotel Motel      | Cooking          | Cooking Fryers - Commercial   | Energy Star Commercial Fryer  | Non-Energy Star Fryer                                    | 0.66                      | 2.5%                          | 45%   | 70%                                 | 12           | \$4,947      |
| Existing             | Hotel Motel      | Cooking          | Hot Food Holding Cabinets - Commercial                              | Energy Star Commercial Hot Food Holding Cabinets                        | Non-Energy Star Commercial Hot Food Holding Cabinets     | 0.66                      | 8.4%                          | 55%   | 85%                                 | 12           | \$1,800      |
| Existing             | Hotel Motel      | Cooking          | Oven - Convection   | Convection Oven   | Standard Oven  | 0.66                      | 3.4%                          | 85%   | 55%                                 | 15           | \$1,733      |
| Existing             | Hotel Motel      | Cooking          | Steam Cookers - Commercial  | Energy Star Commercial Steam Cookers (50% efficiency)                   | Non-Energy Star Commercial Steam Cooker (35% efficiency) | 0.66                      | 2.3%                          | 15%   | 75%                                 | 10           | \$2          |
| Existing             | Hotel Motel      | Cooling Chillers | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)                             | Constant Ventilation                                     | 1.60                      | 2.0%                          | 50%   | 94%                                 | 15           | \$2,269      |
| Existing             | Hotel Motel      | Cooling Chillers | Centrifugal Chiller - VSD Remodel for Existing                      | VSD motor   | Constant Speed Motor                                     | 1.60                      | 40.0%                         | 43%   | 45%                                 | 10           | \$5,628      |
| Existing             | Hotel Motel      | Cooling Chillers | Chilled Water Piping Loop w/ VSD Control                            | VSD for Secondary Chilled Water Loop                                    | Primary Loop Only w/ Constant Speed Pump                 | 1.60                      | 7.6%                          | 25%   | 70%                                 | 10           | \$6,827      |
| Existing             | Hotel Motel      | Cooling Chillers | Chilled Water Reset   | Install Chilled Water Reset   | No Chilled Water Reset                                   | 1.60                      | 5.0%                          | 95%   | 100%                                | 10           | \$11453      |
| Existing             | Hotel Motel      | Cooling Chillers | Chiller-Water Side Economizer                                       | Install Economizer  | No Economizer  | 1.60                      | 5.0%                          | 45%   | 30%                                 | 10           | \$15854      |
| Existing             | Hotel Motel      | Cooling Chillers | Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning                            | No Commissioning   | 1.60                      | 12.5%                         | 90%   | 40%                                 | 3            | \$3,313      |
| Existing             | Hotel Motel      | Cooling Chillers | Cooling Tower-Decrease Temperature                                  | Approach 6 Deg F  | 10 Deg F   | 1.60                      | 8.0%                          | 50%   | 94%                                 | 15           | \$676        |
| Existing             | Hotel Motel      | Cooling Chillers | Cooling Tower-Two-Speed Fan Motor                                   | Two-Speed Tower Fans replace Single-Speed                               | Cooling Tower-One-Speed Fan Motor                        | 1.60                      | 14.0%                         | 95%   | 35%                                 | 10           | \$76         |
| Existing             | Hotel Motel      | Cooling Chillers | Cooling Tower-VSD Fan Control                                       | Variable-Speed Tower Fans replace Two-Speed                             | Cooling Tower-Two-Speed Fan Motor                        | 1.60                      | 4.0%                          | 95%   | 75%                                 | 10           | \$610        |
| Existing             | Hotel Motel      | Cooling Chillers | Direct Digital Control System-Installation                          | DDC Retrofit  | Pnuematic  | 1.60                      | 15.0%                         | 5%  | 52%                                 | 5            | \$16164      |
| Existing             | Hotel Motel      | Cooling Chillers | Direct Digital Control System-Optimization                          | DDC System (Optimized)  | DDC System (Basic)                                       | 1.60                      | 10.0%                         | 75%   | 80%                                 | 5            | \$9,052      |
| Existing             | Hotel Motel      | Cooling Chillers | Direct Digital Control System-Wireless Performance Monitoring       | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control | Pnuematic  | 1.60                      | 15.0%                         | 50%   | 80%                                 | 5            | \$6,532      |
| Existing             | Hotel Motel      | Cooling Chillers | Duct Repair And Sealing   | Reduction In Duct Losses to 5%  | No Repair or Sealing, 15% duct losses                    | 1.60                      | 2.5%                          | 45%   | 45%                                 | 18           | \$6,724      |

| Construction Vintage | Customer Segment | End Use          | Measure Name                                     | Measure Description  | Base Equipment                              | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|--|--|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Hotel Motel      | Cooling Chillers | Exhaust Hood Makeup Air                          | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air) | 1.60                     | 4.5%                          | 58%   | 85%                                 | 10           | \$5,725      |
| Existing             | Hotel Motel      | Cooling Chillers | Green Roof                                       | Vegetation on Roof   | Standard roofing techniques                 | 1.60                     | 10.0%                         | 15%   | 98%                                 | 30           | \$85144      |
| Existing             | Hotel Motel      | Cooling Chillers | Insulation (Ceiling)                             | R-38   | R-21 (Code)                                 | 1.60                     | 1.0%                          | 75%   | 45%                                 | 25           | \$4,371      |
| Existing             | Hotel Motel      | Cooling Chillers | Insulation (Ceiling)                             | R-49   | R-21 (Code)                                 | 1.60                     | 1.5%                          | 75%   | 85%                                 | 25           | \$5,799      |
| Existing             | Hotel Motel      | Cooling Chillers | Insulation (Ceiling) - Existing to Code          | R-21 (Code)  | Existing Ceiling Insulation (Average R-9)   | 1.60                     | 1.2%                          | 75%   | 25%                                 | 25           | \$5,127      |
| Existing             | Hotel Motel      | Cooling Chillers | Insulation (Ceiling) - Zero to Code              | R-21 (Code)  | R-0   | 1.60                     | 3.0%                          | 75%   | 0%                                  | 25           | \$5,127      |
| Existing             | Hotel Motel      | Cooling Chillers | Insulation (Duct) (Unconditioned Spaces)         | Install New Duct Insulation (R-8)  | R-0   | 1.60                     | 4.4%                          | 10%   | 15%                                 | 25           | \$1,879      |
| Existing             | Hotel Motel      | Cooling Chillers | Insulation (Duct) (Unconditioned Spaces)         | R-4  | R-0   | 1.60                     | 2.4%                          | 10%   | 15%                                 | 25           | \$1,958      |
| Existing             | Hotel Motel      | Cooling Chillers | Insulation (Wall)                                | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 1.60                     | 3.0%                          | 10%   | 95%                                 | 25           | \$4,436      |
| Existing             | Hotel Motel      | Cooling Chillers | Insulation (Wall) - Existing to Code             | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)              | 1.60                     | 8.4%                          | 10%   | 35%                                 | 25           | \$4,860      |
| Existing             | Hotel Motel      | Cooling Chillers | Insulation (Wall) - Zero to Code                 | R-19 (2x6 Framing) - (Code)  | R-0   | 1.60                     | 10.0%                         | 10%   | 0%                                  | 25           | \$4,804      |
| Existing             | Hotel Motel      | Cooling Chillers | Insulation - Floor (Non-Slab)                    | R-19   | R-10 (Code)                                 | 1.60                     | 0.5%                          | 35%   | 35%                                 | 25           | \$756        |
| Existing             | Hotel Motel      | Cooling Chillers | Insulation - Floor (Non-Slab) - Existing to Code | R-10 (Code)  | R-0   | 1.60                     | 1.5%                          | 35%   | 35%                                 | 25           | \$4,371      |
| Existing             | Hotel Motel      | Cooling Chillers | Pipe Insulation                                  | R-4  | R-0   | 1.60                     | 1.0%                          | 65%   | 45%                                 | 15           | \$345        |
| Existing             | Hotel Motel      | Cooling Chillers | Sensible And Total Heat Recovery Devices         | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery                            | 1.60                     | 25.0%                         | 25%   | 98%                                 | 10           | \$35469      |
| Existing             | Hotel Motel      | Cooling Chillers | Turbocor Compressor                              | 0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)                                 | 0.634 kW/ton (Code) chiller water cooled    | 1.60                     | 44.8%                         | 60%   | 99%                                 | 20           | \$18486      |
| Existing             | Hotel Motel      | Cooling Chillers | Windows  | U = 0.35   | U = 0.55 (Code)                             | 1.60                     | 1.7%                          | 80%   | 50%                                 | 25           | \$28774      |
| Existing             | Hotel Motel      | Cooling Chillers | Windows - Existing to Code                       | U = 0.55 (Code)  | Existing Windows (U=0.65)                   | 1.60                     | 0.8%                          | 10%   | 50%                                 | 25           | \$81238      |

| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description  | Base Equipment                              | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|--|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Hotel Motel      | Cooling DX | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)              | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)                         | 10.3 EER Rooftop Unit (State Code)          | 1.59                     | 14.2%                         | NA  | NA                                  | 15           | \$6,803      |
| Existing             | Hotel Motel      | Cooling DX | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)                 | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)                            | 10.3 EER Rooftop Unit (State Code)          | 1.59                     | 6.4%                          | NA  | NA                                  | 15           | \$3,621      |
| Existing             | Hotel Motel      | Cooling DX | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)               | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)                          | 10.3 EER Rooftop Unit (State Code)          | 1.59                     | 10.4%                         | NA  | NA                                  | 15           | \$5,613      |
| Existing             | Hotel Motel      | Cooling DX | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)                                    | Constant Ventilation                        | 1.72                     | 2.0%                          | 50%   | 94%                                 | 15           | \$2,269      |
| Existing             | Hotel Motel      | Cooling DX | Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning                                   | No Commissioning                            | 1.72                     | 12.5%                         | 90%   | 40%                                 | 3            | \$3,313      |
| Existing             | Hotel Motel      | Cooling DX | Cooling DX Package-Air Side Economizer                              | Air-Side Economizer  | No Economizer                               | 1.72                     | 15.0%                         | 10%   | 30%                                 | 15           | \$5,468      |
| Existing             | Hotel Motel      | Cooling DX | Direct / Indirect Evaporative Cooling, Pre-Cooling                  | Direct / Indirect Evaporative Cooling, Pre-Cooling                             | No modification to DX system                | 1.72                     | 25.0%                         | 50%   | 85%                                 | 15           | \$35022      |
| Existing             | Hotel Motel      | Cooling DX | Direct Digital Control System-Installation                          | DDC Retrofit   | Pneumatic                                   | 1.72                     | 15.0%                         | 5%  | 52%                                 | 5            | \$16164      |
| Existing             | Hotel Motel      | Cooling DX | Direct Digital Control System-Optimization                          | DDC System (Optimized)   | DDC System (Basic)                          | 1.72                     | 10.0%                         | 75%   | 80%                                 | 5            | \$9,052      |
| Existing             | Hotel Motel      | Cooling DX | Direct Digital Control System-Wireless Performance Monitoring       | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control        | Pneumatic                                   | 1.72                     | 15.0%                         | 50%   | 80%                                 | 5            | \$6,532      |
| Existing             | Hotel Motel      | Cooling DX | Duct Repair And Sealing   | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 1.72                     | 2.5%                          | 45%   | 45%                                 | 18           | \$6,724      |
| Existing             | Hotel Motel      | Cooling DX | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air) | 1.72                     | 4.5%                          | 58%   | 85%                                 | 10           | \$5,725      |
| Existing             | Hotel Motel      | Cooling DX | Green Roof  | Vegetation on Roof   | Standard roofing techniques                 | 1.72                     | 5.0%                          | 15%   | 98%                                 | 30           | \$85144      |
| Existing             | Hotel Motel      | Cooling DX | Insulation (Ceiling)  | R-38   | R-21 (Code)                                 | 1.72                     | 1.0%                          | 75%   | 45%                                 | 25           | \$4,371      |
| Existing             | Hotel Motel      | Cooling DX | Insulation (Ceiling)  | R-49   | R-21 (Code)                                 | 1.72                     | 1.5%                          | 75%   | 85%                                 | 25           | \$5,799      |
| Existing             | Hotel Motel      | Cooling DX | Insulation (Ceiling) - Existing to Code                             | R-21 (Code)  | Existing Ceiling Insulation (Average R-9)   | 1.72                     | 1.2%                          | 75%   | 25%                                 | 25           | \$5,127      |
| Existing             | Hotel Motel      | Cooling DX | Insulation (Ceiling) - Zero to Code                                 | R-21 (Code)  | R-0   | 1.72                     | 3.0%                          | 75%   | 0%                                  | 25           | \$5,127      |
| Existing             | Hotel Motel      | Cooling DX | Insulation (Duct) (Unconditioned Spaces)                            | Install New Duct Insulation (R-8)  | R-0   | 1.72                     | 4.4%                          | 10%   | 15%                                 | 25           | \$1,879      |
| Existing             | Hotel Motel      | Cooling DX | Insulation (Duct) (Unconditioned Spaces)                            | R-4  | R-0   | 1.72                     | 2.4%                          | 10%   | 15%                                 | 25           | \$1,958      |
| Existing             | Hotel Motel      | Cooling DX | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 1.72                     | 3.0%                          | 10%   | 95%                                 | 25           | \$4,436      |
| Existing             | Hotel Motel      | Cooling DX | Insulation (Wall) - Existing to Code                                | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)              | 1.72                     | 8.4%                          | 10%   | 35%                                 | 25           | \$4,860      |
| Existing             | Hotel Motel      | Cooling DX | Insulation (Wall) - Zero to Code                                    | R-19 (2x6 Framing) - (Code)  | R-0   | 1.72                     | 10.0%                         | 10%   | 0%                                  | 25           | \$4,804      |
| Existing             | Hotel Motel      | Cooling DX | Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)                                 | 1.72                     | 0.5%                          | 35%   | 45%                                 | 25           | \$756        |
| Existing             | Hotel Motel      | Cooling DX | Insulation - Floor (Non-Slab) - Existing to Code                    | R-10 (Code)  | R-0   | 1.72                     | 1.5%                          | 35%   | 45%                                 | 25           | \$4,371      |

| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description   | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|---|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Hotel Motel      | Cooling DX | Thermostat - Programmable   | Energy Star Programmable Thermostat   | Manual Thermostat  | 1.72                     | 3.0%                          | 95%   | 78%                                 | 15           | \$146        |
| Existing             | Hotel Motel      | Cooling DX | Windows   | U = 0.35  | U = 0.55 (Code)  | 1.72                     | 1.7%                          | 80%   | 50%                                 | 25           | \$28774      |
| Existing             | Hotel Motel      | Cooling DX | Windows - Existing to Code  | U = 0.55 (Code)   | Existing Windows (U=0.65)  | 1.72                     | 0.8%                          | 10%   | 50%                                 | 25           | \$81238      |
| Existing             | Hotel Motel      | HVAC Aux   | Automated Exhaust VFD Control - Parking Garage CO sensor            | CO Sensors  | No CO Sensors  | 3.30                     | 20.0%                         | 20%   | 85%                                 | 10           | \$3,436      |
| Existing             | Hotel Motel      | HVAC Aux   | Cooking Hood Controls   | Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air | No Cooking Hood Controls   | 3.30                     | 7.5%                          | 60%   | 45%                                 | 10           | \$13132      |
| Existing             | Hotel Motel      | HVAC Aux   | Motor - Premium-Efficiency  | PE Motors for HVAC Applications   | Standard Efficiency Motors   | 3.30                     | 3.8%                          | 85%   | 81%                                 | 10           | \$439        |
| Existing             | Hotel Motel      | HVAC Aux   | Motor - Pump & Fan System - Variable Speed Control                  | Pump And Fan System Optimization w/ VSD Control   | No Pump And Fan System VSD Optimization  | 3.30                     | 33.8%                         | 85%   | 75%                                 | 20           | \$3,411      |
| Existing             | Hotel Motel      | HVAC Aux   | Motor - VAV Box High-Efficiency                                     | ECM Motors  | Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control | 3.30                     | 8.8%                          | 10%   | 77%                                 | 10           | \$6,139      |
| Existing             | Hotel Motel      | HVAC Aux   | Optimized Variable Volume Lab Hood Design                           | Optimized Variable Volume Lab Hood Design   | Constant Volume Lab Hood Design  | 3.30                     | 1.6%                          | 0%  | 94%                                 | 10           | \$1,792      |
| Existing             | Hotel Motel      | Heat Pump  | High-Efficiency EER=11.0, COP=3.5                                   | High-Efficiency EER=11.0, COP=3.5   | EER=10.1, COP=3.2  | 3.83                     | 16.8%                         | NA  | NA                                  | 15           | \$4,823      |
| Existing             | Hotel Motel      | Heat Pump  | Premium-Efficiency EER=11.8, COP=3.8                                | Premium-Efficiency EER=11.8, COP=3.8  | EER=10.1, COP=3.2  | 3.83                     | 30.2%                         | NA  | NA                                  | 15           | \$10326      |
| Existing             | Hotel Motel      | Heat Pump  | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)   | Constant Ventilation   | 3.99                     | 2.0%                          | 50%   | 94%                                 | 15           | \$2,269      |
| Existing             | Hotel Motel      | Heat Pump  | Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning  | No Commissioning   | 3.99                     | 12.5%                         | 90%   | 40%                                 | 3            | \$3,313      |
| Existing             | Hotel Motel      | Heat Pump  | Direct Digital Control System-Installation                          | DDC Retrofit  | Pneumatic  | 3.99                     | 15.0%                         | 5%  | 52%                                 | 5            | \$16164      |
| Existing             | Hotel Motel      | Heat Pump  | Direct Digital Control System-Optimization                          | DDC System (Optimized)  | DDC System (Basic)   | 3.99                     | 10.0%                         | 75%   | 80%                                 | 5            | \$9,052      |
| Existing             | Hotel Motel      | Heat Pump  | Direct Digital Control System-Wireless Performance Monitoring       | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control   | Pneumatic  | 3.99                     | 15.0%                         | 50%   | 80%                                 | 5            | \$6,532      |
| Existing             | Hotel Motel      | Heat Pump  | Duct Repair And Sealing   | Reduction In Duct Losses to 5%  | No Repair or Sealing, 15% duct losses  | 3.99                     | 2.5%                          | 45%   | 45%                                 | 18           | \$6,724      |
| Existing             | Hotel Motel      | Heat Pump  | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery   | No Heat Recovery   | 3.99                     | 8.8%                          | 5%  | 94%                                 | 10           | \$15247      |
| Existing             | Hotel Motel      | Heat Pump  | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air                                      | Hood Pulls Conditioned Air (No Make-up Air)  | 3.99                     | 4.5%                          | 58%   | 85%                                 | 10           | \$5,725      |
| Existing             | Hotel Motel      | Heat Pump  | Green Roof  | Vegetation on Roof  | Standard roofing techniques  | 3.99                     | 0.6%                          | 15%   | 98%                                 | 30           | \$85144      |
| Existing             | Hotel Motel      | Heat Pump  | Heat Pump - Ground Source (Closed Loop)                             | GSHP: COP=3.1, EER=13.4   | Std. Air Source HP 'EER=10.1, COP=3.2  | 3.99                     | 12.0%                         | 5%  | 92%                                 | 20           | \$55935      |
| Existing             | Hotel Motel      | Heat Pump  | Heat Pump - Ground Source (Closed Loop)                             | GSHP: COP=4.0, EER=20   | Std. Air Source HP 'EER=10.1, COP=3.2  | 3.99                     | 33.7%                         | 5%  | 92%                                 | 20           | 105086       |
| Existing             | Hotel Motel      | Heat Pump  | Heat Pump - Water Source (Closed Loop)                              | WSHP: COP=4.2, EER=12.0   | Std. Air Source Heat Pump'EER=10.1, COP=3.2  | 3.99                     | 21.9%                         | 0%  | 90%                                 | 20           | \$11251      |

| Construction Vintage | Customer Segment | End Use   | Measure Name  | Measure Description   | Base Equipment                                      | Baseline kWh (UEC or EU) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|---|---|---|--------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Hotel Motel      | Heat Pump | Heat Pump - Water Source (Closed Loop)                          | WSHP: COP=4.8, EER=14.5   | Std. Air Source Heat Pump'EER=10.1, COP=3.2         | 3.99                     | 33.3%                     | 0%  | 90%                                 | 20           | \$14860      |
| Existing             | Hotel Motel      | Heat Pump | Insulation (Ceiling)  | R-38  | R-21 (Code)   | 3.99                     | 3.0%                      | 75%   | 45%                                 | 25           | \$4,371      |
| Existing             | Hotel Motel      | Heat Pump | Insulation (Ceiling)  | R-49  | R-21 (Code)   | 3.99                     | 4.4%                      | 75%   | 85%                                 | 25           | \$5,799      |
| Existing             | Hotel Motel      | Heat Pump | Insulation (Ceiling) - Existing to Code                         | R-21 (Code)   | Existing Ceiling Insulation (Average R-9)           | 3.99                     | 2.8%                      | 75%   | 25%                                 | 25           | \$5,127      |
| Existing             | Hotel Motel      | Heat Pump | Insulation (Ceiling) - Zero to Code                             | R-21 (Code)   | R-0   | 3.99                     | 6.9%                      | 75%   | 0%                                  | 25           | \$5,127      |
| Existing             | Hotel Motel      | Heat Pump | Insulation (Duct) (Unconditioned Spaces)                        | Install New Duct Insulation (R-8)                                   | R-0   | 3.99                     | 4.4%                      | 10%   | 15%                                 | 25           | \$1,879      |
| Existing             | Hotel Motel      | Heat Pump | Insulation (Duct) (Unconditioned Spaces)                        | R-4   | R-0   | 3.99                     | 2.4%                      | 10%   | 15%                                 | 25           | \$1,958      |
| Existing             | Hotel Motel      | Heat Pump | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced                                       | R-19 (2x6 Framing) - (Code)                         | 3.99                     | 5.0%                      | 10%   | 95%                                 | 25           | \$4,436      |
| Existing             | Hotel Motel      | Heat Pump | Insulation (Wall) - Existing to Code                            | R-19 (2x6 Framing) - (Code)   | Existing R-value (Average R-3)                      | 3.99                     | 16.6%                     | 10%   | 35%                                 | 25           | \$4,860      |
| Existing             | Hotel Motel      | Heat Pump | Insulation (Wall) - Zero to Code                                | R-19 (2x6 Framing) - (Code)   | R-0   | 3.99                     | 19.8%                     | 10%   | 0%                                  | 25           | \$4,804      |
| Existing             | Hotel Motel      | Heat Pump | Insulation - Floor (Non-Slab)                                   | R-19  | R-10 (Code)   | 3.99                     | 1.9%                      | 35%   | 45%                                 | 25           | \$756        |
| Existing             | Hotel Motel      | Heat Pump | Insulation - Floor (Non-Slab) - Existing to Code                | R-10 (Code)   | R-0   | 3.99                     | 5.6%                      | 35%   | 45%                                 | 25           | \$4,371      |
| Existing             | Hotel Motel      | Heat Pump | Thermostat - Programmable                                       | Energy Star Programmable Thermostat                                 | Manual Thermostat                                   | 3.99                     | 3.0%                      | 95%   | 78%                                 | 15           | \$146        |
| Existing             | Hotel Motel      | Heat Pump | Windows   | U = 0.35  | U = 0.55 (Code)                                     | 3.99                     | 11.4%                     | 80%   | 50%                                 | 25           | \$28774      |
| Existing             | Hotel Motel      | Heat Pump | Windows - Existing to Code                                      | U = 0.55 (Code)   | Existing Windows (U=0.65)                           | 3.99                     | 7.5%                      | 10%   | 50%                                 | 25           | \$81238      |
| Existing             | Hotel Motel      | Lighting  | Bi-Level Control, Stairwell Lighting                            | Occupancy Sensor Control, 50% Lighting Power during unoccupied Time | Continuous Full Power Lighting in Stairways         | 2.92                     | 2.0%                      | 85%   | 75%                                 | 9            | \$1,325      |
| Existing             | Hotel Motel      | Lighting  | Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures | Continuous Dimming, Fluorescent Fixtures (Day-Lighting)             | No Dimming Controls                                 | 2.92                     | 6.0%                      | 30%   | 92%                                 | 9            | \$2,017      |
| Existing             | Hotel Motel      | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 15%             | Code Required LPD And Control Strategies: LPD = 1.0 | 2.92                     | 15.0%                     | 90%   | 70%                                 | 14           | \$2,179      |
| Existing             | Hotel Motel      | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 20%             | Code Required LPD And Control Strategies: LPD = 1.0 | 2.92                     | 20.0%                     | 75%   | 85%                                 | 14           | \$5,396      |
| Existing             | Hotel Motel      | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 25%             | Code Required LPD And Control Strategies: LPD = 1.0 | 2.92                     | 25.0%                     | 70%   | 90%                                 | 14           | \$8,613      |
| Existing             | Hotel Motel      | Lighting  | HE Fixtures/Design - Existing to Code                           | Code Required LPD And Control Strategies: LPD = 1.0                 | Existing Lighting Design                            | 2.92                     | 53.0%                     | 95%   | 45%                                 | 14           | \$13008      |
| Existing             | Hotel Motel      | Lighting  | LED Exit Lighting   | 5 Watts   | CFL Exit Sign (26 Watts)                            | 2.92                     | 1.6%                      | 95%   | 65%                                 | 11           | \$52         |
| Existing             | Hotel Motel      | Lighting  | LED Refrigeration Case Lights                                   | LED Refrigeration Case Lights (28W)                                 | Fluorescent Refrigeration Case Lights (60W)         | 2.92                     | 1.2%                      | 25%   | 80%                                 | 13           | \$630        |
| Existing             | Hotel Motel      | Lighting  | LED Solid State White Lighting Package                          | Landscape, merchandise, signage, structure & task lighting          | 50W 10hrs/day, 365 day/yr                           | 2.92                     | 0.8%                      | 10%   | 95%                                 | 14           | \$37         |
| Existing             | Hotel Motel      | Lighting  | Occupancy Sensor Control, Fluorescent                           | Occupancy Sensor Control, Fluorescent                               | No Occupancy Sensor                                 | 2.92                     | 4.0%                      | 90%   | 98%                                 | 9            | \$314        |

| Construction Vintage | Customer Segment | End Use       | Measure Name  | Measure Description   | Base Equipment                           | Baseline kWh (UEC or EUJ) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|---|---|--|---------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Hotel Motel      | Lighting      | Time Clocks And Timers  | Install Time Clock Lighting   | No Time Clock                            | 2.92                      | 4.9%                      | 85%   | 100%                                | 9            | \$215        |
| Existing             | Hotel Motel      | Plug Load     | Energy Star - Battery Charging System                               | Energy Star Battery Charging System   | Non-Energy Star Battery Chargers         | 2.29                      | 0.4%                      | 95%   | 90%                                 | 7            | \$2          |
| Existing             | Hotel Motel      | Plug Load     | Energy Star - Computer  | Energy Star Features Enabled  | Non-Energy Star Features                 | 2.29                      | 13.6%                     | 64%   | 25%                                 | 4            | \$2          |
| Existing             | Hotel Motel      | Plug Load     | Energy Star - Copiers   | Energy Star or Better Office Equipment: Copiers,  | Office Equipment: Copiers, Standard      | 2.29                      | 3.3%                      | 90%   | 45%                                 | 6            | \$165        |
| Existing             | Hotel Motel      | Plug Load     | Energy Star - Fax   | Energy Star Features Enabled  | Non-Energy Star Features                 | 2.29                      | 1.8%                      | 75%   | 55%                                 | 4            | \$2          |
| Existing             | Hotel Motel      | Plug Load     | Energy Star - Monitors  | Energy Star Features Enabled  | Non-Energy Star Features                 | 2.29                      | 18.4%                     | 64%   | 15%                                 | 4            | \$158        |
| Existing             | Hotel Motel      | Plug Load     | Energy Star - Printers  | Energy Star Features Enabled  | Non-Energy Star Features                 | 2.29                      | 1.3%                      | 75%   | 40%                                 | 5            | \$15         |
| Existing             | Hotel Motel      | Plug Load     | Energy Star - Scanners  | Energy Star Features Enabled  | Non-Energy Star Features                 | 2.29                      | 0.9%                      | 75%   | 45%                                 | 4            | \$2          |
| Existing             | Hotel Motel      | Plug Load     | Energy Star - Water Cooler  | Energy Star Water Cooler (Hot/Cold Water)   | Non-Energy Star Water Cooler             | 2.29                      | 1.0%                      | 5%  | 75%                                 | 10           | \$2          |
| Existing             | Hotel Motel      | Plug Load     | Office Computer Network Management                                  | Energy Office Computer Network Energy Management  | No Network Management                    | 2.29                      | 1.8%                      | 95%   | 30%                                 | 3            | \$309        |
| Existing             | Hotel Motel      | Plug Load     | Power Supply 80+ Office Measure                                     | 80% Efficient Power supply  | No 80+                                   | 2.29                      | 1.0%                      | 95%   | 86%                                 | 7            | \$0          |
| Existing             | Hotel Motel      | Plug Load     | Refrigerator eCube  | Refrigerator eCube  | No Refrigerator eCube                    | 2.29                      | 1.2%                      | 75%   | 95%                                 | 10           | \$171        |
| Existing             | Hotel Motel      | Plug Load     | Residential-Size Refrigerator                                       | Energy Star Residential-Size Refrigerator   | Residential-Size Refrigerator - Standard | 2.29                      | 0.2%                      | 45%   | 65%                                 | 13           | \$126        |
| Existing             | Hotel Motel      | Plug Load     | Residential-Size Refrigerator/Freezer - Early Replacement           | Energy Star Refrigerator/Freezer  | Baseline Refrigerator/Freezer            | 2.29                      | 2.7%                      | 25%   | 35%                                 | 7            | \$578        |
| Existing             | Hotel Motel      | Plug Load     | Vending Machine   | Energy Star Vending Machines - High-Efficiency  | Vending Machines - Standard              | 2.29                      | 5.0%                      | 90%   | 80%                                 | 14           | \$190        |
| Existing             | Hotel Motel      | Plug Load     | Vending Miser   | Passive Infrared Sensor on Vending Machine Monitoring Vacancy of Area And Cycles Cooling - Controls | No Vending Miser - No controls           | 2.29                      | 5.2%                      | 90%   | 25%                                 | 3            | \$298        |
| Existing             | Hotel Motel      | Refrigeration | Commercial Reach-In Refrigerator                                    | Energy Star Commercial Reach-In Refrigerator  | Commercial-Size Refrigerator - Standard  | 0.31                      | 24.9%                     | 95%   | 95%                                 | 12           | \$345        |
| Existing             | Hotel Motel      | Refrigeration | Custom Refrigeration System   | High-Efficiency Custom Refrigeration System (Walk-in) includes compressors                          | Custom Refrigeration System - Standard   | 0.31                      | 3.6%                      | 85%   | 65%                                 | 10           | \$9,595      |
| Existing             | Hotel Motel      | Refrigeration | Ice Maker   | Energy Star Ice Maker - High-Efficiency   | Standard Ice Maker                       | 0.31                      | 1.1%                      | 100%  | 86%                                 | 9            | \$377        |
| Existing             | Hotel Motel      | Refrigeration | Reduced Speed or Cycling of Evaporator Fans                         | VFD on Evaporator Fans (Evap Fan Control on Walk-In)  | Constant Speed Evaporator Fans           | 0.31                      | 6.0%                      | 75%   | 70%                                 | 10           | \$13         |
| Existing             | Hotel Motel      | Refrigeration | Refrigeration - Retro Commissioning                                 | Refrigeration Retro Commissioning (Refrigeration System Diagnostics / Operations And Maintenance)   | No Re-commissioning                      | 0.31                      | 5.0%                      | 80%   | 90%                                 | 3            | \$17         |
| Existing             | Hotel Motel      | Refrigeration | Special Glass Doors for Refrigerated Reach-in Cases                 | Do Not Require Anti-Sweat Heating   | Standard Glass Doors                     | 0.31                      | 3.2%                      | 95%   | 77%                                 | 16           | \$55         |
| Existing             | Hotel Motel      | Refrigeration | Strip Curtains for Walk-Ins   | Strip Curtains for Walk-Ins   | No Strip Curtains for Walk-Ins           | 0.31                      | 2.0%                      | 95%   | 20%                                 | 4            | \$188        |
| Existing             | Hotel Motel      | Space Heat    | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)   | Constant Ventilation                     | 4.09                      | 2.0%                      | 50%   | 94%                                 | 15           | \$2,269      |
| Existing             | Hotel Motel      | Space Heat    | Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning  | No Commissioning                         | 4.09                      | 12.5%                     | 90%   | 40%                                 | 3            | \$3,313      |

| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description  | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|--|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Hotel Motel      | Space Heat | Direct Digital Control System-Installation                    | DDC Retrofit   | Pneumatic  | 4.09                     | 15.0%                         | 5%  | 52%                                 | 5            | \$16164      |
| Existing             | Hotel Motel      | Space Heat | Direct Digital Control System-Optimization                    | DDC System (Optimized)   | DDC System (Basic)   | 4.09                     | 10.0%                         | 75%   | 80%                                 | 5            | \$9,052      |
| Existing             | Hotel Motel      | Space Heat | Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control  | Pneumatic  | 4.09                     | 15.0%                         | 50%   | 80%                                 | 5            | \$6,532      |
| Existing             | Hotel Motel      | Space Heat | Duct Repair And Sealing                                       | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses                      | 4.09                     | 2.5%                          | 45%   | 45%                                 | 18           | \$6,724      |
| Existing             | Hotel Motel      | Space Heat | Exhaust Air to Ventilation Air Heat Recovery                  | Exhaust Air Heat Recovery  | No Heat Recovery   | 4.09                     | 15.0%                         | 5%  | 94%                                 | 10           | \$15247      |
| Existing             | Hotel Motel      | Space Heat | Exhaust Hood Makeup Air                                       | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air)                | 4.09                     | 4.5%                          | 58%   | 85%                                 | 10           | \$5,725      |
| Existing             | Hotel Motel      | Space Heat | Insulation (Ceiling)  | R-49   | R-30   | 4.09                     | 4.0%                          | 75%   | 85%                                 | 25           | \$4,371      |
| Existing             | Hotel Motel      | Space Heat | Insulation (Ceiling) - Existing to Code                       | R-30   | Existing Ceiling Insulation (Average R-9)                  | 4.09                     | 6.3%                          | 75%   | 25%                                 | 25           | \$5,127      |
| Existing             | Hotel Motel      | Space Heat | Insulation (Ceiling) - Zero to Code                           | R-30   | R-0  | 4.09                     | 12.5%                         | 75%   | 0%                                  | 25           | \$5,127      |
| Existing             | Hotel Motel      | Space Heat | Insulation (Duct) (Unconditioned Spaces)                      | Install New Duct Insulation (R-8)  | R-0  | 4.09                     | 4.4%                          | 10%   | 15%                                 | 25           | \$1,879      |
| Existing             | Hotel Motel      | Space Heat | Insulation (Duct) (Unconditioned Spaces)                      | R-4  | R-0  | 4.09                     | 2.4%                          | 10%   | 15%                                 | 25           | \$1,958      |
| Existing             | Hotel Motel      | Space Heat | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                                | 4.09                     | 6.0%                          | 10%   | 95%                                 | 25           | \$4,436      |
| Existing             | Hotel Motel      | Space Heat | Insulation (Wall) - Existing to Code                          | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)                             | 4.09                     | 21.1%                         | 10%   | 35%                                 | 25           | \$4,860      |
| Existing             | Hotel Motel      | Space Heat | Insulation (Wall) - Zero to Code                              | R-19 (2x6 Framing) - (Code)  | R-0  | 4.09                     | 25.0%                         | 10%   | 0%                                  | 25           | \$4,804      |
| Existing             | Hotel Motel      | Space Heat | Insulation - Floor (Non-Slab)                                 | R-19   | R-10 (Code)  | 4.09                     | 2.5%                          | 35%   | 45%                                 | 25           | \$756        |
| Existing             | Hotel Motel      | Space Heat | Insulation - Floor (Non-Slab) - Existing to Code              | R-10 (Code)  | R-0  | 4.09                     | 7.5%                          | 35%   | 45%                                 | 25           | \$4,371      |
| Existing             | Hotel Motel      | Space Heat | Sensible And Total Heat Recovery Devices                      | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery   | 4.09                     | 25.0%                         | 25%   | 98%                                 | 10           | \$35469      |
| Existing             | Hotel Motel      | Space Heat | Thermostat - Programmable                                     | Energy Star Programmable Thermostat  | Manual Thermostat  | 4.09                     | 3.0%                          | 95%   | 78%                                 | 15           | \$146        |
| Existing             | Hotel Motel      | Space Heat | Windows   | U = 0.35   | U = 0.40   | 4.09                     | 5.5%                          | 80%   | 50%                                 | 25           | \$7,193      |
| Existing             | Hotel Motel      | Space Heat | Windows - Existing to Code                                    | U = 0.40   | Existing Windows (U=0.65)                                  | 4.09                     | 16.6%                         | 10%   | 50%                                 | 25           | 102818       |
| Existing             | Hotel Motel      | Water Heat | Water_Heater (40 Gallon Electric) - Residential Sized         | EF = 0.95  | EF = 0.92  | 1.69                     | 3.3%                          | NA  | NA                                  | 20           | \$1,615      |
| Existing             | Hotel Motel      | Water Heat | Clothes Washer - Ozonating                                    | Ozonating Clothes Washer   | Standard Commercial Clothes Washer                         | 1.73                     | 15.1%                         | 35%   | 95%                                 | 10           | \$8,704      |
| Existing             | Hotel Motel      | Water Heat | Clothes Washer Commercial                                     | Energy Star Commercial Clothes Washer MEF=1.72   | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 1.73                     | 2.3%                          | 35%   | 80%                                 | 11           | \$304        |
| Existing             | Hotel Motel      | Water Heat | Demand controlled Circulating Systems                         | Install demand-based control system (VFD Control by Demand)  | No demand control systems in place                         | 1.73                     | 5.0%                          | 55%   | 80%                                 | 15           | \$4,670      |
| Existing             | Hotel Motel      | Water Heat | Dishwashing - Commercial - High Efficiency                    | High Efficiency Dishwasher   | Standard Dishwasher  | 1.73                     | 2.1%                          | 45%   | 80%                                 | 10           | \$2,700      |

| Construction Vintage | Customer Segment | End Use          | Measure Name  | Measure Description                                      | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|--|--|--------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Hotel Motel      | Water Heat       | Dishwashing - Commercial Chemical System                            | Low-Temp Commercial Dishwasher (Includes Chemical Cost)  | High Temp Commercial Dishwasher                          | 1.73                     | 5.6%                      | 45%   | 95%                                 | 10           | \$841        |
| Existing             | Hotel Motel      | Water Heat       | Dishwashing - Residential Sized System                              | EF = 0.65 (ENERGY STAR)                                  | Standard Dishwasher (FED Std. EF=0.46)                   | 1.73                     | 0.5%                      | 45%   | 25%                                 | 13           | \$32         |
| Existing             | Hotel Motel      | Water Heat       | Dishwashing - Residential Sized System                              | EF = 0.77  | Standard Dishwasher (FED Std. EF=0.46)                   | 1.73                     | 0.7%                      | 45%   | 55%                                 | 13           | \$630        |
| Existing             | Hotel Motel      | Water Heat       | Drainwater Heat Recovery Water Heater                               | Install (Power-Pipe or GFX) - Heat Recovery Water Heater | No Heat Recovery System                                  | 1.73                     | 20.0%                     | 5%  | 92%                                 | 25           | \$8,755      |
| Existing             | Hotel Motel      | Water Heat       | Faucet Aerators   | 1.5 GPM Aerator  | 2.5 GPM Aerator (Federal Code)                           | 1.73                     | 4.0%                      | 95%   | 25%                                 | 10           | \$0          |
| Existing             | Hotel Motel      | Water Heat       | Faucet Aerators - Existing to Code                                  | 2.5 GPM Aerator (Federal Code)                           | 4.0 GPM Aerator  | 1.73                     | 3.8%                      | 95%   | 15%                                 | 10           | \$2          |
| Existing             | Hotel Motel      | Water Heat       | Heat Pump Water Heater  | EF = 2.9   | EF=0.93 Baseline Electric Water Heater                   | 1.73                     | 58.9%                     | 40%   | 94%                                 | 15           | \$6,435      |
| Existing             | Hotel Motel      | Water Heat       | Hot Water (SHW) Pipe Insulation                                     | Install Insulation (R-4)                                 | No Pipe Insulation                                       | 1.73                     | 1.0%                      | 80%   | 90%                                 | 15           | \$178        |
| Existing             | Hotel Motel      | Water Heat       | Low Flow Spray Heads  | 1.6 GPM  | 3.0 GPM  | 1.73                     | 2.3%                      | 85%   | 50%                                 | 5            | \$5          |
| Existing             | Hotel Motel      | Water Heat       | Low-Flow Showerheads  | 2.0 GPM Showerhead                                       | 2.5 GPM Showerhead (Federal Code)                        | 1.73                     | 7.5%                      | 100%  | 75%                                 | 10           | \$7          |
| Existing             | Hotel Motel      | Water Heat       | Low-Flow Showerheads - Existing to Code                             | 2.5 GPM Showerhead (Federal Code)                        | 4.5 GPM Showerhead                                       | 1.73                     | 16.7%                     | 100%  | 20%                                 | 10           | \$12         |
| Existing             | Hotel Motel      | Water Heat       | Solar RE - Solar Water Heater                                       | Passive solar water heating                              | Non-solar hot water heater                               | 1.73                     | 56.1%                     | 20%   | 95%                                 | 20           | \$89303      |
| Existing             | Hotel Motel      | Water Heat       | Ultrasonic Faucet Control   | Install Ultrasonic Motion Faucet Control                 | No Faucet Control  | 1.73                     | 3.3%                      | 95%   | 85%                                 | 10           | \$207        |
| Existing             | Hotel Motel      | Water Heat       | Water Heater Thermostat Setback                                     | Thermostat Setback and Replacement (120 Degrees)         | No Thermostat Setback (130 Degrees)                      | 1.73                     | 7.7%                      | 75%   | 5%                                  | 11           | \$108        |
| New                  | Hotel Motel      | Cooking          | Cooking Fryers - Commercial   | Energy Star Commercial Fryer                             | Non-Energy Star Fryer                                    | 0.66                     | 2.5%                      | 45%   | 70%                                 | 12           | \$4,947      |
| New                  | Hotel Motel      | Cooking          | Hot Food Holding Cabinets - Commercial                              | Energy Star Commercial Hot Food Holding Cabinets         | Non-Energy Star Commercial Hot Food Holding Cabinets     | 0.66                     | 8.3%                      | 55%   | 85%                                 | 12           | \$1,800      |
| New                  | Hotel Motel      | Cooking          | Oven - Convection   | Convection Oven  | Standard Oven  | 0.66                     | 3.4%                      | 85%   | 55%                                 | 15           | \$1,733      |
| New                  | Hotel Motel      | Cooking          | Steam Cookers - Commercial  | Energy Star Commercial Steam Cookers (50% efficiency)    | Non-Energy Star Commercial Steam Cooker (35% efficiency) | 0.66                     | 2.3%                      | 15%   | 75%                                 | 10           | \$2          |
| New                  | Hotel Motel      | Cooling Chillers | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)              | Constant Ventilation                                     | 0.51                     | 2.0%                      | 50%   | 94%                                 | 15           | \$2,269      |
| New                  | Hotel Motel      | Cooling Chillers | Chilled Water Piping Loop w/ VSD Control                            | VSD for Secondary Chilled Water Loop                     | Primary Loop Only w/ Constant Speed Pump                 | 0.51                     | 7.6%                      | 25%   | 70%                                 | 10           | \$6,827      |
| New                  | Hotel Motel      | Cooling Chillers | Chilled Water Reset   | Install Chilled Water Reset                              | No Chilled Water Reset                                   | 0.51                     | 5.0%                      | 95%   | 100%                                | 10           | \$11453      |
| New                  | Hotel Motel      | Cooling Chillers | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning               | No Commissioning   | 0.51                     | 12.5%                     | 90%   | 80%                                 | 3            | \$12271      |
| New                  | Hotel Motel      | Cooling Chillers | Cooling Tower-Decrease Temperature Approach                         | 6 Deg F  | 10 Deg F   | 0.51                     | 8.0%                      | 50%   | 94%                                 | 15           | \$676        |
| New                  | Hotel Motel      | Cooling Chillers | Direct Digital Control System-Optimization                          | DDC System (Optimized)                                   | DDC System (Basic)                                       | 0.51                     | 10.0%                     | 75%   | 80%                                 | 5            | \$9,052      |



| Construction Vintage | Customer Segment | End Use          | Measure Name  | Measure Description  | Base Equipment                              | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|--|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Hotel Motel      | Cooling Chillers | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air) | 0.51                     | 4.5%                          | 58%   | 85%                                 | 10           | \$5,725      |
| New                  | Hotel Motel      | Cooling Chillers | Green Roof  | Vegetation on Roof   | Standard roofing techniques                 | 0.51                     | 10.0%                         | 15%   | 98%                                 | 30           | \$85144      |
| New                  | Hotel Motel      | Cooling Chillers | Insulation (Ceiling)  | R-38   | R-21 (Code)                                 | 0.51                     | 1.0%                          | 75%   | 45%                                 | 25           | \$4,371      |
| New                  | Hotel Motel      | Cooling Chillers | Insulation (Ceiling)  | R-49   | R-21 (Code)                                 | 0.51                     | 1.5%                          | 75%   | 85%                                 | 25           | \$5,799      |
| New                  | Hotel Motel      | Cooling Chillers | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 0.51                     | 3.0%                          | 95%   | 95%                                 | 25           | \$4,436      |
| New                  | Hotel Motel      | Cooling Chillers | Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)                                 | 0.51                     | 0.5%                          | 35%   | 35%                                 | 25           | \$756        |
| New                  | Hotel Motel      | Cooling Chillers | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                        | 0.51                     | 10.0%                         | 40%   | 98%                                 | 25           | \$2,606      |
| New                  | Hotel Motel      | Cooling Chillers | Sensible And Total Heat Recovery Devices                            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery                            | 0.51                     | 25.0%                         | 50%   | 98%                                 | 10           | \$35469      |
| New                  | Hotel Motel      | Cooling Chillers | Turbocor Compressor   | 0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)                                 | 0.634 kW/ton (Code) chiller water cooled    | 0.51                     | 44.8%                         | 95%   | 99%                                 | 20           | \$13061      |
| New                  | Hotel Motel      | Cooling Chillers | Window RE - Window Overhangs  | Overhangs over windows for shading   | No window overhangs                         | 0.51                     | 9.6%                          | 75%   | 75%                                 | 30           | \$12033      |
| New                  | Hotel Motel      | Cooling Chillers | Windows   | U = 0.35   | U = 0.55 (Code)                             | 0.51                     | 1.7%                          | 80%   | 50%                                 | 25           | \$28774      |
| New                  | Hotel Motel      | Cooling DX       | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)              | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)   | 10.3 EER Rooftop Unit (State Code)          | 0.56                     | 14.2%                         | NA  | NA                                  | 15           | \$6,803      |
| New                  | Hotel Motel      | Cooling DX       | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)                 | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)  | 10.3 EER Rooftop Unit (State Code)          | 0.56                     | 6.4%                          | NA  | NA                                  | 15           | \$3,621      |
| New                  | Hotel Motel      | Cooling DX       | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)               | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)  | 10.3 EER Rooftop Unit (State Code)          | 0.56                     | 10.4%                         | NA  | NA                                  | 15           | \$5,613      |
| New                  | Hotel Motel      | Cooling DX       | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)  | Constant Ventilation                        | 0.51                     | 2.0%                          | 50%   | 94%                                 | 15           | \$2,269      |
| New                  | Hotel Motel      | Cooling DX       | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning   | No Commissioning                            | 0.51                     | 12.5%                         | 90%   | 80%                                 | 3            | \$12271      |
| New                  | Hotel Motel      | Cooling DX       | Direct / Indirect Evaporative Cooling, Pre-Cooling                  | Direct / Indirect Evaporative Cooling, Pre-Cooling   | No modification to DX system                | 0.51                     | 25.0%                         | 50%   | 85%                                 | 15           | \$35022      |
| New                  | Hotel Motel      | Cooling DX       | Direct Digital Control System-Optimization                          | DDC System (Optimized)   | DDC System (Basic)                          | 0.51                     | 10.0%                         | 75%   | 80%                                 | 5            | \$9,052      |
| New                  | Hotel Motel      | Cooling DX       | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air) | 0.51                     | 4.5%                          | 58%   | 85%                                 | 10           | \$5,725      |

| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description   | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|---|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Hotel Motel      | Cooling DX | Green Roof  | Vegetation on Roof  | Standard roofing techniques  | 0.51                     | 5.0%                          | 15%   | 98%                                 | 30           | \$85144      |
| New                  | Hotel Motel      | Cooling DX | Hotel Key Card Room Energy Control System                           | Key card system to control room HVAC and lighting during non-occupied periods                                       | 325 sqft room, \$100/room  | 0.51                     | 25.0%                         | 60%   | 95%                                 | 15           | \$5,275      |
| New                  | Hotel Motel      | Cooling DX | Insulation (Ceiling)  | R-38  | R-21 (Code)  | 0.51                     | 1.0%                          | 75%   | 45%                                 | 25           | \$4,371      |
| New                  | Hotel Motel      | Cooling DX | Insulation (Ceiling)  | R-49  | R-21 (Code)  | 0.51                     | 1.5%                          | 75%   | 85%                                 | 25           | \$5,799      |
| New                  | Hotel Motel      | Cooling DX | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced   | R-19 (2x6 Framing) - (Code)  | 0.51                     | 3.0%                          | 95%   | 95%                                 | 25           | \$4,436      |
| New                  | Hotel Motel      | Cooling DX | Insulation - Floor (Non-Slab)                                       | R-19  | R-10 (Code)  | 0.51                     | 0.5%                          | 35%   | 45%                                 | 25           | \$756        |
| New                  | Hotel Motel      | Cooling DX | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands  | Std duct workmanship   | 0.51                     | 10.0%                         | 40%   | 98%                                 | 25           | \$2,606      |
| New                  | Hotel Motel      | Cooling DX | Window RE - Window Overhangs  | Overhangs over windows for shading  | No window overhangs  | 0.51                     | 9.6%                          | 75%   | 75%                                 | 30           | \$12033      |
| New                  | Hotel Motel      | Cooling DX | Windows   | U = 0.35  | U = 0.55 (Code)  | 0.51                     | 1.7%                          | 80%   | 50%                                 | 25           | \$28774      |
| New                  | Hotel Motel      | HVAC Aux   | Automated Exhaust VFD Control - Parking Garage CO sensor            | CO Sensors  | No CO Sensors  | 2.06                     | 20.0%                         | 20%   | 75%                                 | 10           | \$3,436      |
| New                  | Hotel Motel      | HVAC Aux   | Cooking Hood Controls   | Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air | No Cooking Hood Controls   | 2.06                     | 7.5%                          | 60%   | 45%                                 | 10           | \$6,828      |
| New                  | Hotel Motel      | HVAC Aux   | Motor - Premium-Efficiency  | PE Motors for HVAC Applications   | Standard Efficiency Motors   | 2.06                     | 3.8%                          | 85%   | 81%                                 | 10           | \$439        |
| New                  | Hotel Motel      | HVAC Aux   | Motor - Pump & Fan System - Variable Speed Control                  | Pump And Fan System Optimization w/ VSD   | No Pump And Fan System VSD Optimization  | 2.06                     | 33.8%                         | 85%   | 75%                                 | 20           | \$3,411      |
| New                  | Hotel Motel      | HVAC Aux   | Motor - VAV Box High-Efficiency                                     | ECM Motors  | Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control | 2.06                     | 8.8%                          | 20%   | 77%                                 | 10           | \$6,139      |
| New                  | Hotel Motel      | HVAC Aux   | Optimized Variable Volume Lab Hood Design                           | Optimized Variable Volume Lab Hood Design   | Constant Volume Lab Hood Design  | 2.06                     | 1.6%                          | 0%  | 94%                                 | 10           | \$1,792      |
| New                  | Hotel Motel      | Heat Pump  | High-Efficiency EER=11.0, COP=3.5                                   | High-Efficiency EER=11.0, COP=3.5   | EER=10.1, COP=3.2  | 2.16                     | 16.8%                         | NA  | NA                                  | 15           | \$4,823      |
| New                  | Hotel Motel      | Heat Pump  | Premium-Efficiency EER=11.8, COP=3.8                                | Premium-Efficiency EER=11.8, COP=3.8  | EER=10.1, COP=3.2  | 2.16                     | 30.2%                         | NA  | NA                                  | 15           | \$10326      |
| New                  | Hotel Motel      | Heat Pump  | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)   | Constant Ventilation   | 1.93                     | 2.0%                          | 50%   | 94%                                 | 15           | \$2,269      |
| New                  | Hotel Motel      | Heat Pump  | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning  | No Commissioning   | 1.93                     | 12.5%                         | 90%   | 80%                                 | 3            | \$12271      |
| New                  | Hotel Motel      | Heat Pump  | Direct Digital Control System-Optimization                          | DDC System (Optimized)  | DDC System (Basic)   | 1.93                     | 10.0%                         | 75%   | 80%                                 | 5            | \$9,052      |
| New                  | Hotel Motel      | Heat Pump  | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery   | No Heat Recovery   | 1.93                     | 8.8%                          | 5%  | 94%                                 | 10           | \$15247      |
| New                  | Hotel Motel      | Heat Pump  | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air                                      | Hood Pulls Conditioned Air (No Make-up Air)  | 1.93                     | 4.5%                          | 58%   | 85%                                 | 10           | \$5,725      |
| New                  | Hotel Motel      | Heat Pump  | Green Roof  | Vegetation on Roof  | Standard roofing techniques  | 1.93                     | 0.6%                          | 15%   | 98%                                 | 30           | \$85144      |
| New                  | Hotel Motel      | Heat Pump  | Heat Pump - Ground Source (Closed Loop)                             | GSHP: COP=3.1, EER=13.4   | Stnd. Air Source HP 'EER=10.1, COP=3.2   | 1.93                     | 12.0%                         | 45%   | 92%                                 | 20           | \$55935      |

| Construction Vintage | Customer Segment | End Use   | Measure Name  | Measure Description   | Base Equipment                                      | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|---|---|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Hotel Motel      | Heat Pump | Heat Pump - Ground Source (Closed Loop)                         | GSHP: COP=4.0, EER=20   | Std. Air Source HP 'EER=10.1, COP=3.2               | 1.93                     | 33.7%                         | 45%   | 92%                                 | 20           | 105086       |
| New                  | Hotel Motel      | Heat Pump | Heat Pump - Water Source (Closed Loop)                          | WSHP: COP=4.2, EER=12.0   | Std. Air Source Heat Pump'EER=10.1, COP=3.2         | 1.93                     | 21.9%                         | 0%  | 90%                                 | 20           | \$11251      |
| New                  | Hotel Motel      | Heat Pump | Heat Pump - Water Source (Closed Loop)                          | WSHP: COP=4.8, EER=14.5   | Std. Air Source Heat Pump'EER=10.1, COP=3.2         | 1.93                     | 33.3%                         | 0%  | 90%                                 | 20           | \$14860      |
| New                  | Hotel Motel      | Heat Pump | Hotel Key Card Room Energy Control System                       | Key card system to control room HVAC and lighting during non-occupied periods | 325 sqft room, \$100/room                           | 1.93                     | 25.0%                         | 60%   | 95%                                 | 15           | \$5,275      |
| New                  | Hotel Motel      | Heat Pump | Insulation (Ceiling)  | R-38  | R-21 (Code)   | 1.93                     | 3.0%                          | 75%   | 45%                                 | 25           | \$4,371      |
| New                  | Hotel Motel      | Heat Pump | Insulation (Ceiling)  | R-49  | R-21 (Code)   | 1.93                     | 4.4%                          | 75%   | 85%                                 | 25           | \$5,799      |
| New                  | Hotel Motel      | Heat Pump | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced   | R-19 (2x6 Framing) - (Code)                         | 1.93                     | 5.0%                          | 95%   | 95%                                 | 25           | \$4,436      |
| New                  | Hotel Motel      | Heat Pump | Insulation - Floor (Non-Slab)                                   | R-19  | R-10 (Code)   | 1.93                     | 1.9%                          | 35%   | 45%                                 | 25           | \$756        |
| New                  | Hotel Motel      | Heat Pump | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands                | Std duct workmanship                                | 1.93                     | 10.0%                         | 40%   | 98%                                 | 25           | \$2,606      |
| New                  | Hotel Motel      | Heat Pump | Windows   | U = 0.35  | U = 0.55 (Code)                                     | 1.93                     | 11.4%                         | 80%   | 50%                                 | 25           | \$28774      |
| New                  | Hotel Motel      | Lighting  | Bi-Level Control, Stairwell Lighting                            | Occupancy Sensor Control, 50% Lighting Power during unoccupied Time           | Continuous Full Power Lighting in Stairways         | 1.93                     | 2.0%                          | 85%   | 75%                                 | 9            | \$1,325      |
| New                  | Hotel Motel      | Lighting  | Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures | Continuous Dimming, Fluorescent Fixtures (Day-Lighting)                       | No Dimming Controls                                 | 1.93                     | 6.0%                          | 60%   | 92%                                 | 9            | \$2,017      |
| New                  | Hotel Motel      | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 15%                       | Code Required LPD And Control Strategies: LPD = 1.0 | 1.93                     | 15.0%                         | 90%   | 70%                                 | 14           | \$1,311      |
| New                  | Hotel Motel      | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 20%                       | Code Required LPD And Control Strategies: LPD = 1.0 | 1.93                     | 20.0%                         | 75%   | 85%                                 | 14           | \$4,236      |
| New                  | Hotel Motel      | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 25%                       | Code Required LPD And Control Strategies: LPD = 1.0 | 1.93                     | 25.0%                         | 70%   | 90%                                 | 14           | \$7,161      |
| New                  | Hotel Motel      | Lighting  | Hotel Key Card Room Energy Control System                       | Key card system to control room HVAC and lighting during non-occupied periods | 325 sqft room, \$100/room                           | 1.93                     | 25.0%                         | 60%   | 95%                                 | 15           | \$5,275      |
| New                  | Hotel Motel      | Lighting  | LED Refrigeration Case Lights                                   | LED Refrigeration Case Lights (28W)   | Fluorescent Refrigeration Case Lights (60W)         | 1.93                     | 1.8%                          | 25%   | 80%                                 | 13           | \$630        |
| New                  | Hotel Motel      | Lighting  | LED Solid State White Lighting Package                          | Landscape, merchandise, signage, structure & task lighting                    | 50W 10hrs/day, 365 day/yr                           | 1.93                     | 0.8%                          | 10%   | 95%                                 | 14           | \$37         |
| New                  | Hotel Motel      | Lighting  | Occupancy Sensor Control, Fluorescent                           | Occupancy Sensor Control, Fluorescent   | No Occupancy Sensor                                 | 1.93                     | 4.0%                          | 90%   | 98%                                 | 10           | \$314        |
| New                  | Hotel Motel      | Plug Load | Energy Star - Battery Charging System                           | Energy Star Battery Charging System   | Non-Energy Star Battery Chargers                    | 2.29                     | 0.4%                          | 95%   | 90%                                 | 7            | \$2          |
| New                  | Hotel Motel      | Plug Load | Energy Star - Computer  | Energy Star Features Enabled  | Non-Energy Star Features                            | 2.29                     | 13.6%                         | 64%   | 25%                                 | 4            | \$2          |
| New                  | Hotel Motel      | Plug Load | Energy Star - Copiers   | Energy Star or Better Office Equipment: Copiers,                              | Office Equipment: Copiers, Standard                 | 2.29                     | 3.2%                          | 90%   | 45%                                 | 6            | \$165        |
| New                  | Hotel Motel      | Plug Load | Energy Star - Fax   | Energy Star Features Enabled  | Non-Energy Star Features                            | 2.29                     | 1.8%                          | 75%   | 55%                                 | 4            | \$2          |
| New                  | Hotel Motel      | Plug Load | Energy Star - Monitors  | Energy Star Features Enabled  | Non-Energy Star Features                            | 2.29                     | 18.4%                         | 64%   | 15%                                 | 4            | \$158        |

| Construction Vintage | Customer Segment | End Use       | Measure Name  | Measure Description  | Base Equipment                              | Baseline kWh (UEC or EUJ) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|---|--|---|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Hotel Motel      | Plug Load     | Energy Star - Printers  | Energy Star Features Enabled   | Non-Energy Star Features                    | 2.29                      | 1.3%                          | 75%   | 40%                                 | 5            | \$15         |
| New                  | Hotel Motel      | Plug Load     | Energy Star - Scanners  | Energy Star Features Enabled   | Non-Energy Star Features                    | 2.29                      | 0.9%                          | 75%   | 45%                                 | 4            | \$2          |
| New                  | Hotel Motel      | Plug Load     | Energy Star - Water Cooler  | Energy Star Water Cooler (Hot/Cold Water)  | Non-Energy Star Water Cooler                | 2.29                      | 1.0%                          | 5%  | 75%                                 | 10           | \$2          |
| New                  | Hotel Motel      | Plug Load     | Office Computer Network Energy Management                           | Office Computer Network Energy Management  | No Network Management                       | 2.29                      | 1.8%                          | 95%   | 30%                                 | 3            | \$309        |
| New                  | Hotel Motel      | Plug Load     | Power Supply 80+ Office Measure                                     | 80% Efficient Power supply   | No 80+                                      | 2.29                      | 1.0%                          | 95%   | 86%                                 | 7            | \$0          |
| New                  | Hotel Motel      | Plug Load     | Refrigerator eCube  | Refrigerator eCube   | No Refrigerator eCube                       | 2.29                      | 1.2%                          | 75%   | 95%                                 | 10           | \$171        |
| New                  | Hotel Motel      | Plug Load     | Residential-Size Refrigerator                                       | Energy Star Residential-Size Refrigerator  | Residential-Size Refrigerator - Standard    | 2.29                      | 0.2%                          | 45%   | 65%                                 | 13           | \$126        |
| New                  | Hotel Motel      | Plug Load     | Residential-Size Refrigerator/Freezer - Early Replacement           | Energy Star Refrigerator/Freezer   | Baseline Refrigerator/Freezer               | 2.29                      | 2.7%                          | 25%   | 35%                                 | 7            | \$578        |
| New                  | Hotel Motel      | Plug Load     | Vending Machine   | Energy Star Vending Machines - High-Efficiency   | Vending Machines - Standard                 | 2.29                      | 4.9%                          | 90%   | 80%                                 | 14           | \$190        |
| New                  | Hotel Motel      | Refrigeration | Commercial Reach-In Refrigerator                                    | Energy Star Commercial Reach-In Refrigerator   | Commercial-Size Refrigerator - Standard     | 0.31                      | 24.7%                         | 95%   | 95%                                 | 12           | \$345        |
| New                  | Hotel Motel      | Refrigeration | Custom Refrigeration System   | High-Efficiency Custom Refrigeration System (Walk-in) includes compressors                   | Custom Refrigeration System - Standard      | 0.31                      | 3.6%                          | 85%   | 65%                                 | 10           | \$9,595      |
| New                  | Hotel Motel      | Refrigeration | Ice Maker   | Energy Star Ice Maker - High-Efficiency  | Standard Ice Maker                          | 0.31                      | 1.1%                          | 100%  | 86%                                 | 9            | \$377        |
| New                  | Hotel Motel      | Refrigeration | Reduced Speed or Cycling of Evaporator Fans                         | VFD on Evaporator Fans (Evap Fan Control on Walk-In)   | Constant Speed Evaporator Fans              | 0.31                      | 6.0%                          | 75%   | 70%                                 | 10           | \$13         |
| New                  | Hotel Motel      | Refrigeration | Refrigeration - Commissioning                                       | Commissioning (Refrigeration System Diagnostics / Operations and Maintenance for a new unit) | No Commissioning                            | 0.31                      | 5.0%                          | 80%   | 90%                                 | 3            | \$17         |
| New                  | Hotel Motel      | Refrigeration | Special Glass Doors for Refrigerated Reach-in Cases                 | Do Not Require Anti-Sweat Heating  | Standard Glass Doors                        | 0.31                      | 3.2%                          | 95%   | 77%                                 | 16           | \$55         |
| New                  | Hotel Motel      | Refrigeration | Strip Curtains for Walk-Ins   | Strip Curtains for Walk-Ins  | No Strip Curtains for Walk-Ins              | 0.31                      | 2.0%                          | 95%   | 20%                                 | 4            | \$188        |
| New                  | Hotel Motel      | Space Heat    | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)  | Constant Ventilation                        | 2.60                      | 2.0%                          | 50%   | 94%                                 | 15           | \$2,269      |
| New                  | Hotel Motel      | Space Heat    | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning   | No Commissioning                            | 2.60                      | 12.5%                         | 90%   | 80%                                 | 3            | \$12271      |
| New                  | Hotel Motel      | Space Heat    | Direct Digital Control System-Optimization                          | DDC System (Optimized)   | DDC System (Basic)                          | 2.60                      | 10.0%                         | 75%   | 80%                                 | 5            | \$9,052      |
| New                  | Hotel Motel      | Space Heat    | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery  | No Heat Recovery                            | 2.60                      | 15.0%                         | 5%  | 94%                                 | 10           | \$15247      |
| New                  | Hotel Motel      | Space Heat    | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air               | Hood Pulls Conditioned Air (No Make-up Air) | 2.60                      | 4.5%                          | 58%   | 85%                                 | 10           | \$5,725      |
| New                  | Hotel Motel      | Space Heat    | Hotel Key Card Room Energy Control System                           | Key card system to control room HVAC and lighting during non-occupied periods                | 325 sqft room, \$100/room                   | 2.60                      | 25.0%                         | 60%   | 95%                                 | 15           | \$5,275      |
| New                  | Hotel Motel      | Space Heat    | Insulation (Ceiling)  | R-49   | R-30  | 2.60                      | 4.0%                          | 75%   | 85%                                 | 25           | \$4,371      |
| New                  | Hotel Motel      | Space Heat    | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 2.60                      | 6.0%                          | 95%   | 95%                                 | 25           | \$4,436      |
| New                  | Hotel Motel      | Space Heat    | Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)                                 | 2.60                      | 2.5%                          | 35%   | 45%                                 | 25           | \$756        |

| Construction Vintage | Customer Segment | End Use          | Measure Name  | Measure Description  | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|--|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Hotel Motel      | Space Heat       | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                                       | 2.60                     | 10.0%                         | 40%   | 98%                                 | 25           | \$2,606      |
| New                  | Hotel Motel      | Space Heat       | Sensible And Total Heat Recovery Devices                            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery   | 2.60                     | 25.0%                         | 50%   | 98%                                 | 10           | \$35469      |
| New                  | Hotel Motel      | Space Heat       | Windows   | U = 0.35   | U = 0.40   | 2.60                     | 5.5%                          | 80%   | 50%                                 | 25           | \$7,193      |
| New                  | Hotel Motel      | Water Heat       | Water_Heater (40 Gallon Electric) Residential Sized                 | EF = 0.95  | EF = 0.92  | 1.76                     | 3.3%                          | NA  | NA                                  | 20           | \$1,615      |
| New                  | Hotel Motel      | Water Heat       | Clothes Washer - Ozonating  | Ozonating Clothes Washer   | Standard Commercial Clothes Washer                         | 1.73                     | 15.1%                         | 35%   | 95%                                 | 10           | \$8,704      |
| New                  | Hotel Motel      | Water Heat       | Clothes Washer Commercial   | Energy Star Commercial Clothes Washer MEF=1.72   | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 1.73                     | 2.2%                          | 35%   | 80%                                 | 11           | \$304        |
| New                  | Hotel Motel      | Water Heat       | Demand controlled Circulating Systems                               | Install demand-based control system (VFD Control by Demand)  | No demand control systems in place                         | 1.73                     | 5.0%                          | 55%   | 80%                                 | 15           | \$4,670      |
| New                  | Hotel Motel      | Water Heat       | Dishwashing - Commercial - High Efficiency                          | High Efficiency Dishwasher   | Standard Dishwasher  | 1.73                     | 2.1%                          | 45%   | 80%                                 | 10           | \$2,700      |
| New                  | Hotel Motel      | Water Heat       | Dishwashing - Commercial Chemical System                            | Low-Temp Commercial Dishwasher (Includes Extra Chemmical Cost)   | High Temp Commercial Dishwasher                            | 1.73                     | 5.6%                          | 45%   | 95%                                 | 10           | \$841        |
| New                  | Hotel Motel      | Water Heat       | Dishwashing - Residential Sized System                              | EF = 0.65 (ENERGY STAR)  | Standard Dishwasher (FED Std. EF=0.46)                     | 1.73                     | 0.5%                          | 45%   | 25%                                 | 13           | \$32         |
| New                  | Hotel Motel      | Water Heat       | Dishwashing - Residential Sized System                              | EF = 0.77  | Standard Dishwasher (FED Std. EF=0.46)                     | 1.73                     | 0.7%                          | 45%   | 55%                                 | 13           | \$630        |
| New                  | Hotel Motel      | Water Heat       | Drainwater Heat Recovery Water Heater                               | Install (Power-Pipe or GFX) - Heat Recovery Water Heater   | No Heat Recovery System                                    | 1.73                     | 20.0%                         | 25%   | 92%                                 | 25           | \$8,755      |
| New                  | Hotel Motel      | Water Heat       | Faucet Aerators   | 1.5 GPM Aerator  | 2.5 GPM Aerator (Federal Code)                             | 1.73                     | 4.0%                          | 95%   | 25%                                 | 10           | \$0          |
| New                  | Hotel Motel      | Water Heat       | Heat Pump Water Heater  | EF = 2.9   | EF=0.93 Baseline Electric Water Heater                     | 1.73                     | 58.9%                         | 50%   | 94%                                 | 15           | \$6,435      |
| New                  | Hotel Motel      | Water Heat       | Low Flow Spray Heads  | 1.6 GPM  | 3.0 GPM  | 1.73                     | 2.3%                          | 85%   | 50%                                 | 5            | \$5          |
| New                  | Hotel Motel      | Water Heat       | Low-Flow Showerheads  | 2.0 GPM Showerhead   | 2.5 GPM Showerhead (Federal Code)                          | 1.73                     | 7.5%                          | 100%  | 75%                                 | 10           | \$7          |
| New                  | Hotel Motel      | Water Heat       | Solar RE - Solar Water Heater                                       | Passive solar water heating  | Non-solar hot water heater                                 | 1.73                     | 56.1%                         | 20%   | 95%                                 | 20           | \$89303      |
| New                  | Hotel Motel      | Water Heat       | Ultrasonic Faucet Control   | Install Ultrasonic Motion Faucet Control   | No Faucet Control  | 1.73                     | 3.3%                          | 95%   | 85%                                 | 10           | \$207        |
| New                  | Hotel Motel      | Water Heat       | Water Heater Thermostat Setback                                     | Thermostat Setback and Replcement (120 Degrees)  | No Thermostat Setback (130 Degrees)                        | 1.73                     | 7.7%                          | 75%   | 5%                                  | 11           | \$108        |
| Existing             | Office           | Cooling Chillers | Chiller - Premium Efficiency  | 0.507 kW/ton   | 0.634 kW/ton   | 1.47                     | 20.0%                         | NA  | NA                                  | 20           | \$2,205      |
| Existing             | Office           | Cooling Chillers | Chiller - Advanced Technology                                       | 0.461 kW/ton   | 0.634 kW/ton   | 1.47                     | 27.3%                         | NA  | NA                                  | 20           | \$2,748      |
| Existing             | Office           | Cooling Chillers | Chiller - High Efficiency   | 0.574 kW/ton   | 0.634 kW/ton   | 1.47                     | 9.5%                          | NA  | NA                                  | 20           | \$790        |
| Existing             | Office           | Cooling Chillers | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)  | Constant Ventilation                                       | 1.54                     | 10.0%                         | 75%   | 94%                                 | 15           | \$5,295      |

| Construction Vintage | Customer Segment | End Use          | Measure Name  | Measure Description   | Base Equipment                            | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|---|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Office           | Cooling Chillers | Centrifugal Chiller - VSD Remodel for Existing                | VSD motor   | Constant Speed Motor                      | 1.54                     | 40.0%                         | 43%   | 45%                                 | 10           | \$4,113      |
| Existing             | Office           | Cooling Chillers | Chilled Water Piping Loop w/ VSD Control                      | VSD for Secondary Chilled Water Loop                                    | Primary Loop Only w/ Constant Speed Pump  | 1.54                     | 7.6%                          | 25%   | 70%                                 | 10           | \$4,988      |
| Existing             | Office           | Cooling Chillers | Chilled Water Reset   | Install Chilled Water Reset   | No Chilled Water Reset                    | 1.54                     | 5.0%                          | 95%   | 95%                                 | 10           | \$5,726      |
| Existing             | Office           | Cooling Chillers | Chiller-Water Side Economizer                                 | Install Economizer  | No Economizer                             | 1.54                     | 5.0%                          | 45%   | 45%                                 | 10           | \$11583      |
| Existing             | Office           | Cooling Chillers | Commissioning - Retro Building Commissioning                  | Commissioning - Retro Building Commissioning                            | No Commissioning                          | 1.54                     | 12.5%                         | 90%   | 40%                                 | 3            | \$1,657      |
| Existing             | Office           | Cooling Chillers | Cooling Tower-Decrease Temperature                            | Approach 6 Deg F  | 10 Deg F                                  | 1.54                     | 8.0%                          | 50%   | 94%                                 | 15           | \$493        |
| Existing             | Office           | Cooling Chillers | Cooling Tower-Two-Speed Fan Motor                             | Two-Speed Tower Fans replace Single-Speed                               | Cooling Tower-One-Speed Fan Motor         | 1.54                     | 14.0%                         | 95%   | 35%                                 | 10           | \$55         |
| Existing             | Office           | Cooling Chillers | Cooling Tower-VSD Fan Control                                 | Variable-Speed Tower Fans replace Two-Speed                             | Cooling Tower-Two-Speed Fan Motor         | 1.54                     | 4.0%                          | 95%   | 75%                                 | 10           | \$446        |
| Existing             | Office           | Cooling Chillers | Direct Digital Control System-Installation                    | DDC Retrofit  | Pneumatic                                 | 1.54                     | 15.0%                         | 45%   | 28%                                 | 5            | \$8,082      |
| Existing             | Office           | Cooling Chillers | Direct Digital Control System-Optimization                    | DDC System (Optimized)  | DDC System (Basic)                        | 1.54                     | 10.0%                         | 75%   | 80%                                 | 5            | \$4,526      |
| Existing             | Office           | Cooling Chillers | Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control | Pneumatic                                 | 1.54                     | 15.0%                         | 50%   | 80%                                 | 5            | \$3,266      |
| Existing             | Office           | Cooling Chillers | Duct Repair And Sealing                                       | Reduction In Duct Losses to 5%  | No Repair or Sealing, 15% duct losses     | 1.54                     | 2.5%                          | 45%   | 45%                                 | 18           | \$3,362      |
| Existing             | Office           | Cooling Chillers | Green Roof  | Vegetation on Roof  | Standard roofing techniques               | 1.54                     | 10.0%                         | 15%   | 98%                                 | 30           | \$85145      |
| Existing             | Office           | Cooling Chillers | Infiltration Control (Caulking, Weather Stripping, etc.)      | Install Caulking And Weatherstripping (ACH 0.65)                        | Infiltration Conditions (ACH 1.0)         | 1.54                     | 5.0%                          | 40%   | 10%                                 | 10           | \$1,968      |
| Existing             | Office           | Cooling Chillers | Insulation (Ceiling)  | R-38  | R-21 (Code)                               | 1.54                     | 2.0%                          | 75%   | 25%                                 | 25           | \$4,371      |
| Existing             | Office           | Cooling Chillers | Insulation (Ceiling)  | R-49  | R-21 (Code)                               | 1.54                     | 3.0%                          | 75%   | 65%                                 | 25           | \$5,799      |
| Existing             | Office           | Cooling Chillers | Insulation (Ceiling) - Existing to Code                       | R-21 (Code)   | Existing Ceiling Insulation (Average R-9) | 1.54                     | 2.4%                          | 75%   | 4%                                  | 25           | \$5,127      |
| Existing             | Office           | Cooling Chillers | Insulation (Ceiling) - Zero to Code                           | R-21 (Code)   | R-0                                       | 1.54                     | 6.0%                          | 75%   | 0%                                  | 25           | \$5,127      |
| Existing             | Office           | Cooling Chillers | Insulation (Duct) (Unconditioned Spaces)                      | Install New Duct Insulation (R-8)                                       | R-0                                       | 1.54                     | 4.4%                          | 10%   | 15%                                 | 25           | \$940        |

| Construction Vintage | Customer Segment | End Use          | Measure Name  | Measure Description  | Base Equipment                           | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|--|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Office           | Cooling Chillers | Insulation (Duct) (Unconditioned Spaces)                            | R-4  | R-0                                      | 1.54                     | 2.4%                          | 10%   | 15%                                 | 25           | \$979        |
| Existing             | Office           | Cooling Chillers | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)              | 1.54                     | 3.0%                          | 10%   | 95%                                 | 25           | \$2,218      |
| Existing             | Office           | Cooling Chillers | Insulation (Wall) - Existing to Code                                | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)           | 1.54                     | 8.4%                          | 10%   | 35%                                 | 25           | \$2,430      |
| Existing             | Office           | Cooling Chillers | Insulation (Wall) - Zero to Code                                    | R-19 (2x6 Framing) - (Code)  | R-0                                      | 1.54                     | 10.0%                         | 10%   | 0%                                  | 25           | \$2,402      |
| Existing             | Office           | Cooling Chillers | Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)                              | 1.54                     | 1.0%                          | 35%   | 15%                                 | 25           | \$756        |
| Existing             | Office           | Cooling Chillers | Insulation - Floor (Non-Slab) - Existing to Code                    | R-10 (Code)  | R-0                                      | 1.54                     | 3.0%                          | 35%   | 15%                                 | 25           | \$4,371      |
| Existing             | Office           | Cooling Chillers | Pipe Insulation   | R-4  | R-0                                      | 1.54                     | 1.0%                          | 65%   | 45%                                 | 15           | \$172        |
| Existing             | Office           | Cooling Chillers | Sensible And Total Heat Recovery Devices                            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery                         | 1.54                     | 25.0%                         | 25%   | 98%                                 | 10           | \$17735      |
| Existing             | Office           | Cooling Chillers | Turbocor Compressor   | 0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)                                 | 0.634 kW/ton (Code) chiller water cooled | 1.54                     | 44.8%                         | 60%   | 99%                                 | 20           | \$13507      |
| Existing             | Office           | Cooling Chillers | Windows   | U = 0.35   | U = 0.55 (Code)                          | 1.54                     | 1.0%                          | 80%   | 95%                                 | 25           | \$8,757      |
| Existing             | Office           | Cooling Chillers | Windows - Existing to Code  | U = 0.55 (Code)  | Existing Windows (U=0.65)                | 1.54                     | 0.5%                          | 10%   | 95%                                 | 25           | \$24726      |
| Existing             | Office           | Cooling DX       | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)              | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)   | 10.3 EER Rooftop Unit (State Code)       | 1.60                     | 14.2%                         | NA  | NA                                  | 15           | \$4,521      |
| Existing             | Office           | Cooling DX       | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)                 | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)  | 10.3 EER Rooftop Unit (State Code)       | 1.60                     | 6.4%                          | NA  | NA                                  | 15           | \$2,406      |
| Existing             | Office           | Cooling DX       | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)               | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)  | 10.3 EER Rooftop Unit (State Code)       | 1.60                     | 10.4%                         | NA  | NA                                  | 15           | \$3,730      |
| Existing             | Office           | Cooling DX       | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)  | Constant Ventilation                     | 1.67                     | 10.0%                         | 75%   | 94%                                 | 15           | \$5,295      |
| Existing             | Office           | Cooling DX       | Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning   | No Commissioning                         | 1.67                     | 12.5%                         | 90%   | 40%                                 | 3            | \$1,657      |
| Existing             | Office           | Cooling DX       | Cooling DX Package-Air Side Economizer                              | Air-Side Economizer  | No Economizer                            | 1.67                     | 15.0%                         | 10%   | 20%                                 | 15           | \$3,996      |
| Existing             | Office           | Cooling DX       | Direct / Indirect Evaporative Cooling, Pre-Cooling                  | Direct / Indirect Evaporative Cooling, Pre-Cooling   | No modification to DX system             | 1.67                     | 25.0%                         | 50%   | 85%                                 | 15           | \$17511      |
| Existing             | Office           | Cooling DX       | Direct Digital Control System-Installation                          | DDC Retrofit   | Pneumatic                                | 1.67                     | 15.0%                         | 5%  | 28%                                 | 5            | \$8,082      |

| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description   | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|---|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Office           | Cooling DX | Direct Digital Control System-Optimization                    | DDC System (Optimized)  | DDC System (Basic)   | 1.67                     | 10.0%                         | 75%   | 80%                                 | 5            | \$4,526      |
| Existing             | Office           | Cooling DX | Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control   | Pneumatic  | 1.67                     | 15.0%                         | 75%   | 80%                                 | 5            | \$3,266      |
| Existing             | Office           | Cooling DX | Duct Repair And Sealing                                       | Reduction In Duct Losses to 5%  | No Repair or Sealing, 15% duct losses  | 1.67                     | 2.5%                          | 45%   | 45%                                 | 18           | \$3,362      |
| Existing             | Office           | Cooling DX | Green Roof  | Vegetation on Roof  | Standard roofing techniques  | 1.67                     | 10.0%                         | 15%   | 98%                                 | 30           | \$85145      |
| Existing             | Office           | Cooling DX | Infiltration Control (Caulking, Weather Stripping, etc.)      | Install Caulking And Weatherstripping (ACH 0.65)  | Infiltration Conditions (ACH 1.0)  | 1.67                     | 5.0%                          | 40%   | 10%                                 | 10           | \$1,968      |
| Existing             | Office           | Cooling DX | Insulation (Ceiling)  | R-38  | R-21 (Code)  | 1.67                     | 2.0%                          | 75%   | 25%                                 | 25           | \$4,371      |
| Existing             | Office           | Cooling DX | Insulation (Ceiling)  | R-49  | R-21 (Code)  | 1.67                     | 3.0%                          | 75%   | 65%                                 | 25           | \$5,799      |
| Existing             | Office           | Cooling DX | Insulation (Ceiling) - Existing to Code                       | R-21 (Code)   | Existing Ceiling Insulation (Average R-9)  | 1.67                     | 2.4%                          | 75%   | 4%                                  | 25           | \$5,127      |
| Existing             | Office           | Cooling DX | Insulation (Ceiling) - Zero to Code                           | R-21 (Code)   | R-0  | 1.67                     | 6.0%                          | 75%   | 0%                                  | 25           | \$5,127      |
| Existing             | Office           | Cooling DX | Insulation (Duct) (Unconditioned Spaces)                      | Install New Duct Insulation (R-8)   | R-0  | 1.67                     | 4.4%                          | 10%   | 15%                                 | 25           | \$940        |
| Existing             | Office           | Cooling DX | Insulation (Duct) (Unconditioned Spaces)                      | R-4   | R-0  | 1.67                     | 2.4%                          | 10%   | 15%                                 | 25           | \$979        |
| Existing             | Office           | Cooling DX | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced   | R-19 (2x6 Framing) - (Code)  | 1.67                     | 3.0%                          | 10%   | 95%                                 | 25           | \$2,218      |
| Existing             | Office           | Cooling DX | Insulation (Wall) - Existing to Code                          | R-19 (2x6 Framing) - (Code)   | Existing R-value (Average R-3)   | 1.67                     | 8.4%                          | 10%   | 35%                                 | 25           | \$2,430      |
| Existing             | Office           | Cooling DX | Insulation (Wall) - Zero to Code                              | R-19 (2x6 Framing) - (Code)   | R-0  | 1.67                     | 10.0%                         | 10%   | 0%                                  | 25           | \$2,402      |
| Existing             | Office           | Cooling DX | Insulation - Floor (Non-Slab)                                 | R-19  | R-10 (Code)  | 1.67                     | 1.0%                          | 35%   | 15%                                 | 25           | \$756        |
| Existing             | Office           | Cooling DX | Insulation - Floor (Non-Slab) - Existing to Code              | R-10 (Code)   | R-0  | 1.67                     | 3.0%                          | 35%   | 15%                                 | 25           | \$4,371      |
| Existing             | Office           | Cooling DX | Thermostat - Programmable                                     | Energy Star Programmable Thermostat   | Manual Thermostat  | 1.67                     | 3.0%                          | 95%   | 67%                                 | 15           | \$145        |
| Existing             | Office           | Cooling DX | Windows   | U = 0.35  | U = 0.55 (Code)  | 1.67                     | 1.0%                          | 80%   | 95%                                 | 25           | \$8,757      |
| Existing             | Office           | Cooling DX | Windows - Existing to Code                                    | U = 0.55 (Code)   | Existing Windows (U=0.65)  | 1.67                     | 0.5%                          | 10%   | 95%                                 | 25           | \$24726      |
| Existing             | Office           | HVAC Aux   | Automated Exhaust VFD Control - Parking Garage CO sensor      | CO Sensors  | No CO Sensors  | 1.56                     | 20.0%                         | 20%   | 85%                                 | 10           | \$1,718      |
| Existing             | Office           | HVAC Aux   | Cooking Hood Controls   | Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air | No Cooking Hood Controls   | 1.56                     | 7.5%                          | 0%  | 85%                                 | 10           | \$13133      |
| Existing             | Office           | HVAC Aux   | Motor - Premium-Efficiency                                    | PE Motors for HVAC Applications   | Standard Efficiency Motors   | 1.56                     | 3.8%                          | 85%   | 81%                                 | 10           | \$395        |
| Existing             | Office           | HVAC Aux   | Motor - Pump & Fan System - Variable Speed Control            | Pump And Fan System Optimization w/ VSD   | No Pump And Fan System VSD Optimization  | 1.56                     | 33.8%                         | 85%   | 75%                                 | 20           | \$1,705      |
| Existing             | Office           | HVAC Aux   | Motor - VAV Box High-Efficiency                               | ECM Motors  | Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control | 1.56                     | 8.8%                          | 50%   | 77%                                 | 10           | \$3,070      |



| Construction Vintage | Customer Segment | End Use   | Measure Name  | Measure Description   | Base Equipment                              | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|---|---|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Office           | HVAC Aux  | Optimized Variable Volume Lab Hood Design                           | Optimized Variable Volume Lab Hood Design                               | Constant Volume Lab Hood Design             | 1.56                     | 1.6%                          | 0%  | 94%                                 | 10           | \$1,791      |
| Existing             | Office           | Heat Pump | High-Efficiency EER=11.0, COP=3.5                                   | High-Efficiency EER=11.0, COP=3.5                                       | EER=10.1, COP=3.2                           | 3.09                     | 16.8%                         | NA  | NA                                  | 15           | \$3,205      |
| Existing             | Office           | Heat Pump | Premium-Efficiency EER=11.8, COP=3.8                                | Premium-Efficiency EER=11.8, COP=3.8                                    | EER=10.1, COP=3.2                           | 3.09                     | 30.2%                         | NA  | NA                                  | 15           | \$6,862      |
| Existing             | Office           | Heat Pump | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)                             | Constant Ventilation                        | 3.22                     | 10.0%                         | 75%   | 94%                                 | 15           | \$5,295      |
| Existing             | Office           | Heat Pump | Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning                            | No Commissioning                            | 3.22                     | 12.5%                         | 90%   | 40%                                 | 3            | \$1,657      |
| Existing             | Office           | Heat Pump | Direct Digital Control System-Installation                          | DDC Retrofit  | Pneumatic                                   | 3.22                     | 15.0%                         | 5%  | 28%                                 | 5            | \$8,082      |
| Existing             | Office           | Heat Pump | Direct Digital Control System-Optimization                          | DDC System (Optimized)  | DDC System (Basic)                          | 3.22                     | 10.0%                         | 75%   | 80%                                 | 5            | \$4,526      |
| Existing             | Office           | Heat Pump | Direct Digital Control System-Wireless Performance Monitoring       | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control | Pneumatic                                   | 3.22                     | 15.0%                         | 75%   | 80%                                 | 5            | \$3,266      |
| Existing             | Office           | Heat Pump | Duct Repair And Sealing   | Reduction In Duct Losses to 5%  | No Repair or Sealing, 15% duct losses       | 3.22                     | 2.5%                          | 45%   | 45%                                 | 18           | \$3,362      |
| Existing             | Office           | Heat Pump | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery   | No Heat Recovery                            | 3.22                     | 7.2%                          | 5%  | 94%                                 | 10           | \$14457      |
| Existing             | Office           | Heat Pump | Green Roof  | Vegetation on Roof  | Standard roofing techniques                 | 3.22                     | 1.6%                          | 15%   | 98%                                 | 30           | \$85145      |
| Existing             | Office           | Heat Pump | Heat Pump - Ground Source (Closed Loop)                             | GSHP: COP=3.1, EER=13.4   | Std. Air Source HP 'EER=10.1, COP=3.2       | 3.22                     | 14.3%                         | 5%  | 92%                                 | 20           | \$37170      |
| Existing             | Office           | Heat Pump | Heat Pump - Ground Source (Closed Loop)                             | GSHP: COP=4.0, EER=20   | Std. Air Source HP 'EER=10.1, COP=3.2       | 3.22                     | 36.5%                         | 5%  | 92%                                 | 20           | \$69833      |
| Existing             | Office           | Heat Pump | Heat Pump - Water Source (Closed Loop)                              | WSHP: COP=4.2, EER=12.0   | Std. Air Source Heat Pump'EER=10.1, COP=3.2 | 3.22                     | 20.8%                         | 20%   | 90%                                 | 20           | \$7,477      |
| Existing             | Office           | Heat Pump | Heat Pump - Water Source (Closed Loop)                              | WSHP: COP=4.8, EER=14.5   | Std. Air Source Heat Pump'EER=10.1, COP=3.2 | 3.22                     | 32.8%                         | 20%   | 90%                                 | 20           | \$9,875      |
| Existing             | Office           | Heat Pump | Infiltration Control (Caulking, Weather Stripping, etc.)            | Install Caulking And Weatherstripping (ACH 0.65)                        | Infiltration Conditions (ACH 1.0)           | 3.22                     | 8.3%                          | 40%   | 10%                                 | 10           | \$1,968      |
| Existing             | Office           | Heat Pump | Insulation (Ceiling)  | R-38  | R-21 (Code)                                 | 3.22                     | 5.9%                          | 75%   | 25%                                 | 25           | \$4,371      |
| Existing             | Office           | Heat Pump | Insulation (Ceiling)  | R-49  | R-21 (Code)                                 | 3.22                     | 8.9%                          | 75%   | 65%                                 | 25           | \$5,799      |
| Existing             | Office           | Heat Pump | Insulation (Ceiling) - Existing to Code                             | R-21 (Code)   | Existing Ceiling Insulation (Average R-9)   | 3.22                     | 5.5%                          | 75%   | 4%                                  | 25           | \$5,127      |
| Existing             | Office           | Heat Pump | Insulation (Ceiling) - Zero to Code                                 | R-21 (Code)   | R-0   | 3.22                     | 13.8%                         | 75%   | 0%                                  | 25           | \$5,127      |
| Existing             | Office           | Heat Pump | Insulation (Duct) (Unconditioned Spaces)                            | Install New Duct Insulation (R-8)                                       | R-0   | 3.22                     | 4.4%                          | 10%   | 15%                                 | 25           | \$940        |
| Existing             | Office           | Heat Pump | Insulation (Duct) (Unconditioned Spaces)                            | R-4   | R-0   | 3.22                     | 2.4%                          | 10%   | 15%                                 | 25           | \$979        |
| Existing             | Office           | Heat Pump | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced   | R-19 (2x6 Framing) - (Code)                 | 3.22                     | 5.0%                          | 10%   | 95%                                 | 25           | \$2,218      |
| Existing             | Office           | Heat Pump | Insulation (Wall) - Existing to Code                                | R-19 (2x6 Framing) - (Code)   | Existing R-value (Average R-3)              | 3.22                     | 16.6%                         | 10%   | 35%                                 | 25           | \$2,430      |
| Existing             | Office           | Heat Pump | Insulation (Wall) - Zero to Code                                    | R-19 (2x6 Framing) - (Code)   | R-0   | 3.22                     | 19.8%                         | 10%   | 0%                                  | 25           | \$2,402      |
| Existing             | Office           | Heat Pump | Insulation - Floor (Non-Slab)                                       | R-19  | R-10 (Code)                                 | 3.22                     | 3.7%                          | 35%   | 15%                                 | 25           | \$756        |

| Construction Vintage | Customer Segment | End Use   | Measure Name  | Measure Description   | Base Equipment                                      | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|---|---|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Office           | Heat Pump | Insulation - Floor (Non-Slab) - Existing to Code                | R-10 (Code)   | R-0   | 3.22                     | 11.1%                         | 35%   | 15%                                 | 25           | \$4,371      |
| Existing             | Office           | Heat Pump | Thermostat - Programmable                                       | Energy Star Programmable Thermostat                                 | Manual Thermostat                                   | 3.22                     | 3.0%                          | 95%   | 67%                                 | 15           | \$145        |
| Existing             | Office           | Heat Pump | Windows   | U = 0.35  | U = 0.55 (Code)                                     | 3.22                     | 6.6%                          | 80%   | 95%                                 | 25           | \$8,757      |
| Existing             | Office           | Heat Pump | Windows - Existing to Code                                      | U = 0.55 (Code)   | Existing Windows (U=0.65)                           | 3.22                     | 4.3%                          | 10%   | 95%                                 | 25           | \$24726      |
| Existing             | Office           | Lighting  | Bi-Level Control, Stairwell Lighting                            | Occupancy Sensor Control, 50% Lighting Power during unoccupied Time | Continuous Full Power Lighting in Stairways         | 3.87                     | 2.0%                          | 85%   | 75%                                 | 9            | \$662        |
| Existing             | Office           | Lighting  | Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures | Continuous Dimming, Fluorescent Fixtures (Day-Lighting)             | No Dimming Controls                                 | 3.87                     | 15.0%                         | 30%   | 78%                                 | 9            | \$2,522      |
| Existing             | Office           | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 15%             | Code Required LPD And Control Strategies: LPD = 1.0 | 3.87                     | 15.0%                         | 90%   | 70%                                 | 14           | \$1,089      |
| Existing             | Office           | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 20%             | Code Required LPD And Control Strategies: LPD = 1.0 | 3.87                     | 20.0%                         | 75%   | 85%                                 | 14           | \$2,698      |
| Existing             | Office           | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 25%             | Code Required LPD And Control Strategies: LPD = 1.0 | 3.87                     | 25.0%                         | 70%   | 90%                                 | 14           | \$4,307      |
| Existing             | Office           | Lighting  | HE Fixtures/Design - Existing to Code                           | Code Required LPD And Control Strategies: LPD = 1.0                 | Existing Lighting Design                            | 3.87                     | 39.5%                         | 95%   | 45%                                 | 14           | \$6,504      |
| Existing             | Office           | Lighting  | LED Exit Lighting   | 5 Watts   | CFL Exit Sign (26 Watts)                            | 3.87                     | 1.6%                          | 95%   | 65%                                 | 11           | \$53         |
| Existing             | Office           | Lighting  | LED Refrigeration Case Lights                                   | LED Refrigeration Case Lights (28W)                                 | Fluorescent Refrigeration Case Lights (60W)         | 3.87                     | 0.7%                          | 5%  | 80%                                 | 13           | \$630        |
| Existing             | Office           | Lighting  | LED Solid State White Lighting Package                          | Landscape, merchandise, signage, structure & task lighting          | 50W 10hrs/day, 365 day/yr                           | 3.87                     | 0.8%                          | 10%   | 95%                                 | 14           | \$36         |
| Existing             | Office           | Lighting  | Occupancy Sensor Control, Fluorescent                           | Occupancy Sensor Control, Fluorescent                               | No Occupancy Sensor                                 | 3.87                     | 4.0%                          | 90%   | 87%                                 | 9            | \$157        |
| Existing             | Office           | Lighting  | Time Clocks And Timers  | Install Time Clock Lighting   | No Time Clock                                       | 3.87                     | 4.9%                          | 85%   | 88%                                 | 9            | \$215        |
| Existing             | Office           | Plug Load | Energy Star - Battery Charging System                           | Energy Star Battery Charging System                                 | Non-Energy Star Battery Chargers                    | 2.33                     | 0.4%                          | 95%   | 90%                                 | 7            | \$3          |
| Existing             | Office           | Plug Load | Energy Star - Computer  | Energy Star Features Enabled  | Non-Energy Star Features                            | 2.33                     | 13.6%                         | 64%   | 25%                                 | 4            | \$1          |
| Existing             | Office           | Plug Load | Energy Star - Copiers   | Energy Star or Better Office Equipment: Copiers,                    | Office Equipment: Copiers, Standard                 | 2.33                     | 6.4%                          | 90%   | 45%                                 | 6            | \$165        |
| Existing             | Office           | Plug Load | Energy Star - Fax   | Energy Star Features Enabled  | Non-Energy Star Features                            | 2.33                     | 1.8%                          | 75%   | 55%                                 | 4            | \$1          |
| Existing             | Office           | Plug Load | Energy Star - Monitors  | Energy Star Features Enabled  | Non-Energy Star Features                            | 2.33                     | 18.4%                         | 64%   | 15%                                 | 4            | \$158        |
| Existing             | Office           | Plug Load | Energy Star - Printers  | Energy Star Features Enabled  | Non-Energy Star Features                            | 2.33                     | 1.3%                          | 75%   | 40%                                 | 5            | \$16         |
| Existing             | Office           | Plug Load | Energy Star - Scanners  | Energy Star Features Enabled  | Non-Energy Star Features                            | 2.33                     | 0.9%                          | 75%   | 45%                                 | 4            | \$1          |
| Existing             | Office           | Plug Load | Energy Star - Water Cooler                                      | Energy Star Water Cooler (Hot/Cold Water)                           | Non-Energy Star Water Cooler                        | 2.33                     | 2.1%                          | 65%   | 75%                                 | 10           | \$1          |
| Existing             | Office           | Plug Load | Office Computer Network Management                              | Office Computer Network Energy Management                           | No Network Management                               | 2.33                     | 1.8%                          | 95%   | 30%                                 | 3            | \$310        |
| Existing             | Office           | Plug Load | Power Supply 80+ Office Measure                                 | 80% Efficient Power supply  | No 80+  | 2.33                     | 1.0%                          | 95%   | 86%                                 | 7            | \$0          |

| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description  | Base Equipment                            | Baseline kWh (UEC or EUJ) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|--|---|---------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Office           | Plug Load  | Residential-Size Refrigerator                                       | Energy Star Residential-Size Refrigerator  | Residential-Size Refrigerator - Standard  | 2.33                      | 0.5%                      | 35%   | 65%                                 | 13           | \$126        |
| Existing             | Office           | Plug Load  | Residential-Size Refrigerator/Freezer - Early Replacement           | Energy Star Refrigerator/Freezer   | Baseline Refrigerator/Freezer             | 2.33                      | 5.4%                      | 25%   | 35%                                 | 7            | \$578        |
| Existing             | Office           | Plug Load  | Vending Machine   | Energy Star Vending Machines - High-Efficiency   | Vending Machines - Standard               | 2.33                      | 9.9%                      | 10%   | 80%                                 | 14           | \$189        |
| Existing             | Office           | Plug Load  | Vending Miser   | Passive Infrared Sensor on Vending Machine Monitoring<br>Vacancy of Area And Cycles Cooling - Controls                   | No Vending Miser - No controls            | 2.33                      | 10.2%                     | 10%   | 25%                                 | 3            | \$298        |
| Existing             | Office           | Space Heat | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)  | Constant Ventilation                      | 3.28                      | 10.0%                     | 75%   | 94%                                 | 15           | \$5,295      |
| Existing             | Office           | Space Heat | Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning   | No Commissioning                          | 3.28                      | 12.5%                     | 90%   | 40%                                 | 3            | \$1,657      |
| Existing             | Office           | Space Heat | Direct Digital Control System-Installation                          | DDC Retrofit   | Pneumatic                                 | 3.28                      | 15.0%                     | 5%  | 28%                                 | 5            | \$8,082      |
| Existing             | Office           | Space Heat | Direct Digital Control System-Optimization                          | DDC System (Optimized)   | DDC System (Basic)                        | 3.28                      | 10.0%                     | 75%   | 80%                                 | 5            | \$4,526      |
| Existing             | Office           | Space Heat | Direct Digital Control System-Wireless Performance Monitoring       | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control  | Pneumatic                                 | 3.28                      | 15.0%                     | 75%   | 80%                                 | 5            | \$3,266      |
| Existing             | Office           | Space Heat | Duct Repair And Sealing   | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses     | 3.28                      | 2.5%                      | 45%   | 45%                                 | 18           | \$3,362      |
| Existing             | Office           | Space Heat | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery  | No Heat Recovery                          | 3.28                      | 15.0%                     | 5%  | 94%                                 | 10           | \$14457      |
| Existing             | Office           | Space Heat | Infiltration Control (Caulking, Weather Stripping, etc.)            | Install Caulking And Weatherstripping (ACH 0.65)   | Infiltration Conditions (ACH 1.0)         | 3.28                      | 10.0%                     | 40%   | 10%                                 | 10           | \$1,968      |
| Existing             | Office           | Space Heat | Insulation (Ceiling)  | R-49   | R-30                                      | 3.28                      | 8.0%                      | 75%   | 65%                                 | 25           | \$4,371      |
| Existing             | Office           | Space Heat | Insulation (Ceiling) - Existing to Code                             | R-30   | Existing Ceiling Insulation (Average R-9) | 3.28                      | 12.5%                     | 75%   | 4%                                  | 25           | \$5,127      |
| Existing             | Office           | Space Heat | Insulation (Ceiling) - Zero to Code                                 | R-30   | R-0                                       | 3.28                      | 25.0%                     | 75%   | 0%                                  | 25           | \$5,127      |
| Existing             | Office           | Space Heat | Insulation (Duct) (Unconditioned Spaces)                            | Install New Duct Insulation (R-8)  | R-0                                       | 3.28                      | 4.4%                      | 10%   | 15%                                 | 25           | \$940        |
| Existing             | Office           | Space Heat | Insulation (Duct) (Unconditioned Spaces)                            | R-4  | R-0                                       | 3.28                      | 2.4%                      | 10%   | 15%                                 | 25           | \$979        |
| Existing             | Office           | Space Heat | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)               | 3.28                      | 6.0%                      | 10%   | 95%                                 | 25           | \$2,218      |
| Existing             | Office           | Space Heat | Insulation (Wall) - Existing to Code                                | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)            | 3.28                      | 21.1%                     | 10%   | 35%                                 | 25           | \$2,430      |
| Existing             | Office           | Space Heat | Insulation (Wall) - Zero to Code                                    | R-19 (2x6 Framing) - (Code)  | R-0                                       | 3.28                      | 25.0%                     | 10%   | 0%                                  | 25           | \$2,402      |
| Existing             | Office           | Space Heat | Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)                               | 3.28                      | 5.0%                      | 35%   | 15%                                 | 25           | \$756        |
| Existing             | Office           | Space Heat | Insulation - Floor (Non-Slab) - Existing to Code                    | R-10 (Code)  | R-0                                       | 3.28                      | 15.0%                     | 35%   | 15%                                 | 25           | \$4,371      |
| Existing             | Office           | Space Heat | Sensible And Total Heat Recovery Devices                            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery                          | 3.28                      | 25.0%                     | 25%   | 98%                                 | 10           | \$17735      |
| Existing             | Office           | Space Heat | Thermostat - Programmable   | Energy Star Programmable Thermostat  | Manual Thermostat                         | 3.28                      | 3.0%                      | 95%   | 67%                                 | 15           | \$145        |

| Construction Vintage | Customer Segment | End Use          | Measure Name  | Measure Description   | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|---|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Office           | Space Heat       | Windows   | U = 0.35  | U = 0.40   | 3.28                     | 3.2%                          | 80%   | 95%                                 | 25           | \$2,190      |
| Existing             | Office           | Space Heat       | Windows - Existing to Code  | U = 0.40  | Existing Windows (U=0.65)                                  | 3.28                     | 9.6%                          | 10%   | 95%                                 | 25           | \$31294      |
| Existing             | Office           | Water Heat       | Water_Heater (40 Gallon Residential Sized Electric)                 | EF = 0.95   | EF = 0.92  | 0.46                     | 3.3%                          | NA  | NA                                  | 20           | \$161        |
| Existing             | Office           | Water Heat       | Clothes Washer - Ozonating  | Ozonating Clothes Washer                                      | Standard Commercial Clothes Washer                         | 0.47                     | 15.1%                         | 5%  | 95%                                 | 10           | \$8,704      |
| Existing             | Office           | Water Heat       | Clothes Washer Commercial   | Energy Star Commercial Clothes Washer MEF=1.72                | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.47                     | 6.9%                          | 5%  | 80%                                 | 11           | \$304        |
| Existing             | Office           | Water Heat       | Demand controlled Circulating Systems                               | Install demand-based control system (VFD Control by Demand)   | No demand control systems in place                         | 0.47                     | 5.0%                          | 55%   | 80%                                 | 15           | \$2,335      |
| Existing             | Office           | Water Heat       | Dishwashing - Commercial - High Efficiency                          | High Efficiency Dishwasher                                    | Standard Dishwasher  | 0.47                     | 2.1%                          | 10%   | 80%                                 | 10           | \$2,700      |
| Existing             | Office           | Water Heat       | Dishwashing - Commercial Chemical System                            | Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost) | High Temp Commercial Dishwasher                            | 0.47                     | 5.6%                          | 10%   | 95%                                 | 10           | \$841        |
| Existing             | Office           | Water Heat       | Dishwashing - Residential Sized System                              | EF = 0.65 (ENERGY STAR)                                       | Standard Dishwasher (FED Std. EF=0.46)                     | 0.47                     | 3.6%                          | 15%   | 25%                                 | 13           | \$32         |
| Existing             | Office           | Water Heat       | Dishwashing - Residential Sized System                              | EF = 0.77   | Standard Dishwasher (FED Std. EF=0.46)                     | 0.47                     | 5.0%                          | 15%   | 55%                                 | 13           | \$630        |
| Existing             | Office           | Water Heat       | Drainwater Heat Recovery Water Heater                               | Install (Power-Pipe or GFX) - Heat Recovery Water Heater      | No Heat Recovery System                                    | 0.47                     | 20.0%                         | 5%  | 92%                                 | 25           | \$876        |
| Existing             | Office           | Water Heat       | Faucet Aerators   | 1.5 GPM Aerator   | 2.5 GPM Aerator (Federal Code)                             | 0.47                     | 4.0%                          | 95%   | 25%                                 | 10           | \$0          |
| Existing             | Office           | Water Heat       | Faucet Aerators - Existing to Code                                  | 2.5 GPM Aerator (Federal Code)                                | 4.0 GPM Aerator  | 0.47                     | 3.8%                          | 95%   | 15%                                 | 10           | \$2          |
| Existing             | Office           | Water Heat       | Heat Pump Water Heater  | EF = 2.9  | EF=0.93 Baseline Electric Water Heater                     | 0.47                     | 58.9%                         | 40%   | 94%                                 | 15           | \$9,626      |
| Existing             | Office           | Water Heat       | Hot Water (SHW) Pipe Insulation                                     | Install Insulation (R-4)                                      | No Pipe Insulation   | 0.47                     | 1.0%                          | 80%   | 30%                                 | 15           | \$89         |
| Existing             | Office           | Water Heat       | Low-Flow Showerheads  | 2.0 GPM Showerhead  | 2.5 GPM Showerhead (Federal Code)                          | 0.47                     | 1.1%                          | 15%   | 75%                                 | 10           | \$6          |
| Existing             | Office           | Water Heat       | Low-Flow Showerheads - Existing to Code                             | 2.5 GPM Showerhead (Federal Code)                             | 4.5 GPM Showerhead   | 0.47                     | 2.5%                          | 15%   | 20%                                 | 10           | \$12         |
| Existing             | Office           | Water Heat       | Solar RE - Solar Water Heater                                       | Passive solar water heating                                   | Non-solar hot water heater                                 | 0.47                     | 55.8%                         | 20%   | 95%                                 | 20           | \$17861      |
| Existing             | Office           | Water Heat       | Ultrasonic Faucet Control   | Install Ultrasonic Motion Faucet Control                      | No Faucet Control  | 0.47                     | 3.3%                          | 95%   | 85%                                 | 10           | \$207        |
| Existing             | Office           | Water Heat       | Water Heater Thermostat Setback                                     | Thermostat Setback and Replacement (120 Degrees)              | No Thermostat Setback (130 Degrees)                        | 0.47                     | 7.7%                          | 75%   | 40%                                 | 11           | \$108        |
| New                  | Office           | Cooling Chillers | Chiller - Premium Efficiency  | 0.507 kW/ton  | 0.634 kW/ton   | 0.58                     | 20.0%                         | NA  | NA                                  | 20           | \$2,205      |
| New                  | Office           | Cooling Chillers | Chiller - Advanced Technology                                       | 0.461 kW/ton  | 0.634 kW/ton   | 0.58                     | 27.3%                         | NA  | NA                                  | 20           | \$2,748      |
| New                  | Office           | Cooling Chillers | Chiller - High Efficiency   | 0.574 kW/ton  | 0.634 kW/ton   | 0.58                     | 9.5%                          | NA  | NA                                  | 20           | \$790        |
| New                  | Office           | Cooling Chillers | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)                   | Constant Ventilation                                       | 0.53                     | 10.0%                         | 75%   | 94%                                 | 15           | \$5,295      |

| Construction Vintage | Customer Segment | End Use          | Measure Name   | Measure Description  | Base Equipment                           | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|--|--|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Office           | Cooling Chillers | Chilled Water Piping Loop w/ VSD Control               | VSD for Secondary Chilled Water Loop   | Primary Loop Only w/ Constant Speed Pump | 0.53                     | 7.6%                          | 25%   | 70%                                 | 10           | \$4,988      |
| New                  | Office           | Cooling Chillers | Chilled Water Reset                                    | Install Chilled Water Reset  | No Chilled Water Reset                   | 0.53                     | 5.0%                          | 95%   | 95%                                 | 10           | \$5,726      |
| New                  | Office           | Cooling Chillers | Commissioning - New Building Commissioning             | Commissioning - New Building Commissioning   | No Commissioning                         | 0.53                     | 12.5%                         | 90%   | 80%                                 | 3            | \$6,136      |
| New                  | Office           | Cooling Chillers | Cooling Tower-Decrease Approach Temperature            | 6 Deg F  | 10 Deg F                                 | 0.53                     | 8.0%                          | 50%   | 94%                                 | 15           | \$493        |
| New                  | Office           | Cooling Chillers | Direct Digital Control System-Optimization             | DDC System (Optimized)   | DDC System (Basic)                       | 0.53                     | 10.0%                         | 75%   | 80%                                 | 5            | \$4,526      |
| New                  | Office           | Cooling Chillers | Green Roof   | Vegetation on Roof   | Standard roofing techniques              | 0.53                     | 10.0%                         | 15%   | 98%                                 | 30           | \$85145      |
| New                  | Office           | Cooling Chillers | Insulation (Ceiling)                                   | R-38   | R-21 (Code)                              | 0.53                     | 2.0%                          | 75%   | 25%                                 | 25           | \$4,371      |
| New                  | Office           | Cooling Chillers | Insulation (Ceiling)                                   | R-49   | R-21 (Code)                              | 0.53                     | 3.0%                          | 75%   | 65%                                 | 25           | \$5,799      |
| New                  | Office           | Cooling Chillers | Insulation (Wall)                                      | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)              | 0.53                     | 3.0%                          | 95%   | 95%                                 | 25           | \$2,218      |
| New                  | Office           | Cooling Chillers | Insulation - Floor (Non-Slab)                          | R-19   | R-10 (Code)                              | 0.53                     | 1.0%                          | 35%   | 15%                                 | 25           | \$756        |
| New                  | Office           | Cooling Chillers | Leak Proof Duct Fittings                               | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                     | 0.53                     | 10.0%                         | 40%   | 98%                                 | 25           | \$1,303      |
| New                  | Office           | Cooling Chillers | Sensible And Total Heat Recovery Devices               | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery                         | 0.53                     | 25.0%                         | 50%   | 98%                                 | 10           | \$17735      |
| New                  | Office           | Cooling Chillers | Turbocor Compressor                                    | 0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)                                 | 0.634 kW/ton (Code) chiller water cooled | 0.53                     | 44.8%                         | 95%   | 99%                                 | 20           | \$12413      |
| New                  | Office           | Cooling Chillers | Window RE - Window Overhangs                           | Overhangs over windows for shading   | No window overhangs                      | 0.53                     | 3.1%                          | 75%   | 75%                                 | 30           | \$2,747      |
| New                  | Office           | Cooling Chillers | Windows  | U = 0.35   | U = 0.55 (Code)                          | 0.53                     | 1.0%                          | 80%   | 95%                                 | 25           | \$8,757      |
| New                  | Office           | Cooling DX       | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3) | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)   | 10.3 EER Rooftop Unit (State Code)       | 0.63                     | 14.2%                         | NA  | NA                                  | 15           | \$4,521      |
| New                  | Office           | Cooling DX       | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)    | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)  | 10.3 EER Rooftop Unit (State Code)       | 0.63                     | 6.4%                          | NA  | NA                                  | 15           | \$2,406      |
| New                  | Office           | Cooling DX       | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)  | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)  | 10.3 EER Rooftop Unit (State Code)       | 0.63                     | 10.4%                         | NA  | NA                                  | 15           | \$3,730      |

| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description   | Base Equipment   | Baseline kWh (UEC or EUJ) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|---|--|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Office           | Cooling DX | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)   | Constant Ventilation   | 0.58                      | 10.0%                         | 75%   | 94%                                 | 15           | \$5,295      |
| New                  | Office           | Cooling DX | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning  | No Commissioning   | 0.58                      | 12.5%                         | 90%   | 80%                                 | 3            | \$6,136      |
| New                  | Office           | Cooling DX | Direct / Indirect Evaporative Cooling, Pre-Cooling                  | Direct / Indirect Evaporative Cooling, Pre-Cooling  | No modification to DX system   | 0.58                      | 25.0%                         | 50%   | 85%                                 | 15           | \$17511      |
| New                  | Office           | Cooling DX | Direct Digital Control System-Optimization                          | DDC System (Optimized)  | DDC System (Basic)   | 0.58                      | 10.0%                         | 75%   | 80%                                 | 5            | \$4,526      |
| New                  | Office           | Cooling DX | Green Roof  | Vegetation on Roof  | Standard roofing techniques  | 0.58                      | 10.0%                         | 15%   | 98%                                 | 30           | \$85145      |
| New                  | Office           | Cooling DX | Insulation (Ceiling)  | R-38  | R-21 (Code)  | 0.58                      | 2.0%                          | 75%   | 25%                                 | 25           | \$4,371      |
| New                  | Office           | Cooling DX | Insulation (Ceiling)  | R-49  | R-21 (Code)  | 0.58                      | 3.0%                          | 75%   | 65%                                 | 25           | \$5,799      |
| New                  | Office           | Cooling DX | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced   | R-19 (2x6 Framing) - (Code)  | 0.58                      | 3.0%                          | 95%   | 95%                                 | 25           | \$2,218      |
| New                  | Office           | Cooling DX | Insulation - Floor (Non-Slab)                                       | R-19  | R-10 (Code)  | 0.58                      | 1.0%                          | 35%   | 15%                                 | 25           | \$756        |
| New                  | Office           | Cooling DX | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands  | Std duct workmanship   | 0.58                      | 10.0%                         | 40%   | 98%                                 | 25           | \$1,303      |
| New                  | Office           | Cooling DX | Window RE - Window Overhangs  | Overhangs over windows for shading  | No window overhangs  | 0.58                      | 3.1%                          | 75%   | 75%                                 | 30           | \$2,747      |
| New                  | Office           | Cooling DX | Windows   | U = 0.35  | U = 0.55 (Code)  | 0.58                      | 1.0%                          | 80%   | 95%                                 | 25           | \$8,757      |
| New                  | Office           | HVAC Aux   | Automated Exhaust VFD Control - Parking Garage CO sensor            | CO Sensors  | No CO Sensors  | 1.31                      | 20.0%                         | 20%   | 75%                                 | 10           | \$1,718      |
| New                  | Office           | HVAC Aux   | Cooking Hood Controls   | Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air | No Cooking Hood Controls   | 1.31                      | 7.5%                          | 0%  | 85%                                 | 10           | \$6,829      |
| New                  | Office           | HVAC Aux   | Motor - Premium-Efficiency  | PE Motors for HVAC Applications   | Standard Efficiency Motors   | 1.31                      | 3.8%                          | 85%   | 81%                                 | 10           | \$395        |
| New                  | Office           | HVAC Aux   | Motor - Pump & Fan System - Variable Speed Control                  | Pump And Fan System Optimization w/ VSD   | No Pump And Fan System VSD Optimization  | 1.31                      | 33.8%                         | 85%   | 75%                                 | 20           | \$1,705      |
| New                  | Office           | HVAC Aux   | Motor - VAV Box High-Efficiency                                     | ECM Motors  | Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control | 1.31                      | 8.8%                          | 65%   | 77%                                 | 10           | \$3,070      |
| New                  | Office           | HVAC Aux   | Optimized Variable Volume Lab Hood Design                           | Optimized Variable Volume Lab Hood Design   | Constant Volume Lab Hood Design  | 1.31                      | 1.6%                          | 0%  | 94%                                 | 10           | \$1,791      |
| New                  | Office           | Heat Pump  | High-Efficiency EER=11.0, COP=3.5                                   | High-Efficiency EER=11.0, COP=3.5   | EER=10.1, COP=3.2  | 1.42                      | 16.8%                         | NA  | NA                                  | 15           | \$3,205      |
| New                  | Office           | Heat Pump  | Premium-Efficiency EER=11.8, COP=3.8                                | Premium-Efficiency EER=11.8, COP=3.8  | EER=10.1, COP=3.2  | 1.42                      | 30.2%                         | NA  | NA                                  | 15           | \$6,862      |
| New                  | Office           | Heat Pump  | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)   | Constant Ventilation   | 1.30                      | 10.0%                         | 75%   | 94%                                 | 15           | \$5,295      |
| New                  | Office           | Heat Pump  | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning  | No Commissioning   | 1.30                      | 12.5%                         | 90%   | 80%                                 | 3            | \$6,136      |
| New                  | Office           | Heat Pump  | Direct Digital Control System-Optimization                          | DDC System (Optimized)  | DDC System (Basic)   | 1.30                      | 10.0%                         | 75%   | 80%                                 | 5            | \$4,526      |
| New                  | Office           | Heat Pump  | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery   | No Heat Recovery   | 1.30                      | 7.2%                          | 5%  | 94%                                 | 10           | \$14457      |

| Construction Vintage | Customer Segment | End Use   | Measure Name  | Measure Description   | Base Equipment                                      | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|---|---|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Office           | Heat Pump | Green Roof  | Vegetation on Roof  | Standard roofing techniques                         | 1.30                     | 1.6%                          | 15%   | 98%                                 | 30           | \$85145      |
| New                  | Office           | Heat Pump | Heat Pump - Ground Source (Closed Loop)                         | GSHP: COP=3.1, EER=13.4   | Std. Air Source HP 'EER=10.1, COP=3.2               | 1.30                     | 14.3%                         | 45%   | 92%                                 | 20           | \$37170      |
| New                  | Office           | Heat Pump | Heat Pump - Ground Source (Closed Loop)                         | GSHP: COP=4.0, EER=20   | Std. Air Source HP 'EER=10.1, COP=3.2               | 1.30                     | 36.5%                         | 45%   | 92%                                 | 20           | \$69833      |
| New                  | Office           | Heat Pump | Heat Pump - Water Source (Closed Loop)                          | WSHP: COP=4.2, EER=12.0   | Std. Air Source Heat Pump'EER=10.1, COP=3.2         | 1.30                     | 20.8%                         | 40%   | 90%                                 | 20           | \$7,477      |
| New                  | Office           | Heat Pump | Heat Pump - Water Source (Closed Loop)                          | WSHP: COP=4.8, EER=14.5   | Std. Air Source Heat Pump'EER=10.1, COP=3.2         | 1.30                     | 32.8%                         | 40%   | 90%                                 | 20           | \$9,875      |
| New                  | Office           | Heat Pump | Insulation (Ceiling)  | R-38  | R-21 (Code)   | 1.30                     | 5.9%                          | 75%   | 25%                                 | 25           | \$4,371      |
| New                  | Office           | Heat Pump | Insulation (Ceiling)  | R-49  | R-21 (Code)   | 1.30                     | 8.9%                          | 75%   | 65%                                 | 25           | \$5,799      |
| New                  | Office           | Heat Pump | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced                                       | R-19 (2x6 Framing) - (Code)                         | 1.30                     | 5.0%                          | 95%   | 95%                                 | 25           | \$2,218      |
| New                  | Office           | Heat Pump | Insulation - Floor (Non-Slab)                                   | R-19  | R-10 (Code)   | 1.30                     | 3.7%                          | 35%   | 15%                                 | 25           | \$756        |
| New                  | Office           | Heat Pump | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands      | Std duct workmanship                                | 1.30                     | 10.0%                         | 40%   | 98%                                 | 25           | \$1,303      |
| New                  | Office           | Heat Pump | Windows   | U = 0.35  | U = 0.55 (Code)                                     | 1.30                     | 6.6%                          | 80%   | 95%                                 | 25           | \$8,757      |
| New                  | Office           | Lighting  | Bi-Level Control, Stairwell Lighting                            | Occupancy Sensor Control, 50% Lighting Power during unoccupied Time | Continuous Full Power Lighting in Stairways         | 2.39                     | 2.0%                          | 85%   | 75%                                 | 9            | \$662        |
| New                  | Office           | Lighting  | Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures | Continuous Dimming, Fluorescent Fixtures (Day-Lighting)             | No Dimming Controls                                 | 2.39                     | 15.0%                         | 60%   | 78%                                 | 9            | \$2,522      |
| New                  | Office           | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 15%             | Code Required LPD And Control Strategies: LPD = 1.0 | 2.39                     | 15.0%                         | 90%   | 70%                                 | 14           | \$656        |
| New                  | Office           | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 20%             | Code Required LPD And Control Strategies: LPD = 1.0 | 2.39                     | 20.0%                         | 75%   | 85%                                 | 14           | \$2,118      |
| New                  | Office           | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 25%             | Code Required LPD And Control Strategies: LPD = 1.0 | 2.39                     | 25.0%                         | 70%   | 90%                                 | 14           | \$3,581      |
| New                  | Office           | Lighting  | LED Refrigeration Case Lights                                   | LED Refrigeration Case Lights (28W)                                 | Fluorescent Refrigeration Case Lights (60W)         | 2.39                     | 1.1%                          | 5%  | 80%                                 | 13           | \$630        |
| New                  | Office           | Lighting  | LED Solid State White Lighting Package                          | Landscape, merchandise, signage, structure & task lighting          | 50W 10hrs/day, 365 day/yr                           | 2.39                     | 0.8%                          | 10%   | 95%                                 | 14           | \$36         |
| New                  | Office           | Lighting  | Occupancy Sensor Control, Fluorescent                           | Occupancy Sensor Control, Fluorescent                               | No Occupancy Sensor                                 | 2.39                     | 4.0%                          | 90%   | 87%                                 | 10           | \$157        |
| New                  | Office           | Plug Load | Energy Star - Battery Charging System                           | Energy Star Battery Charging System                                 | Non-Energy Star Battery Chargers                    | 2.33                     | 0.4%                          | 95%   | 90%                                 | 7            | \$3          |
| New                  | Office           | Plug Load | Energy Star - Computer  | Energy Star Features Enabled  | Non-Energy Star Features                            | 2.33                     | 13.6%                         | 64%   | 25%                                 | 4            | \$1          |
| New                  | Office           | Plug Load | Energy Star - Copiers   | Energy Star or Better Office Equipment: Copiers,                    | Office Equipment: Copiers, Standard                 | 2.33                     | 6.2%                          | 90%   | 45%                                 | 6            | \$165        |
| New                  | Office           | Plug Load | Energy Star - Fax   | Energy Star Features Enabled  | Non-Energy Star Features                            | 2.33                     | 1.8%                          | 75%   | 55%                                 | 4            | \$1          |
| New                  | Office           | Plug Load | Energy Star - Monitors  | Energy Star Features Enabled  | Non-Energy Star Features                            | 2.33                     | 18.4%                         | 64%   | 15%                                 | 4            | \$157        |
| New                  | Office           | Plug Load | Energy Star - Printers  | Energy Star Features Enabled  | Non-Energy Star Features                            | 2.33                     | 1.3%                          | 75%   | 40%                                 | 5            | \$16         |

| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description  | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|--|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Office           | Plug Load  | Energy Star - Scanners  | Energy Star Features Enabled   | Non-Energy Star Features                                   | 2.33                     | 0.9%                          | 75%   | 45%                                 | 4            | \$1          |
| New                  | Office           | Plug Load  | Energy Star - Water Cooler  | Energy Star Water Cooler (Hot/Cold Water)  | Non-Energy Star Water Cooler                               | 2.33                     | 2.0%                          | 65%   | 75%                                 | 10           | \$1          |
| New                  | Office           | Plug Load  | Office Computer Network Management                                  | Office Computer Network Energy Management  | No Network Management                                      | 2.33                     | 1.8%                          | 95%   | 30%                                 | 3            | \$310        |
| New                  | Office           | Plug Load  | Power Supply 80+ Office Measure                                     | 80% Efficient Power supply   | No 80+   | 2.33                     | 1.0%                          | 95%   | 86%                                 | 7            | \$0          |
| New                  | Office           | Plug Load  | Residential-Size Refrigerator                                       | Energy Star Residential-Size Refrigerator  | Residential-Size Refrigerator - Standard                   | 2.33                     | 0.4%                          | 35%   | 65%                                 | 13           | \$126        |
| New                  | Office           | Plug Load  | Residential-Size Refrigerator/Freezer - Early Replacement           | Energy Star Refrigerator/Freezer   | Baseline Refrigerator/Freezer                              | 2.33                     | 5.2%                          | 25%   | 35%                                 | 7            | \$578        |
| New                  | Office           | Plug Load  | Vending Machine   | Energy Star Vending Machines - High-Efficiency   | Vending Machines - Standard                                | 2.33                     | 9.6%                          | 10%   | 80%                                 | 14           | \$189        |
| New                  | Office           | Space Heat | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)  | Constant Ventilation                                       | 0.67                     | 10.0%                         | 75%   | 94%                                 | 15           | \$5,295      |
| New                  | Office           | Space Heat | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning   | No Commissioning   | 0.67                     | 12.5%                         | 90%   | 80%                                 | 3            | \$6,136      |
| New                  | Office           | Space Heat | Direct Digital Control System-Optimization                          | DDC System (Optimized)   | DDC System (Basic)   | 0.67                     | 10.0%                         | 75%   | 80%                                 | 5            | \$4,526      |
| New                  | Office           | Space Heat | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery  | No Heat Recovery   | 0.67                     | 15.0%                         | 5%  | 94%                                 | 10           | \$14457      |
| New                  | Office           | Space Heat | Insulation (Ceiling)  | R-49   | R-30   | 0.67                     | 8.0%                          | 75%   | 65%                                 | 25           | \$4,371      |
| New                  | Office           | Space Heat | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                                | 0.67                     | 6.0%                          | 95%   | 95%                                 | 25           | \$2,218      |
| New                  | Office           | Space Heat | Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)  | 0.67                     | 5.0%                          | 35%   | 15%                                 | 25           | \$756        |
| New                  | Office           | Space Heat | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                                       | 0.67                     | 10.0%                         | 40%   | 98%                                 | 25           | \$1,303      |
| New                  | Office           | Space Heat | Sensible And Total Heat Recovery Devices                            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery   | 0.67                     | 25.0%                         | 50%   | 98%                                 | 10           | \$17735      |
| New                  | Office           | Space Heat | Windows   | U = 0.35   | U = 0.40   | 0.67                     | 3.2%                          | 80%   | 95%                                 | 25           | \$2,190      |
| New                  | Office           | Water Heat | Water_Heater (40 Gallon Electric) - Residential Sized               | EF = 0.95  | EF = 0.92  | 0.48                     | 3.3%                          | NA  | NA                                  | 20           | \$161        |
| New                  | Office           | Water Heat | Clothes Washer - Ozonating  | Ozonating Clothes Washer   | Standard Commercial Clothes Washer                         | 0.47                     | 15.1%                         | 5%  | 95%                                 | 10           | \$8,704      |
| New                  | Office           | Water Heat | Clothes Washer Commercial   | Energy Star Commercial Clothes Washer MEF=1.72   | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.47                     | 6.8%                          | 5%  | 80%                                 | 11           | \$304        |
| New                  | Office           | Water Heat | Demand controlled Circulating Systems                               | Install demand-based control system (VFD Control by Demand)  | No demand control systems in place                         | 0.47                     | 5.0%                          | 55%   | 80%                                 | 15           | \$2,335      |
| New                  | Office           | Water Heat | Dishwashing - Commercial - High Efficiency                          | High Efficiency Dishwasher   | Standard Dishwasher  | 0.47                     | 2.1%                          | 10%   | 80%                                 | 10           | \$2,700      |
| New                  | Office           | Water Heat | Dishwashing - Commercial Chemical System                            | Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)  | High Temp Commercial Dishwasher                            | 0.47                     | 5.6%                          | 10%   | 95%                                 | 10           | \$841        |
| New                  | Office           | Water Heat | Dishwashing - Residential Sized System                              | EF = 0.65 (ENERGY STAR)  | Standard Dishwasher (FED Std. EF=0.46)                     | 0.47                     | 3.6%                          | 15%   | 25%                                 | 13           | \$32         |



| Construction Vintage | Customer Segment | End Use          | Measure Name  | Measure Description                                      | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|--|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Office           | Water Heat       | Dishwashing - Residential Sized System                              | EF = 0.77  | Standard Dishwasher (FED Std. EF=0.46)                   | 0.47                     | 5.0%                          | 15%   | 55%                                 | 13           | \$630        |
| New                  | Office           | Water Heat       | Drainwater Heat Recovery Water Heater                               | Install (Power-Pipe or GFX) - Heat Recovery Water Heater | No Heat Recovery System                                  | 0.47                     | 20.0%                         | 25%   | 92%                                 | 25           | \$876        |
| New                  | Office           | Water Heat       | Faucet Aerators   | 1.5 GPM Aerator  | 2.5 GPM Aerator (Federal Code)                           | 0.47                     | 4.0%                          | 95%   | 25%                                 | 10           | \$0          |
| New                  | Office           | Water Heat       | Heat Pump Water Heater  | EF = 2.9   | EF=0.93 Baseline Electric Water Heater                   | 0.47                     | 58.9%                         | 50%   | 94%                                 | 15           | \$9,626      |
| New                  | Office           | Water Heat       | Low-Flow Showerheads  | 2.0 GPM Showerhead                                       | 2.5 GPM Showerhead (Federal Code)                        | 0.47                     | 1.1%                          | 15%   | 75%                                 | 10           | \$6          |
| New                  | Office           | Water Heat       | Solar RE - Solar Water Heater                                       | Passive solar water heating                              | Non-solar hot water heater                               | 0.47                     | 55.8%                         | 20%   | 95%                                 | 20           | \$17861      |
| New                  | Office           | Water Heat       | Ultrasonic Faucet Control   | Install Ultrasonic Motion Faucet Control                 | No Faucet Control  | 0.47                     | 3.3%                          | 95%   | 85%                                 | 10           | \$207        |
| New                  | Office           | Water Heat       | Water Heater Thermostat Setback                                     | Thermostat Setback and Replecement (120 Degrees)         | No Thermostat Setback (130 Degrees)                      | 0.47                     | 7.7%                          | 75%   | 40%                                 | 11           | \$108        |
| Existing             | Other            | Cooking          | Cooking Fryers - Commercial   | Energy Star Commercial Fryer                             | Non-Energy Star Fryer                                    | 0.39                     | 2.5%                          | 25%   | 70%                                 | 12           | \$4,946      |
| Existing             | Other            | Cooking          | Hot Food Holding Cabinets - Commercial                              | Energy Star Commercial Hot Food Holding Cabinets         | Non-Energy Star Commercial Hot Food Holding Cabinets     | 0.39                     | 8.4%                          | 35%   | 85%                                 | 12           | \$1,800      |
| Existing             | Other            | Cooking          | Oven - Convection   | Convection Oven  | Standard Oven  | 0.39                     | 3.4%                          | 85%   | 85%                                 | 15           | \$1,734      |
| Existing             | Other            | Cooking          | Steam Cookers - Commercial  | Energy Star Commercial Steam Cookers (50% efficiency)    | Non-Energy Star Commercial Steam Cooker (35% efficiency) | 0.39                     | 2.3%                          | 15%   | 75%                                 | 10           | \$1          |
| Existing             | Other            | Cooling Chillers | Chiller - Premium Efficiency  | 0.507 kW/ton   | 0.634 kW/ton   | 1.64                     | 20.0%                         | NA  | NA                                  | 20           | \$1,069      |
| Existing             | Other            | Cooling Chillers | Chiller - Advanced Technology                                       | 0.461 kW/ton   | 0.634 kW/ton   | 1.64                     | 27.3%                         | NA  | NA                                  | 20           | \$1,333      |
| Existing             | Other            | Cooling Chillers | Chiller - High Efficiency   | 0.574 kW/ton   | 0.634 kW/ton   | 1.64                     | 9.5%                          | NA  | NA                                  | 20           | \$383        |
| Existing             | Other            | Cooling Chillers | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)              | Constant Ventilation                                     | 1.69                     | 10.0%                         | 50%   | 94%                                 | 15           | \$3,640      |
| Existing             | Other            | Cooling Chillers | Centrifugal Chiller - VSD Remodel for Existing                      | VSD motor  | Constant Speed Motor                                     | 1.69                     | 40.0%                         | 43%   | 45%                                 | 10           | \$1,995      |
| Existing             | Other            | Cooling Chillers | Chilled Water Piping Loop w/ VSD Control                            | VSD for Secondary Chilled Water Loop                     | Primary Loop Only w/ Constant Speed Pump                 | 1.69                     | 7.6%                          | 25%   | 70%                                 | 10           | \$2,419      |
| Existing             | Other            | Cooling Chillers | Chilled Water Reset   | Install Chilled Water Reset                              | No Chilled Water Reset                                   | 1.69                     | 5.0%                          | 95%   | 95%                                 | 10           | \$3,937      |
| Existing             | Other            | Cooling Chillers | Chiller-Water Side Economizer                                       | Install Economizer                                       | No Economizer  | 1.69                     | 5.0%                          | 45%   | 85%                                 | 10           | \$5,617      |
| Existing             | Other            | Cooling Chillers | Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning             | No Commissioning   | 1.69                     | 12.5%                         | 90%   | 40%                                 | 3            | \$1,139      |
| Existing             | Other            | Cooling Chillers | Cooling Tower-Decrease Temperature                                  | Approach 6 Deg F   | 10 Deg F   | 1.69                     | 8.0%                          | 50%   | 94%                                 | 15           | \$239        |

| Construction Vintage | Customer Segment | End Use          | Measure Name  | Measure Description  | Base Equipment                              | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|--|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Other            | Cooling Chillers | Cooling Tower-Two-Speed Fan Motor                             | Two-Speed Tower Fans replace Single-Speed                                      | Cooling Tower-One-Speed Fan Motor           | 1.69                     | 14.0%                         | 95%   | 35%                                 | 10           | \$27         |
| Existing             | Other            | Cooling Chillers | Cooling Tower-VSD Fan Control                                 | Variable-Speed Tower Fans replace Two-Speed                                    | Cooling Tower-Two-Speed Fan Motor           | 1.69                     | 4.0%                          | 95%   | 75%                                 | 10           | \$217        |
| Existing             | Other            | Cooling Chillers | Direct Digital Control System-Installation                    | DDC Retrofit   | Pneumatic                                   | 1.69                     | 15.0%                         | 5%  | 66%                                 | 5            | \$5,557      |
| Existing             | Other            | Cooling Chillers | Direct Digital Control System-Optimization                    | DDC System (Optimized)   | DDC System (Basic)                          | 1.69                     | 10.0%                         | 75%   | 80%                                 | 5            | \$3,112      |
| Existing             | Other            | Cooling Chillers | Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control        | Pneumatic                                   | 1.69                     | 15.0%                         | 50%   | 80%                                 | 5            | \$2,246      |
| Existing             | Other            | Cooling Chillers | Duct Repair And Sealing                                       | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 1.69                     | 2.5%                          | 45%   | 45%                                 | 18           | \$2,311      |
| Existing             | Other            | Cooling Chillers | Exhaust Hood Makeup Air                                       | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air) | 1.69                     | 4.5%                          | 100%  | 85%                                 | 10           | \$5,726      |
| Existing             | Other            | Cooling Chillers | Green Roof  | Vegetation on Roof   | Standard roofing techniques                 | 1.69                     | 5.0%                          | 15%   | 98%                                 | 30           | \$58537      |
| Existing             | Other            | Cooling Chillers | Infiltration Control (Caulking, Weather Stripping, etc.)      | Install Caulking And Weatherstripping (ACH 0.65)                               | Infiltration Conditions (ACH 1.0)           | 1.69                     | 5.0%                          | 40%   | 10%                                 | 10           | \$1,353      |
| Existing             | Other            | Cooling Chillers | Insulation (Ceiling)  | R-38   | R-21 (Code)                                 | 1.69                     | 2.0%                          | 75%   | 45%                                 | 25           | \$3,005      |
| Existing             | Other            | Cooling Chillers | Insulation (Ceiling)  | R-49   | R-21 (Code)                                 | 1.69                     | 3.0%                          | 75%   | 85%                                 | 25           | \$3,987      |
| Existing             | Other            | Cooling Chillers | Insulation (Ceiling) - Existing to Code                       | R-21 (Code)  | Existing Ceiling Insulation (Average R-9)   | 1.69                     | 2.4%                          | 75%   | 30%                                 | 25           | \$3,525      |
| Existing             | Other            | Cooling Chillers | Insulation (Ceiling) - Zero to Code                           | R-21 (Code)  | R-0   | 1.69                     | 6.0%                          | 75%   | 0%                                  | 25           | \$3,525      |
| Existing             | Other            | Cooling Chillers | Insulation (Duct) (Unconditioned Spaces)                      | Install New Duct Insulation (R-8)  | R-0   | 1.69                     | 4.4%                          | 10%   | 15%                                 | 25           | \$646        |
| Existing             | Other            | Cooling Chillers | Insulation (Duct) (Unconditioned Spaces)                      | R-4  | R-0   | 1.69                     | 2.4%                          | 10%   | 15%                                 | 25           | \$673        |
| Existing             | Other            | Cooling Chillers | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 1.69                     | 3.0%                          | 10%   | 95%                                 | 25           | \$1,839      |
| Existing             | Other            | Cooling Chillers | Insulation (Wall) - Existing to Code                          | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)              | 1.69                     | 8.4%                          | 10%   | 35%                                 | 25           | \$2,014      |
| Existing             | Other            | Cooling Chillers | Insulation (Wall) - Zero to Code                              | R-19 (2x6 Framing) - (Code)  | R-0   | 1.69                     | 10.0%                         | 10%   | 0%                                  | 25           | \$1,992      |
| Existing             | Other            | Cooling Chillers | Insulation - Floor (Non-Slab)                                 | R-19   | R-10 (Code)                                 | 1.69                     | 1.0%                          | 35%   | 50%                                 | 25           | \$520        |

| Construction Vintage | Customer Segment | End Use          | Measure Name  | Measure Description  | Base Equipment                              | Baseline kWh (UEC or EU) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|--|---|--------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Other            | Cooling Chillers | Insulation - Floor (Non-Slab) - Existing to Code                    | R-10 (Code)  | R-0   | 1.69                     | 3.0%                      | 35%   | 50%                                 | 25           | \$3,005      |
| Existing             | Other            | Cooling Chillers | Pipe Insulation   | R-4  | R-0   | 1.69                     | 1.0%                      | 65%   | 45%                                 | 15           | \$119        |
| Existing             | Other            | Cooling Chillers | Sensible And Total Heat Recovery Devices                            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery                            | 1.69                     | 25.0%                     | 25%   | 98%                                 | 10           | \$12193      |
| Existing             | Other            | Cooling Chillers | Turbocor Compressor   | 0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)                                 | 0.634 kW/ton (Code) chiller water cooled    | 1.69                     | 44.8%                     | 60%   | 99%                                 | 20           | \$6,550      |
| Existing             | Other            | Cooling Chillers | Windows   | U = 0.35   | U = 0.55 (Code)                             | 1.69                     | 0.7%                      | 80%   | 70%                                 | 25           | \$2,851      |
| Existing             | Other            | Cooling Chillers | Windows - Existing to Code  | U = 0.55 (Code)  | Existing Windows (U=0.65)                   | 1.69                     | 0.4%                      | 10%   | 70%                                 | 25           | \$8,049      |
| Existing             | Other            | Cooling DX       | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)              | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)   | 10.3 EER Rooftop Unit (State Code)          | 1.78                     | 14.2%                     | NA  | NA                                  | 15           | \$2,411      |
| Existing             | Other            | Cooling DX       | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)                 | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)  | 10.3 EER Rooftop Unit (State Code)          | 1.78                     | 6.4%                      | NA  | NA                                  | 15           | \$1,283      |
| Existing             | Other            | Cooling DX       | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)               | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)  | 10.3 EER Rooftop Unit (State Code)          | 1.78                     | 10.4%                     | NA  | NA                                  | 15           | \$1,989      |
| Existing             | Other            | Cooling DX       | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)  | Constant Ventilation                        | 1.84                     | 10.0%                     | 50%   | 94%                                 | 15           | \$3,640      |
| Existing             | Other            | Cooling DX       | Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning   | No Commissioning                            | 1.84                     | 12.5%                     | 90%   | 40%                                 | 3            | \$1,139      |
| Existing             | Other            | Cooling DX       | Cooling DX Package-Air Side Economizer                              | Air-Side Economizer  | No Economizer                               | 1.84                     | 15.0%                     | 10%   | 70%                                 | 15           | \$1,938      |
| Existing             | Other            | Cooling DX       | Direct / Indirect Evaporative Cooling, Pre-Cooling                  | Direct / Indirect Evaporative Cooling, Pre-Cooling   | No modification to DX system                | 1.84                     | 25.0%                     | 50%   | 85%                                 | 15           | \$12039      |
| Existing             | Other            | Cooling DX       | Direct Digital Control System-Installation                          | DDC Retrofit   | Pneumatic                                   | 1.84                     | 15.0%                     | 45%   | 66%                                 | 5            | \$5,557      |
| Existing             | Other            | Cooling DX       | Direct Digital Control System-Optimization                          | DDC System (Optimized)   | DDC System (Basic)                          | 1.84                     | 10.0%                     | 75%   | 80%                                 | 5            | \$3,112      |
| Existing             | Other            | Cooling DX       | Direct Digital Control System-Wireless Performance Monitoring       | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control  | Pneumatic                                   | 1.84                     | 15.0%                     | 50%   | 80%                                 | 5            | \$2,246      |
| Existing             | Other            | Cooling DX       | Duct Repair And Sealing   | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 1.84                     | 2.5%                      | 45%   | 45%                                 | 18           | \$2,311      |
| Existing             | Other            | Cooling DX       | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air) | 1.84                     | 4.5%                      | 5%  | 85%                                 | 10           | \$5,726      |
| Existing             | Other            | Cooling DX       | Green Roof  | Vegetation on Roof   | Standard roofing techniques                 | 1.84                     | 10.0%                     | 15%   | 98%                                 | 30           | \$58537      |
| Existing             | Other            | Cooling DX       | Infiltration Control (Caulking, Weather Stripping, etc.)            | Install Caulking And Weatherstripping (ACH 0.65)   | Infiltration Conditions (ACH 1.0)           | 1.84                     | 5.0%                      | 40%   | 10%                                 | 10           | \$1,353      |

| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description   | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|---|--|--------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Other            | Cooling DX | Insulation (Ceiling)  | R-38  | R-21 (Code)  | 1.84                     | 2.0%                      | 75%   | 45%                                 | 25           | \$3,005      |
| Existing             | Other            | Cooling DX | Insulation (Ceiling)  | R-49  | R-21 (Code)  | 1.84                     | 3.0%                      | 75%   | 85%                                 | 25           | \$3,987      |
| Existing             | Other            | Cooling DX | Insulation (Ceiling) - Existing to Code                             | R-21 (Code)   | Existing Ceiling Insulation (Average R-9)  | 1.84                     | 2.4%                      | 75%   | 30%                                 | 25           | \$3,525      |
| Existing             | Other            | Cooling DX | Insulation (Ceiling) - Zero to Code                                 | R-21 (Code)   | R-0  | 1.84                     | 6.0%                      | 75%   | 0%                                  | 25           | \$3,525      |
| Existing             | Other            | Cooling DX | Insulation (Duct) (Unconditioned Spaces)                            | Install New Duct Insulation (R-8)   | R-0  | 1.84                     | 4.4%                      | 10%   | 15%                                 | 25           | \$646        |
| Existing             | Other            | Cooling DX | Insulation (Duct) (Unconditioned Spaces)                            | R-4   | R-0  | 1.84                     | 2.4%                      | 10%   | 15%                                 | 25           | \$673        |
| Existing             | Other            | Cooling DX | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced   | R-19 (2x6 Framing) - (Code)  | 1.84                     | 3.0%                      | 10%   | 95%                                 | 25           | \$1,839      |
| Existing             | Other            | Cooling DX | Insulation (Wall) - Existing to Code                                | R-19 (2x6 Framing) - (Code)   | Existing R-value (Average R-3)   | 1.84                     | 8.4%                      | 10%   | 35%                                 | 25           | \$2,014      |
| Existing             | Other            | Cooling DX | Insulation (Wall) - Zero to Code                                    | R-19 (2x6 Framing) - (Code)   | R-0  | 1.84                     | 10.0%                     | 10%   | 0%                                  | 25           | \$1,992      |
| Existing             | Other            | Cooling DX | Insulation - Floor (Non-Slab)                                       | R-19  | R-10 (Code)  | 1.84                     | 1.0%                      | 35%   | 50%                                 | 25           | \$520        |
| Existing             | Other            | Cooling DX | Insulation - Floor (Non-Slab) - Existing to Code                    | R-10 (Code)   | R-0  | 1.84                     | 3.0%                      | 35%   | 50%                                 | 25           | \$3,005      |
| Existing             | Other            | Cooling DX | Thermostat - Programmable   | Energy Star Programmable Thermostat   | Manual Thermostat  | 1.84                     | 3.0%                      | 95%   | 63%                                 | 15           | \$146        |
| Existing             | Other            | Cooling DX | Windows   | U = 0.35  | U = 0.55 (Code)  | 1.84                     | 0.7%                      | 80%   | 70%                                 | 25           | \$2,851      |
| Existing             | Other            | Cooling DX | Windows - Existing to Code  | U = 0.55 (Code)   | Existing Windows (U=0.65)  | 1.84                     | 0.4%                      | 10%   | 70%                                 | 25           | \$8,049      |
| Existing             | Other            | HVAC Aux   | Automated Exhaust VFD Control - Parking Garage CO sensor            | CO Sensors  | No CO Sensors  | 2.14                     | 20.0%                     | 5%  | 85%                                 | 10           | \$1,181      |
| Existing             | Other            | HVAC Aux   | Cooking Hood Controls   | Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air | No Cooking Hood Controls   | 2.14                     | 7.5%                      | 5%  | 85%                                 | 10           | \$13133      |
| Existing             | Other            | HVAC Aux   | Motor - Premium-Efficiency  | PE Motors for HVAC Applications   | Standard Efficiency Motors   | 2.14                     | 3.8%                      | 85%   | 81%                                 | 10           | \$272        |
| Existing             | Other            | HVAC Aux   | Motor - Pump & Fan System - Variable Speed Control                  | Pump And Fan System Optimization w/ VSD   | No Pump And Fan System VSD Optimization  | 2.14                     | 33.8%                     | 85%   | 75%                                 | 20           | \$1,172      |
| Existing             | Other            | HVAC Aux   | Motor - VAV Box High-Efficiency                                     | ECM Motors  | Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control | 2.14                     | 8.8%                      | 10%   | 77%                                 | 10           | \$2,110      |
| Existing             | Other            | HVAC Aux   | Optimized Variable Volume Lab Hood Design                           | Optimized Variable Volume Lab Hood Design   | Constant Volume Lab Hood Design  | 2.14                     | 1.6%                      | 5%  | 94%                                 | 10           | \$1,791      |
| Existing             | Other            | Heat Pump  | High-Efficiency EER=11.0, COP=3.5                                   | High-Efficiency EER=11.0, COP=3.5   | EER=10.1, COP=3.2  | 2.98                     | 16.8%                     | NA  | NA                                  | 15           | \$1,709      |
| Existing             | Other            | Heat Pump  | Premium-Efficiency EER=11.8, COP=3.8                                | Premium-Efficiency EER=11.8, COP=3.8  | EER=10.1, COP=3.2  | 2.98                     | 30.2%                     | NA  | NA                                  | 15           | \$3,659      |
| Existing             | Other            | Heat Pump  | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)   | Constant Ventilation   | 3.10                     | 10.0%                     | 50%   | 94%                                 | 15           | \$3,640      |
| Existing             | Other            | Heat Pump  | Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning  | No Commissioning   | 3.10                     | 12.5%                     | 90%   | 40%                                 | 3            | \$1,139      |

| Construction Vintage | Customer Segment | End Use   | Measure Name  | Measure Description  | Base Equipment                              | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|---|--|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Other            | Heat Pump | Direct Digital Control System-Installation                    | DDC Retrofit   | Pneumatic                                   | 3.10                     | 15.0%                         | 45%   | 66%                                 | 5            | \$5,557      |
| Existing             | Other            | Heat Pump | Direct Digital Control System-Optimization                    | DDC System (Optimized)   | DDC System (Basic)                          | 3.10                     | 10.0%                         | 75%   | 80%                                 | 5            | \$3,112      |
| Existing             | Other            | Heat Pump | Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control        | Pneumatic                                   | 3.10                     | 15.0%                         | 50%   | 80%                                 | 5            | \$2,246      |
| Existing             | Other            | Heat Pump | Duct Repair And Sealing                                       | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 3.10                     | 2.5%                          | 45%   | 45%                                 | 18           | \$2,311      |
| Existing             | Other            | Heat Pump | Exhaust Air to Ventilation Air Heat Recovery                  | Exhaust Air Heat Recovery  | No Heat Recovery                            | 3.10                     | 6.0%                          | 5%  | 94%                                 | 10           | \$9,939      |
| Existing             | Other            | Heat Pump | Exhaust Hood Makeup Air                                       | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air) | 3.10                     | 4.5%                          | 5%  | 85%                                 | 10           | \$5,726      |
| Existing             | Other            | Heat Pump | Green Roof  | Vegetation on Roof   | Standard roofing techniques                 | 3.10                     | 1.8%                          | 15%   | 98%                                 | 30           | \$58537      |
| Existing             | Other            | Heat Pump | Heat Pump - Ground Source (Closed Loop)                       | GSHP: COP=3.1, EER=13.4  | Std. Air Source HP 'EER=10.1, COP=3.2       | 3.10                     | 16.0%                         | 5%  | 92%                                 | 20           | \$19820      |
| Existing             | Other            | Heat Pump | Heat Pump - Ground Source (Closed Loop)                       | GSHP: COP=4.0, EER=20  | Std. Air Source HP 'EER=10.1, COP=3.2       | 3.10                     | 38.7%                         | 5%  | 92%                                 | 20           | \$37237      |
| Existing             | Other            | Heat Pump | Heat Pump - Water Source (Closed Loop)                        | WSHP: COP=4.2, EER=12.0  | Std. Air Source Heat Pump'EER=10.1, COP=3.2 | 3.10                     | 20.0%                         | 5%  | 90%                                 | 20           | \$3,987      |
| Existing             | Other            | Heat Pump | Heat Pump - Water Source (Closed Loop)                        | WSHP: COP=4.8, EER=14.5  | Std. Air Source Heat Pump'EER=10.1, COP=3.2 | 3.10                     | 32.4%                         | 5%  | 90%                                 | 20           | \$5,265      |
| Existing             | Other            | Heat Pump | Infiltration Control (Caulking, Weather Stripping, etc.)      | Install Caulking And Weatherstripping (ACH 0.65)                               | Infiltration Conditions (ACH 1.0)           | 3.10                     | 8.3%                          | 40%   | 10%                                 | 10           | \$1,353      |
| Existing             | Other            | Heat Pump | Insulation (Ceiling)  | R-38   | R-21 (Code)                                 | 3.10                     | 5.9%                          | 75%   | 45%                                 | 25           | \$3,005      |
| Existing             | Other            | Heat Pump | Insulation (Ceiling)  | R-49   | R-21 (Code)                                 | 3.10                     | 8.9%                          | 75%   | 85%                                 | 25           | \$3,987      |
| Existing             | Other            | Heat Pump | Insulation (Ceiling) - Existing to Code                       | R-21 (Code)  | Existing Ceiling Insulation (Average R-9)   | 3.10                     | 5.5%                          | 75%   | 30%                                 | 25           | \$3,525      |
| Existing             | Other            | Heat Pump | Insulation (Ceiling) - Zero to Code                           | R-21 (Code)  | R-0   | 3.10                     | 13.8%                         | 75%   | 0%                                  | 25           | \$3,525      |
| Existing             | Other            | Heat Pump | Insulation (Duct) (Unconditioned Spaces)                      | Install New Duct Insulation (R-8)  | R-0   | 3.10                     | 4.4%                          | 10%   | 15%                                 | 25           | \$646        |
| Existing             | Other            | Heat Pump | Insulation (Duct) (Unconditioned Spaces)                      | R-4  | R-0   | 3.10                     | 2.4%                          | 10%   | 15%                                 | 25           | \$673        |
| Existing             | Other            | Heat Pump | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 3.10                     | 5.0%                          | 10%   | 95%                                 | 25           | \$1,839      |
| Existing             | Other            | Heat Pump | Insulation (Wall) - Existing to Code                          | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)              | 3.10                     | 16.6%                         | 10%   | 35%                                 | 25           | \$2,014      |
| Existing             | Other            | Heat Pump | Insulation (Wall) - Zero to Code                              | R-19 (2x6 Framing) - (Code)  | R-0   | 3.10                     | 19.8%                         | 10%   | 0%                                  | 25           | \$1,992      |
| Existing             | Other            | Heat Pump | Insulation - Floor (Non-Slab)                                 | R-19   | R-10 (Code)                                 | 3.10                     | 3.7%                          | 35%   | 50%                                 | 25           | \$520        |
| Existing             | Other            | Heat Pump | Insulation - Floor (Non-Slab) - Existing to Code              | R-10 (Code)  | R-0   | 3.10                     | 11.1%                         | 35%   | 50%                                 | 25           | \$3,005      |
| Existing             | Other            | Heat Pump | Thermostat - Programmable                                     | Energy Star Programmable Thermostat  | Manual Thermostat                           | 3.10                     | 3.0%                          | 95%   | 63%                                 | 15           | \$146        |
| Existing             | Other            | Heat Pump | Windows   | U = 0.35   | U = 0.55 (Code)                             | 3.10                     | 4.8%                          | 80%   | 70%                                 | 25           | \$2,851      |
| Existing             | Other            | Heat Pump | Windows - Existing to Code                                    | U = 0.55 (Code)  | Existing Windows (U=0.65)                   | 3.10                     | 3.2%                          | 10%   | 70%                                 | 25           | \$8,049      |

| Construction Vintage | Customer Segment | End Use   | Measure Name  | Measure Description   | Base Equipment                                       | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|---|---|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Other            | Lighting  | Bi-Level Control, Stairwell Lighting                            | Occupancy Sensor Control, 50% Lighting Power during unoccupied Time | Continuous Full Power Lighting in Stairways          | 2.78                     | 2.0%                          | 25%   | 75%                                 | 9            | \$455        |
| Existing             | Other            | Lighting  | Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures | Continuous Dimming, Fluorescent Fixtures (Day-Lighting)             | No Dimming Controls                                  | 2.78                     | 15.0%                         | 30%   | 84%                                 | 9            | \$1,734      |
| Existing             | Other            | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 15%             | Code Required LPD And Control Strategies: LPD = 1.23 | 2.78                     | 15.0%                         | 90%   | 70%                                 | 14           | \$984        |
| Existing             | Other            | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 20%             | Code Required LPD And Control Strategies: LPD = 1.23 | 2.78                     | 20.0%                         | 75%   | 85%                                 | 14           | \$2,332      |
| Existing             | Other            | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 25%             | Code Required LPD And Control Strategies: LPD = 1.23 | 2.78                     | 25.0%                         | 70%   | 90%                                 | 14           | \$3,683      |
| Existing             | Other            | Lighting  | HE Fixtures/Design - Existing to Code                           | Code Required LPD And Control Strategies: LPD = 1.23                | Existing Lighting Design                             | 2.78                     | 34.2%                         | 95%   | 45%                                 | 14           | \$5,404      |
| Existing             | Other            | Lighting  | LED Exit Lighting   | 5 Watts   | CFL Exit Sign (26 Watts)                             | 2.78                     | 1.6%                          | 95%   | 65%                                 | 11           | \$53         |
| Existing             | Other            | Lighting  | LED Refrigeration Case Lights                                   | LED Refrigeration Case Lights (28W)                                 | Fluorescent Refrigeration Case Lights (60W)          | 2.78                     | 1.6%                          | 5%  | 80%                                 | 13           | \$630        |
| Existing             | Other            | Lighting  | LED Solid State White Lighting Package                          | Landscape, merchandise, signage, structure & task lighting          | 50W 10hrs/day, 365 day/yr                            | 2.78                     | 1.5%                          | 10%   | 95%                                 | 14           | \$36         |
| Existing             | Other            | Lighting  | Occupancy Sensor Control, Fluorescent                           | Occupancy Sensor Control, Fluorescent                               | No Occupancy Sensor                                  | 2.78                     | 4.0%                          | 90%   | 83%                                 | 9            | \$108        |
| Existing             | Other            | Lighting  | Time Clocks And Timers  | Install Time Clock Lighting   | No Time Clock  | 2.78                     | 4.9%                          | 85%   | 100%                                | 9            | \$216        |
| Existing             | Other            | Plug Load | Energy Star - Battery Charging System                           | Energy Star Battery Charging System                                 | Non-Energy Star Battery Chargers                     | 2.57                     | 0.4%                          | 95%   | 90%                                 | 7            | \$2          |
| Existing             | Other            | Plug Load | Energy Star - Computer  | Energy Star Features Enabled  | Non-Energy Star Features                             | 2.57                     | 13.6%                         | 64%   | 25%                                 | 4            | \$1          |
| Existing             | Other            | Plug Load | Energy Star - Copiers   | Energy Star or Better Office Equipment: Copiers,                    | Office Equipment: Copiers, Standard                  | 2.57                     | 8.4%                          | 10%   | 45%                                 | 6            | \$165        |
| Existing             | Other            | Plug Load | Energy Star - Fax   | Energy Star Features Enabled  | Non-Energy Star Features                             | 2.57                     | 1.8%                          | 75%   | 55%                                 | 4            | \$1          |
| Existing             | Other            | Plug Load | Energy Star - Monitors  | Energy Star Features Enabled  | Non-Energy Star Features                             | 2.57                     | 18.4%                         | 64%   | 15%                                 | 4            | \$158        |
| Existing             | Other            | Plug Load | Energy Star - Printers  | Energy Star Features Enabled  | Non-Energy Star Features                             | 2.57                     | 1.3%                          | 75%   | 40%                                 | 5            | \$16         |
| Existing             | Other            | Plug Load | Energy Star - Scanners  | Energy Star Features Enabled  | Non-Energy Star Features                             | 2.57                     | 0.9%                          | 75%   | 45%                                 | 4            | \$1          |
| Existing             | Other            | Plug Load | Energy Star - Water Cooler                                      | Energy Star Water Cooler (Hot/Cold Water)                           | Non-Energy Star Water Cooler                         | 2.57                     | 2.7%                          | 10%   | 75%                                 | 10           | \$1          |
| Existing             | Other            | Plug Load | Office Computer Network Energy Management                       | Office Computer Network Energy Management                           | No Network Management                                | 2.57                     | 1.8%                          | 95%   | 30%                                 | 3            | \$310        |
| Existing             | Other            | Plug Load | Power Supply 80+ Office Measure                                 | 80% Efficient Power supply  | No 80+   | 2.57                     | 1.0%                          | 95%   | 86%                                 | 7            | \$1          |
| Existing             | Other            | Plug Load | Refrigerator eCube  | Refrigerator eCube  | No Refrigerator eCube                                | 2.57                     | 1.2%                          | 75%   | 95%                                 | 10           | \$86         |
| Existing             | Other            | Plug Load | Residential-Size Refrigerator                                   | Energy Star Residential-Size Refrigerator                           | Residential-Size Refrigerator - Standard             | 2.57                     | 0.6%                          | 5%  | 65%                                 | 13           | \$126        |
| Existing             | Other            | Plug Load | Residential-Size Refrigerator/Freezer - Early Replacement       | Energy Star Refrigerator/Freezer                                    | Baseline Refrigerator/Freezer                        | 2.57                     | 7.0%                          | 25%   | 35%                                 | 7            | \$578        |
| Existing             | Other            | Plug Load | Vending Machine   | Energy Star Vending Machines - High-Efficiency                      | Vending Machines - Standard                          | 2.57                     | 13.0%                         | 10%   | 80%                                 | 14           | \$189        |

| Construction Vintage | Customer Segment | End Use       | Measure Name  | Measure Description   | Base Equipment                              | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|---|---|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Other            | Plug Load     | Vending Miser   | Passive Infrared Sensor on Vending Machine Monitoring Vacancy of Area And Cycles Cooling - Controls | No Vending Miser - No controls              | 2.57                     | 13.3%                         | 10%   | 25%                                 | 3            | \$298        |
| Existing             | Other            | Refrigeration | Commercial Reach-In Refrigerator                                    | Energy Star Commercial Reach-In Refrigerator  | Commercial-Size Refrigerator - Standard     | 0.20                     | 108.9%                        | 95%   | 95%                                 | 12           | \$344        |
| Existing             | Other            | Refrigeration | Custom Refrigeration System   | High-Efficiency Custom Refrigeration System (Walk-in) includes compressors                          | Custom Refrigeration System - Standard      | 0.20                     | 3.6%                          | 85%   | 65%                                 | 10           | \$9,596      |
| Existing             | Other            | Refrigeration | Ice Maker   | Energy Star Ice Maker - High-Efficiency   | Standard Ice Maker                          | 0.20                     | 1.1%                          | 5%  | 86%                                 | 9            | \$376        |
| Existing             | Other            | Refrigeration | Reduced Speed or Cycling of Evaporator Fans                         | VFD on Evaporator Fans (Evap Fan Control on Walk-In)  | Constant Speed Evaporator Fans              | 0.20                     | 6.0%                          | 75%   | 70%                                 | 10           | \$3          |
| Existing             | Other            | Refrigeration | Refrigeration - Retro Commissioning                                 | Refrigeration Retro Commissioning (Refrigeration System Diagnostics / Operations And Maintenance)   | No Re-commissioning                         | 0.20                     | 5.0%                          | 80%   | 90%                                 | 3            | \$4          |
| Existing             | Other            | Refrigeration | Special Glass Doors for Refrigerated Reach-in Cases                 | Do Not Require Anti-Sweat Heating   | Standard Glass Doors                        | 0.20                     | 3.2%                          | 95%   | 77%                                 | 16           | \$13         |
| Existing             | Other            | Refrigeration | Strip Curtains for Walk-Ins   | Strip Curtains for Walk-Ins   | No Strip Curtains for Walk-Ins              | 0.20                     | 2.0%                          | 95%   | 20%                                 | 4            | \$189        |
| Existing             | Other            | Space Heat    | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)   | Constant Ventilation                        | 2.64                     | 10.0%                         | 50%   | 94%                                 | 15           | \$3,640      |
| Existing             | Other            | Space Heat    | Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning  | No Commissioning                            | 2.64                     | 12.5%                         | 90%   | 40%                                 | 3            | \$1,139      |
| Existing             | Other            | Space Heat    | Direct Digital Control System-Installation                          | DDC Retrofit  | Pneumatic                                   | 2.64                     | 15.0%                         | 45%   | 66%                                 | 5            | \$5,557      |
| Existing             | Other            | Space Heat    | Direct Digital Control System-Optimization                          | DDC System (Optimized)  | DDC System (Basic)                          | 2.64                     | 10.0%                         | 75%   | 80%                                 | 5            | \$3,112      |
| Existing             | Other            | Space Heat    | Direct Digital Control System-Wireless Performance Monitoring       | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control                             | Pneumatic                                   | 2.64                     | 15.0%                         | 50%   | 80%                                 | 5            | \$2,246      |
| Existing             | Other            | Space Heat    | Duct Repair And Sealing   | Reduction In Duct Losses to 5%  | No Repair or Sealing, 15% duct losses       | 2.64                     | 2.5%                          | 45%   | 45%                                 | 18           | \$2,311      |
| Existing             | Other            | Space Heat    | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery   | No Heat Recovery                            | 2.64                     | 15.0%                         | 5%  | 94%                                 | 10           | \$9,939      |
| Existing             | Other            | Space Heat    | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air                      | Hood Pulls Conditioned Air (No Make-up Air) | 2.64                     | 4.5%                          | 5%  | 85%                                 | 10           | \$5,726      |
| Existing             | Other            | Space Heat    | Infiltration Control (Caulking, Weather Stripping, etc.)            | Install Caulking And Weatherstripping (ACH 0.65)  | Infiltration Conditions (ACH 1.0)           | 2.64                     | 10.0%                         | 40%   | 10%                                 | 10           | \$1,353      |
| Existing             | Other            | Space Heat    | Insulation (Ceiling)  | R-49  | R-30  | 2.64                     | 8.0%                          | 75%   | 85%                                 | 25           | \$3,005      |
| Existing             | Other            | Space Heat    | Insulation (Ceiling) - Existing to Code                             | R-30  | Existing Ceiling Insulation (Average R-9)   | 2.64                     | 12.5%                         | 75%   | 30%                                 | 25           | \$3,525      |
| Existing             | Other            | Space Heat    | Insulation (Ceiling) - Zero to Code                                 | R-30  | R-0   | 2.64                     | 25.0%                         | 75%   | 0%                                  | 25           | \$3,525      |
| Existing             | Other            | Space Heat    | Insulation (Duct) (Unconditioned Spaces)                            | Install New Duct Insulation (R-8)   | R-0   | 2.64                     | 4.4%                          | 10%   | 15%                                 | 25           | \$646        |
| Existing             | Other            | Space Heat    | Insulation (Duct) (Unconditioned Spaces)                            | R-4   | R-0   | 2.64                     | 2.4%                          | 10%   | 15%                                 | 25           | \$673        |
| Existing             | Other            | Space Heat    | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced   | R-19 (2x6 Framing) - (Code)                 | 2.64                     | 6.0%                          | 10%   | 95%                                 | 25           | \$1,839      |
| Existing             | Other            | Space Heat    | Insulation (Wall) - Existing to Code                                | R-19 (2x6 Framing) - (Code)   | Existing R-value (Average R-3)              | 2.64                     | 21.1%                         | 10%   | 35%                                 | 25           | \$2,014      |

| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description  | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|--|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Other            | Space Heat | Insulation (Wall) - Zero to Code                    | R-19 (2x6 Framing) - (Code)  | R-0  | 2.64                     | 25.0%                         | 10%   | 0%                                  | 25           | \$1,992      |
| Existing             | Other            | Space Heat | Insulation - Floor (Non-Slab)                       | R-19   | R-10 (Code)  | 2.64                     | 5.0%                          | 35%   | 50%                                 | 25           | \$520        |
| Existing             | Other            | Space Heat | Insulation - Floor (Non-Slab) - Existing to Code    | R-10 (Code)  | R-0  | 2.64                     | 15.0%                         | 35%   | 50%                                 | 25           | \$3,005      |
| Existing             | Other            | Space Heat | Sensible And Total Heat Recovery Devices            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery   | 2.64                     | 25.0%                         | 25%   | 98%                                 | 10           | \$12193      |
| Existing             | Other            | Space Heat | Thermostat - Programmable                           | Energy Star Programmable Thermostat  | Manual Thermostat  | 2.64                     | 3.0%                          | 95%   | 63%                                 | 15           | \$146        |
| Existing             | Other            | Space Heat | Windows   | U = 0.35   | U = 0.40   | 2.64                     | 2.3%                          | 80%   | 70%                                 | 25           | \$712        |
| Existing             | Other            | Space Heat | Windows - Existing to Code                          | U = 0.40   | Existing Windows (U=0.65)                                  | 2.64                     | 7.0%                          | 10%   | 70%                                 | 25           | \$10187      |
| Existing             | Other            | Water Heat | Water_Heater (40 Gallon Electric) Residential Sized | EF = 0.95  | EF = 0.92  | 0.36                     | 3.3%                          | NA  | NA                                  | 20           | \$162        |
| Existing             | Other            | Water Heat | Clothes Washer - Ozonating                          | Ozonating Clothes Washer   | Standard Commercial Clothes Washer                         | 0.37                     | 15.1%                         | 5%  | 95%                                 | 10           | \$8,705      |
| Existing             | Other            | Water Heat | Clothes Washer Commercial                           | Energy Star Commercial Clothes Washer MEF=1.72   | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.37                     | 12.5%                         | 5%  | 80%                                 | 11           | \$305        |
| Existing             | Other            | Water Heat | Demand controlled Circulating Systems               | Install demand-based control system (VFD Control by Demand)  | No demand control systems in place                         | 0.37                     | 5.0%                          | 75%   | 94%                                 | 15           | \$1,605      |
| Existing             | Other            | Water Heat | Dishwashing - Commercial - High Efficiency          | High Efficiency Dishwasher   | Standard Dishwasher  | 0.37                     | 2.1%                          | 10%   | 80%                                 | 10           | \$2,700      |
| Existing             | Other            | Water Heat | Dishwashing - Commercial Chemical System            | Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)  | High Temp Commercial Dishwasher                            | 0.37                     | 5.6%                          | 10%   | 95%                                 | 10           | \$841        |
| Existing             | Other            | Water Heat | Dishwashing - Residential Sized System              | EF = 0.65 (ENERGY STAR)  | Standard Dishwasher (FED Std. EF=0.46)                     | 0.37                     | 6.6%                          | 10%   | 25%                                 | 13           | \$32         |
| Existing             | Other            | Water Heat | Dishwashing - Residential Sized System              | EF = 0.77  | Standard Dishwasher (FED Std. EF=0.46)                     | 0.37                     | 9.1%                          | 10%   | 55%                                 | 13           | \$630        |
| Existing             | Other            | Water Heat | Drainwater Heat Recovery Water Heater               | Install (Power-Pipe or GFX) - Heat Recovery Water Heater   | No Heat Recovery System                                    | 0.37                     | 20.0%                         | 5%  | 92%                                 | 25           | \$875        |
| Existing             | Other            | Water Heat | Faucet Aerators                                     | 1.5 GPM Aerator  | 2.5 GPM Aerator (Federal Code)                             | 0.37                     | 4.0%                          | 95%   | 25%                                 | 10           | \$0          |
| Existing             | Other            | Water Heat | Faucet Aerators - Existing to Code                  | 2.5 GPM Aerator (Federal Code)   | 4.0 GPM Aerator  | 0.37                     | 3.8%                          | 95%   | 15%                                 | 10           | \$2          |
| Existing             | Other            | Water Heat | Heat Pump Water Heater                              | EF = 2.9   | EF=0.93 Baseline Electric Water Heater                     | 0.37                     | 58.9%                         | 40%   | 94%                                 | 15           | \$9,626      |
| Existing             | Other            | Water Heat | Hot Water (SHW) Pipe Insulation                     | Install Insulation (R-4)   | No Pipe Insulation   | 0.37                     | 1.0%                          | 80%   | 90%                                 | 15           | \$61         |
| Existing             | Other            | Water Heat | Low Flow Spray Heads                                | 1.6 GPM  | 3.0 GPM  | 0.37                     | 2.3%                          | 50%   | 50%                                 | 5            | \$5          |
| Existing             | Other            | Water Heat | Low-Flow Showerheads                                | 2.0 GPM Showerhead   | 2.5 GPM Showerhead (Federal Code)                          | 0.37                     | 1.1%                          | 15%   | 75%                                 | 10           | \$6          |
| Existing             | Other            | Water Heat | Low-Flow Showerheads - Existing to Code             | 2.5 GPM Showerhead (Federal Code)  | 4.5 GPM Showerhead   | 0.37                     | 2.5%                          | 15%   | 20%                                 | 10           | \$12         |
| Existing             | Other            | Water Heat | Solar RE - Solar Water Heater                       | Passive solar water heating  | Non-solar hot water heater                                 | 0.37                     | 62.3%                         | 20%   | 95%                                 | 20           | \$17861      |
| Existing             | Other            | Water Heat | Ultrasonic Faucet Control                           | Install Ultrasonic Motion Faucet Control   | No Faucet Control  | 0.37                     | 3.3%                          | 95%   | 95%                                 | 10           | \$206        |



| Construction Vintage | Customer Segment | End Use          | Measure Name  | Measure Description  | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|--|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Other            | Water Heat       | Water Heater Thermostat Setback                                     | Thermostat Setback and Replcement (120 Degrees)                                | No Thermostat Setback (130 Degrees)                      | 0.37                     | 7.7%                          | 75%   | 55%                                 | 11           | \$107        |
| New                  | Other            | Cooking          | Cooking Fryers - Commercial   | Energy Star Commercial Fryer   | Non-Energy Star Fryer                                    | 0.39                     | 2.5%                          | 25%   | 70%                                 | 12           | \$4,946      |
| New                  | Other            | Cooking          | Hot Food Holding Cabinets - Commercial                              | Energy Star Commercial Hot Food Holding Cabinets                               | Non-Energy Star Commercial Hot Food Holding Cabinets     | 0.39                     | 8.3%                          | 35%   | 85%                                 | 12           | \$1,800      |
| New                  | Other            | Cooking          | Oven - Convection   | Convection Oven  | Standard Oven  | 0.39                     | 3.4%                          | 85%   | 85%                                 | 15           | \$1,734      |
| New                  | Other            | Cooking          | Steam Cookers - Commercial  | Energy Star Commercial Steam Cookers (50% efficiency)                          | Non-Energy Star Commercial Steam Cooker (35% efficiency) | 0.39                     | 2.3%                          | 15%   | 75%                                 | 10           | \$1          |
| New                  | Other            | Cooling Chillers | Chiller - Premium Efficiency  | 0.507 kW/ton   | 0.634 kW/ton   | 0.78                     | 20.0%                         | NA  | NA                                  | 20           | \$1,069      |
| New                  | Other            | Cooling Chillers | Chiller - Advanced Technology                                       | 0.461 kW/ton   | 0.634 kW/ton   | 0.78                     | 27.3%                         | NA  | NA                                  | 20           | \$1,333      |
| New                  | Other            | Cooling Chillers | Chiller - High Efficiency   | 0.574 kW/ton   | 0.634 kW/ton   | 0.78                     | 9.5%                          | NA  | NA                                  | 20           | \$383        |
| New                  | Other            | Cooling Chillers | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)                                    | Constant Ventilation                                     | 0.72                     | 10.0%                         | 50%   | 94%                                 | 15           | \$3,640      |
| New                  | Other            | Cooling Chillers | Chilled Water Piping Loop w/ VSD Control                            | VSD for Secondary Chilled Water Loop   | Primary Loop Only w/ Constant Speed Pump                 | 0.72                     | 7.6%                          | 25%   | 70%                                 | 10           | \$2,419      |
| New                  | Other            | Cooling Chillers | Chilled Water Reset   | Install Chilled Water Reset  | No Chilled Water Reset                                   | 0.72                     | 5.0%                          | 95%   | 95%                                 | 10           | \$3,937      |
| New                  | Other            | Cooling Chillers | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning                                     | No Commissioning   | 0.72                     | 12.5%                         | 90%   | 80%                                 | 3            | \$4,218      |
| New                  | Other            | Cooling Chillers | Cooling Tower-Decrease Temperature Approach                         | 6 Deg F  | 10 Deg F   | 0.72                     | 8.0%                          | 50%   | 94%                                 | 15           | \$239        |
| New                  | Other            | Cooling Chillers | Direct Digital Control System-Optimization                          | DDC System (Optimized)   | DDC System (Basic)                                       | 0.72                     | 10.0%                         | 75%   | 80%                                 | 5            | \$3,112      |
| New                  | Other            | Cooling Chillers | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air)              | 0.72                     | 4.5%                          | 100%  | 85%                                 | 10           | \$5,726      |
| New                  | Other            | Cooling Chillers | Green Roof  | Vegetation on Roof   | Standard roofing techniques                              | 0.72                     | 5.0%                          | 15%   | 98%                                 | 30           | \$58537      |
| New                  | Other            | Cooling Chillers | Insulation (Ceiling)  | R-38   | R-21 (Code)  | 0.72                     | 2.0%                          | 75%   | 45%                                 | 25           | \$3,005      |
| New                  | Other            | Cooling Chillers | Insulation (Ceiling)  | R-49   | R-21 (Code)  | 0.72                     | 3.0%                          | 75%   | 85%                                 | 25           | \$3,987      |
| New                  | Other            | Cooling Chillers | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                              | 0.72                     | 3.0%                          | 95%   | 95%                                 | 25           | \$1,839      |
| New                  | Other            | Cooling Chillers | Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)  | 0.72                     | 1.0%                          | 35%   | 50%                                 | 25           | \$520        |

| Construction Vintage | Customer Segment | End Use          | Measure Name  | Measure Description  | Base Equipment                              | Baseline kWh (UEC or EU) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|--|---|--------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Other            | Cooling Chillers | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                        | 0.72                     | 10.0%                     | 40%   | 98%                                 | 25           | \$896        |
| New                  | Other            | Cooling Chillers | Sensible And Total Heat Recovery Devices                            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery                            | 0.72                     | 25.0%                     | 50%   | 98%                                 | 10           | \$12193      |
| New                  | Other            | Cooling Chillers | Turbocor Compressor   | 0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)                                 | 0.634 kW/ton (Code) chiller water cooled    | 0.72                     | 44.8%                     | 95%   | 99%                                 | 20           | \$4,629      |
| New                  | Other            | Cooling Chillers | Windows   | U = 0.35   | U = 0.55 (Code)                             | 0.72                     | 0.7%                      | 80%   | 70%                                 | 25           | \$2,851      |
| New                  | Other            | Cooling DX       | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)              | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)   | 10.3 EER Rooftop Unit (State Code)          | 0.85                     | 14.2%                     | NA  | NA                                  | 15           | \$2,411      |
| New                  | Other            | Cooling DX       | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)                 | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)  | 10.3 EER Rooftop Unit (State Code)          | 0.85                     | 6.4%                      | NA  | NA                                  | 15           | \$1,283      |
| New                  | Other            | Cooling DX       | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)               | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)  | 10.3 EER Rooftop Unit (State Code)          | 0.85                     | 10.4%                     | NA  | NA                                  | 15           | \$1,989      |
| New                  | Other            | Cooling DX       | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)  | Constant Ventilation                        | 0.78                     | 10.0%                     | 50%   | 94%                                 | 15           | \$3,640      |
| New                  | Other            | Cooling DX       | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning   | No Commissioning                            | 0.78                     | 12.5%                     | 90%   | 80%                                 | 3            | \$4,218      |
| New                  | Other            | Cooling DX       | Direct / Indirect Evaporative Cooling, Pre-Cooling                  | Direct / Indirect Evaporative Cooling, Pre-Cooling   | No modification to DX system                | 0.78                     | 25.0%                     | 50%   | 85%                                 | 15           | \$12039      |
| New                  | Other            | Cooling DX       | Direct Digital Control System-Optimization                          | DDC System (Optimized)   | DDC System (Basic)                          | 0.78                     | 10.0%                     | 75%   | 80%                                 | 5            | \$3,112      |
| New                  | Other            | Cooling DX       | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air) | 0.78                     | 4.5%                      | 5%  | 85%                                 | 10           | \$5,726      |
| New                  | Other            | Cooling DX       | Green Roof  | Vegetation on Roof   | Standard roofing techniques                 | 0.78                     | 10.0%                     | 15%   | 98%                                 | 30           | \$58537      |
| New                  | Other            | Cooling DX       | Insulation (Ceiling)  | R-38   | R-21 (Code)                                 | 0.78                     | 2.0%                      | 75%   | 45%                                 | 25           | \$3,005      |
| New                  | Other            | Cooling DX       | Insulation (Ceiling)  | R-49   | R-21 (Code)                                 | 0.78                     | 3.0%                      | 75%   | 85%                                 | 25           | \$3,987      |
| New                  | Other            | Cooling DX       | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 0.78                     | 3.0%                      | 95%   | 95%                                 | 25           | \$1,839      |
| New                  | Other            | Cooling DX       | Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)                                 | 0.78                     | 1.0%                      | 35%   | 50%                                 | 25           | \$520        |
| New                  | Other            | Cooling DX       | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                        | 0.78                     | 10.0%                     | 40%   | 98%                                 | 25           | \$896        |
| New                  | Other            | Cooling DX       | Windows   | U = 0.35   | U = 0.55 (Code)                             | 0.78                     | 0.7%                      | 80%   | 70%                                 | 25           | \$2,851      |
| New                  | Other            | HVAC Aux         | Automated Exhaust VFD Control - Parking Garage CO sensor            | CO Sensors   | No CO Sensors                               | 1.77                     | 20.0%                     | 5%  | 75%                                 | 10           | \$1,181      |
| New                  | Other            | HVAC Aux         | Cooking Hood Controls   | Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air      | No Cooking Hood Controls                    | 1.77                     | 7.5%                      | 5%  | 85%                                 | 10           | \$6,829      |

| Construction Vintage | Customer Segment | End Use   | Measure Name  | Measure Description  | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|---|--|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Other            | HVAC Aux  | Motor - Premium-Efficiency  | PE Motors for HVAC Applications  | Standard Efficiency Motors   | 1.77                     | 3.8%                          | 85%   | 81%                                 | 10           | \$272        |
| New                  | Other            | HVAC Aux  | Motor - Pump & Fan System - Variable Speed Control                  | Pump And Fan System Optimization w/ VSD Control                                | No Pump And Fan System VSD Optimization  | 1.77                     | 33.8%                         | 85%   | 75%                                 | 20           | \$1,172      |
| New                  | Other            | HVAC Aux  | Motor - VAV Box High-Efficiency                                     | ECM Motors   | Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control | 1.77                     | 8.8%                          | 20%   | 77%                                 | 10           | \$2,110      |
| New                  | Other            | HVAC Aux  | Optimized Variable Volume Lab Hood Design                           | Optimized Variable Volume Lab Hood Design                                      | Constant Volume Lab Hood Design  | 1.77                     | 1.6%                          | 5%  | 94%                                 | 10           | \$1,791      |
| New                  | Other            | Heat Pump | High-Efficiency EER=11.0, COP=3.5                                   | High-Efficiency EER=11.0, COP=3.5  | EER=10.1, COP=3.2  | 1.49                     | 16.8%                         | NA  | NA                                  | 15           | \$1,709      |
| New                  | Other            | Heat Pump | Premium-Efficiency EER=11.8, COP=3.8                                | Premium-Efficiency EER=11.8, COP=3.8   | EER=10.1, COP=3.2  | 1.49                     | 30.2%                         | NA  | NA                                  | 15           | \$3,659      |
| New                  | Other            | Heat Pump | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)                                    | Constant Ventilation   | 1.35                     | 10.0%                         | 50%   | 94%                                 | 15           | \$3,640      |
| New                  | Other            | Heat Pump | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning                                     | No Commissioning   | 1.35                     | 12.5%                         | 90%   | 80%                                 | 3            | \$4,218      |
| New                  | Other            | Heat Pump | Direct Digital Control System-Optimization                          | DDC System (Optimized)   | DDC System (Basic)   | 1.35                     | 10.0%                         | 75%   | 80%                                 | 5            | \$3,112      |
| New                  | Other            | Heat Pump | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery  | No Heat Recovery   | 1.35                     | 6.0%                          | 5%  | 94%                                 | 10           | \$9,939      |
| New                  | Other            | Heat Pump | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air)  | 1.35                     | 4.5%                          | 5%  | 85%                                 | 10           | \$5,726      |
| New                  | Other            | Heat Pump | Green Roof  | Vegetation on Roof   | Standard roofing techniques  | 1.35                     | 1.8%                          | 15%   | 98%                                 | 30           | \$58537      |
| New                  | Other            | Heat Pump | Heat Pump - Ground Source (Closed Loop)                             | GSHP: COP=3.1, EER=13.4  | Std. Air Source HP 'EER=10.1, COP=3.2  | 1.35                     | 16.0%                         | 45%   | 92%                                 | 20           | \$19820      |
| New                  | Other            | Heat Pump | Heat Pump - Ground Source (Closed Loop)                             | GSHP: COP=4.0, EER=20  | Std. Air Source HP 'EER=10.1, COP=3.2  | 1.35                     | 38.7%                         | 45%   | 92%                                 | 20           | \$37237      |
| New                  | Other            | Heat Pump | Heat Pump - Water Source (Closed Loop)                              | WSHP: COP=4.2, EER=12.0  | Std. Air Source Heat Pump'EER=10.1, COP=3.2  | 1.35                     | 20.0%                         | 10%   | 90%                                 | 20           | \$3,987      |
| New                  | Other            | Heat Pump | Heat Pump - Water Source (Closed Loop)                              | WSHP: COP=4.8, EER=14.5  | Std. Air Source Heat Pump'EER=10.1, COP=3.2  | 1.35                     | 32.4%                         | 10%   | 90%                                 | 20           | \$5,265      |
| New                  | Other            | Heat Pump | Insulation (Ceiling)  | R-38   | R-21 (Code)  | 1.35                     | 5.9%                          | 75%   | 45%                                 | 25           | \$3,005      |
| New                  | Other            | Heat Pump | Insulation (Ceiling)  | R-49   | R-21 (Code)  | 1.35                     | 8.9%                          | 75%   | 85%                                 | 25           | \$3,987      |
| New                  | Other            | Heat Pump | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)  | 1.35                     | 5.0%                          | 95%   | 95%                                 | 25           | \$1,839      |
| New                  | Other            | Heat Pump | Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)  | 1.35                     | 3.7%                          | 35%   | 50%                                 | 25           | \$520        |
| New                  | Other            | Heat Pump | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands                 | Std duct workmanship   | 1.35                     | 10.0%                         | 40%   | 98%                                 | 25           | \$896        |
| New                  | Other            | Heat Pump | Windows   | U = 0.35   | U = 0.55 (Code)  | 1.35                     | 4.8%                          | 80%   | 70%                                 | 25           | \$2,851      |
| New                  | Other            | Lighting  | Bi-Level Control, Stairwell Lighting                                | Occupancy Sensor Control, 50% Lighting Power during unoccupied Time            | Continuous Full Power Lighting in Stairways  | 1.97                     | 2.0%                          | 25%   | 75%                                 | 9            | \$455        |
| New                  | Other            | Lighting  | Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures     | Continuous Dimming, Fluorescent Fixtures (Day-Lighting)                        | No Dimming Controls  | 1.97                     | 15.0%                         | 60%   | 84%                                 | 9            | \$1,734      |

| Construction Vintage | Customer Segment | End Use       | Measure Name  | Measure Description  | Base Equipment                                       | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|---|--|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Other            | Lighting      | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 15%                                      | Code Required LPD And Control Strategies: LPD = 1.23 | 1.97                     | 15.0%                         | 90%   | 70%                                 | 14           | \$617        |
| New                  | Other            | Lighting      | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 20%                                      | Code Required LPD And Control Strategies: LPD = 1.23 | 1.97                     | 20.0%                         | 75%   | 85%                                 | 14           | \$1,842      |
| New                  | Other            | Lighting      | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 25%                                      | Code Required LPD And Control Strategies: LPD = 1.23 | 1.97                     | 25.0%                         | 70%   | 90%                                 | 14           | \$3,070      |
| New                  | Other            | Lighting      | LED Refrigeration Case Lights                             | LED Refrigeration Case Lights (28W)  | Fluorescent Refrigeration Case Lights (60W)          | 1.97                     | 2.2%                          | 5%  | 80%                                 | 13           | \$630        |
| New                  | Other            | Lighting      | LED Solid State White Lighting Package                    | Landscape, merchandise, signage, structure & task lighting                                   | 50W 10hrs/day, 365 day/yr                            | 1.97                     | 1.5%                          | 10%   | 95%                                 | 14           | \$36         |
| New                  | Other            | Lighting      | Occupancy Sensor Control, Fluorescent                     | Occupancy Sensor Control, Fluorescent  | No Occupancy Sensor                                  | 1.97                     | 4.0%                          | 90%   | 83%                                 | 10           | \$108        |
| New                  | Other            | Plug Load     | Energy Star - Battery Charging System                     | Energy Star Battery Charging System  | Non-Energy Star Battery Chargers                     | 2.57                     | 0.4%                          | 95%   | 90%                                 | 7            | \$2          |
| New                  | Other            | Plug Load     | Energy Star - Computer                                    | Energy Star Features Enabled   | Non-Energy Star Features                             | 2.57                     | 13.6%                         | 64%   | 25%                                 | 4            | \$1          |
| New                  | Other            | Plug Load     | Energy Star - Copiers                                     | Energy Star or Better Office Equipment: Copiers,   | Office Equipment: Copiers, Standard                  | 2.57                     | 8.2%                          | 10%   | 45%                                 | 6            | \$165        |
| New                  | Other            | Plug Load     | Energy Star - Fax   | Energy Star Features Enabled   | Non-Energy Star Features                             | 2.57                     | 1.8%                          | 75%   | 55%                                 | 4            | \$1          |
| New                  | Other            | Plug Load     | Energy Star - Monitors                                    | Energy Star Features Enabled   | Non-Energy Star Features                             | 2.57                     | 18.4%                         | 64%   | 15%                                 | 4            | \$158        |
| New                  | Other            | Plug Load     | Energy Star - Printers                                    | Energy Star Features Enabled   | Non-Energy Star Features                             | 2.57                     | 1.3%                          | 75%   | 40%                                 | 5            | \$16         |
| New                  | Other            | Plug Load     | Energy Star - Scanners                                    | Energy Star Features Enabled   | Non-Energy Star Features                             | 2.57                     | 0.9%                          | 75%   | 45%                                 | 4            | \$1          |
| New                  | Other            | Plug Load     | Energy Star - Water Cooler                                | Energy Star Water Cooler (Hot/Cold Water)  | Non-Energy Star Water Cooler                         | 2.57                     | 2.6%                          | 10%   | 75%                                 | 10           | \$1          |
| New                  | Other            | Plug Load     | Office Computer Network Energy Management                 | Office Computer Network Energy Management  | No Network Management                                | 2.57                     | 1.8%                          | 95%   | 30%                                 | 3            | \$310        |
| New                  | Other            | Plug Load     | Power Supply 80+ Office Measure                           | 80% Efficient Power supply   | No 80+   | 2.57                     | 1.0%                          | 95%   | 86%                                 | 7            | \$1          |
| New                  | Other            | Plug Load     | Refrigerator eCube  | Refrigerator eCube   | No Refrigerator eCube                                | 2.57                     | 1.2%                          | 75%   | 95%                                 | 10           | \$86         |
| New                  | Other            | Plug Load     | Residential-Size Refrigerator                             | Energy Star Residential-Size Refrigerator  | Residential-Size Refrigerator - Standard             | 2.57                     | 0.6%                          | 5%  | 65%                                 | 13           | \$126        |
| New                  | Other            | Plug Load     | Residential-Size Refrigerator/Freezer - Early Replacement | Energy Star Refrigerator/Freezer   | Baseline Refrigerator/Freezer                        | 2.57                     | 6.9%                          | 25%   | 35%                                 | 7            | \$578        |
| New                  | Other            | Plug Load     | Vending Machine   | Energy Star Vending Machines - High-Efficiency   | Vending Machines - Standard                          | 2.57                     | 12.6%                         | 10%   | 80%                                 | 14           | \$189        |
| New                  | Other            | Refrigeration | Commercial Reach-In Refrigerator                          | Energy Star Commercial Reach-In Refrigerator   | Commercial-Size Refrigerator - Standard              | 0.20                     | 54.2%                         | 95%   | 95%                                 | 12           | \$344        |
| New                  | Other            | Refrigeration | Custom Refrigeration System                               | High-Efficiency Custom Refrigeration System (Walk-in) includes compressors                   | Custom Refrigeration System - Standard               | 0.20                     | 3.6%                          | 85%   | 65%                                 | 10           | \$9,596      |
| New                  | Other            | Refrigeration | Ice Maker   | Energy Star Ice Maker - High-Efficiency  | Standard Ice Maker                                   | 0.20                     | 1.1%                          | 5%  | 86%                                 | 9            | \$376        |
| New                  | Other            | Refrigeration | Reduced Speed or Cycling of Evaporator Fans               | VFD on Evaporator Fans (Evap Fan Control on Walk-In)   | Constant Speed Evaporator Fans                       | 0.20                     | 6.0%                          | 75%   | 70%                                 | 10           | \$3          |
| New                  | Other            | Refrigeration | Refrigeration - Commissioning                             | Commissioning (Refrigeration System Diagnostics / Operations and Maintenance for a new unit) | No Commissioning                                     | 0.20                     | 5.0%                          | 80%   | 90%                                 | 3            | \$4          |

| Construction Vintage | Customer Segment | End Use       | Measure Name  | Measure Description  | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|---|--|--|--------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Other            | Refrigeration | Special Glass Doors for Refrigerated Reach-in Cases                 | Do Not Require Anti-Sweat Heating  | Standard Glass Doors                                       | 0.20                     | 3.2%                      | 95%   | 77%                                 | 16           | \$13         |
| New                  | Other            | Refrigeration | Strip Curtains for Walk-Ins   | Strip Curtains for Walk-Ins  | No Strip Curtains for Walk-Ins                             | 0.20                     | 2.0%                      | 95%   | 20%                                 | 4            | \$189        |
| New                  | Other            | Space Heat    | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)  | Constant Ventilation                                       | 0.56                     | 10.0%                     | 50%   | 94%                                 | 15           | \$3,640      |
| New                  | Other            | Space Heat    | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning   | No Commissioning   | 0.56                     | 12.5%                     | 90%   | 80%                                 | 3            | \$4,218      |
| New                  | Other            | Space Heat    | Direct Digital Control System-Optimization                          | DDC System (Optimized)   | DDC System (Basic)   | 0.56                     | 10.0%                     | 75%   | 80%                                 | 5            | \$3,112      |
| New                  | Other            | Space Heat    | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery  | No Heat Recovery   | 0.56                     | 15.0%                     | 5%  | 94%                                 | 10           | \$9,939      |
| New                  | Other            | Space Heat    | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air)                | 0.56                     | 4.5%                      | 5%  | 85%                                 | 10           | \$5,726      |
| New                  | Other            | Space Heat    | Insulation (Ceiling)  | R-49   | R-30   | 0.56                     | 8.0%                      | 75%   | 85%                                 | 25           | \$3,005      |
| New                  | Other            | Space Heat    | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                                | 0.56                     | 6.0%                      | 95%   | 95%                                 | 25           | \$1,839      |
| New                  | Other            | Space Heat    | Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)  | 0.56                     | 5.0%                      | 35%   | 50%                                 | 25           | \$520        |
| New                  | Other            | Space Heat    | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                                       | 0.56                     | 10.0%                     | 40%   | 98%                                 | 25           | \$896        |
| New                  | Other            | Space Heat    | Sensible And Total Heat Recovery Devices                            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery   | 0.56                     | 25.0%                     | 50%   | 98%                                 | 10           | \$12193      |
| New                  | Other            | Space Heat    | Windows   | U = 0.35   | U = 0.40   | 0.56                     | 2.3%                      | 80%   | 70%                                 | 25           | \$712        |
| New                  | Other            | Water Heat    | Water_Heater (40 Gallon Electric) - Residential Sized               | EF = 0.95  | EF = 0.92  | 0.38                     | 3.3%                      | NA  | NA                                  | 20           | \$162        |
| New                  | Other            | Water Heat    | Clothes Washer - Ozonating  | Ozonating Clothes Washer   | Standard Commercial Clothes Washer                         | 0.37                     | 15.1%                     | 5%  | 95%                                 | 10           | \$8,705      |
| New                  | Other            | Water Heat    | Clothes Washer Commercial   | Energy Star Commercial Clothes Washer MEF=1.72   | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.37                     | 12.5%                     | 5%  | 80%                                 | 11           | \$305        |
| New                  | Other            | Water Heat    | Demand controlled Circulating Systems                               | Install demand-based control system (VFD Control by Demand)  | No demand control systems in place                         | 0.37                     | 5.0%                      | 90%   | 94%                                 | 15           | \$1,605      |
| New                  | Other            | Water Heat    | Dishwashing - Commercial - High Efficiency                          | High Efficiency Dishwasher   | Standard Dishwasher  | 0.37                     | 2.1%                      | 10%   | 80%                                 | 10           | \$2,700      |
| New                  | Other            | Water Heat    | Dishwashing - Commercial Chemical System                            | Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)  | High Temp Commercial Dishwasher                            | 0.37                     | 5.6%                      | 10%   | 95%                                 | 10           | \$841        |
| New                  | Other            | Water Heat    | Dishwashing - Residential Sized System                              | EF = 0.65 (ENERGY STAR)  | Standard Dishwasher (FED Std. EF=0.46)                     | 0.37                     | 6.6%                      | 10%   | 25%                                 | 13           | \$32         |
| New                  | Other            | Water Heat    | Dishwashing - Residential Sized System                              | EF = 0.77  | Standard Dishwasher (FED Std. EF=0.46)                     | 0.37                     | 9.1%                      | 10%   | 55%                                 | 13           | \$630        |
| New                  | Other            | Water Heat    | Drainwater Heat Recovery Water Heater                               | Install (Power-Pipe or GFX) - Heat Recovery Water Heater   | No Heat Recovery System                                    | 0.37                     | 20.0%                     | 25%   | 92%                                 | 25           | \$875        |
| New                  | Other            | Water Heat    | Faucet Aerators   | 1.5 GPM Aerator  | 2.5 GPM Aerator (Federal Code)                             | 0.37                     | 4.0%                      | 95%   | 25%                                 | 10           | \$0          |
| New                  | Other            | Water Heat    | Heat Pump Water Heater  | EF = 2.9   | EF=0.93 Baseline Electric Water Heater                     | 0.37                     | 58.9%                     | 50%   | 94%                                 | 15           | \$9,626      |

| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description  | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|--|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Other            | Water Heat | Low Flow Spray Heads  | 1.6 GPM  | 3.0 GPM  | 0.37                     | 2.3%                          | 50%   | 50%                                 | 5            | \$5          |
| New                  | Other            | Water Heat | Low-Flow Showerheads  | 2.0 GPM Showerhead   | 2.5 GPM Showerhead (Federal Code)                        | 0.37                     | 1.1%                          | 15%   | 75%                                 | 10           | \$6          |
| New                  | Other            | Water Heat | Solar RE - Solar Water Heater                                 | Passive solar water heating  | Non-solar hot water heater                               | 0.37                     | 62.3%                         | 20%   | 95%                                 | 20           | \$17861      |
| New                  | Other            | Water Heat | Ultrasonic Faucet Control                                     | Install Ultrasonic Motion Faucet Control                                       | No Faucet Control  | 0.37                     | 3.3%                          | 95%   | 95%                                 | 10           | \$206        |
| New                  | Other            | Water Heat | Water Heater Thermostat Setback                               | Thermostat Setback and Replacement (120 Degrees)                               | No Thermostat Setback (130 Degrees)                      | 0.37                     | 7.7%                          | 75%   | 55%                                 | 11           | \$107        |
| Existing             | Restaurant       | Cooking    | Cooking Fryers - Commercial                                   | Energy Star Commercial Fryer   | Non-Energy Star Fryer                                    | 9.60                     | 2.5%                          | 45%   | 70%                                 | 12           | \$4,946      |
| Existing             | Restaurant       | Cooking    | Hot Food Holding Cabinets - Commercial                        | Energy Star Commercial Hot Food Holding Cabinets                               | Non-Energy Star Commercial Hot Food Holding Cabinets     | 9.60                     | 8.4%                          | 35%   | 85%                                 | 12           | \$1,800      |
| Existing             | Restaurant       | Cooking    | Oven - Convection   | Convection Oven  | Standard Oven  | 9.60                     | 3.4%                          | 85%   | 85%                                 | 15           | \$1,734      |
| Existing             | Restaurant       | Cooking    | Steam Cookers - Commercial                                    | Energy Star Commercial Steam Cookers (50% efficiency)                          | Non-Energy Star Commercial Steam Cooker (35% efficiency) | 9.60                     | 5.5%                          | 35%   | 75%                                 | 10           | \$1          |
| Existing             | Restaurant       | Cooling DX | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)        | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)                         | 10.3 EER Rooftop Unit (State Code)                       | 4.00                     | 14.2%                         | NA  | NA                                  | 15           | \$4,353      |
| Existing             | Restaurant       | Cooling DX | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)           | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)                            | 10.3 EER Rooftop Unit (State Code)                       | 4.00                     | 6.4%                          | NA  | NA                                  | 15           | \$2,317      |
| Existing             | Restaurant       | Cooling DX | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)         | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)                          | 10.3 EER Rooftop Unit (State Code)                       | 4.00                     | 10.4%                         | NA  | NA                                  | 15           | \$3,592      |
| Existing             | Restaurant       | Cooling DX | Commissioning - Retro Building Commissioning                  | Commissioning - Retro Building Commissioning                                   | No Commissioning   | 4.16                     | 12.5%                         | 90%   | 40%                                 | 3            | \$1,035      |
| Existing             | Restaurant       | Cooling DX | Cooling DX Package-Air Side Economizer                        | Air-Side Economizer  | No Economizer  | 4.16                     | 15.0%                         | 10%   | 50%                                 | 15           | \$3,173      |
| Existing             | Restaurant       | Cooling DX | Direct / Indirect Evaporative Cooling, Pre-Cooling            | Direct / Indirect Evaporative Cooling, Pre-Cooling                             | No modification to DX system                             | 4.16                     | 25.0%                         | 50%   | 85%                                 | 15           | \$10944      |
| Existing             | Restaurant       | Cooling DX | Direct Digital Control System-Installation                    | DDC Retrofit   | Pneumatic  | 4.16                     | 15.0%                         | 5%  | 100%                                | 5            | \$5,051      |
| Existing             | Restaurant       | Cooling DX | Direct Digital Control System-Optimization                    | DDC System (Optimized)   | DDC System (Basic)                                       | 4.16                     | 10.0%                         | 75%   | 100%                                | 5            | \$2,829      |
| Existing             | Restaurant       | Cooling DX | Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control        | Pneumatic  | 4.16                     | 15.0%                         | 50%   | 100%                                | 5            | \$2,041      |
| Existing             | Restaurant       | Cooling DX | Duct Repair And Sealing                                       | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses                    | 4.16                     | 2.5%                          | 45%   | 45%                                 | 18           | \$2,101      |
| Existing             | Restaurant       | Cooling DX | Exhaust Hood Makeup Air                                       | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air)              | 4.16                     | 4.5%                          | 100%  | 85%                                 | 10           | \$5,726      |
| Existing             | Restaurant       | Cooling DX | Green Roof  | Vegetation on Roof   | Standard roofing techniques                              | 4.16                     | 5.0%                          | 15%   | 98%                                 | 30           | \$53216      |
| Existing             | Restaurant       | Cooling DX | Infiltration Control (Caulking, Weather Stripping, etc.)      | Install Caulking And Weatherstripping (ACH 0.65)                               | Infiltration Conditions (ACH 1.0)                        | 4.16                     | 5.0%                          | 40%   | 10%                                 | 10           | \$1,230      |
| Existing             | Restaurant       | Cooling DX | Insulation (Ceiling)  | R-38   | R-21 (Code)  | 4.16                     | 2.0%                          | 75%   | 95%                                 | 25           | \$2,732      |
| Existing             | Restaurant       | Cooling DX | Insulation (Ceiling)  | R-49   | R-21 (Code)  | 4.16                     | 3.0%                          | 75%   | 98%                                 | 25           | \$3,625      |

| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description   | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|---|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Restaurant       | Cooling DX | Insulation (Ceiling) - Existing to Code                       | R-21 (Code)   | Existing Ceiling Insulation (Average R-9)  | 4.16                     | 2.4%                          | 75%   | 85%                                 | 25           | \$3,204      |
| Existing             | Restaurant       | Cooling DX | Insulation (Ceiling) - Zero to Code                           | R-21 (Code)   | R-0  | 4.16                     | 6.0%                          | 75%   | 0%                                  | 25           | \$3,204      |
| Existing             | Restaurant       | Cooling DX | Insulation (Duct) (Unconditioned Spaces)                      | Install New Duct Insulation (R-8)   | R-0  | 4.16                     | 4.4%                          | 10%   | 15%                                 | 25           | \$587        |
| Existing             | Restaurant       | Cooling DX | Insulation (Duct) (Unconditioned Spaces)                      | R-4   | R-0  | 4.16                     | 2.4%                          | 10%   | 15%                                 | 25           | \$612        |
| Existing             | Restaurant       | Cooling DX | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced   | R-19 (2x6 Framing) - (Code)  | 4.16                     | 3.0%                          | 10%   | 95%                                 | 25           | \$1,753      |
| Existing             | Restaurant       | Cooling DX | Insulation (Wall) - Existing to Code                          | R-19 (2x6 Framing) - (Code)   | Existing R-value (Average R-3)   | 4.16                     | 8.4%                          | 10%   | 35%                                 | 25           | \$1,921      |
| Existing             | Restaurant       | Cooling DX | Insulation (Wall) - Zero to Code                              | R-19 (2x6 Framing) - (Code)   | R-0  | 4.16                     | 10.0%                         | 10%   | 0%                                  | 25           | \$1,899      |
| Existing             | Restaurant       | Cooling DX | Insulation - Floor (Non-Slab)                                 | R-19  | R-10 (Code)  | 4.16                     | 1.0%                          | 35%   | 90%                                 | 25           | \$473        |
| Existing             | Restaurant       | Cooling DX | Insulation - Floor (Non-Slab) - Existing to Code              | R-10 (Code)   | R-0  | 4.16                     | 3.0%                          | 35%   | 90%                                 | 25           | \$2,732      |
| Existing             | Restaurant       | Cooling DX | Thermostat - Programmable                                     | Energy Star Programmable Thermostat   | Manual Thermostat  | 4.16                     | 3.0%                          | 95%   | 42%                                 | 15           | \$146        |
| Existing             | Restaurant       | Cooling DX | Windows   | U = 0.35  | U = 0.55 (Code)  | 4.16                     | 1.0%                          | 80%   | 80%                                 | 25           | \$6,876      |
| Existing             | Restaurant       | Cooling DX | Windows - Existing to Code                                    | U = 0.55 (Code)   | Existing Windows (U=0.65)  | 4.16                     | 0.5%                          | 10%   | 80%                                 | 25           | \$19413      |
| Existing             | Restaurant       | HVAC Aux   | Automated Exhaust VFD Control - Parking Garage CO sensor      | CO Sensors  | No CO Sensors  | 3.64                     | 20.0%                         | 1%  | 85%                                 | 10           | \$1,074      |
| Existing             | Restaurant       | HVAC Aux   | Cooking Hood Controls   | Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air | No Cooking Hood Controls   | 3.64                     | 7.5%                          | 100%  | 25%                                 | 10           | \$13133      |
| Existing             | Restaurant       | HVAC Aux   | Motor - Premium-Efficiency                                    | PE Motors for HVAC Applications   | Standard Efficiency Motors   | 3.64                     | 3.8%                          | 85%   | 81%                                 | 10           | \$247        |
| Existing             | Restaurant       | HVAC Aux   | Motor - Pump & Fan System - Variable Speed Control            | Pump And Fan System Optimization w/ VSD Control   | No Pump And Fan System VSD Optimization  | 3.64                     | 33.8%                         | 85%   | 75%                                 | 20           | \$1,066      |
| Existing             | Restaurant       | HVAC Aux   | Motor - VAV Box High-Efficiency                               | ECM Motors  | Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control | 3.64                     | 8.8%                          | 10%   | 77%                                 | 10           | \$1,918      |
| Existing             | Restaurant       | HVAC Aux   | Optimized Variable Volume Lab Hood Design                     | Optimized Variable Volume Lab Hood Design   | Constant Volume Lab Hood Design  | 3.64                     | 1.6%                          | 0%  | 94%                                 | 10           | \$1,791      |
| Existing             | Restaurant       | Heat Pump  | High-Efficiency EER=11.0, COP=3.5                             | High-Efficiency EER=11.0, COP=3.5   | EER=10.1, COP=3.2  | 4.79                     | 16.8%                         | NA  | NA                                  | 15           | \$3,086      |
| Existing             | Restaurant       | Heat Pump  | Premium-Efficiency EER=11.8, COP=3.8                          | Premium-Efficiency EER=11.8, COP=3.8  | EER=10.1, COP=3.2  | 4.79                     | 30.2%                         | NA  | NA                                  | 15           | \$6,607      |
| Existing             | Restaurant       | Heat Pump  | Commissioning - Retro Building Commissioning                  | Commissioning - Retro Building Commissioning  | No Commissioning   | 5.06                     | 12.5%                         | 90%   | 40%                                 | 3            | \$1,035      |
| Existing             | Restaurant       | Heat Pump  | Direct Digital Control System-Installation                    | DDC Retrofit  | Pneumatic  | 5.06                     | 15.0%                         | 5%  | 100%                                | 5            | \$5,051      |
| Existing             | Restaurant       | Heat Pump  | Direct Digital Control System-Optimization                    | DDC System (Optimized)  | DDC System (Basic)   | 5.06                     | 10.0%                         | 75%   | 100%                                | 5            | \$2,829      |
| Existing             | Restaurant       | Heat Pump  | Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control   | Pneumatic  | 5.06                     | 15.0%                         | 50%   | 100%                                | 5            | \$2,041      |

| Construction Vintage | Customer Segment | End Use   | Measure Name  | Measure Description  | Base Equipment                              | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|---|--|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Restaurant       | Heat Pump | Duct Repair And Sealing   | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 5.06                     | 2.5%                          | 45%   | 45%                                 | 18           | \$2,101      |
| Existing             | Restaurant       | Heat Pump | Exhaust Air to Ventilation Air Heat Recovery                    | Exhaust Air Heat Recovery  | No Heat Recovery                            | 5.06                     | 2.5%                          | 5%  | 94%                                 | 10           | \$9,035      |
| Existing             | Restaurant       | Heat Pump | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air) | 5.06                     | 4.5%                          | 100%  | 85%                                 | 10           | \$5,726      |
| Existing             | Restaurant       | Heat Pump | Green Roof  | Vegetation on Roof   | Standard roofing techniques                 | 5.06                     | 1.3%                          | 15%   | 98%                                 | 30           | \$53216      |
| Existing             | Restaurant       | Heat Pump | Heat Pump - Ground Source (Closed Loop)                         | GSHP: COP=3.1, EER=13.4  | Std. Air Source HP 'EER=10.1, COP=3.2       | 5.06                     | 21.1%                         | 5%  | 92%                                 | 20           | \$35790      |
| Existing             | Restaurant       | Heat Pump | Heat Pump - Ground Source (Closed Loop)                         | GSHP: COP=4.0, EER=20  | Std. Air Source HP 'EER=10.1, COP=3.2       | 5.06                     | 45.0%                         | 5%  | 92%                                 | 20           | \$67238      |
| Existing             | Restaurant       | Heat Pump | Heat Pump - Water Source (Closed Loop)                          | WSHP: COP=4.2, EER=12.0  | Std. Air Source Heat Pump'EER=10.1, COP=3.2 | 5.06                     | 17.6%                         | 0%  | 90%                                 | 20           | \$7,199      |
| Existing             | Restaurant       | Heat Pump | Heat Pump - Water Source (Closed Loop)                          | WSHP: COP=4.8, EER=14.5  | Std. Air Source Heat Pump'EER=10.1, COP=3.2 | 5.06                     | 31.2%                         | 0%  | 90%                                 | 20           | \$9,508      |
| Existing             | Restaurant       | Heat Pump | Infiltration Control (Caulking, Weather Stripping, etc.)        | Install Caulking And Weatherstripping (ACH 0.65)                               | Infiltration Conditions (ACH 1.0)           | 5.06                     | 8.3%                          | 40%   | 10%                                 | 10           | \$1,230      |
| Existing             | Restaurant       | Heat Pump | Insulation (Ceiling)  | R-38   | R-21 (Code)                                 | 5.06                     | 5.9%                          | 75%   | 95%                                 | 25           | \$2,732      |
| Existing             | Restaurant       | Heat Pump | Insulation (Ceiling)  | R-49   | R-21 (Code)                                 | 5.06                     | 8.9%                          | 75%   | 98%                                 | 25           | \$3,625      |
| Existing             | Restaurant       | Heat Pump | Insulation (Ceiling) - Existing to Code                         | R-21 (Code)  | Existing Ceiling Insulation (Average R-9)   | 5.06                     | 5.5%                          | 75%   | 85%                                 | 25           | \$3,204      |
| Existing             | Restaurant       | Heat Pump | Insulation (Ceiling) - Zero to Code                             | R-21 (Code)  | R-0   | 5.06                     | 13.8%                         | 75%   | 0%                                  | 25           | \$3,204      |
| Existing             | Restaurant       | Heat Pump | Insulation (Duct) (Unconditioned Spaces)                        | Install New Duct Insulation (R-8)  | R-0   | 5.06                     | 4.4%                          | 10%   | 15%                                 | 25           | \$587        |
| Existing             | Restaurant       | Heat Pump | Insulation (Duct) (Unconditioned Spaces)                        | R-4  | R-0   | 5.06                     | 2.4%                          | 10%   | 15%                                 | 25           | \$612        |
| Existing             | Restaurant       | Heat Pump | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 5.06                     | 5.0%                          | 10%   | 95%                                 | 25           | \$1,753      |
| Existing             | Restaurant       | Heat Pump | Insulation (Wall) - Existing to Code                            | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)              | 5.06                     | 16.6%                         | 10%   | 35%                                 | 25           | \$1,921      |
| Existing             | Restaurant       | Heat Pump | Insulation (Wall) - Zero to Code                                | R-19 (2x6 Framing) - (Code)  | R-0   | 5.06                     | 19.8%                         | 10%   | 0%                                  | 25           | \$1,899      |
| Existing             | Restaurant       | Heat Pump | Insulation - Floor (Non-Slab)                                   | R-19   | R-10 (Code)                                 | 5.06                     | 3.7%                          | 35%   | 90%                                 | 25           | \$473        |
| Existing             | Restaurant       | Heat Pump | Insulation - Floor (Non-Slab) - Existing to Code                | R-10 (Code)  | R-0   | 5.06                     | 11.1%                         | 35%   | 90%                                 | 25           | \$2,732      |
| Existing             | Restaurant       | Heat Pump | Thermostat - Programmable                                       | Energy Star Programmable Thermostat  | Manual Thermostat                           | 5.06                     | 3.0%                          | 95%   | 42%                                 | 15           | \$146        |
| Existing             | Restaurant       | Heat Pump | Windows   | U = 0.35   | U = 0.55 (Code)                             | 5.06                     | 6.8%                          | 80%   | 80%                                 | 25           | \$6,876      |
| Existing             | Restaurant       | Heat Pump | Windows - Existing to Code                                      | U = 0.55 (Code)  | Existing Windows (U=0.65)                   | 5.06                     | 4.5%                          | 10%   | 80%                                 | 25           | \$19413      |
| Existing             | Restaurant       | Lighting  | Bi-Level Control, Stairwell Lighting                            | Occupancy Sensor Control, 50% Lighting Power during unoccupied Time            | Continuous Full Power Lighting in Stairways | 5.82                     | 2.0%                          | 10%   | 75%                                 | 9            | \$414        |
| Existing             | Restaurant       | Lighting  | Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures | Continuous Dimming, Fluorescent Fixtures (Day-Lighting)                        | No Dimming Controls                         | 5.82                     | 6.0%                          | 30%   | 98%                                 | 9            | \$631        |



| Construction Vintage | Customer Segment | End Use       | Measure Name  | Measure Description   | Base Equipment                                       | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|---|---|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Restaurant       | Lighting      | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 15%   | Code Required LPD And Control Strategies: LPD = 1.43 | 5.82                     | 15.0%                         | 90%   | 70%                                 | 14           | \$1,283      |
| Existing             | Restaurant       | Lighting      | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 20%   | Code Required LPD And Control Strategies: LPD = 1.43 | 5.82                     | 20.0%                         | 75%   | 85%                                 | 14           | \$2,843      |
| Existing             | Restaurant       | Lighting      | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 25%   | Code Required LPD And Control Strategies: LPD = 1.43 | 5.82                     | 25.0%                         | 70%   | 90%                                 | 14           | \$4,438      |
| Existing             | Restaurant       | Lighting      | HE Fixtures/Design - Existing to Code                     | Code Required LPD And Control Strategies: LPD = 1.43  | Existing Lighting Design                             | 5.82                     | 22.0%                         | 95%   | 45%                                 | 14           | \$6,125      |
| Existing             | Restaurant       | Lighting      | LED Exit Lighting   | 5 Watts   | CFL Exit Sign (26 Watts)                             | 5.82                     | 1.6%                          | 95%   | 65%                                 | 11           | \$53         |
| Existing             | Restaurant       | Lighting      | LED Refrigeration Case Lights                             | LED Refrigeration Case Lights (28W)   | Fluorescent Refrigeration Case Lights (60W)          | 5.82                     | 1.1%                          | 50%   | 80%                                 | 13           | \$630        |
| Existing             | Restaurant       | Lighting      | LED Solid State White Lighting Package                    | Landscape, merchandise, signage, structure & task lighting  | 50W 10hrs/day, 365 day/yr                            | 5.82                     | 1.5%                          | 10%   | 95%                                 | 14           | \$37         |
| Existing             | Restaurant       | Lighting      | Occupancy Sensor Control, Fluorescent                     | Occupancy Sensor Control, Fluorescent   | No Occupancy Sensor                                  | 5.82                     | 4.0%                          | 45%   | 100%                                | 9            | \$98         |
| Existing             | Restaurant       | Lighting      | Time Clocks And Timers                                    | Install Time Clock Lighting   | No Time Clock  | 5.82                     | 4.9%                          | 85%   | 100%                                | 9            | \$215        |
| Existing             | Restaurant       | Plug Load     | Energy Star - Battery Charging System                     | Energy Star Battery Charging System   | Non-Energy Star Battery Chargers                     | 2.25                     | 0.4%                          | 95%   | 90%                                 | 7            | \$2          |
| Existing             | Restaurant       | Plug Load     | Energy Star - Computer                                    | Energy Star Features Enabled  | Non-Energy Star Features                             | 2.25                     | 13.6%                         | 64%   | 25%                                 | 4            | \$1          |
| Existing             | Restaurant       | Plug Load     | Energy Star - Copiers                                     | Energy Star or Better Office Equipment: Copiers,  | Office Equipment: Copiers, Standard                  | 2.25                     | 10.6%                         | 5%  | 45%                                 | 6            | \$165        |
| Existing             | Restaurant       | Plug Load     | Energy Star - Fax   | Energy Star Features Enabled  | Non-Energy Star Features                             | 2.25                     | 1.8%                          | 75%   | 55%                                 | 4            | \$1          |
| Existing             | Restaurant       | Plug Load     | Energy Star - Monitors                                    | Energy Star Features Enabled  | Non-Energy Star Features                             | 2.25                     | 18.4%                         | 64%   | 15%                                 | 4            | \$158        |
| Existing             | Restaurant       | Plug Load     | Energy Star - Printers                                    | Energy Star Features Enabled  | Non-Energy Star Features                             | 2.25                     | 1.3%                          | 75%   | 40%                                 | 5            | \$16         |
| Existing             | Restaurant       | Plug Load     | Energy Star - Scanners                                    | Energy Star Features Enabled  | Non-Energy Star Features                             | 2.25                     | 0.9%                          | 75%   | 45%                                 | 4            | \$1          |
| Existing             | Restaurant       | Plug Load     | Energy Star - Water Cooler                                | Energy Star Water Cooler (Hot/Cold Water)   | Non-Energy Star Water Cooler                         | 2.25                     | 3.4%                          | 35%   | 75%                                 | 10           | \$1          |
| Existing             | Restaurant       | Plug Load     | Office Computer Network Energy Management                 | Office Computer Network Energy Management   | No Network Management                                | 2.25                     | 1.8%                          | 95%   | 30%                                 | 3            | \$310        |
| Existing             | Restaurant       | Plug Load     | Power Supply 80+ Office Measure                           | 80% Efficient Power supply  | No 80+   | 2.25                     | 1.0%                          | 95%   | 86%                                 | 7            | \$1          |
| Existing             | Restaurant       | Plug Load     | Refrigerator eCube  | Refrigerator eCube  | No Refrigerator eCube                                | 2.25                     | 1.2%                          | 75%   | 95%                                 | 10           | \$86         |
| Existing             | Restaurant       | Plug Load     | Residential-Size Refrigerator                             | Energy Star Residential-Size Refrigerator   | Residential-Size Refrigerator - Standard             | 2.25                     | 0.8%                          | 35%   | 65%                                 | 13           | \$126        |
| Existing             | Restaurant       | Plug Load     | Residential-Size Refrigerator/Freezer - Early Replacement | Energy Star Refrigerator/Freezer  | Baseline Refrigerator/Freezer                        | 2.25                     | 8.9%                          | 25%   | 35%                                 | 7            | \$578        |
| Existing             | Restaurant       | Plug Load     | Vending Machine   | Energy Star Vending Machines - High-Efficiency  | Vending Machines - Standard                          | 2.25                     | 16.5%                         | 5%  | 80%                                 | 14           | \$189        |
| Existing             | Restaurant       | Plug Load     | Vending Miser   | Passive Infrared Sensor on Vending Machine Monitoring Vacancy of Area And Cycles Cooling - Controls | No Vending Miser - No controls                       | 2.25                     | 16.9%                         | 5%  | 25%                                 | 3            | \$298        |
| Existing             | Restaurant       | Refrigeration | Anti-Sweat (Humidistat) Controls                          | Variable Temp. Controls (Humidistat)  | Constant Controls                                    | 5.60                     | 35.8%                         | 25%   | 45%                                 | 12           | \$954        |
| Existing             | Restaurant       | Refrigeration | Commercial Reach-In Refrigerator                          | Energy Star Commercial Reach-In Refrigerator  | Commercial-Size Refrigerator - Standard              | 5.60                     | 17.4%                         | 95%   | 100%                                | 12           | \$345        |

| Construction Vintage | Customer Segment | End Use       | Measure Name  | Measure Description   | Base Equipment                                | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|---|---|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Restaurant       | Refrigeration | Custom Refrigeration System                                   | High-Efficiency Custom Refrigeration System (Walk-in) includes compressors                        | Custom Refrigeration System - Standard        | 5.60                     | 3.6%                          | 85%   | 65%                                 | 10           | \$9,595      |
| Existing             | Restaurant       | Refrigeration | Display Cases   | High-Efficiency Display Cases   | Display Cases - Standard                      | 5.60                     | 3.6%                          | 40%   | 90%                                 | 15           | \$1,278      |
| Existing             | Restaurant       | Refrigeration | High-Efficiency Compressor                                    | High-Efficiency Compressor (15% More Efficient)   | Standard Compressor, 40% Efficiency           | 5.60                     | 8.4%                          | 85%   | 72%                                 | 10           | \$1,578      |
| Existing             | Restaurant       | Refrigeration | High-Efficiency Evaporator Fans - Walk-ins                    | High-Efficiency Evaporator Fans, Walk-in Refrigerators  | Standard Evaporator Fans                      | 5.60                     | 1.0%                          | 92%   | 75%                                 | 15           | \$203        |
| Existing             | Restaurant       | Refrigeration | Ice Maker   | Energy Star Ice Maker - High-Efficiency   | Standard Ice Maker                            | 5.60                     | 5.8%                          | 85%   | 86%                                 | 9            | \$376        |
| Existing             | Restaurant       | Refrigeration | Motor - Case Fans with ECM motors                             | ECM motors on evaporator fan, on display cases  | 48 cf 2-door reach-in commercial refrigerator | 5.60                     | 0.5%                          | 80%   | 50%                                 | 20           | \$229        |
| Existing             | Restaurant       | Refrigeration | Reduced Speed or Cycling of Evaporator Fans                   | VFD on Evaporator Fans (Evap Fan Control on Walk-In)  | Constant Speed Evaporator Fans                | 5.60                     | 6.0%                          | 75%   | 70%                                 | 10           | \$76         |
| Existing             | Restaurant       | Refrigeration | Refrigeration - Retro Commissioning                           | Refrigeration Retro Commissioning (Refrigeration System Diagnostics / Operations And Maintenance) | No Re-commissioning                           | 5.60                     | 5.0%                          | 80%   | 90%                                 | 3            | \$94         |
| Existing             | Restaurant       | Refrigeration | Special Glass Doors for Refrigerated Reach-in Cases           | Do Not Require Anti-Sweat Heating   | Standard Glass Doors                          | 5.60                     | 3.2%                          | 95%   | 77%                                 | 16           | \$315        |
| Existing             | Restaurant       | Refrigeration | Strip Curtains for Walk-Ins                                   | Strip Curtains for Walk-Ins   | No Strip Curtains for Walk-Ins                | 5.60                     | 2.0%                          | 95%   | 20%                                 | 4            | \$189        |
| Existing             | Restaurant       | Space Heat    | Commissioning - Retro Building Commissioning                  | Commissioning - Retro Building Commissioning  | No Commissioning                              | 1.38                     | 12.5%                         | 90%   | 40%                                 | 3            | \$1,035      |
| Existing             | Restaurant       | Space Heat    | Direct Digital Control System-Installation                    | DDC Retrofit  | Pneumatic                                     | 1.38                     | 15.0%                         | 5%  | 100%                                | 5            | \$5,051      |
| Existing             | Restaurant       | Space Heat    | Direct Digital Control System-Optimization                    | DDC System (Optimized)  | DDC System (Basic)                            | 1.38                     | 10.0%                         | 75%   | 100%                                | 5            | \$2,829      |
| Existing             | Restaurant       | Space Heat    | Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control                           | Pneumatic                                     | 1.38                     | 15.0%                         | 50%   | 100%                                | 5            | \$2,041      |
| Existing             | Restaurant       | Space Heat    | Duct Repair And Sealing                                       | Reduction In Duct Losses to 5%  | No Repair or Sealing, 15% duct losses         | 1.38                     | 2.5%                          | 45%   | 45%                                 | 18           | \$2,101      |
| Existing             | Restaurant       | Space Heat    | Exhaust Air to Ventilation Air Heat Recovery                  | Exhaust Air Heat Recovery   | No Heat Recovery                              | 1.38                     | 15.0%                         | 5%  | 94%                                 | 10           | \$9,035      |
| Existing             | Restaurant       | Space Heat    | Exhaust Hood Makeup Air                                       | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air                    | Hood Pulls Conditioned Air (No Make-up Air)   | 1.38                     | 4.5%                          | 100%  | 85%                                 | 10           | \$5,726      |
| Existing             | Restaurant       | Space Heat    | Infiltration Control (Caulking, Weather Stripping, etc.)      | Install Caulking And Weatherstripping (ACH 0.65)  | Infiltration Conditions (ACH 1.0)             | 1.38                     | 10.0%                         | 40%   | 10%                                 | 10           | \$1,230      |
| Existing             | Restaurant       | Space Heat    | Insulation (Ceiling)  | R-49  | R-30  | 1.38                     | 8.0%                          | 75%   | 98%                                 | 25           | \$2,732      |
| Existing             | Restaurant       | Space Heat    | Insulation (Ceiling) - Existing to Code                       | R-30  | Existing Ceiling Insulation (Average R-9)     | 1.38                     | 12.5%                         | 75%   | 85%                                 | 25           | \$3,204      |
| Existing             | Restaurant       | Space Heat    | Insulation (Ceiling) - Zero to Code                           | R-30  | R-0   | 1.38                     | 25.0%                         | 75%   | 0%                                  | 25           | \$3,204      |
| Existing             | Restaurant       | Space Heat    | Insulation (Duct) (Unconditioned Spaces)                      | Install New Duct Insulation (R-8)   | R-0   | 1.38                     | 4.4%                          | 10%   | 15%                                 | 25           | \$587        |
| Existing             | Restaurant       | Space Heat    | Insulation (Duct) (Unconditioned Spaces)                      | R-4   | R-0   | 1.38                     | 2.4%                          | 10%   | 15%                                 | 25           | \$612        |
| Existing             | Restaurant       | Space Heat    | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced   | R-19 (2x6 Framing) - (Code)                   | 1.38                     | 6.0%                          | 10%   | 95%                                 | 25           | \$1,753      |
| Existing             | Restaurant       | Space Heat    | Insulation (Wall) - Existing to Code                          | R-19 (2x6 Framing) - (Code)   | Existing R-value (Average R-3)                | 1.38                     | 21.1%                         | 10%   | 35%                                 | 25           | \$1,921      |

| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description  | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|--|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Restaurant       | Space Heat | Insulation (Wall) - Zero to Code                    | R-19 (2x6 Framing) - (Code)  | R-0  | 1.38                     | 25.0%                         | 10%   | 0%                                  | 25           | \$1,899      |
| Existing             | Restaurant       | Space Heat | Insulation - Floor (Non-Slab)                       | R-19   | R-10 (Code)  | 1.38                     | 5.0%                          | 35%   | 90%                                 | 25           | \$473        |
| Existing             | Restaurant       | Space Heat | Insulation - Floor (Non-Slab) - Existing to Code    | R-10 (Code)  | R-0  | 1.38                     | 15.0%                         | 35%   | 90%                                 | 25           | \$2,732      |
| Existing             | Restaurant       | Space Heat | Sensible And Total Heat Recovery Devices            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery   | 1.38                     | 25.0%                         | 25%   | 98%                                 | 10           | \$11084      |
| Existing             | Restaurant       | Space Heat | Thermostat - Programmable                           | Energy Star Programmable Thermostat  | Manual Thermostat  | 1.38                     | 3.0%                          | 95%   | 42%                                 | 15           | \$146        |
| Existing             | Restaurant       | Space Heat | Windows   | U = 0.35   | U = 0.40   | 1.38                     | 3.3%                          | 80%   | 80%                                 | 25           | \$1,719      |
| Existing             | Restaurant       | Space Heat | Windows - Existing to Code                          | U = 0.40   | Existing Windows (U=0.65)                                  | 1.38                     | 9.9%                          | 10%   | 80%                                 | 25           | \$24570      |
| Existing             | Restaurant       | Water Heat | Water_Heater (40 Gallon Electric) Residential Sized | EF = 0.95  | EF = 0.92  | 8.57                     | 3.3%                          | NA  | NA                                  | 20           | \$420        |
| Existing             | Restaurant       | Water Heat | Clothes Washer - Ozonating                          | Ozonating Clothes Washer   | Standard Commercial Clothes Washer                         | 8.81                     | 15.1%                         | 5%  | 95%                                 | 10           | \$8,704      |
| Existing             | Restaurant       | Water Heat | Clothes Washer Commercial                           | Energy Star Commercial Clothes Washer MEF=1.72   | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 8.81                     | 0.6%                          | 5%  | 80%                                 | 11           | \$305        |
| Existing             | Restaurant       | Water Heat | Demand controlled Circulating Systems               | Install demand-based control system (VFD Control by Demand)  | No demand control systems in place                         | 8.81                     | 5.0%                          | 75%   | 94%                                 | 15           | \$1,459      |
| Existing             | Restaurant       | Water Heat | Dishwashing - Commercial - High Efficiency          | High Efficiency Dishwasher   | Standard Dishwasher  | 8.81                     | 2.1%                          | 100%  | 80%                                 | 10           | \$2,700      |
| Existing             | Restaurant       | Water Heat | Dishwashing - Commercial Chemical System            | Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)  | High Temp Commercial Dishwasher                            | 8.81                     | 5.6%                          | 100%  | 95%                                 | 10           | \$841        |
| Existing             | Restaurant       | Water Heat | Dishwashing - Residential Sized System              | EF = 0.65 (ENERGY STAR)  | Standard Dishwasher (FED Std. EF=0.46)                     | 8.81                     | 0.3%                          | 85%   | 25%                                 | 13           | \$32         |
| Existing             | Restaurant       | Water Heat | Dishwashing - Residential Sized System              | EF = 0.77  | Standard Dishwasher (FED Std. EF=0.46)                     | 8.81                     | 0.4%                          | 85%   | 55%                                 | 13           | \$630        |
| Existing             | Restaurant       | Water Heat | Drainwater Heat Recovery Water Heater               | Install (Power-Pipe or GFX) - Heat Recovery Water Heater   | No Heat Recovery System                                    | 8.81                     | 20.0%                         | 5%  | 92%                                 | 25           | \$2,276      |
| Existing             | Restaurant       | Water Heat | Faucet Aerators                                     | 1.5 GPM Aerator  | 2.5 GPM Aerator (Federal Code)                             | 8.81                     | 4.0%                          | 95%   | 25%                                 | 10           | \$0          |
| Existing             | Restaurant       | Water Heat | Faucet Aerators - Existing to Code                  | 2.5 GPM Aerator (Federal Code)   | 4.0 GPM Aerator  | 8.81                     | 3.8%                          | 95%   | 15%                                 | 10           | \$2          |
| Existing             | Restaurant       | Water Heat | Heat Pump Water Heater                              | EF = 2.9   | EF=0.93 Baseline Electric Water Heater                     | 8.81                     | 58.9%                         | 40%   | 94%                                 | 15           | \$9,059      |
| Existing             | Restaurant       | Water Heat | Hot Water (SHW) Pipe Insulation                     | Install Insulation (R-4)   | No Pipe Insulation   | 8.81                     | 1.0%                          | 80%   | 90%                                 | 15           | \$56         |
| Existing             | Restaurant       | Water Heat | Low Flow Spray Heads                                | 1.6 GPM  | 3.0 GPM  | 8.81                     | 2.3%                          | 95%   | 25%                                 | 5            | \$5          |
| Existing             | Restaurant       | Water Heat | Low-Flow Showerheads                                | 2.0 GPM Showerhead   | 2.5 GPM Showerhead (Federal Code)                          | 8.81                     | 1.1%                          | 15%   | 75%                                 | 10           | \$6          |
| Existing             | Restaurant       | Water Heat | Low-Flow Showerheads - Existing to Code             | 2.5 GPM Showerhead (Federal Code)  | 4.5 GPM Showerhead   | 8.81                     | 2.5%                          | 15%   | 20%                                 | 10           | \$12         |
| Existing             | Restaurant       | Water Heat | Solar RE - Solar Water Heater                       | Passive solar water heating  | Non-solar hot water heater                                 | 8.81                     | 39.5%                         | 20%   | 95%                                 | 20           | 107164       |
| Existing             | Restaurant       | Water Heat | Ultrasonic Faucet Control                           | Install Ultrasonic Motion Faucet Control   | No Faucet Control  | 8.81                     | 3.3%                          | 95%   | 75%                                 | 10           | \$206        |

| Construction Vintage | Customer Segment | End Use    | Measure Name   | Measure Description   | Base Equipment   | Baseline kWh (UEC or EUJ) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|--|---|--|---------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Restaurant       | Water Heat | Water Heater Thermostat Setback                          | Thermostat Setback and Replacement (120 Degrees)  | No Thermostat Setback (130 Degrees)                      | 8.81                      | 7.7%                      | 75%   | 75%                                 | 11           | \$108        |
| New                  | Restaurant       | Cooking    | Cooking Fryers - Commercial                              | Energy Star Commercial Fryer  | Non-Energy Star Fryer                                    | 9.60                      | 2.5%                      | 45%   | 70%                                 | 12           | \$4,946      |
| New                  | Restaurant       | Cooking    | Hot Food Holding Cabinets - Commercial                   | Energy Star Commercial Hot Food Holding Cabinets  | Non-Energy Star Commercial Hot Food Holding Cabinets     | 9.60                      | 8.3%                      | 35%   | 85%                                 | 12           | \$1,800      |
| New                  | Restaurant       | Cooking    | Oven - Convection  | Convection Oven   | Standard Oven  | 9.60                      | 3.4%                      | 85%   | 85%                                 | 15           | \$1,734      |
| New                  | Restaurant       | Cooking    | Steam Cookers - Commercial                               | Energy Star Commercial Steam Cookers (50% efficiency)   | Non-Energy Star Commercial Steam Cooker (35% efficiency) | 9.60                      | 5.5%                      | 35%   | 75%                                 | 10           | \$1          |
| New                  | Restaurant       | Cooling DX | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)   | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)  | 10.3 EER Rooftop Unit (State Code)                       | 1.61                      | 14.2%                     | NA  | NA                                  | 15           | \$4,353      |
| New                  | Restaurant       | Cooling DX | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)      | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)   | 10.3 EER Rooftop Unit (State Code)                       | 1.61                      | 6.4%                      | NA  | NA                                  | 15           | \$2,317      |
| New                  | Restaurant       | Cooling DX | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)    | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)   | 10.3 EER Rooftop Unit (State Code)                       | 1.61                      | 10.4%                     | NA  | NA                                  | 15           | \$3,592      |
| New                  | Restaurant       | Cooling DX | Commissioning - New Building Commissioning               | Commissioning - New Building Commissioning  | No Commissioning   | 1.48                      | 12.5%                     | 90%   | 80%                                 | 3            | \$3,835      |
| New                  | Restaurant       | Cooling DX | Direct / Indirect Evaporative Cooling, Pre-Cooling       | Direct / Indirect Evaporative Cooling, Pre-Cooling  | No modification to DX system                             | 1.48                      | 25.0%                     | 50%   | 85%                                 | 15           | \$10944      |
| New                  | Restaurant       | Cooling DX | Direct Digital Control System-Optimization               | DDC System (Optimized)  | DDC System (Basic)                                       | 1.48                      | 10.0%                     | 75%   | 100%                                | 5            | \$2,829      |
| New                  | Restaurant       | Cooling DX | Exhaust Hood Makeup Air                                  | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air                                      | Hood Pulls Conditioned Air (No Make-up Air)              | 1.48                      | 4.5%                      | 100%  | 85%                                 | 10           | \$5,726      |
| New                  | Restaurant       | Cooling DX | Green Roof   | Vegetation on Roof  | Standard roofing techniques                              | 1.48                      | 5.0%                      | 15%   | 98%                                 | 30           | \$53216      |
| New                  | Restaurant       | Cooling DX | Insulation (Ceiling)                                     | R-38  | R-21 (Code)  | 1.48                      | 2.0%                      | 75%   | 95%                                 | 25           | \$2,732      |
| New                  | Restaurant       | Cooling DX | Insulation (Ceiling)                                     | R-49  | R-21 (Code)  | 1.48                      | 3.0%                      | 75%   | 98%                                 | 25           | \$3,625      |
| New                  | Restaurant       | Cooling DX | Insulation (Wall)  | R-25 (2x6 Framing) - Advanced   | R-19 (2x6 Framing) - (Code)                              | 1.48                      | 3.0%                      | 95%   | 95%                                 | 25           | \$1,753      |
| New                  | Restaurant       | Cooling DX | Insulation - Floor (Non-Slab)                            | R-19  | R-10 (Code)  | 1.48                      | 1.0%                      | 35%   | 90%                                 | 25           | \$473        |
| New                  | Restaurant       | Cooling DX | Leak Proof Duct Fittings                                 | Quick connect fittings that do not require mastic or drawbands  | Std duct workmanship                                     | 1.48                      | 10.0%                     | 40%   | 98%                                 | 25           | \$814        |
| New                  | Restaurant       | Cooling DX | Window RE - Window Overhangs                             | Overhangs over windows for shading  | No window overhangs                                      | 1.48                      | 2.3%                      | 75%   | 75%                                 | 30           | \$2,156      |
| New                  | Restaurant       | Cooling DX | Windows  | U = 0.35  | U = 0.55 (Code)  | 1.48                      | 1.0%                      | 80%   | 80%                                 | 25           | \$6,876      |
| New                  | Restaurant       | HVAC Aux   | Automated Exhaust VFD Control - Parking Garage CO sensor | CO Sensors  | No CO Sensors  | 2.90                      | 20.0%                     | 1%  | 75%                                 | 10           | \$1,074      |
| New                  | Restaurant       | HVAC Aux   | Cooking Hood Controls                                    | Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air | No Cooking Hood Controls                                 | 2.90                      | 7.5%                      | 100%  | 25%                                 | 10           | \$6,829      |
| New                  | Restaurant       | HVAC Aux   | Motor - Premium-Efficiency                               | PE Motors for HVAC Applications   | Standard Efficiency Motors                               | 2.90                      | 3.8%                      | 85%   | 81%                                 | 10           | \$247        |

| Construction Vintage | Customer Segment | End Use   | Measure Name  | Measure Description  | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|---|--|--|--------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Restaurant       | HVAC Aux  | Motor - Pump & Fan System - Variable Speed Control              | Pump And Fan System Optimization w/ VSD  | No Pump And Fan System VSD Optimization  | 2.90                     | 33.8%                     | 85%   | 75%                                 | 20           | \$1,066      |
| New                  | Restaurant       | HVAC Aux  | Motor - VAV Box High-Efficiency                                 | ECM Motors   | Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control | 2.90                     | 8.8%                      | 20%   | 77%                                 | 10           | \$1,918      |
| New                  | Restaurant       | HVAC Aux  | Optimized Variable Volume Lab Hood Design                       | Optimized Variable Volume Lab Hood Design                                      | Constant Volume Lab Hood Design  | 2.90                     | 1.6%                      | 0%  | 94%                                 | 10           | \$1,791      |
| New                  | Restaurant       | Heat Pump | High-Efficiency EER=11.0, COP=3.5                               | High-Efficiency EER=11.0, COP=3.5  | EER=10.1, COP=3.2  | 2.28                     | 16.8%                     | NA  | NA                                  | 15           | \$3,086      |
| New                  | Restaurant       | Heat Pump | Premium-Efficiency EER=11.8, COP=3.8                            | Premium-Efficiency EER=11.8, COP=3.8   | EER=10.1, COP=3.2  | 2.28                     | 30.2%                     | NA  | NA                                  | 15           | \$6,607      |
| New                  | Restaurant       | Heat Pump | Commissioning - New Building Commissioning                      | Commissioning - New Building Commissioning                                     | No Commissioning   | 1.94                     | 12.5%                     | 90%   | 80%                                 | 3            | \$3,835      |
| New                  | Restaurant       | Heat Pump | Direct Digital Control System-Optimization                      | DDC System (Optimized)   | DDC System (Basic)   | 1.94                     | 10.0%                     | 75%   | 100%                                | 5            | \$2,829      |
| New                  | Restaurant       | Heat Pump | Exhaust Air to Ventilation Air Heat Recovery                    | Exhaust Air Heat Recovery  | No Heat Recovery   | 1.94                     | 2.5%                      | 5%  | 94%                                 | 10           | \$9,035      |
| New                  | Restaurant       | Heat Pump | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air)  | 1.94                     | 4.5%                      | 100%  | 85%                                 | 10           | \$5,726      |
| New                  | Restaurant       | Heat Pump | Green Roof  | Vegetation on Roof   | Standard roofing techniques  | 1.94                     | 1.3%                      | 15%   | 98%                                 | 30           | \$53216      |
| New                  | Restaurant       | Heat Pump | Heat Pump - Ground Source (Closed Loop)                         | GSHP: COP=3.1, EER=13.4  | Std. Air Source HP 'EER=10.1, COP=3.2  | 1.94                     | 21.1%                     | 45%   | 92%                                 | 20           | \$35790      |
| New                  | Restaurant       | Heat Pump | Heat Pump - Ground Source (Closed Loop)                         | GSHP: COP=4.0, EER=20  | Std. Air Source HP 'EER=10.1, COP=3.2  | 1.94                     | 45.0%                     | 45%   | 92%                                 | 20           | \$67238      |
| New                  | Restaurant       | Heat Pump | Heat Pump - Water Source (Closed Loop)                          | WSHP: COP=4.2, EER=12.0  | Std. Air Source Heat Pump'EER=10.1, COP=3.2  | 1.94                     | 17.6%                     | 0%  | 90%                                 | 20           | \$7,199      |
| New                  | Restaurant       | Heat Pump | Heat Pump - Water Source (Closed Loop)                          | WSHP: COP=4.8, EER=14.5  | Std. Air Source Heat Pump'EER=10.1, COP=3.2  | 1.94                     | 31.2%                     | 0%  | 90%                                 | 20           | \$9,508      |
| New                  | Restaurant       | Heat Pump | Insulation (Ceiling)  | R-38   | R-21 (Code)  | 1.94                     | 5.9%                      | 75%   | 95%                                 | 25           | \$2,732      |
| New                  | Restaurant       | Heat Pump | Insulation (Ceiling)  | R-49   | R-21 (Code)  | 1.94                     | 8.9%                      | 75%   | 98%                                 | 25           | \$3,625      |
| New                  | Restaurant       | Heat Pump | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)  | 1.94                     | 5.0%                      | 95%   | 95%                                 | 25           | \$1,753      |
| New                  | Restaurant       | Heat Pump | Insulation - Floor (Non-Slab)                                   | R-19   | R-10 (Code)  | 1.94                     | 3.7%                      | 35%   | 90%                                 | 25           | \$473        |
| New                  | Restaurant       | Heat Pump | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands                 | Std duct workmanship   | 1.94                     | 10.0%                     | 40%   | 98%                                 | 25           | \$814        |
| New                  | Restaurant       | Heat Pump | Windows   | U = 0.35   | U = 0.55 (Code)  | 1.94                     | 6.8%                      | 80%   | 80%                                 | 25           | \$6,876      |
| New                  | Restaurant       | Lighting  | Bi-Level Control, Stairwell Lighting                            | Occupancy Sensor Control, 50% Lighting Power during unoccupied Time            | Continuous Full Power Lighting in Stairways  | 3.29                     | 2.0%                      | 10%   | 75%                                 | 9            | \$414        |
| New                  | Restaurant       | Lighting  | Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures | Continuous Dimming, Fluorescent Fixtures (Day-Lighting)                        | No Dimming Controls  | 3.29                     | 6.0%                      | 60%   | 98%                                 | 9            | \$631        |
| New                  | Restaurant       | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 15%                        | Code Required LPD And Control Strategies: LPD = 1.43   | 3.29                     | 15.0%                     | 90%   | 70%                                 | 14           | \$851        |

| Construction Vintage | Customer Segment | End Use       | Measure Name  | Measure Description  | Base Equipment                                       | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|---|--|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Restaurant       | Lighting      | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 20%                    | Code Required LPD And Control Strategies: LPD = 1.43 | 3.29                     | 20.0%                         | 75%   | 85%                                 | 14           | \$2,269      |
| New                  | Restaurant       | Lighting      | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 25%                    | Code Required LPD And Control Strategies: LPD = 1.43 | 3.29                     | 25.0%                         | 70%   | 90%                                 | 14           | \$3,719      |
| New                  | Restaurant       | Lighting      | LED Refrigeration Case Lights                             | LED Refrigeration Case Lights (28W)  | Fluorescent Refrigeration Case Lights (60W)          | 3.29                     | 1.9%                          | 50%   | 80%                                 | 13           | \$630        |
| New                  | Restaurant       | Lighting      | LED Solid State White Lighting Package                    | Landscape, merchandise, signage, structure & task lighting                 | 50W 10hrs/day, 365 day/yr                            | 3.29                     | 1.5%                          | 10%   | 95%                                 | 14           | \$36         |
| New                  | Restaurant       | Lighting      | Occupancy Sensor Control, Fluorescent                     | Occupancy Sensor Control, Fluorescent                                      | No Occupancy Sensor                                  | 3.29                     | 4.0%                          | 45%   | 100%                                | 10           | \$98         |
| New                  | Restaurant       | Plug Load     | Energy Star - Battery Charging System                     | Energy Star Battery Charging System  | Non-Energy Star Battery Chargers                     | 2.25                     | 0.4%                          | 95%   | 90%                                 | 7            | \$2          |
| New                  | Restaurant       | Plug Load     | Energy Star - Computer                                    | Energy Star Features Enabled   | Non-Energy Star Features                             | 2.25                     | 13.6%                         | 64%   | 25%                                 | 4            | \$1          |
| New                  | Restaurant       | Plug Load     | Energy Star - Copiers                                     | Energy Star or Better Office Equipment: Copiers,                           | Office Equipment: Copiers, Standard                  | 2.25                     | 10.3%                         | 5%  | 45%                                 | 6            | \$165        |
| New                  | Restaurant       | Plug Load     | Energy Star - Fax   | Energy Star Features Enabled   | Non-Energy Star Features                             | 2.25                     | 1.8%                          | 75%   | 55%                                 | 4            | \$1          |
| New                  | Restaurant       | Plug Load     | Energy Star - Monitors                                    | Energy Star Features Enabled   | Non-Energy Star Features                             | 2.25                     | 18.4%                         | 64%   | 15%                                 | 4            | \$158        |
| New                  | Restaurant       | Plug Load     | Energy Star - Printers                                    | Energy Star Features Enabled   | Non-Energy Star Features                             | 2.25                     | 1.3%                          | 75%   | 40%                                 | 5            | \$16         |
| New                  | Restaurant       | Plug Load     | Energy Star - Scanners                                    | Energy Star Features Enabled   | Non-Energy Star Features                             | 2.25                     | 0.9%                          | 75%   | 45%                                 | 4            | \$1          |
| New                  | Restaurant       | Plug Load     | Energy Star - Water Cooler                                | Energy Star Water Cooler (Hot/Cold Water)                                  | Non-Energy Star Water Cooler                         | 2.25                     | 3.3%                          | 35%   | 75%                                 | 10           | \$1          |
| New                  | Restaurant       | Plug Load     | Office Computer Network Management                        | Office Computer Network Energy Management                                  | No Network Management                                | 2.25                     | 1.8%                          | 95%   | 30%                                 | 3            | \$310        |
| New                  | Restaurant       | Plug Load     | Power Supply 80+ Office Measure                           | 80% Efficient Power supply   | No 80+   | 2.25                     | 1.0%                          | 95%   | 86%                                 | 7            | \$1          |
| New                  | Restaurant       | Plug Load     | Refrigerator eCube  | Refrigerator eCube   | No Refrigerator eCube                                | 2.25                     | 1.2%                          | 75%   | 95%                                 | 10           | \$86         |
| New                  | Restaurant       | Plug Load     | Residential-Size Refrigerator                             | Energy Star Residential-Size Refrigerator                                  | Residential-Size Refrigerator - Standard             | 2.25                     | 0.7%                          | 35%   | 65%                                 | 13           | \$126        |
| New                  | Restaurant       | Plug Load     | Residential-Size Refrigerator/Freezer - Early Replacement | Energy Star Refrigerator/Freezer   | Baseline Refrigerator/Freezer                        | 2.25                     | 8.7%                          | 25%   | 35%                                 | 7            | \$578        |
| New                  | Restaurant       | Plug Load     | Vending Machine   | Energy Star Vending Machines - High-Efficiency                             | Vending Machines - Standard                          | 2.25                     | 16.0%                         | 5%  | 80%                                 | 14           | \$189        |
| New                  | Restaurant       | Refrigeration | Anti-Sweat (Humidistat) Controls                          | Variable Temp. Controls (Humidistat)                                       | Constant Controls                                    | 5.60                     | 35.4%                         | 25%   | 45%                                 | 12           | \$954        |
| New                  | Restaurant       | Refrigeration | Commercial Reach-In Refrigerator                          | Energy Star Commercial Reach-In Refrigerator                               | Commercial-Size Refrigerator - Standard              | 5.60                     | 17.3%                         | 95%   | 100%                                | 12           | \$345        |
| New                  | Restaurant       | Refrigeration | Custom Refrigeration System                               | High-Efficiency Custom Refrigeration System (Walk-in) includes compressors | Custom Refrigeration System - Standard               | 5.60                     | 3.6%                          | 85%   | 65%                                 | 10           | \$9,595      |
| New                  | Restaurant       | Refrigeration | Display Cases   | High-Efficiency Display Cases  | Display Cases - Standard                             | 5.60                     | 3.6%                          | 40%   | 90%                                 | 15           | \$1,278      |
| New                  | Restaurant       | Refrigeration | High-Efficiency Compressor                                | High-Efficiency Compressor (15% More Efficient)                            | Standard Compressor, 40% Efficiency                  | 5.60                     | 8.4%                          | 85%   | 72%                                 | 10           | \$1,578      |
| New                  | Restaurant       | Refrigeration | High-Efficiency Evaporator Fans - Walk-ins                | High-Efficiency Evaporator Fans, Walk-in Refrigerators                     | Standard Evaporator Fans                             | 5.60                     | 1.0%                          | 92%   | 75%                                 | 15           | \$203        |
| New                  | Restaurant       | Refrigeration | Ice Maker   | Energy Star Ice Maker - High-Efficiency                                    | Standard Ice Maker                                   | 5.60                     | 5.8%                          | 85%   | 86%                                 | 9            | \$376        |
| New                  | Restaurant       | Refrigeration | Motor - Case Fans with ECM motors                         | ECM motors on evaporator fan, on display cases                             | 48 cf 2-door reach-in commercial refrigerator        | 5.60                     | 0.5%                          | 95%   | 50%                                 | 20           | \$229        |

| Construction Vintage | Customer Segment | End Use       | Measure Name  | Measure Description  | Base Equipment   | Baseline kWh (UEC or EUJ) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|---|--|--|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Restaurant       | Refrigeration | Reduced Speed or Cycling of Evaporator Fans           | VFD on Evaporator Fans (Evap Fan Control on Walk-In)   | Constant Speed Evaporator Fans                             | 5.60                      | 6.0%                          | 75%   | 70%                                 | 10           | \$76         |
| New                  | Restaurant       | Refrigeration | Refrigeration - Commissioning                         | Commissioning (Refrigeration System Diagnostics / Operations and Maintenance for a new unit)                             | No Commissioning   | 5.60                      | 5.0%                          | 80%   | 90%                                 | 3            | \$94         |
| New                  | Restaurant       | Refrigeration | Special Glass Doors for Refrigerated Reach-in Cases   | Do Not Require Anti-Sweat Heating  | Standard Glass Doors                                       | 5.60                      | 3.2%                          | 95%   | 77%                                 | 16           | \$315        |
| New                  | Restaurant       | Refrigeration | Strip Curtains for Walk-Ins                           | Strip Curtains for Walk-Ins  | No Strip Curtains for Walk-Ins                             | 5.60                      | 2.0%                          | 95%   | 20%                                 | 4            | \$189        |
| New                  | Restaurant       | Space Heat    | Commissioning - New Building Commissioning            | Commissioning - New Building Commissioning   | No Commissioning   | 0.32                      | 12.5%                         | 90%   | 80%                                 | 3            | \$3,835      |
| New                  | Restaurant       | Space Heat    | Direct Digital Control System-Optimization            | DDC System (Optimized)   | DDC System (Basic)   | 0.32                      | 10.0%                         | 75%   | 100%                                | 5            | \$2,829      |
| New                  | Restaurant       | Space Heat    | Exhaust Air to Ventilation Air Heat Recovery          | Exhaust Air Heat Recovery  | No Heat Recovery   | 0.32                      | 15.0%                         | 5%  | 94%                                 | 10           | \$9,035      |
| New                  | Restaurant       | Space Heat    | Exhaust Hood Makeup Air                               | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air)                | 0.32                      | 4.5%                          | 100%  | 85%                                 | 10           | \$5,726      |
| New                  | Restaurant       | Space Heat    | Insulation (Ceiling)                                  | R-49   | R-30   | 0.32                      | 8.0%                          | 75%   | 98%                                 | 25           | \$2,732      |
| New                  | Restaurant       | Space Heat    | Insulation (Wall)                                     | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                                | 0.32                      | 6.0%                          | 95%   | 95%                                 | 25           | \$1,753      |
| New                  | Restaurant       | Space Heat    | Insulation - Floor (Non-Slab)                         | R-19   | R-10 (Code)  | 0.32                      | 5.0%                          | 35%   | 90%                                 | 25           | \$473        |
| New                  | Restaurant       | Space Heat    | Leak Proof Duct Fittings                              | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                                       | 0.32                      | 10.0%                         | 40%   | 98%                                 | 25           | \$814        |
| New                  | Restaurant       | Space Heat    | Sensible And Total Heat Recovery Devices              | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery   | 0.32                      | 25.0%                         | 50%   | 98%                                 | 10           | \$11084      |
| New                  | Restaurant       | Space Heat    | Windows   | U = 0.35   | U = 0.40   | 0.32                      | 3.3%                          | 80%   | 80%                                 | 25           | \$1,719      |
| New                  | Restaurant       | Water Heat    | Water_Heater (40 Gallon Electric) - Residential Sized | EF = 0.95  | EF = 0.92  | 8.76                      | 3.3%                          | NA  | NA                                  | 20           | \$420        |
| New                  | Restaurant       | Water Heat    | Clothes Washer - Ozonating                            | Ozonating Clothes Washer   | Standard Commercial Clothes Washer                         | 8.61                      | 15.1%                         | 5%  | 95%                                 | 10           | \$8,704      |
| New                  | Restaurant       | Water Heat    | Clothes Washer Commercial                             | Energy Star Commercial Clothes Washer MEF=1.72   | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 8.61                      | 0.6%                          | 5%  | 80%                                 | 11           | \$305        |
| New                  | Restaurant       | Water Heat    | Demand controlled Circulating Systems                 | Install demand-based control system (VFD Control by Demand)  | No demand control systems in place                         | 8.61                      | 5.0%                          | 90%   | 94%                                 | 15           | \$1,459      |
| New                  | Restaurant       | Water Heat    | Dishwashing - Commercial - High Efficiency            | High Efficiency Dishwasher   | Standard Dishwasher  | 8.61                      | 2.1%                          | 100%  | 80%                                 | 10           | \$2,700      |
| New                  | Restaurant       | Water Heat    | Dishwashing - Commercial Chemical System              | Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)  | High Temp Commercial Dishwasher                            | 8.61                      | 5.6%                          | 100%  | 95%                                 | 10           | \$841        |
| New                  | Restaurant       | Water Heat    | Dishwashing - Residential Sized System                | EF = 0.65 (ENERGY STAR)  | Standard Dishwasher (FED Std. EF=0.46)                     | 8.61                      | 0.3%                          | 85%   | 25%                                 | 13           | \$32         |
| New                  | Restaurant       | Water Heat    | Dishwashing - Residential Sized System                | EF = 0.77  | Standard Dishwasher (FED Std. EF=0.46)                     | 8.61                      | 0.4%                          | 85%   | 55%                                 | 13           | \$630        |
| New                  | Restaurant       | Water Heat    | Drainwater Heat Recovery Water Heater                 | Install (Power-Pipe or GFX) - Heat Recovery Water Heater   | No Heat Recovery System                                    | 8.61                      | 20.0%                         | 25%   | 92%                                 | 25           | \$2,276      |
| New                  | Restaurant       | Water Heat    | Faucet Aerators                                       | 1.5 GPM Aerator  | 2.5 GPM Aerator (Federal Code)                             | 8.61                      | 4.0%                          | 95%   | 25%                                 | 10           | \$0          |



| Construction Vintage | Customer Segment | End Use          | Measure Name  | Measure Description                                   | Base Equipment   | Baseline kWh (UEC or EUJ) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|---|--|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Restaurant       | Water Heat       | Heat Pump Water Heater  | EF = 2.9  | EF=0.93 Baseline Electric Water Heater                   | 8.61                      | 58.9%                         | 50%   | 94%                                 | 15           | \$9,059      |
| New                  | Restaurant       | Water Heat       | Low Flow Spray Heads  | 1.6 GPM   | 3.0 GPM  | 8.61                      | 2.3%                          | 95%   | 25%                                 | 5            | \$5          |
| New                  | Restaurant       | Water Heat       | Low-Flow Showerheads  | 2.0 GPM Showerhead                                    | 2.5 GPM Showerhead (Federal Code)                        | 8.61                      | 1.1%                          | 15%   | 75%                                 | 10           | \$6          |
| New                  | Restaurant       | Water Heat       | Solar RE - Solar Water Heater                                       | Passive solar water heating                           | Non-solar hot water heater                               | 8.61                      | 40.3%                         | 20%   | 95%                                 | 20           | 107164       |
| New                  | Restaurant       | Water Heat       | Ultrasonic Faucet Control   | Install Ultrasonic Motion Faucet Control              | No Faucet Control  | 8.61                      | 3.3%                          | 95%   | 75%                                 | 10           | \$206        |
| New                  | Restaurant       | Water Heat       | Water Heater Thermostat Setback                                     | Thermostat Setback and Replcement (120 Degrees)       | No Thermostat Setback (130 Degrees)                      | 8.61                      | 7.7%                          | 75%   | 75%                                 | 11           | \$108        |
| Existing             | School           | Cooking          | Cooking Fryers - Commercial   | Energy Star Commercial Fryer                          | Non-Energy Star Fryer                                    | 0.22                      | 2.5%                          | 35%   | 70%                                 | 12           | \$4,948      |
| Existing             | School           | Cooking          | Hot Food Holding Cabinets - Commercial                              | Energy Star Commercial Hot Food Holding Cabinets      | Non-Energy Star Commercial Hot Food Holding Cabinets     | 0.22                      | 8.4%                          | 75%   | 85%                                 | 12           | \$1,800      |
| Existing             | School           | Cooking          | Oven - Convection   | Convection Oven                                       | Standard Oven  | 0.22                      | 3.4%                          | 85%   | 40%                                 | 15           | \$1,736      |
| Existing             | School           | Cooking          | Steam Cookers - Commercial  | Energy Star Commercial Steam Cookers (50% efficiency) | Non-Energy Star Commercial Steam Cooker (35% efficiency) | 0.22                      | 2.3%                          | 35%   | 75%                                 | 10           | \$0          |
| Existing             | School           | Cooling Chillers | Chiller - Premium Efficiency  | 0.507 kW/ton  | 0.634 kW/ton   | 0.29                      | 20.0%                         | NA  | NA                                  | 20           | \$7,619      |
| Existing             | School           | Cooling Chillers | Chiller - Advanced Technology                                       | 0.461 kW/ton  | 0.634 kW/ton   | 0.29                      | 27.3%                         | NA  | NA                                  | 20           | \$9,496      |
| Existing             | School           | Cooling Chillers | Chiller - High Efficiency   | 0.574 kW/ton  | 0.634 kW/ton   | 0.29                      | 9.5%                          | NA  | NA                                  | 20           | \$2,730      |
| Existing             | School           | Cooling Chillers | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)           | Constant Ventilation                                     | 0.32                      | 10.0%                         | 25%   | 94%                                 | 15           | \$37066      |
| Existing             | School           | Cooling Chillers | Centrifugal Chiller - VSD Remodel for Existing                      | VSD motor   | Constant Speed Motor                                     | 0.32                      | 40.0%                         | 43%   | 45%                                 | 10           | \$14209      |
| Existing             | School           | Cooling Chillers | Chilled Water Piping Loop w/ VSD Control                            | VSD for Secondary Chilled Water Loop                  | Primary Loop Only w/ Constant Speed Pump                 | 0.32                      | 7.6%                          | 25%   | 70%                                 | 10           | \$17233      |
| Existing             | School           | Cooling Chillers | Chilled Water Reset   | Install Chilled Water Reset                           | No Chilled Water Reset                                   | 0.32                      | 5.0%                          | 95%   | 85%                                 | 10           | \$40084      |
| Existing             | School           | Cooling Chillers | Chiller-Water Side Economizer                                       | Install Economizer                                    | No Economizer  | 0.32                      | 5.0%                          | 45%   | 90%                                 | 10           | \$40025      |
| Existing             | School           | Cooling Chillers | Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning          | No Commissioning   | 0.32                      | 12.5%                         | 90%   | 40%                                 | 3            | \$11596      |
| Existing             | School           | Cooling Chillers | Cooling Tower-Decrease Temperature                                  | Approach 6 Deg F                                      | 10 Deg F   | 0.32                      | 8.0%                          | 50%   | 94%                                 | 15           | \$1,706      |
| Existing             | School           | Cooling Chillers | Cooling Tower-Two-Speed Fan Motor                                   | Two-Speed Tower Fans replace Single-Speed             | Cooling Tower-One-Speed Fan Motor                        | 0.32                      | 14.0%                         | 95%   | 35%                                 | 10           | \$188        |



| Construction Vintage | Customer Segment | End Use          | Measure Name  | Measure Description  | Base Equipment                              | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|--|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | School           | Cooling Chillers | Cooling Tower-VSD Fan Control                                 | Variable-Speed Tower Fans replace Two-Speed                                    | Cooling Tower-Two-Speed Fan Motor           | 0.32                     | 4.0%                          | 95%   | 75%                                 | 10           | \$1,541      |
| Existing             | School           | Cooling Chillers | Direct Digital Control System-Installation                    | DDC Retrofit   | Pnuematic                                   | 0.32                     | 15.0%                         | 5%  | 34%                                 | 5            | \$56576      |
| Existing             | School           | Cooling Chillers | Direct Digital Control System-Optimization                    | DDC System (Optimized)   | DDC System (Basic)                          | 0.32                     | 10.0%                         | 75%   | 80%                                 | 5            | \$31683      |
| Existing             | School           | Cooling Chillers | Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control        | Pnuematic                                   | 0.32                     | 15.0%                         | 50%   | 80%                                 | 5            | \$22863      |
| Existing             | School           | Cooling Chillers | Duct Repair And Sealing                                       | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 0.32                     | 2.5%                          | 45%   | 45%                                 | 18           | \$23534      |
| Existing             | School           | Cooling Chillers | Exhaust Hood Makeup Air                                       | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air) | 0.32                     | 4.5%                          | 73%   | 85%                                 | 10           | \$5,725      |
| Existing             | School           | Cooling Chillers | Green Roof  | Vegetation on Roof   | Standard roofing techniques                 | 0.32                     | 5.0%                          | 15%   | 98%                                 | 30           | 298005       |
| Existing             | School           | Cooling Chillers | Insulation (Ceiling)  | R-38   | R-21 (Code)                                 | 0.32                     | 1.0%                          | 75%   | 45%                                 | 25           | \$15297      |
| Existing             | School           | Cooling Chillers | Insulation (Ceiling)  | R-49   | R-21 (Code)                                 | 0.32                     | 1.5%                          | 75%   | 85%                                 | 25           | \$20298      |
| Existing             | School           | Cooling Chillers | Insulation (Ceiling) - Existing to Code                       | R-21 (Code)  | Existing Ceiling Insulation (Average R-9)   | 0.32                     | 1.2%                          | 75%   | 15%                                 | 25           | \$17945      |
| Existing             | School           | Cooling Chillers | Insulation (Ceiling) - Zero to Code                           | R-21 (Code)  | R-0   | 0.32                     | 3.0%                          | 75%   | 0%                                  | 25           | \$17945      |
| Existing             | School           | Cooling Chillers | Insulation (Duct) (Unconditioned Spaces)                      | Install New Duct Insulation (R-8)  | R-0   | 0.32                     | 4.4%                          | 10%   | 15%                                 | 25           | \$6,578      |
| Existing             | School           | Cooling Chillers | Insulation (Duct) (Unconditioned Spaces)                      | R-4  | R-0   | 0.32                     | 2.4%                          | 10%   | 15%                                 | 25           | \$6,854      |
| Existing             | School           | Cooling Chillers | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 0.32                     | 3.0%                          | 10%   | 95%                                 | 25           | \$8,296      |
| Existing             | School           | Cooling Chillers | Insulation (Wall) - Existing to Code                          | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)              | 0.32                     | 8.4%                          | 10%   | 35%                                 | 25           | \$9,090      |
| Existing             | School           | Cooling Chillers | Insulation (Wall) - Zero to Code                              | R-19 (2x6 Framing) - (Code)  | R-0   | 0.32                     | 10.0%                         | 10%   | 0%                                  | 25           | \$8,990      |
| Existing             | School           | Cooling Chillers | Insulation - Floor (Non-Slab)                                 | R-19   | R-10 (Code)                                 | 0.32                     | 0.5%                          | 35%   | 35%                                 | 25           | \$2,648      |
| Existing             | School           | Cooling Chillers | Insulation - Floor (Non-Slab) - Existing to Code              | R-10 (Code)  | R-0   | 0.32                     | 1.5%                          | 35%   | 35%                                 | 25           | \$15297      |
| Existing             | School           | Cooling Chillers | Pipe Insulation   | R-4  | R-0   | 0.32                     | 1.0%                          | 65%   | 45%                                 | 15           | \$1,206      |



| Construction Vintage | Customer Segment | End Use          | Measure Name  | Measure Description  | Base Equipment                              | Baseline kWh (UEC or EUJ) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|--|---|---------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | School           | Cooling Chillers | Sensible And Total Heat Recovery Devices                            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery                            | 0.32                      | 25.0%                     | 25%   | 98%                                 | 10           | 124142       |
| Existing             | School           | Cooling Chillers | Turbocor Compressor   | 0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)                                 | 0.634 kW/ton (Code) chiller water cooled    | 0.32                      | 44.8%                     | 60%   | 99%                                 | 20           | \$46674      |
| Existing             | School           | Cooling Chillers | Windows   | U = 0.35   | U = 0.55 (Code)                             | 0.32                      | 2.2%                      | 80%   | 60%                                 | 25           | \$49751      |
| Existing             | School           | Cooling Chillers | Windows - Existing to Code  | U = 0.55 (Code)  | Existing Windows (U=0.65)                   | 0.32                      | 1.1%                      | 10%   | 60%                                 | 25           | 140474       |
| Existing             | School           | Cooling DX       | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)              | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)   | 10.3 EER Rooftop Unit (State Code)          | 0.32                      | 14.2%                     | NA  | NA                                  | 15           | \$19910      |
| Existing             | School           | Cooling DX       | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)                 | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)  | 10.3 EER Rooftop Unit (State Code)          | 0.32                      | 6.4%                      | NA  | NA                                  | 15           | \$10602      |
| Existing             | School           | Cooling DX       | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)               | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)  | 10.3 EER Rooftop Unit (State Code)          | 0.32                      | 10.4%                     | NA  | NA                                  | 15           | \$16433      |
| Existing             | School           | Cooling DX       | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)  | Constant Ventilation                        | 0.35                      | 10.0%                     | 25%   | 94%                                 | 15           | \$37066      |
| Existing             | School           | Cooling DX       | Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning   | No Commissioning                            | 0.35                      | 12.5%                     | 90%   | 40%                                 | 3            | \$11596      |
| Existing             | School           | Cooling DX       | Cooling DX Package-Air Side Economizer                              | Air-Side Economizer  | No Economizer                               | 0.35                      | 15.0%                     | 10%   | 30%                                 | 15           | \$13809      |
| Existing             | School           | Cooling DX       | Direct / Indirect Evaporative Cooling, Pre-Cooling                  | Direct / Indirect Evaporative Cooling, Pre-Cooling   | No modification to DX system                | 0.35                      | 25.0%                     | 50%   | 85%                                 | 15           | 122577       |
| Existing             | School           | Cooling DX       | Direct Digital Control System-Installation                          | DDC Retrofit   | Pneumatic                                   | 0.35                      | 15.0%                     | 5%  | 34%                                 | 5            | \$56576      |
| Existing             | School           | Cooling DX       | Direct Digital Control System-Optimization                          | DDC System (Optimized)   | DDC System (Basic)                          | 0.35                      | 10.0%                     | 75%   | 80%                                 | 5            | \$31683      |
| Existing             | School           | Cooling DX       | Direct Digital Control System-Wireless Performance Monitoring       | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control  | Pneumatic                                   | 0.35                      | 15.0%                     | 50%   | 80%                                 | 5            | \$22863      |
| Existing             | School           | Cooling DX       | Duct Repair And Sealing   | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 0.35                      | 2.5%                      | 45%   | 45%                                 | 18           | \$23534      |
| Existing             | School           | Cooling DX       | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air) | 0.35                      | 4.5%                      | 73%   | 85%                                 | 10           | \$5,725      |
| Existing             | School           | Cooling DX       | Green Roof  | Vegetation on Roof   | Standard roofing techniques                 | 0.35                      | 5.0%                      | 15%   | 98%                                 | 30           | 298005       |
| Existing             | School           | Cooling DX       | Insulation (Ceiling)  | R-38   | R-21 (Code)                                 | 0.35                      | 1.0%                      | 75%   | 45%                                 | 25           | \$15297      |
| Existing             | School           | Cooling DX       | Insulation (Ceiling)  | R-49   | R-21 (Code)                                 | 0.35                      | 1.5%                      | 75%   | 85%                                 | 25           | \$20298      |
| Existing             | School           | Cooling DX       | Insulation (Ceiling) - Existing to Code                             | R-21 (Code)  | Existing Ceiling Insulation (Average R-9)   | 0.35                      | 1.2%                      | 75%   | 15%                                 | 25           | \$17945      |
| Existing             | School           | Cooling DX       | Insulation (Ceiling) - Zero to Code                                 | R-21 (Code)  | R-0   | 0.35                      | 3.0%                      | 75%   | 0%                                  | 25           | \$17945      |
| Existing             | School           | Cooling DX       | Insulation (Duct) (Unconditioned Spaces)                            | Install New Duct Insulation (R-8)  | R-0   | 0.35                      | 4.4%                      | 10%   | 15%                                 | 25           | \$6,578      |

| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description   | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|---|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | School           | Cooling DX | Insulation (Duct) (Unconditioned Spaces)                            | R-4   | R-0  | 0.35                     | 2.4%                          | 10%   | 15%                                 | 25           | \$6,854      |
| Existing             | School           | Cooling DX | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced   | R-19 (2x6 Framing) - (Code)  | 0.35                     | 3.0%                          | 10%   | 95%                                 | 25           | \$8,296      |
| Existing             | School           | Cooling DX | Insulation (Wall) - Existing to Code                                | R-19 (2x6 Framing) - (Code)   | Existing R-value (Average R-3)   | 0.35                     | 8.4%                          | 10%   | 35%                                 | 25           | \$9,090      |
| Existing             | School           | Cooling DX | Insulation (Wall) - Zero to Code                                    | R-19 (2x6 Framing) - (Code)   | R-0  | 0.35                     | 10.0%                         | 10%   | 0%                                  | 25           | \$8,990      |
| Existing             | School           | Cooling DX | Insulation - Floor (Non-Slab)                                       | R-19  | R-10 (Code)  | 0.35                     | 0.5%                          | 35%   | 35%                                 | 25           | \$2,648      |
| Existing             | School           | Cooling DX | Insulation - Floor (Non-Slab) - Existing to Code                    | R-10 (Code)   | R-0  | 0.35                     | 1.5%                          | 35%   | 35%                                 | 25           | \$15297      |
| Existing             | School           | Cooling DX | Thermostat - Programmable   | Energy Star Programmable Thermostat   | Manual Thermostat  | 0.35                     | 3.0%                          | 95%   | 79%                                 | 15           | \$147        |
| Existing             | School           | Cooling DX | Windows   | U = 0.35  | U = 0.55 (Code)  | 0.35                     | 2.2%                          | 80%   | 60%                                 | 25           | \$49751      |
| Existing             | School           | Cooling DX | Windows - Existing to Code  | U = 0.55 (Code)   | Existing Windows (U=0.65)  | 0.35                     | 1.1%                          | 10%   | 60%                                 | 25           | 140474       |
| Existing             | School           | HVAC Aux   | Automated Exhaust VFD Control - Parking Garage CO sensor            | CO Sensors  | No CO Sensors  | 1.34                     | 20.0%                         | 1%  | 85%                                 | 10           | \$12026      |
| Existing             | School           | HVAC Aux   | Cooking Hood Controls   | Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air | No Cooking Hood Controls   | 1.34                     | 7.5%                          | 60%   | 85%                                 | 10           | \$13132      |
| Existing             | School           | HVAC Aux   | Motor - Premium-Efficiency  | PE Motors for HVAC Applications   | Standard Efficiency Motors   | 1.34                     | 3.8%                          | 85%   | 81%                                 | 10           | \$1,536      |
| Existing             | School           | HVAC Aux   | Motor - Pump & Fan System - Variable Speed Control                  | Pump And Fan System Optimization w/ VSD Control   | No Pump And Fan System VSD Optimization  | 1.34                     | 33.8%                         | 85%   | 75%                                 | 20           | \$11938      |
| Existing             | School           | HVAC Aux   | Motor - VAV Box High-Efficiency                                     | ECM Motors  | Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control | 1.34                     | 8.8%                          | 50%   | 77%                                 | 10           | \$21487      |
| Existing             | School           | HVAC Aux   | Optimized Variable Volume Lab Hood Design                           | Optimized Variable Volume Lab Hood Design   | Constant Volume Lab Hood Design  | 1.34                     | 1.6%                          | 50%   | 94%                                 | 10           | \$1,789      |
| Existing             | School           | Heat Pump  | High-Efficiency EER=11.0, COP=3.5                                   | High-Efficiency EER=11.0, COP=3.5   | EER=10.1, COP=3.2  | 2.62                     | 16.8%                         | NA  | NA                                  | 15           | \$14115      |
| Existing             | School           | Heat Pump  | Premium-Efficiency EER=11.8, COP=3.8                                | Premium-Efficiency EER=11.8, COP=3.8  | EER=10.1, COP=3.2  | 2.62                     | 30.2%                         | NA  | NA                                  | 15           | \$30224      |
| Existing             | School           | Heat Pump  | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)   | Constant Ventilation   | 2.78                     | 10.0%                         | 25%   | 94%                                 | 15           | \$37066      |
| Existing             | School           | Heat Pump  | Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning  | No Commissioning   | 2.78                     | 12.5%                         | 90%   | 40%                                 | 3            | \$11596      |
| Existing             | School           | Heat Pump  | Direct Digital Control System-Installation                          | DDC Retrofit  | Pneumatic  | 2.78                     | 15.0%                         | 5%  | 34%                                 | 5            | \$56576      |
| Existing             | School           | Heat Pump  | Direct Digital Control System-Optimization                          | DDC System (Optimized)  | DDC System (Basic)   | 2.78                     | 10.0%                         | 75%   | 80%                                 | 5            | \$31683      |
| Existing             | School           | Heat Pump  | Direct Digital Control System-Wireless Performance Monitoring       | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control   | Pneumatic  | 2.78                     | 15.0%                         | 50%   | 80%                                 | 5            | \$22863      |
| Existing             | School           | Heat Pump  | Duct Repair And Sealing   | Reduction In Duct Losses to 5%  | No Repair or Sealing, 15% duct losses  | 2.78                     | 2.5%                          | 45%   | 45%                                 | 18           | \$23534      |
| Existing             | School           | Heat Pump  | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery   | No Heat Recovery   | 2.78                     | 13.2%                         | 5%  | 94%                                 | 10           | \$53363      |

| Construction Vintage | Customer Segment | End Use   | Measure Name  | Measure Description  | Base Equipment                                      | Baseline kWh (UEC or EU) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|---|--|---|--------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | School           | Heat Pump | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air)         | 2.78                     | 4.5%                      | 73%   | 85%                                 | 10           | \$5,725      |
| Existing             | School           | Heat Pump | Green Roof  | Vegetation on Roof   | Standard roofing techniques                         | 2.78                     | 0.2%                      | 15%   | 98%                                 | 30           | 298005       |
| Existing             | School           | Heat Pump | Heat Pump - Ground Source (Closed Loop)                         | GSHP: COP=3.1, EER=13.4  | Std. Air Source HP 'EER=10.1, COP=3.2               | 2.78                     | 5.7%                      | 5%  | 92%                                 | 20           | 163708       |
| Existing             | School           | Heat Pump | Heat Pump - Ground Source (Closed Loop)                         | GSHP: COP=4.0, EER=20  | Std. Air Source HP 'EER=10.1, COP=3.2               | 2.78                     | 25.8%                     | 5%  | 92%                                 | 20           | 307566       |
| Existing             | School           | Heat Pump | Heat Pump - Water Source (Closed Loop)                          | WSHP: COP=4.2, EER=12.0  | Std. Air Source Heat Pump'EER=10.1, COP=3.2         | 2.78                     | 24.9%                     | 5%  | 90%                                 | 20           | \$32930      |
| Existing             | School           | Heat Pump | Heat Pump - Water Source (Closed Loop)                          | WSHP: COP=4.8, EER=14.5  | Std. Air Source Heat Pump'EER=10.1, COP=3.2         | 2.78                     | 34.8%                     | 5%  | 90%                                 | 20           | \$43491      |
| Existing             | School           | Heat Pump | Insulation (Ceiling)  | R-38   | R-21 (Code)   | 2.78                     | 3.0%                      | 75%   | 45%                                 | 25           | \$15297      |
| Existing             | School           | Heat Pump | Insulation (Ceiling)  | R-49   | R-21 (Code)   | 2.78                     | 4.4%                      | 75%   | 85%                                 | 25           | \$20298      |
| Existing             | School           | Heat Pump | Insulation (Ceiling) - Existing to Code                         | R-21 (Code)  | Existing Ceiling Insulation (Average R-9)           | 2.78                     | 2.8%                      | 75%   | 15%                                 | 25           | \$17945      |
| Existing             | School           | Heat Pump | Insulation (Ceiling) - Zero to Code                             | R-21 (Code)  | R-0   | 2.78                     | 6.9%                      | 75%   | 0%                                  | 25           | \$17945      |
| Existing             | School           | Heat Pump | Insulation (Duct) (Unconditioned Spaces)                        | Install New Duct Insulation (R-8)  | R-0   | 2.78                     | 4.4%                      | 10%   | 15%                                 | 25           | \$6,578      |
| Existing             | School           | Heat Pump | Insulation (Duct) (Unconditioned Spaces)                        | R-4  | R-0   | 2.78                     | 2.4%                      | 10%   | 15%                                 | 25           | \$6,854      |
| Existing             | School           | Heat Pump | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                         | 2.78                     | 5.0%                      | 10%   | 95%                                 | 25           | \$8,296      |
| Existing             | School           | Heat Pump | Insulation (Wall) - Existing to Code                            | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)                      | 2.78                     | 16.6%                     | 10%   | 35%                                 | 25           | \$9,090      |
| Existing             | School           | Heat Pump | Insulation (Wall) - Zero to Code                                | R-19 (2x6 Framing) - (Code)  | R-0   | 2.78                     | 19.8%                     | 10%   | 0%                                  | 25           | \$8,990      |
| Existing             | School           | Heat Pump | Insulation - Floor (Non-Slab)                                   | R-19   | R-10 (Code)   | 2.78                     | 1.9%                      | 35%   | 35%                                 | 25           | \$2,648      |
| Existing             | School           | Heat Pump | Insulation - Floor (Non-Slab) - Existing to Code                | R-10 (Code)  | R-0   | 2.78                     | 5.6%                      | 35%   | 35%                                 | 25           | \$15297      |
| Existing             | School           | Heat Pump | Thermostat - Programmable                                       | Energy Star Programmable Thermostat  | Manual Thermostat                                   | 2.78                     | 3.0%                      | 95%   | 79%                                 | 15           | \$147        |
| Existing             | School           | Heat Pump | Windows   | U = 0.35   | U = 0.55 (Code)                                     | 2.78                     | 14.9%                     | 80%   | 60%                                 | 25           | \$49751      |
| Existing             | School           | Heat Pump | Windows - Existing to Code                                      | U = 0.55 (Code)  | Existing Windows (U=0.65)                           | 2.78                     | 9.8%                      | 10%   | 60%                                 | 25           | 140474       |
| Existing             | School           | Lighting  | Bi-Level Control, Stairwell Lighting                            | Occupancy Sensor Control, 50% Lighting Power during unoccupied Time            | Continuous Full Power Lighting in Stairways         | 2.75                     | 2.0%                      | 50%   | 75%                                 | 9            | \$4,636      |
| Existing             | School           | Lighting  | Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures | Continuous Dimming, Fluorescent Fixtures (Day-Lighting)                        | No Dimming Controls                                 | 2.75                     | 15.0%                     | 20%   | 81%                                 | 9            | \$17651      |
| Existing             | School           | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 15%                        | Code Required LPD And Control Strategies: LPD = 1.2 | 2.75                     | 15.0%                     | 90%   | 70%                                 | 14           | \$8,931      |
| Existing             | School           | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 20%                        | Code Required LPD And Control Strategies: LPD = 1.2 | 2.75                     | 20.0%                     | 75%   | 85%                                 | 14           | \$22522      |

| Construction Vintage | Customer Segment | End Use       | Measure Name  | Measure Description   | Base Equipment                                      | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|---|---|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | School           | Lighting      | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 25%   | Code Required LPD And Control Strategies: LPD = 1.2 | 2.75                     | 25.0%                         | 70%   | 90%                                 | 14           | \$35725      |
| Existing             | School           | Lighting      | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 35% - Only High Bay Applications                | Code Required LPD And Control Strategies: LPD = 1.2 | 2.75                     | 5.3%                          | 65%   | 95%                                 | 14           | \$28347      |
| Existing             | School           | Lighting      | HE Fixtures/Design - Existing to Code                     | Code Required LPD And Control Strategies: LPD = 1.2   | Existing Lighting Design                            | 2.75                     | 36.0%                         | 95%   | 45%                                 | 14           | \$54881      |
| Existing             | School           | Lighting      | LED Exit Lighting   | 5 Watts   | CFL Exit Sign (26 Watts)                            | 2.75                     | 1.6%                          | 95%   | 65%                                 | 11           | \$53         |
| Existing             | School           | Lighting      | LED Refrigeration Case Lights                             | LED Refrigeration Case Lights (28W)   | Fluorescent Refrigeration Case Lights (60W)         | 2.75                     | 0.1%                          | 50%   | 80%                                 | 13           | \$630        |
| Existing             | School           | Lighting      | LED Solid State White Lighting Package                    | Landscape, merchandise, signage, structure & task lighting  | 50W 10hrs/day, 365 day/yr                           | 2.75                     | 0.8%                          | 10%   | 95%                                 | 14           | \$35         |
| Existing             | School           | Lighting      | Occupancy Sensor Control, Fluorescent                     | Occupancy Sensor Control, Fluorescent   | No Occupancy Sensor                                 | 2.75                     | 4.0%                          | 90%   | 65%                                 | 9            | \$1,100      |
| Existing             | School           | Lighting      | Time Clocks And Timers                                    | Install Time Clock Lighting   | No Time Clock                                       | 2.75                     | 4.9%                          | 85%   | 98%                                 | 9            | \$218        |
| Existing             | School           | Plug Load     | Energy Star - Battery Charging System                     | Energy Star Battery Charging System   | Non-Energy Star Battery Chargers                    | 1.57                     | 0.4%                          | 95%   | 90%                                 | 7            | \$0          |
| Existing             | School           | Plug Load     | Energy Star - Computer                                    | Energy Star Features Enabled  | Non-Energy Star Features                            | 1.57                     | 13.6%                         | 64%   | 25%                                 | 4            | \$0          |
| Existing             | School           | Plug Load     | Energy Star - Copiers                                     | Energy Star or Better Office Equipment: Copiers,  | Office Equipment: Copiers, Standard                 | 1.57                     | 1.3%                          | 90%   | 45%                                 | 6            | \$165        |
| Existing             | School           | Plug Load     | Energy Star - Fax   | Energy Star Features Enabled  | Non-Energy Star Features                            | 1.57                     | 1.8%                          | 75%   | 55%                                 | 4            | \$0          |
| Existing             | School           | Plug Load     | Energy Star - Monitors                                    | Energy Star Features Enabled  | Non-Energy Star Features                            | 1.57                     | 18.4%                         | 64%   | 15%                                 | 4            | \$159        |
| Existing             | School           | Plug Load     | Energy Star - Printers                                    | Energy Star Features Enabled  | Non-Energy Star Features                            | 1.57                     | 1.3%                          | 75%   | 40%                                 | 5            | \$18         |
| Existing             | School           | Plug Load     | Energy Star - Scanners                                    | Energy Star Features Enabled  | Non-Energy Star Features                            | 1.57                     | 0.9%                          | 75%   | 45%                                 | 4            | \$0          |
| Existing             | School           | Plug Load     | Energy Star - Water Cooler                                | Energy Star Water Cooler (Hot/Cold Water)   | Non-Energy Star Water Cooler                        | 1.57                     | 0.4%                          | 10%   | 75%                                 | 10           | \$0          |
| Existing             | School           | Plug Load     | Office Computer Network Energy Management                 | Office Computer Network Energy Management   | No Network Management                               | 1.57                     | 1.8%                          | 95%   | 30%                                 | 3            | \$312        |
| Existing             | School           | Plug Load     | Power Supply 80+ Office Measure                           | 80% Efficient Power supply  | No 80+  | 1.57                     | 1.0%                          | 95%   | 86%                                 | 7            | \$0          |
| Existing             | School           | Plug Load     | Refrigerator eCube  | Refrigerator eCube  | No Refrigerator eCube                               | 1.57                     | 1.2%                          | 75%   | 95%                                 | 10           | \$171        |
| Existing             | School           | Plug Load     | Residential-Size Refrigerator                             | Energy Star Residential-Size Refrigerator   | Residential-Size Refrigerator - Standard            | 1.57                     | 0.1%                          | 75%   | 65%                                 | 13           | \$124        |
| Existing             | School           | Plug Load     | Residential-Size Refrigerator/Freezer - Early Replacement | Energy Star Refrigerator/Freezer  | Baseline Refrigerator/Freezer                       | 1.57                     | 1.1%                          | 25%   | 35%                                 | 7            | \$577        |
| Existing             | School           | Plug Load     | Vending Machine   | Energy Star Vending Machines - High-Efficiency  | Vending Machines - Standard                         | 1.57                     | 2.1%                          | 75%   | 80%                                 | 14           | \$188        |
| Existing             | School           | Plug Load     | Vending Miser   | Passive Infrared Sensor on Vending Machine Monitoring Vacancy of Area And Cycles Cooling - Controls | No Vending Miser - No controls                      | 1.57                     | 2.1%                          | 75%   | 25%                                 | 3            | \$300        |
| Existing             | School           | Refrigeration | Commercial Reach-In Refrigerator                          | Energy Star Commercial Reach-In Refrigerator  | Commercial-Size Refrigerator - Standard             | 0.50                     | 12.8%                         | 95%   | 100%                                | 12           | \$347        |
| Existing             | School           | Refrigeration | Custom Refrigeration System                               | High-Efficiency Custom Refrigeration System (Walk-in) includes compressors                          | Custom Refrigeration System - Standard              | 0.50                     | 3.6%                          | 85%   | 65%                                 | 10           | \$9,596      |
| Existing             | School           | Refrigeration | Ice Maker   | Energy Star Ice Maker - High-Efficiency   | Standard Ice Maker                                  | 0.50                     | 1.1%                          | 85%   | 86%                                 | 9            | \$377        |

| Construction Vintage | Customer Segment | End Use       | Measure Name  | Measure Description  | Base Equipment                              | Baseline kWh (UEC or EUJ) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|---|--|---|---------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | School           | Refrigeration | Reduced Speed or Cycling of Evaporator Fans                         | VFD on Evaporator Fans (Evap Fan Control on Walk-In)   | Constant Speed Evaporator Fans              | 0.50                      | 6.0%                      | 75%   | 70%                                 | 10           | \$76         |
| Existing             | School           | Refrigeration | Refrigeration - Retro Commissioning                                 | Refrigeration Retro Commissioning (Refrigeration System Diagnostics / Operations And Maintenance)                        | No Re-commissioning                         | 0.50                      | 5.0%                      | 80%   | 90%                                 | 3            | \$94         |
| Existing             | School           | Refrigeration | Special Glass Doors for Refrigerated Reach-in Cases                 | Do Not Require Anti-Sweat Heating  | Standard Glass Doors                        | 0.50                      | 3.2%                      | 95%   | 77%                                 | 16           | \$318        |
| Existing             | School           | Refrigeration | Strip Curtains for Walk-Ins   | Strip Curtains for Walk-Ins  | No Strip Curtains for Walk-Ins              | 0.50                      | 2.0%                      | 95%   | 20%                                 | 4            | \$188        |
| Existing             | School           | Space Heat    | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)  | Constant Ventilation                        | 5.72                      | 10.0%                     | 25%   | 94%                                 | 15           | \$37066      |
| Existing             | School           | Space Heat    | Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning   | No Commissioning                            | 5.72                      | 12.5%                     | 90%   | 40%                                 | 3            | \$11596      |
| Existing             | School           | Space Heat    | Direct Digital Control System-Installation                          | DDC Retrofit   | Pneumatic                                   | 5.72                      | 15.0%                     | 5%  | 34%                                 | 5            | \$56576      |
| Existing             | School           | Space Heat    | Direct Digital Control System-Optimization                          | DDC System (Optimized)   | DDC System (Basic)                          | 5.72                      | 10.0%                     | 75%   | 80%                                 | 5            | \$31683      |
| Existing             | School           | Space Heat    | Direct Digital Control System-Wireless Performance Monitoring       | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control  | Pneumatic                                   | 5.72                      | 15.0%                     | 50%   | 80%                                 | 5            | \$22863      |
| Existing             | School           | Space Heat    | Duct Repair And Sealing   | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 5.72                      | 2.5%                      | 45%   | 45%                                 | 18           | \$23534      |
| Existing             | School           | Space Heat    | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery  | No Heat Recovery                            | 5.72                      | 15.0%                     | 5%  | 94%                                 | 10           | \$53363      |
| Existing             | School           | Space Heat    | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air) | 5.72                      | 4.5%                      | 73%   | 85%                                 | 10           | \$5,725      |
| Existing             | School           | Space Heat    | Insulation (Ceiling)  | R-49   | R-30  | 5.72                      | 4.0%                      | 75%   | 85%                                 | 25           | \$15297      |
| Existing             | School           | Space Heat    | Insulation (Ceiling) - Existing to Code                             | R-30   | Existing Ceiling Insulation (Average R-9)   | 5.72                      | 6.3%                      | 75%   | 15%                                 | 25           | \$17945      |
| Existing             | School           | Space Heat    | Insulation (Ceiling) - Zero to Code                                 | R-30   | R-0   | 5.72                      | 12.5%                     | 75%   | 0%                                  | 25           | \$17945      |
| Existing             | School           | Space Heat    | Insulation (Duct) (Unconditioned Spaces)                            | Install New Duct Insulation (R-8)  | R-0   | 5.72                      | 4.4%                      | 10%   | 15%                                 | 25           | \$6,578      |
| Existing             | School           | Space Heat    | Insulation (Duct) (Unconditioned Spaces)                            | R-4  | R-0   | 5.72                      | 2.4%                      | 10%   | 15%                                 | 25           | \$6,854      |
| Existing             | School           | Space Heat    | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 5.72                      | 6.0%                      | 10%   | 95%                                 | 25           | \$8,296      |
| Existing             | School           | Space Heat    | Insulation (Wall) - Existing to Code                                | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)              | 5.72                      | 21.1%                     | 10%   | 35%                                 | 25           | \$9,090      |
| Existing             | School           | Space Heat    | Insulation (Wall) - Zero to Code                                    | R-19 (2x6 Framing) - (Code)  | R-0   | 5.72                      | 25.0%                     | 10%   | 0%                                  | 25           | \$8,990      |
| Existing             | School           | Space Heat    | Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)                                 | 5.72                      | 2.5%                      | 35%   | 35%                                 | 25           | \$2,648      |
| Existing             | School           | Space Heat    | Insulation - Floor (Non-Slab) - Existing to Code                    | R-10 (Code)  | R-0   | 5.72                      | 7.5%                      | 35%   | 35%                                 | 25           | \$15297      |
| Existing             | School           | Space Heat    | Sensible And Total Heat Recovery Devices                            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery                            | 5.72                      | 25.0%                     | 25%   | 98%                                 | 10           | 124142       |
| Existing             | School           | Space Heat    | Thermostat - Programmable   | Energy Star Programmable Thermostat  | Manual Thermostat                           | 5.72                      | 3.0%                      | 95%   | 79%                                 | 15           | \$147        |

| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description   | Base Equipment   | Savings as Percent of End Use |                    | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|---|--|-------------------------------|--------------------|---|-------------------------------------|--------------|--------------|
|                      |                  |            |   |   |  | Baseline kWh (UEC or EU)      | Percent of End Use |   |                                     |              |              |
| Existing             | School           | Space Heat | Windows   | U = 0.35  | U = 0.40   | 5.72                          | 7.3%               | 80%   | 60%                                 | 25           | \$12438      |
| Existing             | School           | Space Heat | Windows - Existing to Code                          | U = 0.40  | Existing Windows (U=0.65)                                  | 5.72                          | 21.8%              | 10%   | 60%                                 | 25           | 177788       |
| Existing             | School           | Water Heat | Water_Heater (40 Gallon Residential Sized Electric) | EF = 0.95   | EF = 0.92  | 1.44                          | 3.3%               | NA  | NA                                  | 20           | \$1,294      |
| Existing             | School           | Water Heat | Clothes Washer - Ozonating                          | Ozonating Clothes Washer                                      | Standard Commercial Clothes Washer                         | 1.44                          | 15.1%              | 35%   | 95%                                 | 10           | \$8,702      |
| Existing             | School           | Water Heat | Clothes Washer Commercial                           | Energy Star Commercial Clothes Washer MEF=1.72                | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 1.44                          | 0.8%               | 35%   | 80%                                 | 11           | \$306        |
| Existing             | School           | Water Heat | Demand controlled Circulating Systems               | Install demand-based control system (VFD Control by Demand)   | No demand control systems in place                         | 1.44                          | 5.0%               | 55%   | 94%                                 | 15           | \$16344      |
| Existing             | School           | Water Heat | Dishwashing - Commercial - High Efficiency          | High Efficiency Dishwasher                                    | Standard Dishwasher  | 1.44                          | 2.1%               | 85%   | 80%                                 | 10           | \$2,701      |
| Existing             | School           | Water Heat | Dishwashing - Commercial Chemical System            | Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost) | High Temp Commercial Dishwasher                            | 1.44                          | 5.6%               | 85%   | 95%                                 | 10           | \$841        |
| Existing             | School           | Water Heat | Dishwashing - Residential Sized System              | EF = 0.65 (ENERGY STAR)                                       | Standard Dishwasher (FED Std. EF=0.46)                     | 1.44                          | 0.2%               | 65%   | 25%                                 | 13           | \$29         |
| Existing             | School           | Water Heat | Dishwashing - Residential Sized System              | EF = 0.77   | Standard Dishwasher (FED Std. EF=0.46)                     | 1.44                          | 0.2%               | 65%   | 55%                                 | 13           | \$630        |
| Existing             | School           | Water Heat | Drainwater Heat Recovery Water Heater               | Install (Power-Pipe or GFX) - Heat Recovery Water Heater      | No Heat Recovery System                                    | 1.44                          | 20.0%              | 5%  | 92%                                 | 25           | \$7,001      |
| Existing             | School           | Water Heat | Faucet Aerators                                     | 1.5 GPM Aerator   | 2.5 GPM Aerator (Federal Code)                             | 1.44                          | 4.0%               | 95%   | 25%                                 | 10           | \$0          |
| Existing             | School           | Water Heat | Faucet Aerators - Existing to Code                  | 2.5 GPM Aerator (Federal Code)                                | 4.0 GPM Aerator  | 1.44                          | 3.8%               | 95%   | 15%                                 | 10           | \$0          |
| Existing             | School           | Water Heat | Heat Pump Water Heater                              | EF = 2.9  | EF=0.93 Baseline Electric Water Heater                     | 1.44                          | 58.9%              | 40%   | 94%                                 | 15           | \$7,143      |
| Existing             | School           | Water Heat | Hot Water (SHW) Pipe Insulation                     | Install Insulation (R-4)                                      | No Pipe Insulation   | 1.44                          | 1.0%               | 80%   | 8%                                  | 15           | \$624        |
| Existing             | School           | Water Heat | Low Flow Spray Heads                                | 1.6 GPM   | 3.0 GPM  | 1.44                          | 2.3%               | 95%   | 25%                                 | 5            | \$6          |
| Existing             | School           | Water Heat | Low-Flow Showerheads                                | 2.0 GPM Showerhead  | 2.5 GPM Showerhead (Federal Code)                          | 1.44                          | 3.4%               | 45%   | 75%                                 | 10           | \$6          |
| Existing             | School           | Water Heat | Low-Flow Showerheads - Existing to Code             | 2.5 GPM Showerhead (Federal Code)                             | 4.5 GPM Showerhead   | 1.44                          | 7.5%               | 45%   | 20%                                 | 10           | \$12         |
| Existing             | School           | Water Heat | Solar RE - Solar Water Heater                       | Passive solar water heating                                   | Non-solar hot water heater                                 | 1.44                          | 7.2%               | 20%   | 95%                                 | 20           | \$17862      |
| Existing             | School           | Water Heat | Ultrasonic Faucet Control                           | Install Ultrasonic Motion Faucet Control                      | No Faucet Control  | 1.44                          | 3.3%               | 95%   | 75%                                 | 10           | \$206        |
| Existing             | School           | Water Heat | Water Heater Thermostat Setback                     | Thermostat Setback and Replacement (120 Degrees)              | No Thermostat Setback (130 Degrees)                        | 1.44                          | 7.7%               | 75%   | 15%                                 | 11           | \$106        |
| New                  | School           | Cooking    | Cooking Fryers - Commercial                         | Energy Star Commercial Fryer                                  | Non-Energy Star Fryer                                      | 0.22                          | 2.5%               | 35%   | 70%                                 | 12           | \$4,948      |
| New                  | School           | Cooking    | Hot Food Holding Cabinets - Commercial              | Energy Star Commercial Hot Food Holding Cabinets              | Non-Energy Star Commercial Hot Food Holding Cabinets       | 0.22                          | 8.3%               | 75%   | 85%                                 | 12           | \$1,800      |
| New                  | School           | Cooking    | Oven - Convection                                   | Convection Oven   | Standard Oven  | 0.22                          | 3.4%               | 85%   | 40%                                 | 15           | \$1,736      |
| New                  | School           | Cooking    | Steam Cookers - Commercial                          | Energy Star Commercial Steam Cookers (50% efficiency)         | Non-Energy Star Commercial Steam Cooker (35% efficiency)   | 0.22                          | 2.3%               | 35%   | 75%                                 | 10           | \$0          |

| Construction Vintage | Customer Segment | End Use          | Measure Name  | Measure Description  | Base Equipment                              | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|--|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | School           | Cooling Chillers | Chiller - Premium Efficiency  | 0.507 kW/ton   | 0.634 kW/ton                                | 0.16                     | 20.0%                         | NA  | NA                                  | 20           | \$7,619      |
| New                  | School           | Cooling Chillers | Chiller - Advanced Technology                                       | 0.461 kW/ton   | 0.634 kW/ton                                | 0.16                     | 27.3%                         | NA  | NA                                  | 20           | \$9,496      |
| New                  | School           | Cooling Chillers | Chiller - High Efficiency   | 0.574 kW/ton   | 0.634 kW/ton                                | 0.16                     | 9.5%                          | NA  | NA                                  | 20           | \$2,730      |
| New                  | School           | Cooling Chillers | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)  | Constant Ventilation                        | 0.14                     | 10.0%                         | 25%   | 94%                                 | 15           | \$37066      |
| New                  | School           | Cooling Chillers | Chilled Water Piping Loop w/ VSD Control                            | VSD for Secondary Chilled Water Loop   | Primary Loop Only w/ Constant Speed Pump    | 0.14                     | 7.6%                          | 25%   | 70%                                 | 10           | \$17233      |
| New                  | School           | Cooling Chillers | Chilled Water Reset   | Install Chilled Water Reset  | No Chilled Water Reset                      | 0.14                     | 5.0%                          | 95%   | 85%                                 | 10           | \$40084      |
| New                  | School           | Cooling Chillers | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning   | No Commissioning                            | 0.14                     | 12.5%                         | 90%   | 80%                                 | 3            | \$42950      |
| New                  | School           | Cooling Chillers | Cooling Tower-Decrease Approach Temperature                         | 6 Deg F  | 10 Deg F                                    | 0.14                     | 8.0%                          | 50%   | 94%                                 | 15           | \$1,706      |
| New                  | School           | Cooling Chillers | Direct Digital Control System-Optimization                          | DDC System (Optimized)   | DDC System (Basic)                          | 0.14                     | 10.0%                         | 75%   | 80%                                 | 5            | \$31683      |
| New                  | School           | Cooling Chillers | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air) | 0.14                     | 4.5%                          | 73%   | 85%                                 | 10           | \$5,725      |
| New                  | School           | Cooling Chillers | Green Roof  | Vegetation on Roof   | Standard roofing techniques                 | 0.14                     | 5.0%                          | 15%   | 98%                                 | 30           | 298005       |
| New                  | School           | Cooling Chillers | Insulation (Ceiling)  | R-38   | R-21 (Code)                                 | 0.14                     | 1.0%                          | 75%   | 45%                                 | 25           | \$15297      |
| New                  | School           | Cooling Chillers | Insulation (Ceiling)  | R-49   | R-21 (Code)                                 | 0.14                     | 1.5%                          | 75%   | 85%                                 | 25           | \$20298      |
| New                  | School           | Cooling Chillers | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 0.14                     | 3.0%                          | 95%   | 95%                                 | 25           | \$8,296      |
| New                  | School           | Cooling Chillers | Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)                                 | 0.14                     | 0.5%                          | 35%   | 35%                                 | 25           | \$2,648      |
| New                  | School           | Cooling Chillers | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                        | 0.14                     | 10.0%                         | 40%   | 98%                                 | 25           | \$9,119      |
| New                  | School           | Cooling Chillers | Sensible And Total Heat Recovery Devices                            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery                            | 0.14                     | 25.0%                         | 50%   | 98%                                 | 10           | 124142       |
| New                  | School           | Cooling Chillers | Turbocor Compressor   | 0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)                                 | 0.634 kW/ton (Code) chiller water cooled    | 0.14                     | 44.8%                         | 95%   | 99%                                 | 20           | \$43991      |



| Construction Vintage | Customer Segment | End Use          | Measure Name  | Measure Description   | Base Equipment                              | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|---|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | School           | Cooling Chillers | Window RE - Window Overhangs  | Overhangs over windows for shading  | No window overhangs                         | 0.14                     | 8.5%                          | 75%   | 75%                                 | 30           | \$15603      |
| New                  | School           | Cooling Chillers | Windows   | U = 0.35  | U = 0.55 (Code)                             | 0.14                     | 2.2%                          | 80%   | 60%                                 | 25           | \$49751      |
| New                  | School           | Cooling DX       | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)              | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)  | 10.3 EER Rooftop Unit (State Code)          | 0.17                     | 14.2%                         | NA  | NA                                  | 15           | \$19910      |
| New                  | School           | Cooling DX       | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)                 | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)   | 10.3 EER Rooftop Unit (State Code)          | 0.17                     | 6.4%                          | NA  | NA                                  | 15           | \$10602      |
| New                  | School           | Cooling DX       | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)               | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)   | 10.3 EER Rooftop Unit (State Code)          | 0.17                     | 10.4%                         | NA  | NA                                  | 15           | \$16433      |
| New                  | School           | Cooling DX       | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)   | Constant Ventilation                        | 0.16                     | 10.0%                         | 25%   | 94%                                 | 15           | \$37066      |
| New                  | School           | Cooling DX       | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning  | No Commissioning                            | 0.16                     | 12.5%                         | 90%   | 80%                                 | 3            | \$42950      |
| New                  | School           | Cooling DX       | Direct / Indirect Evaporative Cooling, Pre-Cooling                  | Direct / Indirect Evaporative Cooling, Pre-Cooling  | No modification to DX system                | 0.16                     | 25.0%                         | 50%   | 85%                                 | 15           | 122577       |
| New                  | School           | Cooling DX       | Direct Digital Control System-Optimization                          | DDC System (Optimized)  | DDC System (Basic)                          | 0.16                     | 10.0%                         | 75%   | 80%                                 | 5            | \$31683      |
| New                  | School           | Cooling DX       | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air                                      | Hood Pulls Conditioned Air (No Make-up Air) | 0.16                     | 4.5%                          | 73%   | 85%                                 | 10           | \$5,725      |
| New                  | School           | Cooling DX       | Green Roof  | Vegetation on Roof  | Standard roofing techniques                 | 0.16                     | 5.0%                          | 15%   | 98%                                 | 30           | 298005       |
| New                  | School           | Cooling DX       | Insulation (Ceiling)  | R-38  | R-21 (Code)                                 | 0.16                     | 1.0%                          | 75%   | 45%                                 | 25           | \$15297      |
| New                  | School           | Cooling DX       | Insulation (Ceiling)  | R-49  | R-21 (Code)                                 | 0.16                     | 1.5%                          | 75%   | 85%                                 | 25           | \$20298      |
| New                  | School           | Cooling DX       | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced   | R-19 (2x6 Framing) - (Code)                 | 0.16                     | 3.0%                          | 95%   | 95%                                 | 25           | \$8,296      |
| New                  | School           | Cooling DX       | Insulation - Floor (Non-Slab)                                       | R-19  | R-10 (Code)                                 | 0.16                     | 0.5%                          | 35%   | 35%                                 | 25           | \$2,648      |
| New                  | School           | Cooling DX       | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands  | Std duct workmanship                        | 0.16                     | 10.0%                         | 40%   | 98%                                 | 25           | \$9,119      |
| New                  | School           | Cooling DX       | Window RE - Window Overhangs  | Overhangs over windows for shading  | No window overhangs                         | 0.16                     | 8.5%                          | 75%   | 75%                                 | 30           | \$15603      |
| New                  | School           | Cooling DX       | Windows   | U = 0.35  | U = 0.55 (Code)                             | 0.16                     | 2.2%                          | 80%   | 60%                                 | 25           | \$49751      |
| New                  | School           | HVAC Aux         | Automated Exhaust VFD Control - Parking Garage CO sensor            | CO Sensors  | No CO Sensors                               | 0.90                     | 20.0%                         | 1%  | 75%                                 | 10           | \$12026      |
| New                  | School           | HVAC Aux         | Cooking Hood Controls   | Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air | No Cooking Hood Controls                    | 0.90                     | 7.5%                          | 60%   | 85%                                 | 10           | \$6,831      |
| New                  | School           | HVAC Aux         | Motor - Premium-Efficiency  | PE Motors for HVAC Applications   | Standard Efficiency Motors                  | 0.90                     | 3.8%                          | 85%   | 81%                                 | 10           | \$1,536      |
| New                  | School           | HVAC Aux         | Motor - Pump & Fan System - Variable Speed Control                  | Pump And Fan System Optimization w/ VSD   | No Pump And Fan System VSD Optimization     | 0.90                     | 33.8%                         | 85%   | 75%                                 | 20           | \$11938      |

| Construction Vintage | Customer Segment | End Use   | Measure Name  | Measure Description  | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|---|--|--|--------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| New                  | School           | HVAC Aux  | Motor - VAV Box High-Efficiency                                     | ECM Motors   | Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control | 0.90                     | 8.8%                      | 65%   | 77%                                 | 10           | \$21487      |
| New                  | School           | HVAC Aux  | Optimized Variable Volume Lab Hood Design                           | Optimized Variable Volume Lab Hood Design                                      | Constant Volume Lab Hood Design  | 0.90                     | 1.6%                      | 50%   | 94%                                 | 10           | \$1,789      |
| New                  | School           | Heat Pump | High-Efficiency EER=11.0, COP=3.5                                   | High-Efficiency EER=11.0, COP=3.5  | EER=10.1, COP=3.2  | 1.24                     | 16.8%                     | NA  | NA                                  | 15           | \$14115      |
| New                  | School           | Heat Pump | Premium-Efficiency EER=11.8, COP=3.8                                | Premium-Efficiency EER=11.8, COP=3.8   | EER=10.1, COP=3.2  | 1.24                     | 30.2%                     | NA  | NA                                  | 15           | \$30224      |
| New                  | School           | Heat Pump | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)                                    | Constant Ventilation   | 1.13                     | 10.0%                     | 25%   | 94%                                 | 15           | \$37066      |
| New                  | School           | Heat Pump | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning                                     | No Commissioning   | 1.13                     | 12.5%                     | 90%   | 80%                                 | 3            | \$42950      |
| New                  | School           | Heat Pump | Direct Digital Control System-Optimization                          | DDC System (Optimized)   | DDC System (Basic)   | 1.13                     | 10.0%                     | 75%   | 80%                                 | 5            | \$31683      |
| New                  | School           | Heat Pump | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery  | No Heat Recovery   | 1.13                     | 13.2%                     | 5%  | 94%                                 | 10           | \$53363      |
| New                  | School           | Heat Pump | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air)  | 1.13                     | 4.5%                      | 73%   | 85%                                 | 10           | \$5,725      |
| New                  | School           | Heat Pump | Green Roof  | Vegetation on Roof   | Standard roofing techniques  | 1.13                     | 0.2%                      | 15%   | 98%                                 | 30           | 298005       |
| New                  | School           | Heat Pump | Heat Pump - Ground Source (Closed Loop)                             | GSHP: COP=3.1, EER=13.4  | Std. Air Source HP 'EER=10.1, COP=3.2  | 1.13                     | 5.7%                      | 45%   | 92%                                 | 20           | 163708       |
| New                  | School           | Heat Pump | Heat Pump - Ground Source (Closed Loop)                             | GSHP: COP=4.0, EER=20  | Std. Air Source HP 'EER=10.1, COP=3.2  | 1.13                     | 25.8%                     | 45%   | 92%                                 | 20           | 307566       |
| New                  | School           | Heat Pump | Heat Pump - Water Source (Closed Loop)                              | WSHP: COP=4.2, EER=12.0  | Std. Air Source Heat Pump'EER=10.1, COP=3.2  | 1.13                     | 24.9%                     | 10%   | 90%                                 | 20           | \$32930      |
| New                  | School           | Heat Pump | Heat Pump - Water Source (Closed Loop)                              | WSHP: COP=4.8, EER=14.5  | Std. Air Source Heat Pump'EER=10.1, COP=3.2  | 1.13                     | 34.8%                     | 10%   | 90%                                 | 20           | \$43491      |
| New                  | School           | Heat Pump | Insulation (Ceiling)  | R-38   | R-21 (Code)  | 1.13                     | 3.0%                      | 75%   | 45%                                 | 25           | \$15297      |
| New                  | School           | Heat Pump | Insulation (Ceiling)  | R-49   | R-21 (Code)  | 1.13                     | 4.4%                      | 75%   | 85%                                 | 25           | \$20298      |
| New                  | School           | Heat Pump | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)  | 1.13                     | 5.0%                      | 95%   | 95%                                 | 25           | \$8,296      |
| New                  | School           | Heat Pump | Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)  | 1.13                     | 1.9%                      | 35%   | 35%                                 | 25           | \$2,648      |
| New                  | School           | Heat Pump | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands                 | Std duct workmanship   | 1.13                     | 10.0%                     | 40%   | 98%                                 | 25           | \$9,119      |
| New                  | School           | Heat Pump | Windows   | U = 0.35   | U = 0.55 (Code)  | 1.13                     | 14.9%                     | 80%   | 60%                                 | 25           | \$49751      |
| New                  | School           | Lighting  | Bi-Level Control, Stairwell Lighting                                | Occupancy Sensor Control, 50% Lighting Power during unoccupied Time            | Continuous Full Power Lighting in Stairways  | 1.98                     | 2.0%                      | 50%   | 75%                                 | 9            | \$4,636      |
| New                  | School           | Lighting  | Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures     | Continuous Dimming, Fluorescent Fixtures (Day-Lighting)                        | No Dimming Controls  | 1.98                     | 15.0%                     | 45%   | 81%                                 | 9            | \$17651      |
| New                  | School           | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 15%                        | Code Required LPD And Control Strategies: LPD = 1.2  | 1.98                     | 15.0%                     | 90%   | 70%                                 | 14           | \$5,295      |

| Construction Vintage | Customer Segment | End Use       | Measure Name  | Measure Description  | Base Equipment                                      | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|---|--|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | School           | Lighting      | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 20%                                      | Code Required LPD And Control Strategies: LPD = 1.2 | 1.98                     | 20.0%                         | 75%   | 85%                                 | 14           | \$17651      |
| New                  | School           | Lighting      | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 25%                                      | Code Required LPD And Control Strategies: LPD = 1.2 | 1.98                     | 25.0%                         | 70%   | 90%                                 | 14           | \$29653      |
| New                  | School           | Lighting      | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 35% - Only High Bay Applications         | Code Required LPD And Control Strategies: LPD = 1.2 | 1.98                     | 5.3%                          | 65%   | 95%                                 | 14           | \$22946      |
| New                  | School           | Lighting      | LED Refrigeration Case Lights                             | LED Refrigeration Case Lights (28W)  | Fluorescent Refrigeration Case Lights (60W)         | 1.98                     | 0.1%                          | 50%   | 80%                                 | 13           | \$630        |
| New                  | School           | Lighting      | LED Solid State White Lighting Package                    | Landscape, merchandise, signage, structure & task lighting                                   | 50W 10hrs/day, 365 day/yr                           | 1.98                     | 0.8%                          | 10%   | 95%                                 | 14           | \$35         |
| New                  | School           | Lighting      | Occupancy Sensor Control, Fluorescent                     | Occupancy Sensor Control, Fluorescent  | No Occupancy Sensor                                 | 1.98                     | 4.0%                          | 90%   | 65%                                 | 10           | \$1,100      |
| New                  | School           | Plug Load     | Energy Star - Battery Charging System                     | Energy Star Battery Charging System  | Non-Energy Star Battery Chargers                    | 1.57                     | 0.4%                          | 95%   | 90%                                 | 7            | \$0          |
| New                  | School           | Plug Load     | Energy Star - Computer                                    | Energy Star Features Enabled   | Non-Energy Star Features                            | 1.57                     | 13.6%                         | 64%   | 25%                                 | 4            | \$0          |
| New                  | School           | Plug Load     | Energy Star - Copiers                                     | Energy Star or Better Office Equipment: Copiers,   | Office Equipment: Copiers, Standard                 | 1.57                     | 1.3%                          | 90%   | 45%                                 | 6            | \$165        |
| New                  | School           | Plug Load     | Energy Star - Fax   | Energy Star Features Enabled   | Non-Energy Star Features                            | 1.57                     | 1.8%                          | 75%   | 55%                                 | 4            | \$0          |
| New                  | School           | Plug Load     | Energy Star - Monitors                                    | Energy Star Features Enabled   | Non-Energy Star Features                            | 1.57                     | 18.4%                         | 64%   | 15%                                 | 4            | \$159        |
| New                  | School           | Plug Load     | Energy Star - Printers                                    | Energy Star Features Enabled   | Non-Energy Star Features                            | 1.57                     | 1.3%                          | 75%   | 40%                                 | 5            | \$18         |
| New                  | School           | Plug Load     | Energy Star - Scanners                                    | Energy Star Features Enabled   | Non-Energy Star Features                            | 1.57                     | 0.9%                          | 75%   | 45%                                 | 4            | \$0          |
| New                  | School           | Plug Load     | Energy Star - Water Cooler                                | Energy Star Water Cooler (Hot/Cold Water)  | Non-Energy Star Water Cooler                        | 1.57                     | 0.4%                          | 10%   | 75%                                 | 10           | \$0          |
| New                  | School           | Plug Load     | Office Computer Network Energy Management                 | Office Computer Network Energy Management  | No Network Management                               | 1.57                     | 1.8%                          | 95%   | 30%                                 | 3            | \$312        |
| New                  | School           | Plug Load     | Power Supply 80+ Office Measure                           | 80% Efficient Power supply   | No 80+  | 1.57                     | 1.0%                          | 95%   | 86%                                 | 7            | \$0          |
| New                  | School           | Plug Load     | Refrigerator eCube  | Refrigerator eCube   | No Refrigerator eCube                               | 1.57                     | 1.2%                          | 75%   | 95%                                 | 10           | \$171        |
| New                  | School           | Plug Load     | Residential-Size Refrigerator                             | Energy Star Residential-Size Refrigerator  | Residential-Size Refrigerator - Standard            | 1.57                     | 0.1%                          | 75%   | 65%                                 | 13           | \$124        |
| New                  | School           | Plug Load     | Residential-Size Refrigerator/Freezer - Early Replacement | Energy Star Refrigerator/Freezer   | Baseline Refrigerator/Freezer                       | 1.57                     | 1.1%                          | 25%   | 35%                                 | 7            | \$577        |
| New                  | School           | Plug Load     | Vending Machine   | Energy Star Vending Machines - High-Efficiency   | Vending Machines - Standard                         | 1.57                     | 2.0%                          | 75%   | 80%                                 | 14           | \$188        |
| New                  | School           | Refrigeration | Commercial Reach-In Refrigerator                          | Energy Star Commercial Reach-In Refrigerator   | Commercial-Size Refrigerator - Standard             | 0.50                     | 8.5%                          | 95%   | 100%                                | 12           | \$347        |
| New                  | School           | Refrigeration | Custom Refrigeration System                               | High-Efficiency Custom Refrigeration System (Walk-in) includes compressors                   | Custom Refrigeration System - Standard              | 0.50                     | 3.6%                          | 85%   | 65%                                 | 10           | \$9,596      |
| New                  | School           | Refrigeration | Ice Maker   | Energy Star Ice Maker - High-Efficiency  | Standard Ice Maker                                  | 0.50                     | 1.1%                          | 85%   | 86%                                 | 9            | \$377        |
| New                  | School           | Refrigeration | Reduced Speed or Cycling of Evaporator Fans               | VFD on Evaporator Fans (Evap Fan Control on Walk-In)   | Constant Speed Evaporator Fans                      | 0.50                     | 6.0%                          | 75%   | 70%                                 | 10           | \$76         |
| New                  | School           | Refrigeration | Refrigeration - Commissioning                             | Commissioning (Refrigeration System Diagnostics / Operations and Maintenance for a new unit) | No Commissioning                                    | 0.50                     | 5.0%                          | 80%   | 90%                                 | 3            | \$94         |

| Construction Vintage | Customer Segment | End Use       | Measure Name  | Measure Description  | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|---|--|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | School           | Refrigeration | Special Glass Doors for Refrigerated Reach-in Cases                 | Do Not Require Anti-Sweat Heating  | Standard Glass Doors                                       | 0.50                     | 3.2%                          | 95%   | 77%                                 | 16           | \$318        |
| New                  | School           | Refrigeration | Strip Curtains for Walk-Ins   | Strip Curtains for Walk-Ins  | No Strip Curtains for Walk-Ins                             | 0.50                     | 2.0%                          | 95%   | 20%                                 | 4            | \$188        |
| New                  | School           | Space Heat    | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)  | Constant Ventilation                                       | 1.85                     | 10.0%                         | 25%   | 94%                                 | 15           | \$37066      |
| New                  | School           | Space Heat    | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning   | No Commissioning   | 1.85                     | 12.5%                         | 90%   | 80%                                 | 3            | \$42950      |
| New                  | School           | Space Heat    | Direct Digital Control System-Optimization                          | DDC System (Optimized)   | DDC System (Basic)   | 1.85                     | 10.0%                         | 75%   | 80%                                 | 5            | \$31683      |
| New                  | School           | Space Heat    | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery  | No Heat Recovery   | 1.85                     | 15.0%                         | 5%  | 94%                                 | 10           | \$53363      |
| New                  | School           | Space Heat    | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air)                | 1.85                     | 4.5%                          | 73%   | 85%                                 | 10           | \$5,725      |
| New                  | School           | Space Heat    | Insulation (Ceiling)  | R-49   | R-30   | 1.85                     | 4.0%                          | 75%   | 85%                                 | 25           | \$15297      |
| New                  | School           | Space Heat    | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                                | 1.85                     | 6.0%                          | 95%   | 95%                                 | 25           | \$8,296      |
| New                  | School           | Space Heat    | Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)  | 1.85                     | 2.5%                          | 35%   | 35%                                 | 25           | \$2,648      |
| New                  | School           | Space Heat    | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                                       | 1.85                     | 10.0%                         | 40%   | 98%                                 | 25           | \$9,119      |
| New                  | School           | Space Heat    | Sensible And Total Heat Recovery Devices                            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery   | 1.85                     | 25.0%                         | 50%   | 98%                                 | 10           | 124142       |
| New                  | School           | Space Heat    | Windows   | U = 0.35   | U = 0.40   | 1.85                     | 7.3%                          | 80%   | 60%                                 | 25           | \$12438      |
| New                  | School           | Water Heat    | Water_Heater (40 Gallon Electric) - Residential Sized               | EF = 0.95  | EF = 0.92  | 1.44                     | 3.3%                          | NA  | NA                                  | 20           | \$1,294      |
| New                  | School           | Water Heat    | Clothes Washer - Ozonating  | Ozonating Clothes Washer   | Standard Commercial Clothes Washer                         | 1.42                     | 15.1%                         | 35%   | 95%                                 | 10           | \$8,702      |
| New                  | School           | Water Heat    | Clothes Washer Commercial   | Energy Star Commercial Clothes Washer MEF=1.72   | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 1.42                     | 0.8%                          | 35%   | 80%                                 | 11           | \$306        |
| New                  | School           | Water Heat    | Demand controlled Circulating Systems                               | Install demand-based control system (VFD Control by Demand)  | No demand control systems in place                         | 1.42                     | 5.0%                          | 55%   | 94%                                 | 15           | \$16344      |
| New                  | School           | Water Heat    | Dishwashing - Commercial - High Efficiency                          | High Efficiency Dishwasher   | Standard Dishwasher  | 1.42                     | 2.1%                          | 85%   | 80%                                 | 10           | \$2,701      |
| New                  | School           | Water Heat    | Dishwashing - Commercial Chemical System                            | Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)  | High Temp Commercial Dishwasher                            | 1.42                     | 5.6%                          | 85%   | 95%                                 | 10           | \$841        |
| New                  | School           | Water Heat    | Dishwashing - Residential Sized System                              | EF = 0.65 (ENERGY STAR)  | Standard Dishwasher (FED Std. EF=0.46)                     | 1.42                     | 0.2%                          | 65%   | 25%                                 | 13           | \$29         |
| New                  | School           | Water Heat    | Dishwashing - Residential Sized System                              | EF = 0.77  | Standard Dishwasher (FED Std. EF=0.46)                     | 1.42                     | 0.2%                          | 65%   | 55%                                 | 13           | \$630        |
| New                  | School           | Water Heat    | Drainwater Heat Recovery Water Heater                               | Install (Power-Pipe or GFX) - Heat Recovery Water Heater   | No Heat Recovery System                                    | 1.42                     | 20.0%                         | 25%   | 92%                                 | 25           | \$7,001      |
| New                  | School           | Water Heat    | Faucet Aerators   | 1.5 GPM Aerator  | 2.5 GPM Aerator (Federal Code)                             | 1.42                     | 4.0%                          | 95%   | 25%                                 | 10           | \$0          |
| New                  | School           | Water Heat    | Heat Pump Water Heater  | EF = 2.9   | EF=0.93 Baseline Electric Water Heater                     | 1.42                     | 58.9%                         | 50%   | 94%                                 | 15           | \$7,143      |

| Construction Vintage | Customer Segment | End Use          | Measure Name  | Measure Description                                   | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|---|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | School           | Water Heat       | Low Flow Spray Heads  | 1.6 GPM   | 3.0 GPM  | 1.42                     | 2.3%                          | 95%   | 25%                                 | 5            | \$6          |
| New                  | School           | Water Heat       | Low-Flow Showerheads  | 2.0 GPM Showerhead                                    | 2.5 GPM Showerhead (Federal Code)                        | 1.42                     | 3.4%                          | 45%   | 75%                                 | 10           | \$6          |
| New                  | School           | Water Heat       | Solar RE - Solar Water Heater                                       | Passive solar water heating                           | Non-solar hot water heater                               | 1.42                     | 7.2%                          | 20%   | 95%                                 | 20           | \$17862      |
| New                  | School           | Water Heat       | Ultrasonic Faucet Control   | Install Ultrasonic Motion Faucet Control              | No Faucet Control  | 1.42                     | 3.3%                          | 95%   | 75%                                 | 10           | \$206        |
| New                  | School           | Water Heat       | Water Heater Thermostat Setback                                     | Thermostat Setback and Replacement (120 Degrees)      | No Thermostat Setback (130 Degrees)                      | 1.42                     | 7.7%                          | 75%   | 15%                                 | 11           | \$106        |
| Existing             | University       | Cooking          | Cooking Fryers - Commercial   | Energy Star Commercial Fryer                          | Non-Energy Star Fryer                                    | 0.42                     | 2.5%                          | 35%   | 70%                                 | 12           | \$4,944      |
| Existing             | University       | Cooking          | Hot Food Holding Cabinets - Commercial                              | Energy Star Commercial Hot Food Holding Cabinets      | Non-Energy Star Commercial Hot Food Holding Cabinets     | 0.42                     | 8.4%                          | 75%   | 85%                                 | 12           | \$1,800      |
| Existing             | University       | Cooking          | Oven - Convection   | Convection Oven                                       | Standard Oven  | 0.42                     | 3.4%                          | 85%   | 40%                                 | 15           | \$1,734      |
| Existing             | University       | Cooking          | Steam Cookers - Commercial  | Energy Star Commercial Steam Cookers (50% efficiency) | Non-Energy Star Commercial Steam Cooker (35% efficiency) | 0.42                     | 2.3%                          | 35%   | 75%                                 | 10           | \$0          |
| Existing             | University       | Cooling Chillers | Chiller - Premium Efficiency  | 0.507 kW/ton  | 0.634 kW/ton   | 0.29                     | 20.0%                         | NA  | NA                                  | 20           | \$8,572      |
| Existing             | University       | Cooling Chillers | Chiller - Advanced Technology                                       | 0.461 kW/ton  | 0.634 kW/ton   | 0.29                     | 27.3%                         | NA  | NA                                  | 20           | \$10683      |
| Existing             | University       | Cooling Chillers | Chiller - High Efficiency   | 0.574 kW/ton  | 0.634 kW/ton   | 0.29                     | 9.5%                          | NA  | NA                                  | 20           | \$3,071      |
| Existing             | University       | Cooling Chillers | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)           | Constant Ventilation                                     | 0.32                     | 10.0%                         | 25%   | 94%                                 | 15           | \$41699      |
| Existing             | University       | Cooling Chillers | Centrifugal Chiller - VSD Remodel for Existing                      | VSD motor   | Constant Speed Motor                                     | 0.32                     | 40.0%                         | 43%   | 45%                                 | 10           | \$15985      |
| Existing             | University       | Cooling Chillers | Chilled Water Piping Loop w/ VSD Control                            | VSD for Secondary Chilled Water Loop                  | Primary Loop Only w/ Constant Speed Pump                 | 0.32                     | 7.6%                          | 25%   | 70%                                 | 10           | \$19387      |
| Existing             | University       | Cooling Chillers | Chilled Water Reset   | Install Chilled Water Reset                           | No Chilled Water Reset                                   | 0.32                     | 5.0%                          | 95%   | 85%                                 | 10           | \$45095      |
| Existing             | University       | Cooling Chillers | Chiller-Water Side Economizer                                       | Install Economizer                                    | No Economizer  | 0.32                     | 5.0%                          | 45%   | 90%                                 | 10           | \$45029      |
| Existing             | University       | Cooling Chillers | Commissioning - Retro Building                                      | Commissioning - Retro Building Commissioning          | No Commissioning   | 0.32                     | 12.5%                         | 90%   | 40%                                 | 3            | \$13046      |
| Existing             | University       | Cooling Chillers | Cooling Tower-Decrease Temperature                                  | Approach 6 Deg F                                      | 10 Deg F   | 0.32                     | 8.0%                          | 50%   | 94%                                 | 15           | \$1,919      |
| Existing             | University       | Cooling Chillers | Cooling Tower-Two-Speed Fan Motor                                   | Two-Speed Tower Fans replace Single-Speed             | Cooling Tower-One-Speed Fan Motor                        | 0.32                     | 14.0%                         | 95%   | 35%                                 | 10           | \$212        |
| Existing             | University       | Cooling Chillers | Cooling Tower-VSD Fan Control                                       | Variable-Speed Tower Fans replace Two-Speed           | Cooling Tower-Two-Speed Fan Motor                        | 0.32                     | 4.0%                          | 95%   | 75%                                 | 10           | \$1,734      |

| Construction Vintage | Customer Segment | End Use          | Measure Name  | Measure Description  | Base Equipment                              | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|--|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | University       | Cooling Chillers | Direct Digital Control System-Installation                    | DDC Retrofit   | Pnuematic                                   | 0.32                     | 15.0%                         | 5%  | 34%                                 | 5            | \$63648      |
| Existing             | University       | Cooling Chillers | Direct Digital Control System-Optimization                    | DDC System (Optimized)   | DDC System (Basic)                          | 0.32                     | 10.0%                         | 75%   | 80%                                 | 5            | \$35643      |
| Existing             | University       | Cooling Chillers | Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control        | Pnuematic                                   | 0.32                     | 15.0%                         | 50%   | 80%                                 | 5            | \$25721      |
| Existing             | University       | Cooling Chillers | Duct Repair And Sealing                                       | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 0.32                     | 2.5%                          | 45%   | 45%                                 | 18           | \$26476      |
| Existing             | University       | Cooling Chillers | Exhaust Hood Makeup Air                                       | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air) | 0.32                     | 4.5%                          | 73%   | 85%                                 | 10           | \$5,725      |
| Existing             | University       | Cooling Chillers | Green Roof  | Vegetation on Roof   | Standard roofing techniques                 | 0.32                     | 10.0%                         | 15%   | 98%                                 | 30           | 335256       |
| Existing             | University       | Cooling Chillers | Insulation (Ceiling)  | R-38   | R-21 (Code)                                 | 0.32                     | 1.0%                          | 75%   | 45%                                 | 25           | \$17209      |
| Existing             | University       | Cooling Chillers | Insulation (Ceiling)  | R-49   | R-21 (Code)                                 | 0.32                     | 1.5%                          | 75%   | 85%                                 | 25           | \$22835      |
| Existing             | University       | Cooling Chillers | Insulation (Ceiling) - Existing to Code                       | R-21 (Code)  | Existing Ceiling Insulation (Average R-9)   | 0.32                     | 1.2%                          | 75%   | 13%                                 | 25           | \$20188      |
| Existing             | University       | Cooling Chillers | Insulation (Ceiling) - Zero to Code                           | R-21 (Code)  | R-0   | 0.32                     | 3.0%                          | 75%   | 0%                                  | 25           | \$20188      |
| Existing             | University       | Cooling Chillers | Insulation (Duct) (Unconditioned Spaces)                      | Install New Duct Insulation (R-8)  | R-0   | 0.32                     | 4.4%                          | 10%   | 15%                                 | 25           | \$7,400      |
| Existing             | University       | Cooling Chillers | Insulation (Duct) (Unconditioned Spaces)                      | R-4  | R-0   | 0.32                     | 2.4%                          | 10%   | 15%                                 | 25           | \$7,711      |
| Existing             | University       | Cooling Chillers | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 0.32                     | 3.0%                          | 10%   | 95%                                 | 25           | \$8,803      |
| Existing             | University       | Cooling Chillers | Insulation (Wall) - Existing to Code                          | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)              | 0.32                     | 8.4%                          | 10%   | 35%                                 | 25           | \$9,644      |
| Existing             | University       | Cooling Chillers | Insulation (Wall) - Zero to Code                              | R-19 (2x6 Framing) - (Code)  | R-0   | 0.32                     | 10.0%                         | 10%   | 0%                                  | 25           | \$9,531      |
| Existing             | University       | Cooling Chillers | Insulation - Floor (Non-Slab)                                 | R-19   | R-10 (Code)                                 | 0.32                     | 0.5%                          | 35%   | 35%                                 | 25           | \$2,979      |
| Existing             | University       | Cooling Chillers | Insulation - Floor (Non-Slab) - Existing to Code              | R-10 (Code)  | R-0   | 0.32                     | 1.5%                          | 35%   | 35%                                 | 25           | \$17209      |
| Existing             | University       | Cooling Chillers | Pipe Insulation   | R-4  | R-0   | 0.32                     | 1.0%                          | 65%   | 45%                                 | 15           | \$1,357      |

| Construction Vintage | Customer Segment | End Use          | Measure Name  | Measure Description  | Base Equipment                              | Baseline kWh (UEC or EU) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|--|---|--------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | University       | Cooling Chillers | Sensible And Total Heat Recovery Devices                            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery                            | 0.32                     | 25.0%                     | 25%   | 98%                                 | 10           | 139660       |
| Existing             | University       | Cooling Chillers | Turbocor Compressor   | 0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)                                 | 0.634 kW/ton (Code) chiller water cooled    | 0.32                     | 44.8%                     | 60%   | 99%                                 | 20           | \$52508      |
| Existing             | University       | Cooling Chillers | Windows   | U = 0.35   | U = 0.55 (Code)                             | 0.32                     | 2.2%                      | 80%   | 60%                                 | 25           | \$55970      |
| Existing             | University       | Cooling Chillers | Windows - Existing to Code  | U = 0.55 (Code)  | Existing Windows (U=0.65)                   | 0.32                     | 1.1%                      | 10%   | 60%                                 | 25           | 158034       |
| Existing             | University       | Cooling DX       | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)              | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)   | 10.3 EER Rooftop Unit (State Code)          | 0.32                     | 14.2%                     | NA  | NA                                  | 15           | \$22398      |
| Existing             | University       | Cooling DX       | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)                 | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)  | 10.3 EER Rooftop Unit (State Code)          | 0.32                     | 6.4%                      | NA  | NA                                  | 15           | \$11927      |
| Existing             | University       | Cooling DX       | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)               | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)  | 10.3 EER Rooftop Unit (State Code)          | 0.32                     | 10.4%                     | NA  | NA                                  | 15           | \$18487      |
| Existing             | University       | Cooling DX       | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)  | Constant Ventilation                        | 0.35                     | 10.0%                     | 25%   | 94%                                 | 15           | \$41699      |
| Existing             | University       | Cooling DX       | Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning   | No Commissioning                            | 0.35                     | 12.5%                     | 90%   | 40%                                 | 3            | \$13046      |
| Existing             | University       | Cooling DX       | Cooling DX Package-Air Side Economizer                              | Air-Side Economizer  | No Economizer                               | 0.35                     | 15.0%                     | 10%   | 90%                                 | 15           | \$15535      |
| Existing             | University       | Cooling DX       | Direct / Indirect Evaporative Cooling, Pre-Cooling                  | Direct / Indirect Evaporative Cooling, Pre-Cooling   | No modification to DX system                | 0.35                     | 25.0%                     | 50%   | 85%                                 | 15           | 137899       |
| Existing             | University       | Cooling DX       | Direct Digital Control System-Installation                          | DDC Retrofit   | Pneumatic                                   | 0.35                     | 15.0%                     | 5%  | 34%                                 | 5            | \$63648      |
| Existing             | University       | Cooling DX       | Direct Digital Control System-Optimization                          | DDC System (Optimized)   | DDC System (Basic)                          | 0.35                     | 10.0%                     | 75%   | 80%                                 | 5            | \$35643      |
| Existing             | University       | Cooling DX       | Direct Digital Control System-Wireless Performance Monitoring       | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control  | Pneumatic                                   | 0.35                     | 15.0%                     | 50%   | 80%                                 | 5            | \$25721      |
| Existing             | University       | Cooling DX       | Duct Repair And Sealing   | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 0.35                     | 2.5%                      | 45%   | 45%                                 | 18           | \$26476      |
| Existing             | University       | Cooling DX       | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air) | 0.35                     | 4.5%                      | 73%   | 85%                                 | 10           | \$5,725      |
| Existing             | University       | Cooling DX       | Green Roof  | Vegetation on Roof   | Standard roofing techniques                 | 0.35                     | 10.0%                     | 15%   | 98%                                 | 30           | 335256       |
| Existing             | University       | Cooling DX       | Insulation (Ceiling)  | R-38   | R-21 (Code)                                 | 0.35                     | 1.0%                      | 75%   | 45%                                 | 25           | \$17209      |
| Existing             | University       | Cooling DX       | Insulation (Ceiling)  | R-49   | R-21 (Code)                                 | 0.35                     | 1.5%                      | 75%   | 85%                                 | 25           | \$22835      |
| Existing             | University       | Cooling DX       | Insulation (Ceiling) - Existing to Code                             | R-21 (Code)  | Existing Ceiling Insulation (Average R-9)   | 0.35                     | 1.2%                      | 75%   | 13%                                 | 25           | \$20188      |
| Existing             | University       | Cooling DX       | Insulation (Ceiling) - Zero to Code                                 | R-21 (Code)  | R-0   | 0.35                     | 3.0%                      | 75%   | 0%                                  | 25           | \$20188      |
| Existing             | University       | Cooling DX       | Insulation (Duct) (Unconditioned Spaces)                            | Install New Duct Insulation (R-8)  | R-0   | 0.35                     | 4.4%                      | 10%   | 15%                                 | 25           | \$7,400      |

| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description   | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|---|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | University       | Cooling DX | Insulation (Duct) (Unconditioned Spaces)                            | R-4   | R-0  | 0.35                     | 2.4%                          | 10%   | 15%                                 | 25           | \$7,711      |
| Existing             | University       | Cooling DX | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced   | R-19 (2x6 Framing) - (Code)  | 0.35                     | 3.0%                          | 10%   | 95%                                 | 25           | \$8,803      |
| Existing             | University       | Cooling DX | Insulation (Wall) - Existing to Code                                | R-19 (2x6 Framing) - (Code)   | Existing R-value (Average R-3)   | 0.35                     | 8.4%                          | 10%   | 35%                                 | 25           | \$9,644      |
| Existing             | University       | Cooling DX | Insulation (Wall) - Zero to Code                                    | R-19 (2x6 Framing) - (Code)   | R-0  | 0.35                     | 10.0%                         | 10%   | 0%                                  | 25           | \$9,531      |
| Existing             | University       | Cooling DX | Insulation - Floor (Non-Slab)                                       | R-19  | R-10 (Code)  | 0.35                     | 0.5%                          | 35%   | 35%                                 | 25           | \$2,979      |
| Existing             | University       | Cooling DX | Insulation - Floor (Non-Slab) - Existing to Code                    | R-10 (Code)   | R-0  | 0.35                     | 1.5%                          | 35%   | 35%                                 | 25           | \$17209      |
| Existing             | University       | Cooling DX | Thermostat - Programmable   | Energy Star Programmable Thermostat   | Manual Thermostat  | 0.35                     | 3.0%                          | 95%   | 66%                                 | 15           | \$146        |
| Existing             | University       | Cooling DX | Windows   | U = 0.35  | U = 0.55 (Code)  | 0.35                     | 2.2%                          | 80%   | 60%                                 | 25           | \$55970      |
| Existing             | University       | Cooling DX | Windows - Existing to Code  | U = 0.55 (Code)   | Existing Windows (U=0.65)  | 0.35                     | 1.1%                          | 10%   | 60%                                 | 25           | 158034       |
| Existing             | University       | HVAC Aux   | Automated Exhaust VFD Control - Parking Garage CO sensor            | CO Sensors  | No CO Sensors  | 1.34                     | 20.0%                         | 20%   | 85%                                 | 10           | \$13529      |
| Existing             | University       | HVAC Aux   | Cooking Hood Controls   | Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air | No Cooking Hood Controls   | 1.34                     | 7.5%                          | 60%   | 85%                                 | 10           | \$13132      |
| Existing             | University       | HVAC Aux   | Motor - Premium-Efficiency  | PE Motors for HVAC Applications   | Standard Efficiency Motors   | 1.34                     | 3.8%                          | 85%   | 81%                                 | 10           | \$1,728      |
| Existing             | University       | HVAC Aux   | Motor - Pump & Fan System - Variable Speed Control                  | Pump And Fan System Optimization w/ VSD Control   | No Pump And Fan System VSD Optimization  | 1.34                     | 33.8%                         | 85%   | 75%                                 | 20           | \$13430      |
| Existing             | University       | HVAC Aux   | Motor - VAV Box High-Efficiency                                     | ECM Motors  | Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control | 1.34                     | 8.8%                          | 50%   | 77%                                 | 10           | \$24172      |
| Existing             | University       | HVAC Aux   | Optimized Variable Volume Lab Hood Design                           | Optimized Variable Volume Lab Hood Design   | Constant Volume Lab Hood Design  | 1.34                     | 1.6%                          | 75%   | 94%                                 | 10           | \$1,794      |
| Existing             | University       | Heat Pump  | High-Efficiency EER=11.0, COP=3.5                                   | High-Efficiency EER=11.0, COP=3.5   | EER=10.1, COP=3.2  | 2.63                     | 16.8%                         | NA  | NA                                  | 15           | \$15879      |
| Existing             | University       | Heat Pump  | Premium-Efficiency EER=11.8, COP=3.8                                | Premium-Efficiency EER=11.8, COP=3.8  | EER=10.1, COP=3.2  | 2.63                     | 30.2%                         | NA  | NA                                  | 15           | \$34001      |
| Existing             | University       | Heat Pump  | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)   | Constant Ventilation   | 2.79                     | 10.0%                         | 25%   | 94%                                 | 15           | \$41699      |
| Existing             | University       | Heat Pump  | Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning  | No Commissioning   | 2.79                     | 12.5%                         | 90%   | 40%                                 | 3            | \$13046      |
| Existing             | University       | Heat Pump  | Direct Digital Control System-Installation                          | DDC Retrofit  | Pneumatic  | 2.79                     | 15.0%                         | 5%  | 34%                                 | 5            | \$63648      |
| Existing             | University       | Heat Pump  | Direct Digital Control System-Optimization                          | DDC System (Optimized)  | DDC System (Basic)   | 2.79                     | 10.0%                         | 75%   | 80%                                 | 5            | \$35643      |
| Existing             | University       | Heat Pump  | Direct Digital Control System-Wireless Performance Monitoring       | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control   | Pneumatic  | 2.79                     | 15.0%                         | 50%   | 80%                                 | 5            | \$25721      |
| Existing             | University       | Heat Pump  | Duct Repair And Sealing   | Reduction In Duct Losses to 5%  | No Repair or Sealing, 15% duct losses  | 2.79                     | 2.5%                          | 45%   | 45%                                 | 18           | \$26476      |
| Existing             | University       | Heat Pump  | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery   | No Heat Recovery   | 2.79                     | 13.2%                         | 5%  | 94%                                 | 10           | \$60034      |



| Construction Vintage | Customer Segment | End Use   | Measure Name  | Measure Description  | Base Equipment                                      | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|---|--|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | University       | Heat Pump | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air)         | 2.79                     | 4.5%                          | 73%   | 85%                                 | 10           | \$5,725      |
| Existing             | University       | Heat Pump | Green Roof  | Vegetation on Roof   | Standard roofing techniques                         | 2.79                     | 0.4%                          | 15%   | 98%                                 | 30           | 335256       |
| Existing             | University       | Heat Pump | Heat Pump - Ground Source (Closed Loop)                         | GSHP: COP=3.1, EER=13.4  | Std. Air Source HP 'EER=10.1, COP=3.2               | 2.79                     | 5.7%                          | 5%  | 92%                                 | 20           | 184172       |
| Existing             | University       | Heat Pump | Heat Pump - Ground Source (Closed Loop)                         | GSHP: COP=4.0, EER=20  | Std. Air Source HP 'EER=10.1, COP=3.2               | 2.79                     | 25.8%                         | 5%  | 92%                                 | 20           | 346012       |
| Existing             | University       | Heat Pump | Heat Pump - Water Source (Closed Loop)                          | WSHP: COP=4.2, EER=12.0  | Std. Air Source Heat Pump'EER=10.1, COP=3.2         | 2.79                     | 24.9%                         | 5%  | 90%                                 | 20           | \$37046      |
| Existing             | University       | Heat Pump | Heat Pump - Water Source (Closed Loop)                          | WSHP: COP=4.8, EER=14.5  | Std. Air Source Heat Pump'EER=10.1, COP=3.2         | 2.79                     | 34.8%                         | 5%  | 90%                                 | 20           | \$48927      |
| Existing             | University       | Heat Pump | Insulation (Ceiling)  | R-38   | R-21 (Code)   | 2.79                     | 3.0%                          | 75%   | 45%                                 | 25           | \$17209      |
| Existing             | University       | Heat Pump | Insulation (Ceiling)  | R-49   | R-21 (Code)   | 2.79                     | 4.4%                          | 75%   | 85%                                 | 25           | \$22835      |
| Existing             | University       | Heat Pump | Insulation (Ceiling) - Existing to Code                         | R-21 (Code)  | Existing Ceiling Insulation (Average R-9)           | 2.79                     | 2.8%                          | 75%   | 13%                                 | 25           | \$20188      |
| Existing             | University       | Heat Pump | Insulation (Ceiling) - Zero to Code                             | R-21 (Code)  | R-0   | 2.79                     | 6.9%                          | 75%   | 0%                                  | 25           | \$20188      |
| Existing             | University       | Heat Pump | Insulation (Duct) (Unconditioned Spaces)                        | Install New Duct Insulation (R-8)  | R-0   | 2.79                     | 4.4%                          | 10%   | 15%                                 | 25           | \$7,400      |
| Existing             | University       | Heat Pump | Insulation (Duct) (Unconditioned Spaces)                        | R-4  | R-0   | 2.79                     | 2.4%                          | 10%   | 15%                                 | 25           | \$7,711      |
| Existing             | University       | Heat Pump | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                         | 2.79                     | 5.0%                          | 10%   | 95%                                 | 25           | \$8,803      |
| Existing             | University       | Heat Pump | Insulation (Wall) - Existing to Code                            | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)                      | 2.79                     | 16.6%                         | 10%   | 35%                                 | 25           | \$9,644      |
| Existing             | University       | Heat Pump | Insulation (Wall) - Zero to Code                                | R-19 (2x6 Framing) - (Code)  | R-0   | 2.79                     | 19.8%                         | 10%   | 0%                                  | 25           | \$9,531      |
| Existing             | University       | Heat Pump | Insulation - Floor (Non-Slab)                                   | R-19   | R-10 (Code)   | 2.79                     | 1.9%                          | 35%   | 35%                                 | 25           | \$2,979      |
| Existing             | University       | Heat Pump | Insulation - Floor (Non-Slab) - Existing to Code                | R-10 (Code)  | R-0   | 2.79                     | 5.6%                          | 35%   | 35%                                 | 25           | \$17209      |
| Existing             | University       | Heat Pump | Thermostat - Programmable                                       | Energy Star Programmable Thermostat  | Manual Thermostat                                   | 2.79                     | 3.0%                          | 95%   | 66%                                 | 15           | \$146        |
| Existing             | University       | Heat Pump | Windows   | U = 0.35   | U = 0.55 (Code)                                     | 2.79                     | 14.9%                         | 80%   | 60%                                 | 25           | \$55970      |
| Existing             | University       | Heat Pump | Windows - Existing to Code                                      | U = 0.55 (Code)  | Existing Windows (U=0.65)                           | 2.79                     | 9.8%                          | 10%   | 60%                                 | 25           | 158034       |
| Existing             | University       | Lighting  | Bi-Level Control, Stairwell Lighting                            | Occupancy Sensor Control, 50% Lighting Power during unoccupied Time            | Continuous Full Power Lighting in Stairways         | 3.83                     | 2.0%                          | 50%   | 75%                                 | 9            | \$5,216      |
| Existing             | University       | Lighting  | Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures | Continuous Dimming, Fluorescent Fixtures (Day-Lighting)                        | No Dimming Controls                                 | 3.83                     | 15.0%                         | 30%   | 63%                                 | 9            | \$19857      |
| Existing             | University       | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 15%                        | Code Required LPD And Control Strategies: LPD = 1.2 | 3.83                     | 15.0%                         | 90%   | 70%                                 | 14           | \$10048      |
| Existing             | University       | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 20%                        | Code Required LPD And Control Strategies: LPD = 1.2 | 3.83                     | 20.0%                         | 75%   | 85%                                 | 14           | \$25337      |

| Construction Vintage | Customer Segment | End Use       | Measure Name  | Measure Description   | Base Equipment                                      | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|---|---|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | University       | Lighting      | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 25%   | Code Required LPD And Control Strategies: LPD = 1.2 | 3.83                     | 25.0%                         | 70%   | 90%                                 | 14           | \$40190      |
| Existing             | University       | Lighting      | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 35% - Only High Bay Applications                | Code Required LPD And Control Strategies: LPD = 1.2 | 3.83                     | 5.3%                          | 65%   | 95%                                 | 14           | \$31890      |
| Existing             | University       | Lighting      | HE Fixtures/Design - Existing to Code                     | Code Required LPD And Control Strategies: LPD = 1.2   | Existing Lighting Design                            | 3.83                     | 36.0%                         | 95%   | 45%                                 | 14           | \$61741      |
| Existing             | University       | Lighting      | LED Exit Lighting   | 5 Watts   | CFL Exit Sign (26 Watts)                            | 3.83                     | 1.6%                          | 95%   | 65%                                 | 11           | \$53         |
| Existing             | University       | Lighting      | LED Refrigeration Case Lights                             | LED Refrigeration Case Lights (28W)   | Fluorescent Refrigeration Case Lights (60W)         | 3.83                     | 0.2%                          | 50%   | 80%                                 | 13           | \$629        |
| Existing             | University       | Lighting      | LED Solid State White Lighting Package                    | Landscape, merchandise, signage, structure & task lighting  | 50W 10hrs/day, 365 day/yr                           | 3.83                     | 0.8%                          | 10%   | 95%                                 | 14           | \$40         |
| Existing             | University       | Lighting      | Occupancy Sensor Control, Fluorescent                     | Occupancy Sensor Control, Fluorescent   | No Occupancy Sensor                                 | 3.83                     | 4.0%                          | 90%   | 37%                                 | 9            | \$1,238      |
| Existing             | University       | Lighting      | Time Clocks And Timers                                    | Install Time Clock Lighting   | No Time Clock                                       | 3.83                     | 4.9%                          | 85%   | 92%                                 | 9            | \$218        |
| Existing             | University       | Plug Load     | Energy Star - Battery Charging System                     | Energy Star Battery Charging System   | Non-Energy Star Battery Chargers                    | 1.16                     | 0.4%                          | 95%   | 90%                                 | 7            | \$0          |
| Existing             | University       | Plug Load     | Energy Star - Computer                                    | Energy Star Features Enabled  | Non-Energy Star Features                            | 1.16                     | 13.6%                         | 64%   | 25%                                 | 4            | \$0          |
| Existing             | University       | Plug Load     | Energy Star - Copiers                                     | Energy Star or Better Office Equipment: Copiers,  | Office Equipment: Copiers, Standard                 | 1.16                     | 1.6%                          | 90%   | 45%                                 | 6            | \$165        |
| Existing             | University       | Plug Load     | Energy Star - Fax   | Energy Star Features Enabled  | Non-Energy Star Features                            | 1.16                     | 1.8%                          | 75%   | 55%                                 | 4            | \$0          |
| Existing             | University       | Plug Load     | Energy Star - Monitors                                    | Energy Star Features Enabled  | Non-Energy Star Features                            | 1.16                     | 18.4%                         | 64%   | 15%                                 | 4            | \$159        |
| Existing             | University       | Plug Load     | Energy Star - Printers                                    | Energy Star Features Enabled  | Non-Energy Star Features                            | 1.16                     | 1.3%                          | 75%   | 40%                                 | 5            | \$13         |
| Existing             | University       | Plug Load     | Energy Star - Scanners                                    | Energy Star Features Enabled  | Non-Energy Star Features                            | 1.16                     | 0.9%                          | 75%   | 45%                                 | 4            | \$0          |
| Existing             | University       | Plug Load     | Energy Star - Water Cooler                                | Energy Star Water Cooler (Hot/Cold Water)   | Non-Energy Star Water Cooler                        | 1.16                     | 0.5%                          | 10%   | 75%                                 | 10           | \$0          |
| Existing             | University       | Plug Load     | Office Computer Network Management                        | Office Computer Network Energy Management   | No Network Management                               | 1.16                     | 1.8%                          | 95%   | 30%                                 | 3            | \$311        |
| Existing             | University       | Plug Load     | Power Supply 80+ Office Measure                           | 80% Efficient Power supply  | No 80+  | 1.16                     | 1.0%                          | 95%   | 86%                                 | 7            | \$0          |
| Existing             | University       | Plug Load     | Refrigerator eCube  | Refrigerator eCube  | No Refrigerator eCube                               | 1.16                     | 1.2%                          | 75%   | 95%                                 | 10           | \$172        |
| Existing             | University       | Plug Load     | Residential-Size Refrigerator                             | Energy Star Residential-Size Refrigerator   | Residential-Size Refrigerator - Standard            | 1.16                     | 0.1%                          | 75%   | 65%                                 | 13           | \$126        |
| Existing             | University       | Plug Load     | Residential-Size Refrigerator/Freezer - Early Replacement | Energy Star Refrigerator/Freezer  | Baseline Refrigerator/Freezer                       | 1.16                     | 1.4%                          | 25%   | 35%                                 | 7            | \$576        |
| Existing             | University       | Plug Load     | Vending Machine   | Energy Star Vending Machines - High-Efficiency  | Vending Machines - Standard                         | 1.16                     | 2.5%                          | 90%   | 80%                                 | 14           | \$192        |
| Existing             | University       | Plug Load     | Vending Miser   | Passive Infrared Sensor on Vending Machine Monitoring Vacancy of Area And Cycles Cooling - Controls | No Vending Miser - No controls                      | 1.16                     | 2.6%                          | 90%   | 25%                                 | 3            | \$298        |
| Existing             | University       | Refrigeration | Commercial Reach-In Refrigerator                          | Energy Star Commercial Reach-In Refrigerator  | Commercial-Size Refrigerator - Standard             | 0.51                     | 7.6%                          | 95%   | 100%                                | 12           | \$344        |
| Existing             | University       | Refrigeration | Custom Refrigeration System                               | High-Efficiency Custom Refrigeration System (Walk-in) includes compressors                          | Custom Refrigeration System - Standard              | 0.51                     | 3.6%                          | 85%   | 65%                                 | 10           | \$9,597      |
| Existing             | University       | Refrigeration | Ice Maker   | Energy Star Ice Maker - High-Efficiency   | Standard Ice Maker                                  | 0.51                     | 1.1%                          | 85%   | 86%                                 | 9            | \$377        |

| Construction Vintage | Customer Segment | End Use       | Measure Name  | Measure Description  | Base Equipment                              | Baseline kWh (UEC or EU) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|---|--|---|--------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | University       | Refrigeration | Reduced Speed or Cycling of Evaporator Fans                         | VFD on Evaporator Fans (Evap Fan Control on Walk-In)   | Constant Speed Evaporator Fans              | 0.51                     | 6.0%                      | 75%   | 70%                                 | 10           | \$86         |
| Existing             | University       | Refrigeration | Refrigeration - Retro Commissioning                                 | Refrigeration Retro Commissioning (Refrigeration System Diagnostics / Operations And Maintenance)                        | No Re-commissioning                         | 0.51                     | 5.0%                      | 80%   | 90%                                 | 3            | \$106        |
| Existing             | University       | Refrigeration | Special Glass Doors for Refrigerated Reach-in Cases                 | Do Not Require Anti-Sweat Heating  | Standard Glass Doors                        | 0.51                     | 3.2%                      | 95%   | 77%                                 | 16           | \$357        |
| Existing             | University       | Refrigeration | Strip Curtains for Walk-Ins   | Strip Curtains for Walk-Ins  | No Strip Curtains for Walk-Ins              | 0.51                     | 2.0%                      | 95%   | 20%                                 | 4            | \$192        |
| Existing             | University       | Space Heat    | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)  | Constant Ventilation                        | 5.74                     | 10.0%                     | 25%   | 94%                                 | 15           | \$41699      |
| Existing             | University       | Space Heat    | Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning   | No Commissioning                            | 5.74                     | 12.5%                     | 90%   | 40%                                 | 3            | \$13046      |
| Existing             | University       | Space Heat    | Direct Digital Control System-Installation                          | DDC Retrofit   | Pneumatic                                   | 5.74                     | 15.0%                     | 5%  | 34%                                 | 5            | \$63648      |
| Existing             | University       | Space Heat    | Direct Digital Control System-Optimization                          | DDC System (Optimized)   | DDC System (Basic)                          | 5.74                     | 10.0%                     | 75%   | 80%                                 | 5            | \$35643      |
| Existing             | University       | Space Heat    | Direct Digital Control System-Wireless Performance Monitoring       | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control  | Pneumatic                                   | 5.74                     | 15.0%                     | 50%   | 80%                                 | 5            | \$25721      |
| Existing             | University       | Space Heat    | Duct Repair And Sealing   | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 5.74                     | 2.5%                      | 45%   | 45%                                 | 18           | \$26476      |
| Existing             | University       | Space Heat    | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery  | No Heat Recovery                            | 5.74                     | 15.0%                     | 5%  | 94%                                 | 10           | \$60034      |
| Existing             | University       | Space Heat    | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air) | 5.74                     | 4.5%                      | 73%   | 85%                                 | 10           | \$5,725      |
| Existing             | University       | Space Heat    | Insulation (Ceiling)  | R-49   | R-30  | 5.74                     | 4.0%                      | 75%   | 85%                                 | 25           | \$17209      |
| Existing             | University       | Space Heat    | Insulation (Ceiling) - Existing to Code                             | R-30   | Existing Ceiling Insulation (Average R-9)   | 5.74                     | 6.3%                      | 75%   | 13%                                 | 25           | \$20188      |
| Existing             | University       | Space Heat    | Insulation (Ceiling) - Zero to Code                                 | R-30   | R-0   | 5.74                     | 12.5%                     | 75%   | 0%                                  | 25           | \$20188      |
| Existing             | University       | Space Heat    | Insulation (Duct) (Unconditioned Spaces)                            | Install New Duct Insulation (R-8)  | R-0   | 5.74                     | 4.4%                      | 10%   | 15%                                 | 25           | \$7,400      |
| Existing             | University       | Space Heat    | Insulation (Duct) (Unconditioned Spaces)                            | R-4  | R-0   | 5.74                     | 2.4%                      | 10%   | 15%                                 | 25           | \$7,711      |
| Existing             | University       | Space Heat    | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 5.74                     | 6.0%                      | 10%   | 95%                                 | 25           | \$8,803      |
| Existing             | University       | Space Heat    | Insulation (Wall) - Existing to Code                                | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)              | 5.74                     | 21.1%                     | 10%   | 35%                                 | 25           | \$9,644      |
| Existing             | University       | Space Heat    | Insulation (Wall) - Zero to Code                                    | R-19 (2x6 Framing) - (Code)  | R-0   | 5.74                     | 25.0%                     | 10%   | 0%                                  | 25           | \$9,531      |
| Existing             | University       | Space Heat    | Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)                                 | 5.74                     | 2.5%                      | 35%   | 35%                                 | 25           | \$2,979      |
| Existing             | University       | Space Heat    | Insulation - Floor (Non-Slab) - Existing to Code                    | R-10 (Code)  | R-0   | 5.74                     | 7.5%                      | 35%   | 35%                                 | 25           | \$17209      |
| Existing             | University       | Space Heat    | Sensible And Total Heat Recovery Devices                            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery                            | 5.74                     | 25.0%                     | 25%   | 98%                                 | 10           | 139660       |
| Existing             | University       | Space Heat    | Thermostat - Programmable   | Energy Star Programmable Thermostat  | Manual Thermostat                           | 5.74                     | 3.0%                      | 95%   | 66%                                 | 15           | \$146        |

| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description   | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|---|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | University       | Space Heat | Windows   | U = 0.35  | U = 0.40   | 5.74                     | 7.3%                          | 80%   | 60%                                 | 25           | \$13992      |
| Existing             | University       | Space Heat | Windows - Existing to Code                          | U = 0.40  | Existing Windows (U=0.65)                                  | 5.74                     | 21.8%                         | 10%   | 60%                                 | 25           | 200011       |
| Existing             | University       | Water Heat | Water_Heater (40 Gallon Residential Sized Electric) | EF = 0.95   | EF = 0.92  | 1.45                     | 3.3%                          | NA  | NA                                  | 20           | \$2,264      |
| Existing             | University       | Water Heat | Clothes Washer - Ozonating                          | Ozonating Clothes Washer                                      | Standard Commercial Clothes Washer                         | 1.45                     | 15.1%                         | 35%   | 95%                                 | 10           | \$8,704      |
| Existing             | University       | Water Heat | Clothes Washer Commercial                           | Energy Star Commercial Clothes Washer MEF=1.72                | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 1.45                     | 0.7%                          | 35%   | 80%                                 | 11           | \$304        |
| Existing             | University       | Water Heat | Demand controlled Circulating Systems               | Install demand-based control system (VFD Control by Demand)   | No demand control systems in place                         | 1.45                     | 5.0%                          | 55%   | 94%                                 | 15           | \$18387      |
| Existing             | University       | Water Heat | Dishwashing - Commercial - High Efficiency          | High Efficiency Dishwasher                                    | Standard Dishwasher  | 1.45                     | 2.1%                          | 85%   | 80%                                 | 10           | \$2,701      |
| Existing             | University       | Water Heat | Dishwashing - Commercial Chemical System            | Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost) | High Temp Commercial Dishwasher                            | 1.45                     | 5.6%                          | 85%   | 95%                                 | 10           | \$841        |
| Existing             | University       | Water Heat | Dishwashing - Residential Sized System              | EF = 0.65 (ENERGY STAR)                                       | Standard Dishwasher (FED Std. EF=0.46)                     | 1.45                     | 0.2%                          | 65%   | 25%                                 | 13           | \$33         |
| Existing             | University       | Water Heat | Dishwashing - Residential Sized System              | EF = 0.77   | Standard Dishwasher (FED Std. EF=0.46)                     | 1.45                     | 0.2%                          | 65%   | 55%                                 | 13           | \$629        |
| Existing             | University       | Water Heat | Drainwater Heat Recovery Water Heater               | Install (Power-Pipe or GFX) - Heat Recovery Water Heater      | No Heat Recovery System                                    | 1.45                     | 20.0%                         | 5%  | 92%                                 | 25           | \$12258      |
| Existing             | University       | Water Heat | Faucet Aerators                                     | 1.5 GPM Aerator   | 2.5 GPM Aerator (Federal Code)                             | 1.45                     | 4.0%                          | 95%   | 25%                                 | 10           | \$0          |
| Existing             | University       | Water Heat | Faucet Aerators - Existing to Code                  | 2.5 GPM Aerator (Federal Code)                                | 4.0 GPM Aerator  | 1.45                     | 3.8%                          | 95%   | 15%                                 | 10           | \$0          |
| Existing             | University       | Water Heat | Heat Pump Water Heater                              | EF = 2.9  | EF=0.93 Baseline Electric Water Heater                     | 1.45                     | 58.9%                         | 40%   | 94%                                 | 15           | \$5,017      |
| Existing             | University       | Water Heat | Hot Water (SHW) Pipe Insulation                     | Install Insulation (R-4)                                      | No Pipe Insulation   | 1.45                     | 1.0%                          | 80%   | 70%                                 | 15           | \$702        |
| Existing             | University       | Water Heat | Low Flow Spray Heads                                | 1.6 GPM   | 3.0 GPM  | 1.45                     | 2.3%                          | 95%   | 45%                                 | 5            | \$7          |
| Existing             | University       | Water Heat | Low-Flow Showerheads                                | 2.0 GPM Showerhead  | 2.5 GPM Showerhead (Federal Code)                          | 1.45                     | 3.4%                          | 45%   | 75%                                 | 10           | \$7          |
| Existing             | University       | Water Heat | Low-Flow Showerheads - Existing to Code             | 2.5 GPM Showerhead (Federal Code)                             | 4.5 GPM Showerhead   | 1.45                     | 7.5%                          | 45%   | 20%                                 | 10           | \$13         |
| Existing             | University       | Water Heat | Solar RE - Solar Water Heater                       | Passive solar water heating                                   | Non-solar hot water heater                                 | 1.45                     | 6.9%                          | 20%   | 95%                                 | 20           | \$26793      |
| Existing             | University       | Water Heat | Ultrasonic Faucet Control                           | Install Ultrasonic Motion Faucet Control                      | No Faucet Control  | 1.45                     | 3.3%                          | 95%   | 75%                                 | 10           | \$205        |
| Existing             | University       | Water Heat | Water Heater Thermostat Setback                     | Thermostat Setback and Replacement (120 Degrees)              | No Thermostat Setback (130 Degrees)                        | 1.45                     | 7.7%                          | 75%   | 15%                                 | 11           | \$106        |
| New                  | University       | Cooking    | Cooking Fryers - Commercial                         | Energy Star Commercial Fryer                                  | Non-Energy Star Fryer                                      | 0.42                     | 2.5%                          | 35%   | 70%                                 | 12           | \$4,944      |
| New                  | University       | Cooking    | Hot Food Holding Cabinets - Commercial              | Energy Star Commercial Hot Food Holding Cabinets              | Non-Energy Star Commercial Hot Food Holding Cabinets       | 0.42                     | 8.3%                          | 75%   | 85%                                 | 12           | \$1,800      |
| New                  | University       | Cooking    | Oven - Convection                                   | Convection Oven   | Standard Oven  | 0.42                     | 3.4%                          | 85%   | 40%                                 | 15           | \$1,734      |
| New                  | University       | Cooking    | Steam Cookers - Commercial                          | Energy Star Commercial Steam Cookers (50% efficiency)         | Non-Energy Star Commercial Steam Cooker (35% efficiency)   | 0.42                     | 2.3%                          | 35%   | 75%                                 | 10           | \$0          |

| Construction Vintage | Customer Segment | End Use          | Measure Name  | Measure Description  | Base Equipment                              | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|--|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | University       | Cooling Chillers | Chiller - Premium Efficiency  | 0.507 kW/ton   | 0.634 kW/ton                                | 0.16                     | 20.0%                         | NA  | NA                                  | 20           | \$8,572      |
| New                  | University       | Cooling Chillers | Chiller - Advanced Technology                                       | 0.461 kW/ton   | 0.634 kW/ton                                | 0.16                     | 27.3%                         | NA  | NA                                  | 20           | \$10683      |
| New                  | University       | Cooling Chillers | Chiller - High Efficiency   | 0.574 kW/ton   | 0.634 kW/ton                                | 0.16                     | 9.5%                          | NA  | NA                                  | 20           | \$3,071      |
| New                  | University       | Cooling Chillers | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)  | Constant Ventilation                        | 0.14                     | 10.0%                         | 25%   | 94%                                 | 15           | \$41699      |
| New                  | University       | Cooling Chillers | Chilled Water Piping Loop w/ VSD Control                            | VSD for Secondary Chilled Water Loop   | Primary Loop Only w/ Constant Speed Pump    | 0.14                     | 7.6%                          | 25%   | 70%                                 | 10           | \$19387      |
| New                  | University       | Cooling Chillers | Chilled Water Reset   | Install Chilled Water Reset  | No Chilled Water Reset                      | 0.14                     | 5.0%                          | 95%   | 85%                                 | 10           | \$45095      |
| New                  | University       | Cooling Chillers | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning   | No Commissioning                            | 0.14                     | 12.5%                         | 90%   | 80%                                 | 3            | \$48318      |
| New                  | University       | Cooling Chillers | Cooling Tower-Decrease Approach Temperature                         | 6 Deg F  | 10 Deg F                                    | 0.14                     | 8.0%                          | 50%   | 94%                                 | 15           | \$1,919      |
| New                  | University       | Cooling Chillers | Direct Digital Control System-Optimization                          | DDC System (Optimized)   | DDC System (Basic)                          | 0.14                     | 10.0%                         | 75%   | 80%                                 | 5            | \$35643      |
| New                  | University       | Cooling Chillers | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air) | 0.14                     | 4.5%                          | 73%   | 85%                                 | 10           | \$5,725      |
| New                  | University       | Cooling Chillers | Green Roof  | Vegetation on Roof   | Standard roofing techniques                 | 0.14                     | 10.0%                         | 15%   | 98%                                 | 30           | 335256       |
| New                  | University       | Cooling Chillers | Insulation (Ceiling)  | R-38   | R-21 (Code)                                 | 0.14                     | 1.0%                          | 75%   | 45%                                 | 25           | \$17209      |
| New                  | University       | Cooling Chillers | Insulation (Ceiling)  | R-49   | R-21 (Code)                                 | 0.14                     | 1.5%                          | 75%   | 85%                                 | 25           | \$22835      |
| New                  | University       | Cooling Chillers | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 0.14                     | 3.0%                          | 95%   | 95%                                 | 25           | \$8,803      |
| New                  | University       | Cooling Chillers | Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)                                 | 0.14                     | 0.5%                          | 35%   | 35%                                 | 25           | \$2,979      |
| New                  | University       | Cooling Chillers | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                        | 0.14                     | 10.0%                         | 40%   | 98%                                 | 25           | \$10259      |
| New                  | University       | Cooling Chillers | Sensible And Total Heat Recovery Devices                            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery                            | 0.14                     | 25.0%                         | 50%   | 98%                                 | 10           | 139660       |
| New                  | University       | Cooling Chillers | Turbocor Compressor   | 0.35 kW/Ton Turbocor oil-free refrigerant compressor with variable frequency drive (VFD)                                 | 0.634 kW/ton (Code) chiller water cooled    | 0.14                     | 44.8%                         | 95%   | 99%                                 | 20           | \$49490      |

| Construction Vintage | Customer Segment | End Use          | Measure Name  | Measure Description   | Base Equipment                              | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|---|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | University       | Cooling Chillers | Window RE - Window Overhangs  | Overhangs over windows for shading  | No window overhangs                         | 0.14                     | 8.5%                          | 75%   | 75%                                 | 30           | \$17553      |
| New                  | University       | Cooling Chillers | Windows   | U = 0.35  | U = 0.55 (Code)                             | 0.14                     | 2.2%                          | 80%   | 60%                                 | 25           | \$55970      |
| New                  | University       | Cooling DX       | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)              | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)  | 10.3 EER Rooftop Unit (State Code)          | 0.17                     | 14.2%                         | NA  | NA                                  | 15           | \$22398      |
| New                  | University       | Cooling DX       | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)                 | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)   | 10.3 EER Rooftop Unit (State Code)          | 0.17                     | 6.4%                          | NA  | NA                                  | 15           | \$11927      |
| New                  | University       | Cooling DX       | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)               | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)   | 10.3 EER Rooftop Unit (State Code)          | 0.17                     | 10.4%                         | NA  | NA                                  | 15           | \$18487      |
| New                  | University       | Cooling DX       | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)   | Constant Ventilation                        | 0.16                     | 10.0%                         | 25%   | 94%                                 | 15           | \$41699      |
| New                  | University       | Cooling DX       | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning  | No Commissioning                            | 0.16                     | 12.5%                         | 90%   | 80%                                 | 3            | \$48318      |
| New                  | University       | Cooling DX       | Direct / Indirect Evaporative Cooling, Pre-Cooling                  | Direct / Indirect Evaporative Cooling, Pre-Cooling  | No modification to DX system                | 0.16                     | 25.0%                         | 50%   | 85%                                 | 15           | 137899       |
| New                  | University       | Cooling DX       | Direct Digital Control System-Optimization                          | DDC System (Optimized)  | DDC System (Basic)                          | 0.16                     | 10.0%                         | 75%   | 80%                                 | 5            | \$35643      |
| New                  | University       | Cooling DX       | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air                                      | Hood Pulls Conditioned Air (No Make-up Air) | 0.16                     | 4.5%                          | 73%   | 85%                                 | 10           | \$5,725      |
| New                  | University       | Cooling DX       | Green Roof  | Vegetation on Roof  | Standard roofing techniques                 | 0.16                     | 10.0%                         | 15%   | 98%                                 | 30           | 335256       |
| New                  | University       | Cooling DX       | Insulation (Ceiling)  | R-38  | R-21 (Code)                                 | 0.16                     | 1.0%                          | 75%   | 45%                                 | 25           | \$17209      |
| New                  | University       | Cooling DX       | Insulation (Ceiling)  | R-49  | R-21 (Code)                                 | 0.16                     | 1.5%                          | 75%   | 85%                                 | 25           | \$22835      |
| New                  | University       | Cooling DX       | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced   | R-19 (2x6 Framing) - (Code)                 | 0.16                     | 3.0%                          | 95%   | 95%                                 | 25           | \$8,803      |
| New                  | University       | Cooling DX       | Insulation - Floor (Non-Slab)                                       | R-19  | R-10 (Code)                                 | 0.16                     | 0.5%                          | 35%   | 35%                                 | 25           | \$2,979      |
| New                  | University       | Cooling DX       | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands  | Std duct workmanship                        | 0.16                     | 10.0%                         | 40%   | 98%                                 | 25           | \$10259      |
| New                  | University       | Cooling DX       | Window RE - Window Overhangs  | Overhangs over windows for shading  | No window overhangs                         | 0.16                     | 8.5%                          | 75%   | 75%                                 | 30           | \$17553      |
| New                  | University       | Cooling DX       | Windows   | U = 0.35  | U = 0.55 (Code)                             | 0.16                     | 2.2%                          | 80%   | 60%                                 | 25           | \$55970      |
| New                  | University       | HVAC Aux         | Automated Exhaust VFD Control - Parking Garage CO sensor            | CO Sensors  | No CO Sensors                               | 0.90                     | 20.0%                         | 20%   | 75%                                 | 10           | \$13529      |
| New                  | University       | HVAC Aux         | Cooking Hood Controls   | Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air | No Cooking Hood Controls                    | 0.90                     | 7.5%                          | 60%   | 85%                                 | 10           | \$6,831      |
| New                  | University       | HVAC Aux         | Motor - Premium-Efficiency  | PE Motors for HVAC Applications   | Standard Efficiency Motors                  | 0.90                     | 3.8%                          | 85%   | 81%                                 | 10           | \$1,728      |
| New                  | University       | HVAC Aux         | Motor - Pump & Fan System - Variable Speed Control                  | Pump And Fan System Optimization w/ VSD Control   | No Pump And Fan System VSD Optimization     | 0.90                     | 33.8%                         | 85%   | 75%                                 | 20           | \$13430      |

| Construction Vintage | Customer Segment | End Use   | Measure Name  | Measure Description  | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|---|--|--|--------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| New                  | University       | HVAC Aux  | Motor - VAV Box High-Efficiency                                     | ECM Motors   | Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control | 0.90                     | 8.8%                      | 65%   | 77%                                 | 10           | \$24172      |
| New                  | University       | HVAC Aux  | Optimized Variable Volume Lab Hood Design                           | Optimized Variable Volume Lab Hood Design                                      | Constant Volume Lab Hood Design  | 0.90                     | 1.6%                      | 75%   | 94%                                 | 10           | \$1,794      |
| New                  | University       | Heat Pump | High-Efficiency EER=11.0, COP=3.5                                   | High-Efficiency EER=11.0, COP=3.5  | EER=10.1, COP=3.2  | 1.24                     | 16.8%                     | NA  | NA                                  | 15           | \$15879      |
| New                  | University       | Heat Pump | Premium-Efficiency EER=11.8, COP=3.8                                | Premium-Efficiency EER=11.8, COP=3.8   | EER=10.1, COP=3.2  | 1.24                     | 30.2%                     | NA  | NA                                  | 15           | \$34001      |
| New                  | University       | Heat Pump | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)                                    | Constant Ventilation   | 1.13                     | 10.0%                     | 25%   | 94%                                 | 15           | \$41699      |
| New                  | University       | Heat Pump | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning                                     | No Commissioning   | 1.13                     | 12.5%                     | 90%   | 80%                                 | 3            | \$48318      |
| New                  | University       | Heat Pump | Direct Digital Control System-Optimization                          | DDC System (Optimized)   | DDC System (Basic)   | 1.13                     | 10.0%                     | 75%   | 80%                                 | 5            | \$35643      |
| New                  | University       | Heat Pump | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery  | No Heat Recovery   | 1.13                     | 13.2%                     | 5%  | 94%                                 | 10           | \$60034      |
| New                  | University       | Heat Pump | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air)  | 1.13                     | 4.5%                      | 73%   | 85%                                 | 10           | \$5,725      |
| New                  | University       | Heat Pump | Green Roof  | Vegetation on Roof   | Standard roofing techniques  | 1.13                     | 0.4%                      | 15%   | 98%                                 | 30           | 335256       |
| New                  | University       | Heat Pump | Heat Pump - Ground Source (Closed Loop)                             | GSHP: COP=3.1, EER=13.4  | Std. Air Source HP 'EER=10.1, COP=3.2  | 1.13                     | 5.7%                      | 45%   | 92%                                 | 20           | 184172       |
| New                  | University       | Heat Pump | Heat Pump - Ground Source (Closed Loop)                             | GSHP: COP=4.0, EER=20  | Std. Air Source HP 'EER=10.1, COP=3.2  | 1.13                     | 25.8%                     | 45%   | 92%                                 | 20           | 346012       |
| New                  | University       | Heat Pump | Heat Pump - Water Source (Closed Loop)                              | WSHP: COP=4.2, EER=12.0  | Std. Air Source Heat Pump'EER=10.1, COP=3.2  | 1.13                     | 24.9%                     | 10%   | 90%                                 | 20           | \$37046      |
| New                  | University       | Heat Pump | Heat Pump - Water Source (Closed Loop)                              | WSHP: COP=4.8, EER=14.5  | Std. Air Source Heat Pump'EER=10.1, COP=3.2  | 1.13                     | 34.8%                     | 10%   | 90%                                 | 20           | \$48927      |
| New                  | University       | Heat Pump | Insulation (Ceiling)  | R-38   | R-21 (Code)  | 1.13                     | 3.0%                      | 75%   | 45%                                 | 25           | \$17209      |
| New                  | University       | Heat Pump | Insulation (Ceiling)  | R-49   | R-21 (Code)  | 1.13                     | 4.4%                      | 75%   | 85%                                 | 25           | \$22835      |
| New                  | University       | Heat Pump | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)  | 1.13                     | 5.0%                      | 95%   | 95%                                 | 25           | \$8,803      |
| New                  | University       | Heat Pump | Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)  | 1.13                     | 1.9%                      | 35%   | 35%                                 | 25           | \$2,979      |
| New                  | University       | Heat Pump | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands                 | Std duct workmanship   | 1.13                     | 10.0%                     | 40%   | 98%                                 | 25           | \$10259      |
| New                  | University       | Heat Pump | Windows   | U = 0.35   | U = 0.55 (Code)  | 1.13                     | 14.9%                     | 80%   | 60%                                 | 25           | \$55970      |
| New                  | University       | Lighting  | Bi-Level Control, Stairwell Lighting                                | Occupancy Sensor Control, 50% Lighting Power during unoccupied Time            | Continuous Full Power Lighting in Stairways  | 2.76                     | 2.0%                      | 50%   | 75%                                 | 9            | \$5,216      |
| New                  | University       | Lighting  | Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures     | Continuous Dimming, Fluorescent Fixtures (Day-Lighting)                        | No Dimming Controls  | 2.76                     | 15.0%                     | 60%   | 63%                                 | 9            | \$19857      |
| New                  | University       | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 15%                        | Code Required LPD And Control Strategies: LPD = 1.2  | 2.76                     | 15.0%                     | 90%   | 70%                                 | 14           | \$5,957      |

| Construction Vintage | Customer Segment | End Use       | Measure Name  | Measure Description  | Base Equipment                                      | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|---|--|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | University       | Lighting      | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 20%                                      | Code Required LPD And Control Strategies: LPD = 1.2 | 2.76                     | 20.0%                         | 75%   | 85%                                 | 14           | \$19857      |
| New                  | University       | Lighting      | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 25%                                      | Code Required LPD And Control Strategies: LPD = 1.2 | 2.76                     | 25.0%                         | 70%   | 90%                                 | 14           | \$33359      |
| New                  | University       | Lighting      | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 35% - Only High Bay Applications         | Code Required LPD And Control Strategies: LPD = 1.2 | 2.76                     | 5.3%                          | 65%   | 95%                                 | 14           | \$25814      |
| New                  | University       | Lighting      | LED Refrigeration Case Lights                             | LED Refrigeration Case Lights (28W)  | Fluorescent Refrigeration Case Lights (60W)         | 2.76                     | 0.2%                          | 50%   | 80%                                 | 13           | \$629        |
| New                  | University       | Lighting      | LED Solid State White Lighting Package                    | Landscape, merchandise, signage, structure & task lighting                                   | 50W 10hrs/day, 365 day/yr                           | 2.76                     | 0.8%                          | 10%   | 95%                                 | 14           | \$40         |
| New                  | University       | Lighting      | Occupancy Sensor Control, Fluorescent                     | Occupancy Sensor Control, Fluorescent  | No Occupancy Sensor                                 | 2.76                     | 4.0%                          | 90%   | 37%                                 | 10           | \$1,238      |
| New                  | University       | Plug Load     | Energy Star - Battery Charging System                     | Energy Star Battery Charging System  | Non-Energy Star Battery Chargers                    | 1.16                     | 0.4%                          | 95%   | 90%                                 | 7            | \$0          |
| New                  | University       | Plug Load     | Energy Star - Computer                                    | Energy Star Features Enabled   | Non-Energy Star Features                            | 1.16                     | 13.6%                         | 64%   | 25%                                 | 4            | \$0          |
| New                  | University       | Plug Load     | Energy Star - Copiers                                     | Energy Star or Better Office Equipment: Copiers,   | Office Equipment: Copiers, Standard                 | 1.16                     | 1.6%                          | 90%   | 45%                                 | 6            | \$165        |
| New                  | University       | Plug Load     | Energy Star - Fax   | Energy Star Features Enabled   | Non-Energy Star Features                            | 1.16                     | 1.8%                          | 75%   | 55%                                 | 4            | \$0          |
| New                  | University       | Plug Load     | Energy Star - Monitors                                    | Energy Star Features Enabled   | Non-Energy Star Features                            | 1.16                     | 18.4%                         | 64%   | 15%                                 | 4            | \$159        |
| New                  | University       | Plug Load     | Energy Star - Printers                                    | Energy Star Features Enabled   | Non-Energy Star Features                            | 1.16                     | 1.3%                          | 75%   | 40%                                 | 5            | \$13         |
| New                  | University       | Plug Load     | Energy Star - Scanners                                    | Energy Star Features Enabled   | Non-Energy Star Features                            | 1.16                     | 0.9%                          | 75%   | 45%                                 | 4            | \$0          |
| New                  | University       | Plug Load     | Energy Star - Water Cooler                                | Energy Star Water Cooler (Hot/Cold Water)  | Non-Energy Star Water Cooler                        | 1.16                     | 0.5%                          | 10%   | 75%                                 | 10           | \$0          |
| New                  | University       | Plug Load     | Office Computer Network Energy Management                 | Office Computer Network Energy Management  | No Network Management                               | 1.16                     | 1.8%                          | 95%   | 30%                                 | 3            | \$311        |
| New                  | University       | Plug Load     | Power Supply 80+ Office Measure                           | 80% Efficient Power supply   | No 80+  | 1.16                     | 1.0%                          | 95%   | 86%                                 | 7            | \$0          |
| New                  | University       | Plug Load     | Refrigerator eCube  | Refrigerator eCube   | No Refrigerator eCube                               | 1.16                     | 1.2%                          | 75%   | 95%                                 | 10           | \$172        |
| New                  | University       | Plug Load     | Residential-Size Refrigerator                             | Energy Star Residential-Size Refrigerator  | Residential-Size Refrigerator - Standard            | 1.16                     | 0.1%                          | 75%   | 65%                                 | 13           | \$126        |
| New                  | University       | Plug Load     | Residential-Size Refrigerator/Freezer - Early Replacement | Energy Star Refrigerator/Freezer   | Baseline Refrigerator/Freezer                       | 1.16                     | 1.3%                          | 25%   | 35%                                 | 7            | \$576        |
| New                  | University       | Plug Load     | Vending Machine   | Energy Star Vending Machines - High-Efficiency   | Vending Machines - Standard                         | 1.16                     | 2.5%                          | 90%   | 80%                                 | 14           | \$192        |
| New                  | University       | Refrigeration | Commercial Reach-In Refrigerator                          | Energy Star Commercial Reach-In Refrigerator   | Commercial-Size Refrigerator - Standard             | 0.51                     | 7.6%                          | 95%   | 100%                                | 12           | \$344        |
| New                  | University       | Refrigeration | Custom Refrigeration System                               | High-Efficiency Custom Refrigeration System (Walk-in) includes compressors                   | Custom Refrigeration System - Standard              | 0.51                     | 3.6%                          | 85%   | 65%                                 | 10           | \$9,597      |
| New                  | University       | Refrigeration | Ice Maker   | Energy Star Ice Maker - High-Efficiency  | Standard Ice Maker                                  | 0.51                     | 1.1%                          | 85%   | 86%                                 | 9            | \$377        |
| New                  | University       | Refrigeration | Reduced Speed or Cycling of Evaporator Fans               | VFD on Evaporator Fans (Evap Fan Control on Walk-In)   | Constant Speed Evaporator Fans                      | 0.51                     | 6.0%                          | 75%   | 70%                                 | 10           | \$86         |
| New                  | University       | Refrigeration | Refrigeration - Commissioning                             | Commissioning (Refrigeration System Diagnostics / Operations and Maintenance for a new unit) | No Commissioning                                    | 0.51                     | 5.0%                          | 80%   | 90%                                 | 3            | \$106        |



| Construction Vintage | Customer Segment | End Use       | Measure Name  | Measure Description  | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|---|--|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | University       | Refrigeration | Special Glass Doors for Refrigerated Reach-in Cases                 | Do Not Require Anti-Sweat Heating  | Standard Glass Doors                                       | 0.51                     | 3.2%                          | 95%   | 77%                                 | 16           | \$357        |
| New                  | University       | Refrigeration | Strip Curtains for Walk-Ins   | Strip Curtains for Walk-Ins  | No Strip Curtains for Walk-Ins                             | 0.51                     | 2.0%                          | 95%   | 20%                                 | 4            | \$192        |
| New                  | University       | Space Heat    | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 sensors)  | Constant Ventilation                                       | 1.86                     | 10.0%                         | 25%   | 94%                                 | 15           | \$41699      |
| New                  | University       | Space Heat    | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning   | No Commissioning   | 1.86                     | 12.5%                         | 90%   | 80%                                 | 3            | \$48318      |
| New                  | University       | Space Heat    | Direct Digital Control System-Optimization                          | DDC System (Optimized)   | DDC System (Basic)   | 1.86                     | 10.0%                         | 75%   | 80%                                 | 5            | \$35643      |
| New                  | University       | Space Heat    | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery  | No Heat Recovery   | 1.86                     | 15.0%                         | 5%  | 94%                                 | 10           | \$60034      |
| New                  | University       | Space Heat    | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air)                | 1.86                     | 4.5%                          | 73%   | 85%                                 | 10           | \$5,725      |
| New                  | University       | Space Heat    | Insulation (Ceiling)  | R-49   | R-30   | 1.86                     | 4.0%                          | 75%   | 85%                                 | 25           | \$17209      |
| New                  | University       | Space Heat    | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                                | 1.86                     | 6.0%                          | 95%   | 95%                                 | 25           | \$8,803      |
| New                  | University       | Space Heat    | Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)  | 1.86                     | 2.5%                          | 35%   | 35%                                 | 25           | \$2,979      |
| New                  | University       | Space Heat    | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                                       | 1.86                     | 10.0%                         | 40%   | 98%                                 | 25           | \$10259      |
| New                  | University       | Space Heat    | Sensible And Total Heat Recovery Devices                            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery   | 1.86                     | 25.0%                         | 50%   | 98%                                 | 10           | 139660       |
| New                  | University       | Space Heat    | Windows   | U = 0.35   | U = 0.40   | 1.86                     | 7.3%                          | 80%   | 60%                                 | 25           | \$13992      |
| New                  | University       | Water Heat    | Water_Heater (40 Gallon Electric) - Residential Sized               | EF = 0.95  | EF = 0.92  | 1.45                     | 3.3%                          | NA  | NA                                  | 20           | \$2,264      |
| New                  | University       | Water Heat    | Clothes Washer - Ozonating  | Ozonating Clothes Washer   | Standard Commercial Clothes Washer                         | 1.42                     | 15.1%                         | 35%   | 95%                                 | 10           | \$8,704      |
| New                  | University       | Water Heat    | Clothes Washer Commercial   | Energy Star Commercial Clothes Washer MEF=1.72   | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 1.42                     | 0.7%                          | 35%   | 80%                                 | 11           | \$304        |
| New                  | University       | Water Heat    | Demand controlled Circulating Systems                               | Install demand-based control system (VFD Control by Demand)  | No demand control systems in place                         | 1.42                     | 5.0%                          | 55%   | 94%                                 | 15           | \$18387      |
| New                  | University       | Water Heat    | Dishwashing - Commercial - High Efficiency                          | High Efficiency Dishwasher   | Standard Dishwasher  | 1.42                     | 2.1%                          | 85%   | 80%                                 | 10           | \$2,701      |
| New                  | University       | Water Heat    | Dishwashing - Commercial Chemical System                            | Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)  | High Temp Commercial Dishwasher                            | 1.42                     | 5.6%                          | 85%   | 95%                                 | 10           | \$841        |
| New                  | University       | Water Heat    | Dishwashing - Residential Sized System                              | EF = 0.65 (ENERGY STAR)  | Standard Dishwasher (FED Std. EF=0.46)                     | 1.42                     | 0.2%                          | 65%   | 25%                                 | 13           | \$33         |
| New                  | University       | Water Heat    | Dishwashing - Residential Sized System                              | EF = 0.77  | Standard Dishwasher (FED Std. EF=0.46)                     | 1.42                     | 0.2%                          | 65%   | 55%                                 | 13           | \$629        |
| New                  | University       | Water Heat    | Drainwater Heat Recovery Water Heater                               | Install (Power-Pipe or GFX) - Heat Recovery Water Heater   | No Heat Recovery System                                    | 1.42                     | 20.0%                         | 25%   | 92%                                 | 25           | \$12258      |
| New                  | University       | Water Heat    | Faucet Aerators   | 1.5 GPM Aerator  | 2.5 GPM Aerator (Federal Code)                             | 1.42                     | 4.0%                          | 95%   | 25%                                 | 10           | \$0          |
| New                  | University       | Water Heat    | Heat Pump Water Heater  | EF = 2.9   | EF=0.93 Baseline Electric Water Heater                     | 1.42                     | 58.9%                         | 50%   | 94%                                 | 15           | \$5,017      |

| Construction Vintage | Customer Segment | End Use          | Measure Name  | Measure Description   | Base Equipment                            | Baseline kWh (UEC or EUJ) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|---|---|---|---------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | University       | Water Heat       | Low Flow Spray Heads  | 1.6 GPM   | 3.0 GPM                                   | 1.42                      | 2.3%                          | 95%   | 45%                                 | 5            | \$7          |
| New                  | University       | Water Heat       | Low-Flow Showerheads  | 2.0 GPM Showerhead  | 2.5 GPM Showerhead (Federal Code)         | 1.42                      | 3.4%                          | 45%   | 75%                                 | 10           | \$7          |
| New                  | University       | Water Heat       | Solar RE - Solar Water Heater                                 | Passive solar water heating   | Non-solar hot water heater                | 1.42                      | 6.9%                          | 20%   | 95%                                 | 20           | \$26793      |
| New                  | University       | Water Heat       | Ultrasonic Faucet Control                                     | Install Ultrasonic Motion Faucet Control                                | No Faucet Control                         | 1.42                      | 3.3%                          | 95%   | 75%                                 | 10           | \$205        |
| New                  | University       | Water Heat       | Water Heater Thermostat Setback                               | Thermostat Setback and Replacement (120 Degrees)                        | No Thermostat Setback (130 Degrees)       | 1.42                      | 7.7%                          | 75%   | 15%                                 | 11           | \$106        |
| Existing             | Warehouse        | Cooling Chillers | Chiller - Premium Efficiency                                  | 0.507 kW/ton  | 0.634 kW/ton                              | 0.17                      | 20.0%                         | NA  | NA                                  | 20           | \$3,055      |
| Existing             | Warehouse        | Cooling Chillers | Chiller - Advanced Technology                                 | 0.461 kW/ton  | 0.634 kW/ton                              | 0.17                      | 27.3%                         | NA  | NA                                  | 20           | \$3,811      |
| Existing             | Warehouse        | Cooling Chillers | Chiller - High Efficiency                                     | 0.574 kW/ton  | 0.634 kW/ton                              | 0.17                      | 9.5%                          | NA  | NA                                  | 20           | \$1,094      |
| Existing             | Warehouse        | Cooling DX       | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)        | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)                  | 10.3 EER Rooftop Unit (State Code)        | 0.18                      | 14.2%                         | NA  | NA                                  | 15           | \$6,830      |
| Existing             | Warehouse        | Cooling DX       | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)           | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)                     | 10.3 EER Rooftop Unit (State Code)        | 0.18                      | 6.4%                          | NA  | NA                                  | 15           | \$3,635      |
| Existing             | Warehouse        | Cooling DX       | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)         | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)                   | 10.3 EER Rooftop Unit (State Code)        | 0.18                      | 10.4%                         | NA  | NA                                  | 15           | \$5,635      |
| Existing             | Warehouse        | Cooling DX       | Commissioning - Retro Building Commissioning                  | Commissioning - Retro Building Commissioning                            | No Commissioning                          | 0.19                      | 12.5%                         | 90%   | 40%                                 | 3            | \$6,419      |
| Existing             | Warehouse        | Cooling DX       | Cooling DX Package-Air Side Economizer                        | Air-Side Economizer   | No Economizer                             | 0.19                      | 15.0%                         | 10%   | 40%                                 | 15           | \$5,540      |
| Existing             | Warehouse        | Cooling DX       | Direct / Indirect Evaporative Cooling, Pre-Cooling            | Direct / Indirect Evaporative Cooling, Pre-Cooling                      | No modification to DX system              | 0.19                      | 25.0%                         | 50%   | 85%                                 | 15           | \$67855      |
| Existing             | Warehouse        | Cooling DX       | Direct Digital Control System-Installation                    | DDC Retrofit  | Pneumatic                                 | 0.19                      | 15.0%                         | 5%  | 93%                                 | 5            | \$31319      |
| Existing             | Warehouse        | Cooling DX       | Direct Digital Control System-Optimization                    | DDC System (Optimized)  | DDC System (Basic)                        | 0.19                      | 10.0%                         | 75%   | 98%                                 | 5            | \$17539      |
| Existing             | Warehouse        | Cooling DX       | Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control | Pneumatic                                 | 0.19                      | 15.0%                         | 50%   | 98%                                 | 5            | \$12656      |
| Existing             | Warehouse        | Cooling DX       | Duct Repair And Sealing                                       | Reduction In Duct Losses to 5%  | No Repair or Sealing, 15% duct losses     | 0.19                      | 2.5%                          | 45%   | 45%                                 | 18           | \$13028      |
| Existing             | Warehouse        | Cooling DX       | Green Roof  | Vegetation on Roof  | Standard roofing techniques               | 0.19                      | 10.0%                         | 15%   | 98%                                 | 30           | 329938       |
| Existing             | Warehouse        | Cooling DX       | Insulation (Ceiling)  | R-38  | R-21 (Code)                               | 0.19                      | 2.0%                          | 75%   | 45%                                 | 25           | \$16936      |
| Existing             | Warehouse        | Cooling DX       | Insulation (Ceiling)  | R-49  | R-21 (Code)                               | 0.19                      | 3.0%                          | 75%   | 85%                                 | 25           | \$22473      |
| Existing             | Warehouse        | Cooling DX       | Insulation (Ceiling) - Existing to Code                       | R-21 (Code)   | Existing Ceiling Insulation (Average R-9) | 0.19                      | 2.4%                          | 75%   | 10%                                 | 25           | \$19867      |
| Existing             | Warehouse        | Cooling DX       | Insulation (Ceiling) - Zero to Code                           | R-21 (Code)   | R-0                                       | 0.19                      | 6.0%                          | 75%   | 0%                                  | 25           | \$19867      |
| Existing             | Warehouse        | Cooling DX       | Insulation (Duct) (Unconditioned Spaces)                      | Install New Duct Insulation (R-8)                                       | R-0                                       | 0.19                      | 4.4%                          | 10%   | 15%                                 | 25           | \$3,641      |

| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description   | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|---|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Warehouse        | Cooling DX | Insulation (Duct) (Unconditioned Spaces)                      | R-4   | R-0  | 0.19                     | 2.4%                          | 10%   | 15%                                 | 25           | \$3,794      |
| Existing             | Warehouse        | Cooling DX | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced   | R-19 (2x6 Framing) - (Code)  | 0.19                     | 3.0%                          | 10%   | 95%                                 | 25           | \$4,364      |
| Existing             | Warehouse        | Cooling DX | Insulation (Wall) - Existing to Code                          | R-19 (2x6 Framing) - (Code)   | Existing R-value (Average R-3)   | 0.19                     | 8.4%                          | 10%   | 35%                                 | 25           | \$4,781      |
| Existing             | Warehouse        | Cooling DX | Insulation (Wall) - Zero to Code                              | R-19 (2x6 Framing) - (Code)   | R-0  | 0.19                     | 10.0%                         | 10%   | 0%                                  | 25           | \$4,729      |
| Existing             | Warehouse        | Cooling DX | Insulation - Floor (Non-Slab)                                 | R-19  | R-10 (Code)  | 0.19                     | 1.0%                          | 35%   | 45%                                 | 25           | \$2,931      |
| Existing             | Warehouse        | Cooling DX | Insulation - Floor (Non-Slab) - Existing to Code              | R-10 (Code)   | R-0  | 0.19                     | 3.0%                          | 35%   | 45%                                 | 25           | \$16936      |
| Existing             | Warehouse        | Cooling DX | Thermostat - Programmable                                     | Energy Star Programmable Thermostat   | Manual Thermostat  | 0.19                     | 3.0%                          | 95%   | 20%                                 | 15           | \$147        |
| Existing             | Warehouse        | Cooling DX | Windows   | U = 0.35  | U = 0.55 (Code)  | 0.19                     | 0.3%                          | 80%   | 98%                                 | 25           | \$7,364      |
| Existing             | Warehouse        | Cooling DX | Windows - Existing to Code                                    | U = 0.55 (Code)   | Existing Windows (U=0.65)  | 0.19                     | 0.2%                          | 10%   | 98%                                 | 25           | \$20789      |
| Existing             | Warehouse        | HVAC Aux   | Automated Exhaust VFD Control - Parking Garage CO sensor      | CO Sensors  | No CO Sensors  | 0.59                     | 20.0%                         | 1%  | 85%                                 | 10           | \$6,657      |
| Existing             | Warehouse        | HVAC Aux   | Cooking Hood Controls   | Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air | No Cooking Hood Controls   | 0.59                     | 7.5%                          | 0%  | 85%                                 | 10           | \$13132      |
| Existing             | Warehouse        | HVAC Aux   | Motor - Premium-Efficiency                                    | PE Motors for HVAC Applications   | Standard Efficiency Motors   | 0.59                     | 3.8%                          | 85%   | 81%                                 | 10           | \$850        |
| Existing             | Warehouse        | HVAC Aux   | Motor - Pump & Fan System - Variable Speed Control            | Pump And Fan System Optimization w/ VSD Control   | No Pump And Fan System VSD Optimization  | 0.59                     | 33.8%                         | 85%   | 75%                                 | 20           | \$6,608      |
| Existing             | Warehouse        | HVAC Aux   | Motor - VAV Box High-Efficiency                               | ECM Motors  | Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control | 0.59                     | 8.8%                          | 10%   | 77%                                 | 10           | \$11894      |
| Existing             | Warehouse        | HVAC Aux   | Optimized Variable Volume Lab Hood Design                     | Optimized Variable Volume Lab Hood Design   | Constant Volume Lab Hood Design  | 0.59                     | 1.6%                          | 0%  | 94%                                 | 10           | \$1,791      |
| Existing             | Warehouse        | Heat Pump  | High-Efficiency EER=11.0, COP=3.5                             | High-Efficiency EER=11.0, COP=3.5   | EER=10.1, COP=3.2  | 0.72                     | 16.8%                         | NA  | NA                                  | 15           | \$4,840      |
| Existing             | Warehouse        | Heat Pump  | Premium-Efficiency EER=11.8, COP=3.8                          | Premium-Efficiency EER=11.8, COP=3.8  | EER=10.1, COP=3.2  | 0.72                     | 30.2%                         | NA  | NA                                  | 15           | \$10367      |
| Existing             | Warehouse        | Heat Pump  | Commissioning - Retro Building Commissioning                  | Commissioning - Retro Building Commissioning  | No Commissioning   | 0.76                     | 12.5%                         | 90%   | 40%                                 | 3            | \$6,419      |
| Existing             | Warehouse        | Heat Pump  | Direct Digital Control System-Installation                    | DDC Retrofit  | Pneumatic  | 0.76                     | 15.0%                         | 5%  | 93%                                 | 5            | \$31319      |
| Existing             | Warehouse        | Heat Pump  | Direct Digital Control System-Optimization                    | DDC System (Optimized)  | DDC System (Basic)   | 0.76                     | 10.0%                         | 75%   | 98%                                 | 5            | \$17539      |
| Existing             | Warehouse        | Heat Pump  | Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control   | Pneumatic  | 0.76                     | 15.0%                         | 50%   | 98%                                 | 5            | \$12656      |
| Existing             | Warehouse        | Heat Pump  | Duct Repair And Sealing                                       | Reduction In Duct Losses to 5%  | No Repair or Sealing, 15% duct losses  | 0.76                     | 2.5%                          | 45%   | 45%                                 | 18           | \$13028      |
| Existing             | Warehouse        | Heat Pump  | Exhaust Air to Ventilation Air Heat Recovery                  | Exhaust Air Heat Recovery   | No Heat Recovery   | 0.76                     | 11.2%                         | 5%  | 94%                                 | 10           | \$29540      |
| Existing             | Warehouse        | Heat Pump  | Green Roof  | Vegetation on Roof  | Standard roofing techniques  | 0.76                     | 0.8%                          | 15%   | 98%                                 | 30           | 329938       |

| Construction Vintage | Customer Segment | End Use   | Measure Name  | Measure Description  | Base Equipment                                       | Baseline kWh (UEC or EU) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|---|--|--|--------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Warehouse        | Heat Pump | Heat Pump - Ground Source (Closed Loop)                         | GSHP: COP=3.1, EER=13.4  | Std. Air Source HP 'EER=10.1, COP=3.2                | 0.76                     | 8.6%                      | 5%  | 92%                                 | 20           | \$56150      |
| Existing             | Warehouse        | Heat Pump | Heat Pump - Ground Source (Closed Loop)                         | GSHP: COP=4.0, EER=20  | Std. Air Source HP 'EER=10.1, COP=3.2                | 0.76                     | 29.3%                     | 5%  | 92%                                 | 20           | 105492       |
| Existing             | Warehouse        | Heat Pump | Heat Pump - Water Source (Closed Loop)                          | WSHP: COP=4.2, EER=12.0  | Std. Air Source Heat Pump'EER=10.1, COP=3.2          | 0.76                     | 23.6%                     | 20%   | 90%                                 | 20           | \$11295      |
| Existing             | Warehouse        | Heat Pump | Heat Pump - Water Source (Closed Loop)                          | WSHP: COP=4.8, EER=14.5  | Std. Air Source Heat Pump'EER=10.1, COP=3.2          | 0.76                     | 34.1%                     | 20%   | 90%                                 | 20           | \$14917      |
| Existing             | Warehouse        | Heat Pump | Insulation (Ceiling)  | R-38   | R-21 (Code)  | 0.76                     | 5.9%                      | 75%   | 45%                                 | 25           | \$16936      |
| Existing             | Warehouse        | Heat Pump | Insulation (Ceiling)  | R-49   | R-21 (Code)  | 0.76                     | 8.9%                      | 75%   | 85%                                 | 25           | \$22473      |
| Existing             | Warehouse        | Heat Pump | Insulation (Ceiling) - Existing to Code                         | R-21 (Code)  | Existing Ceiling Insulation (Average R-9)            | 0.76                     | 5.5%                      | 75%   | 10%                                 | 25           | \$19867      |
| Existing             | Warehouse        | Heat Pump | Insulation (Ceiling) - Zero to Code                             | R-21 (Code)  | R-0  | 0.76                     | 13.8%                     | 75%   | 0%                                  | 25           | \$19867      |
| Existing             | Warehouse        | Heat Pump | Insulation (Duct) (Unconditioned Spaces)                        | Install New Duct Insulation (R-8)  | R-0  | 0.76                     | 4.4%                      | 10%   | 15%                                 | 25           | \$3,641      |
| Existing             | Warehouse        | Heat Pump | Insulation (Duct) (Unconditioned Spaces)                        | R-4  | R-0  | 0.76                     | 2.4%                      | 10%   | 15%                                 | 25           | \$3,794      |
| Existing             | Warehouse        | Heat Pump | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                          | 0.76                     | 5.0%                      | 10%   | 95%                                 | 25           | \$4,364      |
| Existing             | Warehouse        | Heat Pump | Insulation (Wall) - Existing to Code                            | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)                       | 0.76                     | 16.6%                     | 10%   | 35%                                 | 25           | \$4,781      |
| Existing             | Warehouse        | Heat Pump | Insulation (Wall) - Zero to Code                                | R-19 (2x6 Framing) - (Code)  | R-0  | 0.76                     | 19.8%                     | 10%   | 0%                                  | 25           | \$4,729      |
| Existing             | Warehouse        | Heat Pump | Insulation - Floor (Non-Slab)                                   | R-19   | R-10 (Code)  | 0.76                     | 3.7%                      | 35%   | 45%                                 | 25           | \$2,931      |
| Existing             | Warehouse        | Heat Pump | Insulation - Floor (Non-Slab) - Existing to Code                | R-10 (Code)  | R-0  | 0.76                     | 11.1%                     | 35%   | 45%                                 | 25           | \$16936      |
| Existing             | Warehouse        | Heat Pump | Thermostat - Programmable                                       | Energy Star Programmable Thermostat  | Manual Thermostat                                    | 0.76                     | 3.0%                      | 95%   | 20%                                 | 15           | \$147        |
| Existing             | Warehouse        | Heat Pump | Windows   | U = 0.35   | U = 0.55 (Code)                                      | 0.76                     | 2.1%                      | 80%   | 98%                                 | 25           | \$7,364      |
| Existing             | Warehouse        | Heat Pump | Windows - Existing to Code                                      | U = 0.55 (Code)  | Existing Windows (U=0.65)                            | 0.76                     | 1.4%                      | 10%   | 98%                                 | 25           | \$20789      |
| Existing             | Warehouse        | Lighting  | Bi-Level Control, Stairwell Lighting                            | Occupancy Sensor Control, 50% Lighting Power during unoccupied Time                  | Continuous Full Power Lighting in Stairways          | 2.54                     | 2.0%                      | 10%   | 75%                                 | 9            | \$2,566      |
| Existing             | Warehouse        | Lighting  | Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures | Continuous Dimming, Fluorescent Fixtures (Day-Lighting)                              | No Dimming Controls                                  | 2.54                     | 6.0%                      | 30%   | 98%                                 | 9            | \$3,908      |
| Existing             | Warehouse        | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 15%                              | Code Required LPD And Control Strategies: LPD = 0.80 | 2.54                     | 15.0%                     | 90%   | 70%                                 | 14           | \$2,775      |
| Existing             | Warehouse        | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 20%                              | Code Required LPD And Control Strategies: LPD = 0.80 | 2.54                     | 20.0%                     | 75%   | 85%                                 | 14           | \$7,074      |
| Existing             | Warehouse        | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 25%                              | Code Required LPD And Control Strategies: LPD = 0.80 | 2.54                     | 25.0%                     | 70%   | 90%                                 | 14           | \$11588      |
| Existing             | Warehouse        | Lighting  | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 35% - Only High Bay Applications | Code Required LPD And Control Strategies: LPD = 0.80 | 2.54                     | 35.0%                     | 65%   | 95%                                 | 14           | \$15887      |

| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description  | Base Equipment                              | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|--|---|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Warehouse        | Lighting   | HE Fixtures/Design - Existing to Code                         | Code Required LPD And Control Strategies: LPD = 0.80   | Existing Lighting Design                    | 2.54                     | 33.0%                         | 95%   | 45%                                 | 14           | \$18643      |
| Existing             | Warehouse        | Lighting   | LED Exit Lighting   | 5 Watts  | CFL Exit Sign (26 Watts)                    | 2.54                     | 1.6%                          | 95%   | 65%                                 | 11           | \$52         |
| Existing             | Warehouse        | Lighting   | LED Refrigeration Case Lights                                 | LED Refrigeration Case Lights (28W)  | Fluorescent Refrigeration Case Lights (60W) | 2.54                     | 0.4%                          | 0%  | 80%                                 | 13           | \$632        |
| Existing             | Warehouse        | Lighting   | LED Solid State White Lighting Package                        | Landscape, merchandise, signage, structure & task lighting   | 50W 10hrs/day, 365 day/yr                   | 2.54                     | 0.8%                          | 10%   | 95%                                 | 14           | \$36         |
| Existing             | Warehouse        | Lighting   | Occupancy Sensor Control, Fluorescent                         | Occupancy Sensor Control, Fluorescent  | No Occupancy Sensor                         | 2.54                     | 4.0%                          | 90%   | 83%                                 | 9            | \$609        |
| Existing             | Warehouse        | Lighting   | Time Clocks And Timers  | Install Time Clock Lighting  | No Time Clock                               | 2.54                     | 4.9%                          | 85%   | 100%                                | 9            | \$215        |
| Existing             | Warehouse        | Plug Load  | Energy Star - Battery Charging System                         | Energy Star Battery Charging System  | Non-Energy Star Battery Chargers            | 0.53                     | 0.4%                          | 95%   | 90%                                 | 7            | \$3          |
| Existing             | Warehouse        | Plug Load  | Energy Star - Computer  | Energy Star Features Enabled   | Non-Energy Star Features                    | 0.53                     | 13.6%                         | 64%   | 25%                                 | 4            | \$0          |
| Existing             | Warehouse        | Plug Load  | Energy Star - Copiers   | Energy Star or Better Office Equipment: Copiers,   | Office Equipment: Copiers, Standard         | 0.53                     | 7.3%                          | 5%  | 45%                                 | 6            | \$166        |
| Existing             | Warehouse        | Plug Load  | Energy Star - Fax   | Energy Star Features Enabled   | Non-Energy Star Features                    | 0.53                     | 1.8%                          | 75%   | 55%                                 | 4            | \$0          |
| Existing             | Warehouse        | Plug Load  | Energy Star - Monitors  | Energy Star Features Enabled   | Non-Energy Star Features                    | 0.53                     | 18.4%                         | 64%   | 15%                                 | 4            | \$156        |
| Existing             | Warehouse        | Plug Load  | Energy Star - Printers  | Energy Star Features Enabled   | Non-Energy Star Features                    | 0.53                     | 1.3%                          | 75%   | 40%                                 | 5            | \$16         |
| Existing             | Warehouse        | Plug Load  | Energy Star - Scanners  | Energy Star Features Enabled   | Non-Energy Star Features                    | 0.53                     | 0.9%                          | 75%   | 45%                                 | 4            | \$0          |
| Existing             | Warehouse        | Plug Load  | Energy Star - Water Cooler                                    | Energy Star Water Cooler (Hot/Cold Water)  | Non-Energy Star Water Cooler                | 0.53                     | 2.3%                          | 75%   | 75%                                 | 10           | \$0          |
| Existing             | Warehouse        | Plug Load  | Office Computer Network Management                            | Office Computer Network Energy Management  | No Network Management                       | 0.53                     | 1.8%                          | 95%   | 30%                                 | 3            | \$309        |
| Existing             | Warehouse        | Plug Load  | Power Supply 80+ Office Measure                               | 80% Efficient Power supply   | No 80+                                      | 0.53                     | 1.0%                          | 95%   | 86%                                 | 7            | \$0          |
| Existing             | Warehouse        | Plug Load  | Refrigerator eCube  | Refrigerator eCube   | No Refrigerator eCube                       | 0.53                     | 1.2%                          | 75%   | 95%                                 | 10           | \$85         |
| Existing             | Warehouse        | Plug Load  | Residential-Size Refrigerator                                 | Energy Star Residential-Size Refrigerator  | Residential-Size Refrigerator - Standard    | 0.53                     | 0.5%                          | 65%   | 65%                                 | 13           | \$127        |
| Existing             | Warehouse        | Plug Load  | Residential-Size Refrigerator/Freezer - Early Replacement     | Energy Star Refrigerator/Freezer   | Baseline Refrigerator/Freezer               | 0.53                     | 6.1%                          | 25%   | 35%                                 | 7            | \$576        |
| Existing             | Warehouse        | Plug Load  | Vending Machine   | Energy Star Vending Machines - High-Efficiency   | Vending Machines - Standard                 | 0.53                     | 11.3%                         | 10%   | 80%                                 | 14           | \$189        |
| Existing             | Warehouse        | Plug Load  | Vending Miser   | Passive Infrared Sensor on Vending Machine Monitoring, Vacancy of Area And Cycles Cooling - Controls | No Vending Miser - No controls              | 0.53                     | 11.6%                         | 10%   | 25%                                 | 3            | \$296        |
| Existing             | Warehouse        | Space Heat | Commissioning - Retro Building Commissioning                  | Commissioning - Retro Building Commissioning   | No Commissioning                            | 1.15                     | 12.5%                         | 90%   | 40%                                 | 3            | \$6,419      |
| Existing             | Warehouse        | Space Heat | Direct Digital Control System-Installation                    | DDC Retrofit   | Pneumatic                                   | 1.15                     | 15.0%                         | 5%  | 93%                                 | 5            | \$31319      |
| Existing             | Warehouse        | Space Heat | Direct Digital Control System-Optimization                    | DDC System (Optimized)   | DDC System (Basic)                          | 1.15                     | 10.0%                         | 75%   | 98%                                 | 5            | \$17539      |
| Existing             | Warehouse        | Space Heat | Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control                              | Pneumatic                                   | 1.15                     | 15.0%                         | 50%   | 98%                                 | 5            | \$12656      |
| Existing             | Warehouse        | Space Heat | Duct Repair And Sealing                                       | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 1.15                     | 2.5%                          | 45%   | 45%                                 | 18           | \$13028      |
| Existing             | Warehouse        | Space Heat | Exhaust Air to Ventilation Air Heat Recovery                  | Exhaust Air Heat Recovery  | No Heat Recovery                            | 1.15                     | 15.0%                         | 5%  | 94%                                 | 10           | \$29540      |

| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description  | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|--|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Warehouse        | Space Heat | Insulation (Ceiling)                                  | R-49   | R-30   | 1.15                     | 8.0%                          | 75%   | 85%                                 | 25           | \$16936      |
| Existing             | Warehouse        | Space Heat | Insulation (Ceiling) - Existing to Code               | R-30   | Existing Ceiling Insulation (Average R-9)                  | 1.15                     | 12.5%                         | 75%   | 10%                                 | 25           | \$19867      |
| Existing             | Warehouse        | Space Heat | Insulation (Ceiling) - Zero to Code                   | R-30   | R-0  | 1.15                     | 25.0%                         | 75%   | 0%                                  | 25           | \$19867      |
| Existing             | Warehouse        | Space Heat | Insulation (Duct) (Unconditioned Spaces)              | Install New Duct Insulation (R-8)  | R-0  | 1.15                     | 4.4%                          | 10%   | 15%                                 | 25           | \$3,641      |
| Existing             | Warehouse        | Space Heat | Insulation (Duct) (Unconditioned Spaces)              | R-4  | R-0  | 1.15                     | 2.4%                          | 10%   | 15%                                 | 25           | \$3,794      |
| Existing             | Warehouse        | Space Heat | Insulation (Wall)                                     | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                                | 1.15                     | 6.0%                          | 10%   | 95%                                 | 25           | \$4,364      |
| Existing             | Warehouse        | Space Heat | Insulation (Wall) - Existing to Code                  | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)                             | 1.15                     | 21.1%                         | 10%   | 35%                                 | 25           | \$4,781      |
| Existing             | Warehouse        | Space Heat | Insulation (Wall) - Zero to Code                      | R-19 (2x6 Framing) - (Code)  | R-0  | 1.15                     | 25.0%                         | 10%   | 0%                                  | 25           | \$4,729      |
| Existing             | Warehouse        | Space Heat | Insulation - Floor (Non-Slab)                         | R-19   | R-10 (Code)  | 1.15                     | 5.0%                          | 35%   | 45%                                 | 25           | \$2,931      |
| Existing             | Warehouse        | Space Heat | Insulation - Floor (Non-Slab) - Existing to Code      | R-10 (Code)  | R-0  | 1.15                     | 15.0%                         | 35%   | 45%                                 | 25           | \$16936      |
| Existing             | Warehouse        | Space Heat | Sensible And Total Heat Recovery Devices              | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery   | 1.15                     | 25.0%                         | 25%   | 98%                                 | 10           | \$68721      |
| Existing             | Warehouse        | Space Heat | Thermostat - Programmable                             | Energy Star Programmable Thermostat  | Manual Thermostat  | 1.15                     | 3.0%                          | 95%   | 20%                                 | 15           | \$147        |
| Existing             | Warehouse        | Space Heat | Windows   | U = 0.35   | U = 0.40   | 1.15                     | 1.0%                          | 80%   | 98%                                 | 25           | \$1,840      |
| Existing             | Warehouse        | Space Heat | Windows - Existing to Code                            | U = 0.40   | Existing Windows (U=0.65)                                  | 1.15                     | 3.0%                          | 10%   | 98%                                 | 25           | \$26313      |
| Existing             | Warehouse        | Water Heat | Water_Heater (40 Gallon Electric) - Residential Sized | EF = 0.95  | EF = 0.92  | 0.19                     | 3.3%                          | NA  | NA                                  | 20           | \$114        |
| Existing             | Warehouse        | Water Heat | Clothes Washer - Ozonating                            | Ozonating Clothes Washer   | Standard Commercial Clothes Washer                         | 0.20                     | 15.1%                         | 5%  | 95%                                 | 10           | \$8,706      |
| Existing             | Warehouse        | Water Heat | Clothes Washer Commercial                             | Energy Star Commercial Clothes Washer MEF=1.72   | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.20                     | 4.3%                          | 5%  | 80%                                 | 11           | \$306        |
| Existing             | Warehouse        | Water Heat | Demand controlled Circulating Systems                 | Install demand-based control system (VFD Control by Demand)  | No demand control systems in place                         | 0.20                     | 5.0%                          | 55%   | 94%                                 | 15           | \$9,048      |
| Existing             | Warehouse        | Water Heat | Dishwashing - Residential Sized System                | EF = 0.65 (ENERGY STAR)  | Standard Dishwasher (FED Std. EF=0.46)                     | 0.20                     | 2.3%                          | 5%  | 25%                                 | 13           | \$33         |
| Existing             | Warehouse        | Water Heat | Dishwashing - Residential Sized System                | EF = 0.77  | Standard Dishwasher (FED Std. EF=0.46)                     | 0.20                     | 3.1%                          | 5%  | 55%                                 | 13           | \$632        |
| Existing             | Warehouse        | Water Heat | Drainwater Heat Recovery Water Heater                 | Install (Power-Pipe or GFX) - Heat Recovery Water Heater   | No Heat Recovery System                                    | 0.20                     | 20.0%                         | 5%  | 92%                                 | 25           | \$612        |
| Existing             | Warehouse        | Water Heat | Faucet Aerators                                       | 1.5 GPM Aerator  | 2.5 GPM Aerator (Federal Code)                             | 0.20                     | 4.0%                          | 95%   | 25%                                 | 10           | \$0          |
| Existing             | Warehouse        | Water Heat | Faucet Aerators - Existing to Code                    | 2.5 GPM Aerator (Federal Code)   | 4.0 GPM Aerator  | 0.20                     | 3.8%                          | 95%   | 15%                                 | 10           | \$3          |
| Existing             | Warehouse        | Water Heat | Heat Pump Water Heater                                | EF = 2.9   | EF=0.93 Baseline Electric Water Heater                     | 0.20                     | 58.9%                         | 40%   | 94%                                 | 15           | \$9,732      |
| Existing             | Warehouse        | Water Heat | Hot Water (SHW) Pipe Insulation                       | Install Insulation (R-4)   | No Pipe Insulation   | 0.20                     | 1.0%                          | 80%   | 90%                                 | 15           | \$173        |
| Existing             | Warehouse        | Water Heat | Low-Flow Showerheads                                  | 2.0 GPM Showerhead   | 2.5 GPM Showerhead (Federal Code)                          | 0.20                     | 1.1%                          | 15%   | 75%                                 | 10           | \$7          |

| Construction Vintage | Customer Segment | End Use          | Measure Name   | Measure Description  | Base Equipment                      | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------------|--|--|-------------------------------------|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Warehouse        | Water Heat       | Low-Flow Showerheads - Existing to Code                  | 2.5 GPM Showerhead (Federal Code)                              | 4.5 GPM Showerhead                  | 0.20                     | 2.5%                          | 15%   | 20%                                 | 10           | \$13         |
| Existing             | Warehouse        | Water Heat       | Solar RE - Solar Water Heater                            | Passive solar water heating                                    | Non-solar hot water heater          | 0.20                     | 32.7%                         | 20%   | 95%                                 | 20           | \$8,931      |
| Existing             | Warehouse        | Water Heat       | Ultrasonic Faucet Control                                | Install Ultrasonic Motion Faucet Control                       | No Faucet Control                   | 0.20                     | 3.3%                          | 95%   | 95%                                 | 10           | \$205        |
| Existing             | Warehouse        | Water Heat       | Water Heater Thermostat Setback                          | Thermostat Setback and Replacement (120 Degrees)               | No Thermostat Setback (130 Degrees) | 0.20                     | 7.7%                          | 75%   | 45%                                 | 11           | \$107        |
| New                  | Warehouse        | Cooling Chillers | Chiller - Premium Efficiency                             | 0.507 kW/ton   | 0.634 kW/ton                        | 0.22                     | 20.0%                         | NA  | NA                                  | 20           | \$3,055      |
| New                  | Warehouse        | Cooling Chillers | Chiller - Advanced Technology                            | 0.461 kW/ton   | 0.634 kW/ton                        | 0.22                     | 27.3%                         | NA  | NA                                  | 20           | \$3,811      |
| New                  | Warehouse        | Cooling Chillers | Chiller - High Efficiency                                | 0.574 kW/ton   | 0.634 kW/ton                        | 0.22                     | 9.5%                          | NA  | NA                                  | 20           | \$1,094      |
| New                  | Warehouse        | Cooling Chillers | Window RE - Window Overhangs                             | Overhangs over windows for shading                             | No window overhangs                 | 0.20                     | 4.9%                          | 75%   | 75%                                 | 30           | \$2,309      |
| New                  | Warehouse        | Cooling DX       | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)   | Advanced-Efficiency 12.0 EER Rooftop Unit (CEE Tier 3)         | 10.3 EER Rooftop Unit (State Code)  | 0.24                     | 14.2%                         | NA  | NA                                  | 15           | \$6,830      |
| New                  | Warehouse        | Cooling DX       | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)      | High-Efficiency 11.0 EER Rooftop Unit, (CEE Tier 1)            | 10.3 EER Rooftop Unit (State Code)  | 0.24                     | 6.4%                          | NA  | NA                                  | 15           | \$3,635      |
| New                  | Warehouse        | Cooling DX       | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)    | Premium-Efficiency 11.5 EER Rooftop Unit (CEE Tier 2)          | 10.3 EER Rooftop Unit (State Code)  | 0.24                     | 10.4%                         | NA  | NA                                  | 15           | \$5,635      |
| New                  | Warehouse        | Cooling DX       | Commissioning - New Building Commissioning               | Commissioning - New Building Commissioning                     | No Commissioning                    | 0.22                     | 12.5%                         | 90%   | 80%                                 | 3            | \$23776      |
| New                  | Warehouse        | Cooling DX       | Direct / Indirect Evaporative Cooling, Pre-Cooling       | Direct / Indirect Evaporative Cooling, Pre-Cooling             | No modification to DX system        | 0.22                     | 25.0%                         | 50%   | 85%                                 | 15           | \$67855      |
| New                  | Warehouse        | Cooling DX       | Direct Digital Control System-Optimization               | DDC System (Optimized)   | DDC System (Basic)                  | 0.22                     | 10.0%                         | 75%   | 98%                                 | 5            | \$17539      |
| New                  | Warehouse        | Cooling DX       | Green Roof   | Vegetation on Roof   | Standard roofing techniques         | 0.22                     | 10.0%                         | 15%   | 98%                                 | 30           | \$29938      |
| New                  | Warehouse        | Cooling DX       | Insulation (Ceiling)                                     | R-38   | R-21 (Code)                         | 0.22                     | 2.0%                          | 75%   | 45%                                 | 25           | \$16936      |
| New                  | Warehouse        | Cooling DX       | Insulation (Ceiling)                                     | R-49   | R-21 (Code)                         | 0.22                     | 3.0%                          | 75%   | 85%                                 | 25           | \$22473      |
| New                  | Warehouse        | Cooling DX       | Insulation (Wall)  | R-25 (2x6 Framing) - Advanced                                  | R-19 (2x6 Framing) - (Code)         | 0.22                     | 3.0%                          | 95%   | 95%                                 | 25           | \$4,364      |
| New                  | Warehouse        | Cooling DX       | Insulation - Floor (Non-Slab)                            | R-19   | R-10 (Code)                         | 0.22                     | 1.0%                          | 35%   | 45%                                 | 25           | \$2,931      |
| New                  | Warehouse        | Cooling DX       | Leak Proof Duct Fittings                                 | Quick connect fittings that do not require mastic or drawbands | Std duct workmanship                | 0.22                     | 10.0%                         | 40%   | 98%                                 | 25           | \$5,048      |
| New                  | Warehouse        | Cooling DX       | Window RE - Window Overhangs                             | Overhangs over windows for shading                             | No window overhangs                 | 0.22                     | 4.9%                          | 75%   | 75%                                 | 30           | \$2,309      |
| New                  | Warehouse        | Cooling DX       | Windows  | U = 0.35   | U = 0.55 (Code)                     | 0.22                     | 0.3%                          | 80%   | 98%                                 | 25           | \$7,364      |
| New                  | Warehouse        | HVAC Aux         | Automated Exhaust VFD Control - Parking Garage CO sensor | CO Sensors   | No CO Sensors                       | 0.57                     | 20.0%                         | 1%  | 75%                                 | 10           | \$6,657      |



| Construction Vintage | Customer Segment | End Use   | Measure Name  | Measure Description   | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-----------|---|---|--|--------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Warehouse        | HVAC Aux  | Cooking Hood Controls   | Demand Controlled Ventilation - Cooking Hood Controls, with Sensors, Variable Speed Control, And Direct Make-up Air | No Cooking Hood Controls   | 0.57                     | 7.5%                      | 0%  | 85%                                 | 10           | \$6,830      |
| New                  | Warehouse        | HVAC Aux  | Motor - Premium-Efficiency                                      | PE Motors for HVAC Applications   | Standard Efficiency Motors   | 0.57                     | 3.8%                      | 85%   | 81%                                 | 10           | \$850        |
| New                  | Warehouse        | HVAC Aux  | Motor - Pump & Fan System - Variable Speed Control              | Pump And Fan System Optimization w/ VSD   | No Pump And Fan System VSD Optimization  | 0.57                     | 33.8%                     | 85%   | 75%                                 | 20           | \$6,608      |
| New                  | Warehouse        | HVAC Aux  | Motor - VAV Box High-Efficiency                                 | ECM Motors  | Standard Efficiency - Induction Motors with Silicon Controlled Rectifier (SCR) Speed Control | 0.57                     | 8.8%                      | 20%   | 77%                                 | 10           | \$11894      |
| New                  | Warehouse        | HVAC Aux  | Optimized Variable Volume Lab Hood Design                       | Optimized Variable Volume Lab Hood Design   | Constant Volume Lab Hood Design  | 0.57                     | 1.6%                      | 0%  | 94%                                 | 10           | \$1,791      |
| New                  | Warehouse        | Heat Pump | High-Efficiency EER=11.0, COP=3.5                               | High-Efficiency EER=11.0, COP=3.5   | EER=10.1, COP=3.2  | 0.57                     | 16.8%                     | NA  | NA                                  | 15           | \$4,840      |
| New                  | Warehouse        | Heat Pump | Premium-Efficiency EER=11.8, COP=3.8                            | Premium-Efficiency EER=11.8, COP=3.8  | EER=10.1, COP=3.2  | 0.57                     | 30.2%                     | NA  | NA                                  | 15           | \$10367      |
| New                  | Warehouse        | Heat Pump | Commissioning - New Building Commissioning                      | Commissioning - New Building Commissioning  | No Commissioning   | 0.52                     | 12.5%                     | 90%   | 80%                                 | 3            | \$23776      |
| New                  | Warehouse        | Heat Pump | Direct Digital Control System-Optimization                      | DDC System (Optimized)  | DDC System (Basic)   | 0.52                     | 10.0%                     | 75%   | 98%                                 | 5            | \$17539      |
| New                  | Warehouse        | Heat Pump | Exhaust Air to Ventilation Air Heat Recovery                    | Exhaust Air Heat Recovery   | No Heat Recovery   | 0.52                     | 11.2%                     | 5%  | 94%                                 | 10           | \$29540      |
| New                  | Warehouse        | Heat Pump | Green Roof  | Vegetation on Roof  | Standard roofing techniques  | 0.52                     | 0.8%                      | 15%   | 98%                                 | 30           | 329938       |
| New                  | Warehouse        | Heat Pump | Heat Pump - Ground Source (Closed Loop)                         | GSHP: COP=3.1, EER=13.4   | Std. Air Source HP 'EER=10.1, COP=3.2  | 0.52                     | 8.6%                      | 45%   | 92%                                 | 20           | \$56150      |
| New                  | Warehouse        | Heat Pump | Heat Pump - Ground Source (Closed Loop)                         | GSHP: COP=4.0, EER=20   | Std. Air Source HP 'EER=10.1, COP=3.2  | 0.52                     | 29.3%                     | 45%   | 92%                                 | 20           | 105492       |
| New                  | Warehouse        | Heat Pump | Heat Pump - Water Source (Closed Loop)                          | WSHP: COP=4.2, EER=12.0   | Std. Air Source Heat Pump'EER=10.1, COP=3.2  | 0.52                     | 23.6%                     | 40%   | 90%                                 | 20           | \$11295      |
| New                  | Warehouse        | Heat Pump | Heat Pump - Water Source (Closed Loop)                          | WSHP: COP=4.8, EER=14.5   | Std. Air Source Heat Pump'EER=10.1, COP=3.2  | 0.52                     | 34.1%                     | 40%   | 90%                                 | 20           | \$14917      |
| New                  | Warehouse        | Heat Pump | Insulation (Ceiling)  | R-38  | R-21 (Code)  | 0.52                     | 5.9%                      | 75%   | 45%                                 | 25           | \$16936      |
| New                  | Warehouse        | Heat Pump | Insulation (Ceiling)  | R-49  | R-21 (Code)  | 0.52                     | 8.9%                      | 75%   | 85%                                 | 25           | \$22473      |
| New                  | Warehouse        | Heat Pump | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced   | R-19 (2x6 Framing) - (Code)  | 0.52                     | 5.0%                      | 95%   | 95%                                 | 25           | \$4,364      |
| New                  | Warehouse        | Heat Pump | Insulation - Floor (Non-Slab)                                   | R-19  | R-10 (Code)  | 0.52                     | 3.7%                      | 35%   | 45%                                 | 25           | \$2,931      |
| New                  | Warehouse        | Heat Pump | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands  | Std duct workmanship   | 0.52                     | 10.0%                     | 40%   | 98%                                 | 25           | \$5,048      |
| New                  | Warehouse        | Heat Pump | Windows   | U = 0.35  | U = 0.55 (Code)  | 0.52                     | 2.1%                      | 80%   | 98%                                 | 25           | \$7,364      |
| New                  | Warehouse        | Lighting  | Bi-Level Control, Stairwell Lighting                            | Occupancy Sensor Control, 50% Lighting Power during unoccupied Time   | Continuous Full Power Lighting in Stairways  | 1.70                     | 2.0%                      | 10%   | 75%                                 | 9            | \$2,566      |
| New                  | Warehouse        | Lighting  | Daylighting Controls - Dimming-Continuous, Fluorescent Fixtures | Continuous Dimming, Fluorescent Fixtures (Day-Lighting)   | No Dimming Controls  | 1.70                     | 6.0%                      | 60%   | 98%                                 | 9            | \$3,908      |



| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description  | Base Equipment                                       | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|--|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Warehouse        | Lighting   | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 15%                              | Code Required LPD And Control Strategies: LPD = 0.80 | 1.70                     | 15.0%                         | 90%   | 70%                                 | 14           | \$1,563      |
| New                  | Warehouse        | Lighting   | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 20%                              | Code Required LPD And Control Strategies: LPD = 0.80 | 1.70                     | 20.0%                         | 75%   | 85%                                 | 14           | \$5,472      |
| New                  | Warehouse        | Lighting   | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 25%                              | Code Required LPD And Control Strategies: LPD = 0.80 | 1.70                     | 25.0%                         | 70%   | 90%                                 | 14           | \$9,575      |
| New                  | Warehouse        | Lighting   | HE Fixtures/Design  | Lighting Power Densities Above Code Requirements by 35% - Only High Bay Applications | Code Required LPD And Control Strategies: LPD = 0.80 | 1.70                     | 35.0%                         | 65%   | 95%                                 | 14           | \$13484      |
| New                  | Warehouse        | Lighting   | LED Refrigeration Case Lights                             | LED Refrigeration Case Lights (28W)  | Fluorescent Refrigeration Case Lights (60W)          | 1.70                     | 0.6%                          | 0%  | 80%                                 | 13           | \$632        |
| New                  | Warehouse        | Lighting   | LED Solid State White Lighting Package                    | Landscape, merchandise, signage, structure & task lighting                           | 50W 10hrs/day, 365 day/yr                            | 1.70                     | 0.8%                          | 10%   | 95%                                 | 14           | \$36         |
| New                  | Warehouse        | Lighting   | Occupancy Sensor Control, Fluorescent                     | Occupancy Sensor Control, Fluorescent  | No Occupancy Sensor                                  | 1.70                     | 4.0%                          | 90%   | 83%                                 | 10           | \$609        |
| New                  | Warehouse        | Plug Load  | Energy Star - Battery Charging System                     | Energy Star Battery Charging System  | Non-Energy Star Battery Chargers                     | 0.53                     | 0.4%                          | 95%   | 90%                                 | 7            | \$3          |
| New                  | Warehouse        | Plug Load  | Energy Star - Computer                                    | Energy Star Features Enabled   | Non-Energy Star Features                             | 0.53                     | 13.6%                         | 64%   | 25%                                 | 4            | \$0          |
| New                  | Warehouse        | Plug Load  | Energy Star - Copiers                                     | Energy Star or Better Office Equipment: Copiers,                                     | Office Equipment: Copiers, Standard                  | 0.53                     | 7.1%                          | 5%  | 45%                                 | 6            | \$166        |
| New                  | Warehouse        | Plug Load  | Energy Star - Fax   | Energy Star Features Enabled   | Non-Energy Star Features                             | 0.53                     | 1.8%                          | 75%   | 55%                                 | 4            | \$0          |
| New                  | Warehouse        | Plug Load  | Energy Star - Monitors                                    | Energy Star Features Enabled   | Non-Energy Star Features                             | 0.53                     | 18.4%                         | 64%   | 15%                                 | 4            | \$156        |
| New                  | Warehouse        | Plug Load  | Energy Star - Printers                                    | Energy Star Features Enabled   | Non-Energy Star Features                             | 0.53                     | 1.3%                          | 75%   | 40%                                 | 5            | \$16         |
| New                  | Warehouse        | Plug Load  | Energy Star - Scanners                                    | Energy Star Features Enabled   | Non-Energy Star Features                             | 0.53                     | 0.9%                          | 75%   | 45%                                 | 4            | \$0          |
| New                  | Warehouse        | Plug Load  | Energy Star - Water Cooler                                | Energy Star Water Cooler (Hot/Cold Water)  | Non-Energy Star Water Cooler                         | 0.53                     | 2.3%                          | 75%   | 75%                                 | 10           | \$0          |
| New                  | Warehouse        | Plug Load  | Office Computer Network Energy Management                 | Office Computer Network Energy Management  | No Network Management                                | 0.53                     | 1.8%                          | 95%   | 30%                                 | 3            | \$309        |
| New                  | Warehouse        | Plug Load  | Power Supply 80+ Office Measure                           | 80% Efficient Power supply   | No 80+   | 0.53                     | 1.0%                          | 95%   | 86%                                 | 7            | \$0          |
| New                  | Warehouse        | Plug Load  | Refrigerator eCube  | Refrigerator eCube   | No Refrigerator eCube                                | 0.53                     | 1.2%                          | 75%   | 95%                                 | 10           | \$85         |
| New                  | Warehouse        | Plug Load  | Residential-Size Refrigerator                             | Energy Star Residential-Size Refrigerator  | Residential-Size Refrigerator - Standard             | 0.53                     | 0.5%                          | 65%   | 65%                                 | 13           | \$127        |
| New                  | Warehouse        | Plug Load  | Residential-Size Refrigerator/Freezer - Early Replacement | Energy Star Refrigerator/Freezer   | Baseline Refrigerator/Freezer                        | 0.53                     | 5.9%                          | 25%   | 35%                                 | 7            | \$576        |
| New                  | Warehouse        | Plug Load  | Vending Machine   | Energy Star Vending Machines - High-Efficiency                                       | Vending Machines - Standard                          | 0.53                     | 10.9%                         | 10%   | 80%                                 | 14           | \$189        |
| New                  | Warehouse        | Space Heat | Commissioning - New Building Commissioning                | Commissioning - New Building Commissioning   | No Commissioning                                     | 0.38                     | 12.5%                         | 90%   | 80%                                 | 3            | \$23776      |
| New                  | Warehouse        | Space Heat | Direct Digital Control System-Optimization                | DDC System (Optimized)   | DDC System (Basic)                                   | 0.38                     | 10.0%                         | 75%   | 98%                                 | 5            | \$17539      |
| New                  | Warehouse        | Space Heat | Exhaust Air to Ventilation Air Heat Recovery              | Exhaust Air Heat Recovery  | No Heat Recovery                                     | 0.38                     | 15.0%                         | 5%  | 94%                                 | 10           | \$29540      |
| New                  | Warehouse        | Space Heat | Insulation (Ceiling)                                      | R-49   | R-30   | 0.38                     | 8.0%                          | 75%   | 85%                                 | 25           | \$16936      |
| New                  | Warehouse        | Space Heat | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                          | 0.38                     | 6.0%                          | 95%   | 95%                                 | 25           | \$4,364      |

| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description  | Base Equipment   | Baseline kWh (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|--|--|--------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Warehouse        | Space Heat | Insulation - Floor (Non-Slab)                         | R-19   | R-10 (Code)  | 0.38                     | 5.0%                          | 35%   | 45%                                 | 25           | \$2,931      |
| New                  | Warehouse        | Space Heat | Leak Proof Duct Fittings                              | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                                       | 0.38                     | 10.0%                         | 40%   | 98%                                 | 25           | \$5,048      |
| New                  | Warehouse        | Space Heat | Sensible And Total Heat Recovery Devices              | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 50% sensible and latent recovery effectiveness | No Heat Recovery   | 0.38                     | 25.0%                         | 50%   | 98%                                 | 10           | \$68721      |
| New                  | Warehouse        | Space Heat | Windows   | U = 0.35   | U = 0.40   | 0.38                     | 1.0%                          | 80%   | 98%                                 | 25           | \$1,840      |
| New                  | Warehouse        | Water Heat | Water_Heater (40 Gallon Electric) - Residential Sized | EF = 0.95  | EF = 0.92  | 0.20                     | 3.3%                          | NA  | NA                                  | 20           | \$114        |
| New                  | Warehouse        | Water Heat | Clothes Washer - Ozonating                            | Ozonating Clothes Washer   | Standard Commercial Clothes Washer                         | 0.20                     | 15.1%                         | 5%  | 95%                                 | 10           | \$8,706      |
| New                  | Warehouse        | Water Heat | Clothes Washer Commercial                             | Energy Star Commercial Clothes Washer MEF=1.72   | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.20                     | 4.2%                          | 5%  | 80%                                 | 11           | \$306        |
| New                  | Warehouse        | Water Heat | Demand controlled Circulating Systems                 | Install demand-based control system (VFD Control by Demand)  | No demand control systems in place                         | 0.20                     | 5.0%                          | 55%   | 94%                                 | 15           | \$9,048      |
| New                  | Warehouse        | Water Heat | Dishwashing - Residential Sized System                | EF = 0.65 (ENERGY STAR)  | Standard Dishwasher (FED Std. EF=0.46)                     | 0.20                     | 2.2%                          | 5%  | 25%                                 | 13           | \$33         |
| New                  | Warehouse        | Water Heat | Dishwashing - Residential Sized System                | EF = 0.77  | Standard Dishwasher (FED Std. EF=0.46)                     | 0.20                     | 3.1%                          | 5%  | 55%                                 | 13           | \$632        |
| New                  | Warehouse        | Water Heat | Drainwater Heat Recovery Water Heater                 | Install (Power-Pipe or GFX) - Heat Recovery Water Heater   | No Heat Recovery System                                    | 0.20                     | 20.0%                         | 25%   | 92%                                 | 25           | \$612        |
| New                  | Warehouse        | Water Heat | Faucet Aerators                                       | 1.5 GPM Aerator  | 2.5 GPM Aerator (Federal Code)                             | 0.20                     | 4.0%                          | 95%   | 25%                                 | 10           | \$0          |
| New                  | Warehouse        | Water Heat | Heat Pump Water Heater                                | EF = 2.9   | EF=0.93 Baseline Electric Water Heater                     | 0.20                     | 58.9%                         | 50%   | 94%                                 | 15           | \$9,732      |
| New                  | Warehouse        | Water Heat | Low-Flow Showerheads                                  | 2.0 GPM Showerhead   | 2.5 GPM Showerhead (Federal Code)                          | 0.20                     | 1.1%                          | 15%   | 75%                                 | 10           | \$7          |
| New                  | Warehouse        | Water Heat | Solar RE - Solar Water Heater                         | Passive solar water heating  | Non-solar hot water heater                                 | 0.20                     | 32.7%                         | 20%   | 95%                                 | 20           | \$8,931      |
| New                  | Warehouse        | Water Heat | Ultrasonic Faucet Control                             | Install Ultrasonic Motion Faucet Control   | No Faucet Control  | 0.20                     | 3.3%                          | 95%   | 95%                                 | 10           | \$205        |
| New                  | Warehouse        | Water Heat | Water Heater Thermostat Setback                       | Thermostat Setback and Replecement (120 Degrees)   | No Thermostat Setback (130 Degrees)                        | 0.20                     | 7.7%                          | 75%   | 45%                                 | 11           | \$107        |

# Commercial Gas Measures

| Construction Vintage | Customer Segment | End Use | Measure Name | Measure Description   | Base Equipment  | Baseline therm (UEC or EU)                | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------|--------------|---|---|---|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Dry Retail       | Goods   | Space Heat   | Gas Boiler - Greater than 300 kBTUH                           | 85% Thermal Efficiency  | 80% Thermal Efficiency (State Code)       | 0.07 5.9%                     | NA  | NA                                  | 20           | \$3,796      |
| Existing             | Dry Retail       | Goods   | Space Heat   | Gas Boiler - Greater than 300 kBTUH                           | 90% Thermal Efficiency  | 80% Thermal Efficiency (State Code)       | 0.07 11.1%                    | NA  | NA                                  | 20           | \$7,744      |
| Existing             | Dry Retail       | Goods   | Space Heat   | Boiler Economizer   | Economizer  | No Economizer                             | 0.07 5.5%                     | 40%   | 90%                                 | 20           | \$15,356     |
| Existing             | Dry Retail       | Goods   | Space Heat   | Commissioning - Retro Building Commissioning                  | Commissioning - Retro Building Commissioning                            | No Commissioning                          | 0.07 12.5%                    | 90%   | 40%                                 | 3            | \$9,319      |
| Existing             | Dry Retail       | Goods   | Space Heat   | Direct Digital Control System-Installation                    | DDC Retrofit (Morning Warm-Up Control Logic Included in This Measure)   | Pneumatic                                 | 0.07 5.0%                     | 75%   | 59%                                 | 15           | \$13,134     |
| Existing             | Dry Retail       | Goods   | Space Heat   | Direct Digital Control System-Optimization                    | Premium-Efficiency EMS System   | High-Efficiency EMS System                | 0.07 10.0%                    | 75%   | 80%                                 | 5            | \$25,459     |
| Existing             | Dry Retail       | Goods   | Space Heat   | Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control | Pneumatic                                 | 0.07 15.0%                    | 50%   | 80%                                 | 5            | \$18,372     |
| Existing             | Dry Retail       | Goods   | Space Heat   | Duct Repair And Sealing                                       | Reduction In Duct Losses to 5%  | No Repair or Sealing, 15% duct losses     | 0.07 2.5%                     | 45%   | 45%                                 | 18           | \$18,911     |
| Existing             | Dry Retail       | Goods   | Space Heat   | Exhaust Air to Ventilation Air Heat Recovery                  | Exhaust Air Heat Recovery   | No Heat Recovery                          | 0.07 15.0%                    | 5%  | 94%                                 | 10           | \$42,881     |
| Existing             | Dry Retail       | Goods   | Space Heat   | Infiltration Control (Caulking, Weather Stripping, etc.)      | Install Caulking And Weatherstripping (ACH 0.65)                        | Infiltration Conditions (ACH 1.0)         | 0.07 10.0%                    | 40%   | 10%                                 | 10           | \$11,068     |
| Existing             | Dry Retail       | Goods   | Space Heat   | Insulation (Ceiling)  | R-21 (Code)   | Existing Ceiling Insulation (Average R-9) | 0.07 7.2%                     | 75%   | 85%                                 | 25           | \$28,840     |
| Existing             | Dry Retail       | Goods   | Space Heat   | Insulation (Ceiling)  | R-21 (Code)   | R-0                                       | 0.07 20.0%                    | 75%   | 0%                                  | 25           | \$28,840     |
| Existing             | Dry Retail       | Goods   | Space Heat   | Insulation (Ceiling)  | R-38  | R-21 (Code)                               | 0.07 8.0%                     | 75%   | 95%                                 | 25           | \$24,585     |
| Existing             | Dry Retail       | Goods   | Space Heat   | Insulation (Ceiling)  | R-49  | R-21 (Code)                               | 0.07 12.0%                    | 75%   | 98%                                 | 25           | \$32,622     |
| Existing             | Dry Retail       | Goods   | Space Heat   | Insulation (Duct) (Unconditioned Spaces)                      | Install New Duct Insulation (R-8)                                       | R-0                                       | 0.07 4.4%                     | 10%   | 15%                                 | 25           | \$5,286      |
| Existing             | Dry Retail       | Goods   | Space Heat   | Insulation (Duct) (Unconditioned Spaces)                      | R-4   | R-0                                       | 0.07 2.4%                     | 10%   | 15%                                 | 25           | \$5,508      |
| Existing             | Dry Retail       | Goods   | Space Heat   | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced   | R-19 (2x6 Framing) - (Code)               | 0.07 6.0%                     | 10%   | 95%                                 | 25           | \$5,262      |

| Construction Vintage | Customer Segment | End Use | Measure Name  | Measure Description   | Base Equipment   | Baseline therm (UEC or EU)                | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|---------|---------------|---|--|---|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| Existing             | Dry Retail       | Goods   | Space Boiler  | Heat Insulation (Wall) - Existing to Code                     | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)            | 0.07                          | 21.1%   | 10%                                 | 35%          | 25           | \$5,697 |
| Existing             | Dry Retail       | Goods   | Space Boiler  | Heat Insulation (Wall) - Zero to Code                         | R-19 (2x6 Framing) - (Code)  | R-0                                       | 0.07                          | 25.0%   | 10%                                 | 0%           | 25           | \$5,697 |
| Existing             | Dry Retail       | Goods   | Space Boiler  | Heat Insulation - Floor (Non-Slab)                            | R-10 (Code)  | R-0                                       | 0.07                          | 15.0%   | 35%                                 | 90%          | 25           | \$24585 |
| Existing             | Dry Retail       | Goods   | Space Boiler  | Heat Insulation - Floor (Non-Slab)                            | R-19   | R-10 (Code)                               | 0.07                          | 5.0%  | 35%                                 | 90%          | 25           | \$4,255 |
| Existing             | Dry Retail       | Goods   | Space Boiler  | Heat Sensible And Total Heat Recovery Devices                 | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness | No Heat Recovery                          | 0.07                          | 25.0%   | 25%                                 | 98%          | 10           | \$99757 |
| Existing             | Dry Retail       | Goods   | Space Boiler  | Heat Steam Pipe Insulation                                    | R-4  | R-0                                       | 0.07                          | 12.1%   | 75%                                 | 65%          | 20           | \$3,229 |
| Existing             | Dry Retail       | Goods   | Space Boiler  | Heat Steam Trap Maintenance                                   | Actively stop steam trap leaks   | No Maintenance                            | 0.07                          | 17.0%   | 90%                                 | 45%          | 3            | \$6,383 |
| Existing             | Dry Retail       | Goods   | Space Boiler  | Heat Thermostat - Programmable                                | Energy Star Programmable Thermostat  | Manual Thermostat                         | 0.07                          | 3.0%  | 95%                                 | 54%          | 15           | \$147   |
| Existing             | Dry Retail       | Goods   | Space Boiler  | Heat Windows  | U = 0.35   | U = 0.55 (Code)                           | 0.07                          | 4.7%  | 80%                                 | 80%          | 25           | \$42460 |
| Existing             | Dry Retail       | Goods   | Space Boiler  | Heat Windows - Existing to Code                               | U = 0.55 (Code)  | Existing Windows (U=0.65)                 | 0.07                          | 3.1%  | 10%                                 | 80%          | 25           | 119878  |
| Existing             | Dry Retail       | Goods   | Space Furnace | Heat Gas Furnace  | AFUE = 90% (Condensing Furnace)  | AFUE=80%                                  | 0.11                          | 11.1%   | NA                                  | NA           | 18           | \$3,943 |
| Existing             | Dry Retail       | Goods   | Space Furnace | Heat Gas Furnace  | AFUE = 94% (Condensing Furnace)  | AFUE=80%                                  | 0.11                          | 14.9%   | NA                                  | NA           | 18           | \$3,943 |
| Existing             | Dry Retail       | Goods   | Space Furnace | Heat Commissioning - Retro Building Commissioning             | Commissioning - Retro Building Commissioning   | No Commissioning                          | 0.10                          | 12.5%   | 90%                                 | 80%          | 3            | \$9,319 |
| Existing             | Dry Retail       | Goods   | Space Furnace | Heat Duct Repair And Sealing                                  | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses     | 0.10                          | 2.5%  | 45%                                 | 45%          | 18           | \$18911 |
| Existing             | Dry Retail       | Goods   | Space Furnace | Heat Exhaust Air to Ventilation Air Heat Recovery             | Exhaust Air Heat Recovery  | No Heat Recovery                          | 0.10                          | 15.0%   | 5%                                  | 94%          | 10           | \$42881 |
| Existing             | Dry Retail       | Goods   | Space Furnace | Heat Infiltration Control (Caulking, Weather Stripping, etc.) | Install Caulking And Weatherstripping (ACH 0.65)   | Infiltration Conditions (ACH 1.0)         | 0.10                          | 10.0%   | 40%                                 | 10%          | 10           | \$11068 |
| Existing             | Dry Retail       | Goods   | Space Furnace | Heat Insulation (Ceiling)                                     | R-21 (Code)  | Existing Ceiling Insulation (Average R-9) | 0.10                          | 7.2%  | 75%                                 | 85%          | 25           | \$28840 |
| Existing             | Dry Retail       | Goods   | Space Furnace | Heat Insulation (Ceiling)                                     | R-21 (Code)  | R-0                                       | 0.10                          | 20.0%   | 75%                                 | 0%           | 25           | \$28840 |
| Existing             | Dry Retail       | Goods   | Space Furnace | Heat Insulation (Ceiling)                                     | R-38   | R-21 (Code)                               | 0.10                          | 8.0%  | 75%                                 | 95%          | 25           | \$24585 |

| Construction Vintage | Customer Segment | End Use | Measure Name | Measure Description                          | Base Equipment  | Baseline therm (UEC or EUI)                                | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|---------|--------------|--|---|--|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| Existing             | Dry Retail       | Goods   | Space Heat   | Insulation (Ceiling)                         | R-49  | R-21 (Code)  | 0.10                          | 12.0%   | 75%                                 | 98%          | 25           | \$32622 |
| Existing             | Dry Retail       | Goods   | Space Heat   | Insulation (Duct) (Unconditioned Spaces)     | Install New Duct Insulation (R-8)                             | R-0  | 0.10                          | 4.4%  | 10%                                 | 15%          | 25           | \$5,286 |
| Existing             | Dry Retail       | Goods   | Space Heat   | Insulation (Duct) (Unconditioned Spaces)     | R-4   | R-0  | 0.10                          | 2.4%  | 10%                                 | 15%          | 25           | \$5,508 |
| Existing             | Dry Retail       | Goods   | Space Heat   | Insulation (Wall)                            | R-25 (2x6 Framing) - Advanced                                 | R-19 (2x6 Framing) - (Code)                                | 0.10                          | 6.0%  | 10%                                 | 95%          | 25           | \$5,262 |
| Existing             | Dry Retail       | Goods   | Space Heat   | Insulation (Wall) - Existing to Code         | R-19 (2x6 Framing) - (Code)                                   | Existing R-value (Average R-3)                             | 0.10                          | 21.1%   | 10%                                 | 35%          | 25           | \$5,697 |
| Existing             | Dry Retail       | Goods   | Space Heat   | Insulation (Wall) - Zero to Code             | R-19 (2x6 Framing) - (Code)                                   | R-0  | 0.10                          | 25.0%   | 10%                                 | 0%           | 25           | \$5,697 |
| Existing             | Dry Retail       | Goods   | Space Heat   | Insulation - Floor (Non-Slab)                | R-10 (Code)   | R-0  | 0.10                          | 15.0%   | 35%                                 | 90%          | 25           | \$24585 |
| Existing             | Dry Retail       | Goods   | Space Heat   | Insulation - Floor (Non-Slab)                | R-19  | R-10 (Code)  | 0.10                          | 5.0%  | 35%                                 | 90%          | 25           | \$4,255 |
| Existing             | Dry Retail       | Goods   | Space Heat   | Thermostat - Programmable                    | Energy Star Programmable Thermostat                           | Manual Thermostat  | 0.10                          | 3.0%  | 95%                                 | 54%          | 15           | \$147   |
| Existing             | Dry Retail       | Goods   | Space Heat   | Windows                                      | U = 0.35  | U = 0.55 (Code)  | 0.10                          | 4.7%  | 80%                                 | 80%          | 25           | \$42460 |
| Existing             | Dry Retail       | Goods   | Space Heat   | Windows - Existing to Code                   | U = 0.55 (Code)   | Existing Windows (U=0.65)                                  | 0.10                          | 3.1%  | 10%                                 | 80%          | 25           | 119878  |
| Existing             | Dry Retail       | Goods   | Water Heat   | Water Heater - Condensing                    | EF = 0.90   | EF = 0.59  | 0.03                          | 34.4%   | NA                                  | NA           | 13           | \$3,626 |
| Existing             | Dry Retail       | Goods   | Water Heat   | Clothes Washer - Ozonating                   | Ozonating Clothes Washer                                      | Standard Commercial Clothes Washer                         | 0.03                          | 15.1%   | 5%                                  | 95%          | 10           | \$8,704 |
| Existing             | Dry Retail       | Goods   | Water Heat   | Clothes Washer Commercial                    | Energy Star Commercial Clothes Washer MEF=1.73                | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.03                          | 0.9%  | 5%                                  | 75%          | 10           | \$303   |
| Existing             | Dry Retail       | Goods   | Water Heat   | Demand controlled Circulating Systems        | Demand Controlled Circulating Systems (VFD Control by Demand) | Constant Circulation                                       | 0.03                          | 5.0%  | 75%                                 | 94%          | 15           | \$13134 |
| Existing             | Dry Retail       | Goods   | Water Heat   | Dishwashing - Residential Sized System       | EF = 0.65 (ENERGY STAR)                                       | Existing Dishwasher (FED Std. EF=0.46)                     | 0.03                          | 0.6%  | 45%                                 | 25%          | 13           | \$33    |
| Existing             | Dry Retail       | Goods   | Water Heat   | Dishwashing - Residential Sized System       | EF = 0.77   | Existing Dishwasher (FED Std. EF=0.46)                     | 0.03                          | 0.8%  | 45%                                 | 55%          | 13           | \$629   |
| Existing             | Dry Retail       | Goods   | Water Heat   | Drainwater Heat Recovery (Power-Pipe or GFX) | Install Power-Pipe or GFX System                              | No GFX or Power-Pipe System                                | 0.03                          | 20.0%   | 5%                                  | 92%          | 25           | \$2,804 |
| Existing             | Dry Retail       | Goods   | Water Heat   | Faucet Aerators                              | 1.5 GPM Aerator   | 2.5 GPM Aerator (Federal Code)                             | 0.03                          | 4.0%  | 95%                                 | 25%          | 10           | \$0     |

| Construction Vintage | Customer Segment | End Use | Measure Name | Measure Description                          | Base Equipment  | Baseline therm (UEC or EU)            | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|---------|--------------|--|---|---------------------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| Existing             | Dry Retail       | Goods   | Water Heat   | Faucet Aerators - Existing to Code           | 2.5 GPM Aerator (Federal Code)                                    | 4.0 GPM Aerator                       | 0.03                          | 3.8%  | 95%                                 | 15%          | 10           | \$0     |
| Existing             | Dry Retail       | Goods   | Water Heat   | Hot Water (SHW) Pipe Insulation              | Install Insulation (R-4)  | No Pipe Insulation                    | 0.03                          | 1.0%  | 75%                                 | 90%          | 15           | \$501   |
| Existing             | Dry Retail       | Goods   | Water Heat   | Low Flow Spray Heads                         | 1.6 GPM   | 3.0 GPM                               | 0.03                          | 2.3%  | 10%                                 | 45%          | 5            | \$5     |
| Existing             | Dry Retail       | Goods   | Water Heat   | Low-Flow Showerheads                         | 2.0 GPM Showerhead  | 2.5 GPM Showerhead (Federal Code)     | 0.03                          | 1.1%  | 15%                                 | 75%          | 10           | \$5     |
| Existing             | Dry Retail       | Goods   | Water Heat   | Low-Flow Showerheads - Existing to Code      | 2.5 GPM Showerhead (Federal Code)                                 | 4.5 GPM Showerhead                    | 0.03                          | 2.5%  | 15%                                 | 20%          | 10           | \$9     |
| Existing             | Dry Retail       | Goods   | Water Heat   | Refrigeration with Heat Recovery             | Heat Recovery from Refrigeration System. Applied to Water Heating | No Heat Recovery                      | 0.03                          | 28.0%   | 75%                                 | 74%          | 16           | \$43023 |
| Existing             | Dry Retail       | Goods   | Water Heat   | Solar RE - Solar Water Heater                | Passive solar water heating                                       | Standard Water Heater EF = 0.93       | 0.03                          | 55.6%   | 20%                                 | 95%          | 20           | \$62587 |
| Existing             | Dry Retail       | Goods   | Water Heat   | Tankless Water Heater - Commercial           | EF = 0.82   | Thermal Efficiency = 80%              | 0.03                          | 30.0%   | 25%                                 | 90%          | 14           | \$2,265 |
| Existing             | Dry Retail       | Goods   | Water Heat   | Tankless Water Heater - Residential          | EF = 0.82   | EF = 0.59 (40 Gal)                    | 0.03                          | 28.0%   | 25%                                 | 90%          | 20           | \$695   |
| Existing             | Dry Retail       | Goods   | Water Heat   | Ultrasonic Faucet Control                    | Install Ultrasonic Motion Faucet Control                          | No Faucet Control                     | 0.03                          | 3.3%  | 95%                                 | 95%          | 10           | \$208   |
| Existing             | Dry Retail       | Goods   | Water Heat   | Water Heater Thermostat Setback              | Thermostat Setback and Replcement (120 Degrees)                   | No Thermostat Setback (130 Degrees)   | 0.03                          | 7.7%  | 75%                                 | 45%          | 11           | \$539   |
| New                  | Dry Retail       | Goods   | Space Heat   | Gas Boiler - Greater than 300 kBTUH          | 85% Thermal Efficiency  | 80% Thermal Efficiency (State Code)   | 0.04                          | 5.9%  | NA                                  | NA           | 20           | \$3,796 |
| New                  | Dry Retail       | Goods   | Space Heat   | Gas Boiler - Greater than 300 kBTUH          | 90% Thermal Efficiency  | 80% Thermal Efficiency (State Code)   | 0.04                          | 11.1%   | NA                                  | NA           | 20           | \$7,744 |
| New                  | Dry Retail       | Goods   | Space Heat   | Boiler Economizer                            | Economizer  | No Economizer                         | 0.04                          | 5.5%  | 40%                                 | 90%          | 20           | \$15356 |
| New                  | Dry Retail       | Goods   | Space Heat   | Commissioning - New Building Commissioning   | Commissioning - New Building Commissioning                        | No Commissioning                      | 0.04                          | 12.5%   | 90%                                 | 40%          | 3            | \$34513 |
| New                  | Dry Retail       | Goods   | Space Heat   | Direct Digital Control System-Optimization   | Premium-Efficiency EMS System                                     | High-Efficiency EMS System            | 0.04                          | 10.0%   | 75%                                 | 80%          | 5            | \$25459 |
| New                  | Dry Retail       | Goods   | Space Heat   | Duct Repair And Sealing                      | Reduction In Duct Losses to 5%                                    | No Repair or Sealing, 15% duct losses | 0.04                          | 2.5%  | 45%                                 | 45%          | 18           | \$18911 |
| New                  | Dry Retail       | Goods   | Space Heat   | Exhaust Air to Ventilation Air Heat Recovery | Exhaust Air Heat Recovery   | No Heat Recovery                      | 0.04                          | 15.0%   | 5%                                  | 94%          | 10           | \$42881 |
| New                  | Dry Retail       | Goods   | Space Heat   | Insulation (Ceiling)                         | R-38  | R-21 (Code)                           | 0.04                          | 8.0%  | 75%                                 | 95%          | 25           | \$24585 |

| Construction Vintage | Customer Segment | End Use | Measure Name  | Measure Description                               | Base Equipment   | Baseline therm (UEC or EU)            | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|---------|---------------|---|--|---------------------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| New                  | Dry Retail       | Goods   | Space Boiler  | Heat Insulation (Ceiling)                         | R-49   | R-21 (Code)                           | 0.04                          | 12.0%   | 75%                                 | 98%          | 25           | \$32622 |
| New                  | Dry Retail       | Goods   | Space Boiler  | Heat Insulation (Wall)                            | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)           | 0.04                          | 6.0%  | 95%                                 | 95%          | 25           | \$5,262 |
| New                  | Dry Retail       | Goods   | Space Boiler  | Heat Insulation - Floor (Non-Slab)                | R-19   | R-10 (Code)                           | 0.04                          | 5.0%  | 35%                                 | 90%          | 25           | \$4,255 |
| New                  | Dry Retail       | Goods   | Space Boiler  | Heat Integrated Space Heating/Water Heating       | Integrated System  | Separate Boiler And HW Heater         | 0.04                          | 5.0%  | 50%                                 | 95%          | 15           | \$10865 |
| New                  | Dry Retail       | Goods   | Space Boiler  | Heat Leak Proof Duct Fittings                     | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                  | 0.04                          | 10.0%   | 40%                                 | 98%          | 25           | \$7,328 |
| New                  | Dry Retail       | Goods   | Space Boiler  | Heat Sensible And Total Heat Recovery Devices     | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness | No Heat Recovery                      | 0.04                          | 25.0%   | 50%                                 | 98%          | 10           | \$99757 |
| New                  | Dry Retail       | Goods   | Space Boiler  | Heat Thermostat - Programmable                    | Energy Star Programmable Thermostat  | Manual Thermostat                     | 0.04                          | 3.0%  | 95%                                 | 54%          | 15           | \$147   |
| New                  | Dry Retail       | Goods   | Space Boiler  | Heat Windows                                      | U = 0.35   | U = 0.55 (Code)                       | 0.04                          | 4.7%  | 80%                                 | 80%          | 25           | \$42460 |
| New                  | Dry Retail       | Goods   | Space Furnace | Heat Gas Furnace                                  | AFUE = 90% (Condensing Furnace)  | AFUE=80%                              | 0.06                          | 11.1%   | NA                                  | NA           | 18           | \$3,943 |
| New                  | Dry Retail       | Goods   | Space Furnace | Heat Gas Furnace                                  | AFUE = 94% (Condensing Furnace)  | AFUE=80%                              | 0.06                          | 14.9%   | NA                                  | NA           | 18           | \$3,943 |
| New                  | Dry Retail       | Goods   | Space Furnace | Heat Commissioning - New Building Commissioning   | Commissioning - New Building Commissioning   | No Commissioning                      | 0.06                          | 12.5%   | 90%                                 | 80%          | 3            | \$34513 |
| New                  | Dry Retail       | Goods   | Space Furnace | Heat Duct Repair And Sealing                      | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses | 0.06                          | 2.5%  | 45%                                 | 45%          | 18           | \$18911 |
| New                  | Dry Retail       | Goods   | Space Furnace | Heat Exhaust Air to Ventilation Air Heat Recovery | Exhaust Air Heat Recovery  | No Heat Recovery                      | 0.06                          | 15.0%   | 5%                                  | 94%          | 10           | \$42881 |
| New                  | Dry Retail       | Goods   | Space Furnace | Heat Insulation (Ceiling)                         | R-38   | R-21 (Code)                           | 0.06                          | 8.0%  | 75%                                 | 95%          | 25           | \$24585 |
| New                  | Dry Retail       | Goods   | Space Furnace | Heat Insulation (Ceiling)                         | R-49   | R-21 (Code)                           | 0.06                          | 12.0%   | 75%                                 | 98%          | 25           | \$32622 |
| New                  | Dry Retail       | Goods   | Space Furnace | Heat Insulation (Wall)                            | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)           | 0.06                          | 6.0%  | 95%                                 | 95%          | 25           | \$5,262 |
| New                  | Dry Retail       | Goods   | Space Furnace | Heat Insulation - Floor (Non-Slab)                | R-19   | R-10 (Code)                           | 0.06                          | 5.0%  | 35%                                 | 90%          | 25           | \$4,255 |
| New                  | Dry Retail       | Goods   | Space Furnace | Heat Leak Proof Duct Fittings                     | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                  | 0.06                          | 10.0%   | 40%                                 | 98%          | 25           | \$7,328 |
| New                  | Dry Retail       | Goods   | Space Furnace | Heat Thermostat - Programmable                    | Energy Star Programmable Thermostat  | Manual Thermostat                     | 0.06                          | 3.0%  | 95%                                 | 54%          | 15           | \$147   |

| Construction Vintage | Customer Segment | End Use | Measure Name | Measure Description                          | Base Equipment  | Baseline therm (UEC or EU)                                 | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|---------|--------------|--|---|--|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| New                  | Dry Retail       | Goods   | Space Heat   | Windows                                      | U = 0.35  | U = 0.55 (Code)  | 0.06                          | 4.7%  | 80%                                 | 80%          | 25           | \$42460 |
| New                  | Dry Retail       | Goods   | Water Heat   | Water Heater - Condensing                    | EF = 0.90   | EF = 0.59  | 0.03                          | 34.4%   | NA                                  | NA           | 13           | \$3,626 |
| New                  | Dry Retail       | Goods   | Water Heat   | Clothes Washer - Ozonating                   | Ozonating Clothes Washer  | Standard Commercial Clothes Washer                         | 0.03                          | 15.1%   | 5%                                  | 95%          | 10           | \$8,704 |
| New                  | Dry Retail       | Goods   | Water Heat   | Clothes Washer Commercial                    | Energy Star Commercial Clothes Washer MEF=1.73                    | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.03                          | 0.9%  | 5%                                  | 75%          | 10           | \$303   |
| New                  | Dry Retail       | Goods   | Water Heat   | Demand controlled Circulating Systems        | Demand Controlled Circulating Systems (VFD Control by Demand)     | Constant Circulation                                       | 0.03                          | 5.0%  | 90%                                 | 94%          | 15           | \$13134 |
| New                  | Dry Retail       | Goods   | Water Heat   | Dishwashing - Residential Sized System       | EF = 0.65 (ENERGY STAR)   | Existing Dishwasher (FED Std. EF=0.46)                     | 0.03                          | 0.6%  | 45%                                 | 25%          | 13           | \$33    |
| New                  | Dry Retail       | Goods   | Water Heat   | Dishwashing - Residential Sized System       | EF = 0.77   | Existing Dishwasher (FED Std. EF=0.46)                     | 0.03                          | 0.8%  | 45%                                 | 55%          | 13           | \$629   |
| New                  | Dry Retail       | Goods   | Water Heat   | Drainwater Heat Recovery (Power-Pipe or GFX) | Install Power-Pipe or GFX System                                  | No GFX or Power-Pipe System                                | 0.03                          | 20.0%   | 25%                                 | 92%          | 25           | \$2,804 |
| New                  | Dry Retail       | Goods   | Water Heat   | Faucet Aerators                              | 1.5 GPM Aerator   | 2.5 GPM Aerator (Federal Code)                             | 0.03                          | 4.0%  | 95%                                 | 25%          | 10           | \$0     |
| New                  | Dry Retail       | Goods   | Water Heat   | Integrated Space Heating/Water Heating       | Integrated System   | Separate Boiler And HW Heater                              | 0.03                          | 5.0%  | 50%                                 | 95%          | 15           | \$10865 |
| New                  | Dry Retail       | Goods   | Water Heat   | Low Flow Spray Heads                         | 1.6 GPM   | 3.0 GPM  | 0.03                          | 2.3%  | 10%                                 | 45%          | 5            | \$5     |
| New                  | Dry Retail       | Goods   | Water Heat   | Low-Flow Showerheads                         | 2.0 GPM Showerhead  | 2.5 GPM Showerhead (Federal Code)                          | 0.03                          | 1.1%  | 15%                                 | 75%          | 10           | \$5     |
| New                  | Dry Retail       | Goods   | Water Heat   | Refrigeration with Heat Recovery             | Heat Recovery from Refrigeration System. Applied to Water Heating | No Heat Recovery   | 0.03                          | 28.0%   | 75%                                 | 74%          | 16           | \$24112 |
| New                  | Dry Retail       | Goods   | Water Heat   | Solar RE - Solar Water Heater                | Passive solar water heating                                       | Standard Water Heater EF = 0.93                            | 0.03                          | 55.6%   | 20%                                 | 95%          | 20           | \$62587 |
| New                  | Dry Retail       | Goods   | Water Heat   | Tankless Water Heater - Commercial           | EF = 0.82   | Thermal Efficiency = 80%                                   | 0.03                          | 30.0%   | 25%                                 | 90%          | 14           | \$2,265 |
| New                  | Dry Retail       | Goods   | Water Heat   | Tankless Water Heater - Residential          | EF = 0.82   | EF = 0.59 (40 Gal)   | 0.03                          | 28.0%   | 25%                                 | 90%          | 20           | \$695   |
| New                  | Dry Retail       | Goods   | Water Heat   | Ultrasonic Faucet Control                    | Install Ultrasonic Motion Faucet Control                          | No Faucet Control  | 0.03                          | 3.3%  | 95%                                 | 95%          | 10           | \$208   |
| New                  | Dry Retail       | Goods   | Water Heat   | Water Heater Thermostat Setback              | Thermostat Setback and Replcement (120 Degrees)                   | No Thermostat Setback (130 Degrees)                        | 0.03                          | 7.7%  | 75%                                 | 45%          | 11           | \$539   |
| Existing             | Grocery          | Cooking |              | Broiler                                      | High-Efficiency Broiler (34% Efficient)                           | Standard Broiler (15% Efficient)                           | 0.20                          | 1.9%  | 95%                                 | 75%          | 10           | \$210   |



| Construction Vintage | Customer Segment | End Use           | Measure Name  | Measure Description  | Base Equipment                              | Baseline therm (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-------------------|---|--|---|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Grocery          | Cooking           | Fryers - Commercial Gas Cooking                               | Energy Star Commercial Fryer (50% efficient)                                   | Non-Energy Star Fryer (35% efficient)       | 0.20                        | 3.1%                          | 45%   | 65%                                 | 8            | \$1,112      |
| Existing             | Grocery          | Cooking           | Griddle   | High-Efficiency Griddle (40% Efficient)  | Standard Griddle (32% Efficient)            | 0.20                        | 0.3%                          | 45%   | 75%                                 | 12           | \$1,223      |
| Existing             | Grocery          | Cooking           | Oven - Convection   | Convection Oven  | Standard Oven                               | 0.20                        | 1.2%                          | 85%   | 85%                                 | 12           | \$420        |
| Existing             | Grocery          | Cooking           | Oven - Conveyor   | High-Efficiency Model (23% Efficient)  | Standard Model (15% Efficient)              | 0.20                        | 10.4%                         | 5%  | 85%                                 | 10           | \$3,541      |
| Existing             | Grocery          | Cooking           | Oven - Power Burner   | Power Burner Oven - Improved Atmospheric Burner (60% Efficient)                | Standard (40%-50% Efficiency)               | 0.20                        | 3.8%                          | 25%   | 90%                                 | 12           | \$5,358      |
| Existing             | Grocery          | Cooking           | Steam Cooker  | Energy Star Steam Cooker (38% Efficient)                                       | Standard Cooker (30% Efficient)             | 0.20                        | 6.9%                          | 25%   | 75%                                 | 10           | \$2,181      |
| Existing             | Grocery          | Space Heat Boiler | Gas Boiler - Greater than 300 kBTUH                           | 85% Thermal Efficiency   | 80% Thermal Efficiency (State Code)         | 0.24                        | 5.9%                          | NA  | NA                                  | 20           | \$2,080      |
| Existing             | Grocery          | Space Heat Boiler | Gas Boiler - Greater than 300 kBTUH                           | 90% Thermal Efficiency   | 80% Thermal Efficiency (State Code)         | 0.24                        | 11.1%                         | NA  | NA                                  | 20           | \$4,242      |
| Existing             | Grocery          | Space Heat Boiler | Boiler Economizer   | Economizer   | No Economizer                               | 0.24                        | 5.5%                          | 40%   | 90%                                 | 20           | \$8,413      |
| Existing             | Grocery          | Space Heat Boiler | Commissioning - Retro Building Commissioning                  | Commissioning - Retro Building Commissioning                                   | No Commissioning                            | 0.24                        | 12.5%                         | 90%   | 40%                                 | 3            | \$4,142      |
| Existing             | Grocery          | Space Heat Boiler | Direct Digital Control System-Installation                    | DDC Retrofit (Morning Warm-Up Control Logic Included in This Measure)          | Pneumatic                                   | 0.24                        | 5.0%                          | 75%   | 61%                                 | 15           | \$5,837      |
| Existing             | Grocery          | Space Heat Boiler | Direct Digital Control System-Optimization                    | Premium-Efficiency EMS System  | High-Efficiency EMS System                  | 0.24                        | 10.0%                         | 75%   | 80%                                 | 5            | \$11,315     |
| Existing             | Grocery          | Space Heat Boiler | Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control        | Pneumatic                                   | 0.24                        | 15.0%                         | 50%   | 80%                                 | 5            | \$8,165      |
| Existing             | Grocery          | Space Heat Boiler | Duct Repair And Sealing                                       | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 0.24                        | 2.5%                          | 45%   | 45%                                 | 18           | \$8,405      |
| Existing             | Grocery          | Space Heat Boiler | Exhaust Air to Ventilation Air Heat Recovery                  | Exhaust Air Heat Recovery  | No Heat Recovery                            | 0.24                        | 15.0%                         | 5%  | 94%                                 | 10           | \$19,058     |
| Existing             | Grocery          | Space Heat Boiler | Exhaust Hood Makeup Air                                       | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air) | 0.24                        | 4.5%                          | 64%   | 85%                                 | 10           | \$5,726      |
| Existing             | Grocery          | Space Heat Boiler | Infiltration Control (Caulking, Weather Stripping, etc.)      | Install Caulking And Weatherstripping (ACH 0.65)                               | Infiltration Conditions (ACH 1.0)           | 0.24                        | 10.0%                         | 40%   | 10%                                 | 10           | \$4,919      |
| Existing             | Grocery          | Space Heat Boiler | Insulation (Ceiling)  | R-21 (Code)  | Existing Ceiling Insulation (Average R-9)   | 0.24                        | 7.2%                          | 75%   | 10%                                 | 25           | \$12,818     |
| Existing             | Grocery          | Space Heat Boiler | Insulation (Ceiling)  | R-21 (Code)  | R-0   | 0.24                        | 20.0%                         | 75%   | 0%                                  | 25           | \$12,818     |
| Existing             | Grocery          | Space Heat Boiler | Insulation (Ceiling)  | R-38   | R-21 (Code)                                 | 0.24                        | 8.0%                          | 75%   | 45%                                 | 25           | \$10,927     |

| Construction Vintage | Customer Segment | End Use       | Measure Name                                      | Measure Description  | Base Equipment                        | Baseline therm (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|---|--|---------------------------------------|----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Grocery          | Space Boiler  | Heat Insulation (Ceiling)                         | R-49   | R-21 (Code)                           | 0.24                       | 12.0%                         | 75%   | 85%                                 | 25           | \$14499      |
| Existing             | Grocery          | Space Boiler  | Heat Insulation (Duct) (Unconditioned Spaces)     | Install New Duct Insulation (R-8)  | R-0                                   | 0.24                       | 4.4%                          | 10%   | 15%                                 | 25           | \$2,349      |
| Existing             | Grocery          | Space Boiler  | Heat Insulation (Duct) (Unconditioned Spaces)     | R-4  | R-0                                   | 0.24                       | 2.4%                          | 10%   | 15%                                 | 25           | \$2,448      |
| Existing             | Grocery          | Space Boiler  | Heat Insulation (Wall)                            | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)           | 0.24                       | 6.0%                          | 10%   | 95%                                 | 25           | \$3,507      |
| Existing             | Grocery          | Space Boiler  | Heat Insulation (Wall) - Existing to Code         | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)        | 0.24                       | 21.1%                         | 10%   | 35%                                 | 25           | \$3,799      |
| Existing             | Grocery          | Space Boiler  | Heat Insulation (Wall) - Zero to Code             | R-19 (2x6 Framing) - (Code)  | R-0                                   | 0.24                       | 25.0%                         | 10%   | 0%                                  | 25           | \$3,799      |
| Existing             | Grocery          | Space Boiler  | Heat Insulation - Floor (Non-Slab)                | R-10 (Code)  | R-0                                   | 0.24                       | 15.0%                         | 35%   | 45%                                 | 25           | \$10927      |
| Existing             | Grocery          | Space Boiler  | Heat Insulation - Floor (Non-Slab)                | R-19   | R-10 (Code)                           | 0.24                       | 5.0%                          | 35%   | 45%                                 | 25           | \$1,891      |
| Existing             | Grocery          | Space Boiler  | Heat Sensible And Total Heat Recovery Devices     | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness | No Heat Recovery                      | 0.24                       | 25.0%                         | 25%   | 98%                                 | 10           | \$44336      |
| Existing             | Grocery          | Space Boiler  | Heat Steam Pipe Insulation                        | R-4  | R-0                                   | 0.24                       | 12.1%                         | 75%   | 65%                                 | 20           | \$2,152      |
| Existing             | Grocery          | Space Boiler  | Heat Steam Trap Maintenance                       | Actively stop steam trap leaks   | No Maintenance                        | 0.24                       | 17.0%                         | 90%   | 45%                                 | 3            | \$2,837      |
| Existing             | Grocery          | Space Boiler  | Heat Thermostat - Programmable                    | Energy Star Programmable Thermostat  | Manual Thermostat                     | 0.24                       | 3.0%                          | 95%   | 46%                                 | 15           | \$145        |
| Existing             | Grocery          | Space Boiler  | Heat Windows                                      | U = 0.35   | U = 0.55 (Code)                       | 0.24                       | 3.7%                          | 80%   | 85%                                 | 25           | \$13402      |
| Existing             | Grocery          | Space Boiler  | Heat Windows - Existing to Code                   | U = 0.55 (Code)  | Existing Windows (U=0.65)             | 0.24                       | 2.4%                          | 10%   | 85%                                 | 25           | \$37841      |
| Existing             | Grocery          | Space Furnace | Heat Gas Furnace                                  | AFUE = 90% (Condensing Furnace)  | AFUE=80%                              | 0.35                       | 11.1%                         | NA  | NA                                  | 18           | \$2,160      |
| Existing             | Grocery          | Space Furnace | Heat Gas Furnace                                  | AFUE = 94% (Condensing Furnace)  | AFUE=80%                              | 0.35                       | 14.9%                         | NA  | NA                                  | 18           | \$2,160      |
| Existing             | Grocery          | Space Furnace | Heat Commissioning - Retro Building Commissioning | Commissioning - Retro Building Commissioning   | No Commissioning                      | 0.35                       | 12.5%                         | 90%   | 80%                                 | 3            | \$4,142      |
| Existing             | Grocery          | Space Furnace | Heat Duct Repair And Sealing                      | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses | 0.35                       | 2.5%                          | 45%   | 45%                                 | 18           | \$8,405      |
| Existing             | Grocery          | Space Furnace | Heat Exhaust Air to Ventilation Air Heat Recovery | Exhaust Air Heat Recovery  | No Heat Recovery                      | 0.35                       | 15.0%                         | 5%  | 94%                                 | 10           | \$19058      |

| Construction Vintage | Customer Segment | End Use            | Measure Name   | Measure Description  | Base Equipment   | Baseline therm (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------------|--|--|--|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Grocery          | Space Heat Furnace | Exhaust Hood Makeup Air                                  | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air)                | 0.35                        | 4.5%                          | 64%   | 85%                                 | 10           | \$5,726      |
| Existing             | Grocery          | Space Heat Furnace | Infiltration Control (Caulking, Weather Stripping, etc.) | Install Caulking And Weatherstripping (ACH 0.65)                               | Infiltration Conditions (ACH 1.0)                          | 0.35                        | 10.0%                         | 40%   | 10%                                 | 10           | \$4,919      |
| Existing             | Grocery          | Space Heat Furnace | Insulation (Ceiling)                                     | R-21 (Code)  | Existing Ceiling Insulation (Average R-9)                  | 0.35                        | 7.2%                          | 75%   | 10%                                 | 25           | \$12818      |
| Existing             | Grocery          | Space Heat Furnace | Insulation (Ceiling)                                     | R-21 (Code)  | R-0  | 0.35                        | 20.0%                         | 75%   | 0%                                  | 25           | \$12818      |
| Existing             | Grocery          | Space Heat Furnace | Insulation (Ceiling)                                     | R-38   | R-21 (Code)  | 0.35                        | 8.0%                          | 75%   | 45%                                 | 25           | \$10927      |
| Existing             | Grocery          | Space Heat Furnace | Insulation (Ceiling)                                     | R-49   | R-21 (Code)  | 0.35                        | 12.0%                         | 75%   | 85%                                 | 25           | \$14499      |
| Existing             | Grocery          | Space Heat Furnace | Insulation (Duct) (Unconditioned Spaces)                 | Install New Duct Insulation (R-8)  | R-0  | 0.35                        | 4.4%                          | 10%   | 15%                                 | 25           | \$2,349      |
| Existing             | Grocery          | Space Heat Furnace | Insulation (Duct) (Unconditioned Spaces)                 | R-4  | R-0  | 0.35                        | 2.4%                          | 10%   | 15%                                 | 25           | \$2,448      |
| Existing             | Grocery          | Space Heat Furnace | Insulation (Wall)  | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                                | 0.35                        | 6.0%                          | 10%   | 95%                                 | 25           | \$3,507      |
| Existing             | Grocery          | Space Heat Furnace | Insulation (Wall) - Existing to Code                     | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)                             | 0.35                        | 21.1%                         | 10%   | 35%                                 | 25           | \$3,799      |
| Existing             | Grocery          | Space Heat Furnace | Insulation (Wall) - Zero to Code                         | R-19 (2x6 Framing) - (Code)  | R-0  | 0.35                        | 25.0%                         | 10%   | 0%                                  | 25           | \$3,799      |
| Existing             | Grocery          | Space Heat Furnace | Insulation - Floor (Non-Slab)                            | R-10 (Code)  | R-0  | 0.35                        | 15.0%                         | 35%   | 45%                                 | 25           | \$10927      |
| Existing             | Grocery          | Space Heat Furnace | Insulation - Floor (Non-Slab)                            | R-19   | R-10 (Code)  | 0.35                        | 5.0%                          | 35%   | 45%                                 | 25           | \$1,891      |
| Existing             | Grocery          | Space Heat Furnace | Thermostat - Programmable                                | Energy Star Programmable Thermostat  | Manual Thermostat  | 0.35                        | 3.0%                          | 95%   | 46%                                 | 15           | \$145        |
| Existing             | Grocery          | Space Heat Furnace | Windows  | U = 0.35   | U = 0.55 (Code)  | 0.35                        | 3.7%                          | 80%   | 85%                                 | 25           | \$13402      |
| Existing             | Grocery          | Space Heat Furnace | Windows - Existing to Code                               | U = 0.55 (Code)  | Existing Windows (U=0.65)                                  | 0.35                        | 2.4%                          | 10%   | 85%                                 | 25           | \$37841      |
| Existing             | Grocery          | Water Heat         | Water Heater - Condensing                                | EF = 0.90  | EF = 0.59  | 0.12                        | 34.4%                         | NA  | NA                                  | 13           | \$3,625      |
| Existing             | Grocery          | Water Heat         | Clothes Washer - Ozonating                               | Ozonating Clothes Washer   | Standard Commercial Clothes Washer                         | 0.12                        | 15.1%                         | 5%  | 95%                                 | 10           | \$8,705      |
| Existing             | Grocery          | Water Heat         | Clothes Washer Commercial                                | Energy Star Commercial Clothes Washer MEF=1.73                                 | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.12                        | 0.5%                          | 5%  | 75%                                 | 10           | \$305        |

| Construction Vintage | Customer Segment | End Use    | Measure Name                                 | Measure Description   | Base Equipment                         | Baseline therm (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|--|---|--|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Grocery          | Water Heat | Demand controlled Circulating Systems        | Demand Controlled Circulating Systems (VFD Control by Demand)     | Constant Circulation                   | 0.12                        | 5.0%                          | 75%   | 94%                                 | 15           | \$5,837      |
| Existing             | Grocery          | Water Heat | Dishwashing - Commercial - High Efficiency   | High Efficiency Dishwasher  | Standard Dishwasher                    | 0.12                        | 3.0%                          | 75%   | 80%                                 | 13           | \$2,700      |
| Existing             | Grocery          | Water Heat | Dishwashing - Commercial Chemical System     | Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)     | High Temp Commercial Dishwasher        | 0.12                        | 6.0%                          | 75%   | 95%                                 | 10           | \$841        |
| Existing             | Grocery          | Water Heat | Dishwashing - Residential Sized System       | EF = 0.65 (ENERGY STAR)   | Existing Dishwasher (FED Std. EF=0.46) | 0.12                        | 0.3%                          | 45%   | 25%                                 | 13           | \$32         |
| Existing             | Grocery          | Water Heat | Dishwashing - Residential Sized System       | EF = 0.77   | Existing Dishwasher (FED Std. EF=0.46) | 0.12                        | 0.4%                          | 45%   | 55%                                 | 13           | \$630        |
| Existing             | Grocery          | Water Heat | Drainwater Heat Recovery (Power-Pipe or GFX) | Install Power-Pipe or GFX System                                  | No GFX or Power-Pipe System            | 0.12                        | 20.0%                         | 5%  | 92%                                 | 25           | \$2,801      |
| Existing             | Grocery          | Water Heat | Faucet Aerators                              | 1.5 GPM Aerator   | 2.5 GPM Aerator (Federal Code)         | 0.12                        | 4.0%                          | 95%   | 25%                                 | 10           | \$0          |
| Existing             | Grocery          | Water Heat | Faucet Aerators - Existing to Code           | 2.5 GPM Aerator (Federal Code)                                    | 4.0 GPM Aerator                        | 0.12                        | 3.8%                          | 95%   | 15%                                 | 10           | \$2          |
| Existing             | Grocery          | Water Heat | Hot Water (SHW) Pipe Insulation              | Install Insulation (R-4)  | No Pipe Insulation                     | 0.12                        | 1.0%                          | 75%   | 90%                                 | 15           | \$223        |
| Existing             | Grocery          | Water Heat | Low Flow Spray Heads                         | 1.6 GPM   | 3.0 GPM                                | 0.12                        | 2.3%                          | 95%   | 40%                                 | 5            | \$6          |
| Existing             | Grocery          | Water Heat | Low-Flow Showerheads                         | 2.0 GPM Showerhead  | 2.5 GPM Showerhead (Federal Code)      | 0.12                        | 1.1%                          | 15%   | 75%                                 | 10           | \$6          |
| Existing             | Grocery          | Water Heat | Low-Flow Showerheads - Existing to Code      | 2.5 GPM Showerhead (Federal Code)                                 | 4.5 GPM Showerhead                     | 0.12                        | 2.5%                          | 15%   | 20%                                 | 10           | \$11         |
| Existing             | Grocery          | Water Heat | Refrigeration with Heat Recovery             | Heat Recovery from Refrigeration System. Applied to Water Heating | No Heat Recovery                       | 0.12                        | 28.0%                         | 75%   | 55%                                 | 16           | \$19121      |
| Existing             | Grocery          | Water Heat | Solar RE - Solar Water Heater                | Passive solar water heating                                       | Standard Water Heater EF = 0.93        | 0.12                        | 38.6%                         | 20%   | 95%                                 | 20           | \$20678      |
| Existing             | Grocery          | Water Heat | Tankless Water Heater - Commercial           | EF = 0.82   | Thermal Efficiency = 80%               | 0.12                        | 30.0%                         | 25%   | 90%                                 | 14           | \$2,265      |
| Existing             | Grocery          | Water Heat | Tankless Water Heater - Residential          | EF = 0.82   | EF = 0.59 (40 Gal)                     | 0.12                        | 28.0%                         | 25%   | 90%                                 | 20           | \$696        |
| Existing             | Grocery          | Water Heat | Ultrasonic Faucet Control                    | Install Ultrasonic Motion Faucet Control                          | No Faucet Control                      | 0.12                        | 3.3%                          | 95%   | 95%                                 | 10           | \$206        |
| Existing             | Grocery          | Water Heat | Water Heater Thermostat Setback              | Thermostat Setback and Replacement (120 Degrees)                  | No Thermostat Setback (130 Degrees)    | 0.12                        | 7.7%                          | 75%   | 50%                                 | 11           | \$538        |
| New                  | Grocery          | Cooking    | Broiler                                      | High-Efficiency Broiler (34% Efficient)                           | Standard Broiler (15% Efficient)       | 0.20                        | 1.9%                          | 95%   | 75%                                 | 10           | \$210        |
| New                  | Grocery          | Cooking    | Fryers - Commercial Gas Cooking              | Energy Star Commercial Fryer (50% efficient)                      | Non-Energy Star Fryer (35% efficient)  | 0.20                        | 3.1%                          | 45%   | 65%                                 | 8            | \$1,112      |
| New                  | Grocery          | Cooking    | Griddle                                      | High-Efficiency Griddle (40% Efficient)                           | Standard Griddle (32% Efficient)       | 0.20                        | 0.3%                          | 45%   | 75%                                 | 12           | \$1,223      |
| New                  | Grocery          | Cooking    | Oven - Convection                            | Convection Oven   | Standard Oven                          | 0.20                        | 1.2%                          | 85%   | 85%                                 | 12           | \$420        |
| New                  | Grocery          | Cooking    | Oven - Conveyor                              | High-Efficiency Model (23% Efficient)                             | Standard Model (15% Efficient)         | 0.20                        | 10.4%                         | 5%  | 85%                                 | 10           | \$2,832      |
| New                  | Grocery          | Cooking    | Oven - Power Burner                          | Power Burner Oven - Improved Atmospheric Burner (60% Efficient)   | Standard (40%-50% Efficiency)          | 0.20                        | 3.8%                          | 25%   | 90%                                 | 12           | \$5,358      |
| New                  | Grocery          | Cooking    | Steam Cooker                                 | Energy Star Steam Cooker (38% Efficient)                          | Standard Cooker (30% Efficient)        | 0.20                        | 6.9%                          | 25%   | 75%                                 | 10           | \$2,181      |

| Construction Vintage | Customer Segment | End Use       | Measure Name | Measure Description                          | Base Equipment   | Baseline therm (UEC or EU)                  | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|---------------|--------------|--|--|---|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| New                  | Grocery          | Space Boiler  | Heat         | Gas Boiler - Greater than 300 KBTUH          | 85% Thermal Efficiency   | 80% Thermal Efficiency (State Code)         | 0.05                          | 5.9%  | NA                                  | NA           | 20           | \$2,080 |
| New                  | Grocery          | Space Boiler  | Heat         | Gas Boiler - Greater than 300 KBTUH          | 90% Thermal Efficiency   | 80% Thermal Efficiency (State Code)         | 0.05                          | 11.1%   | NA                                  | NA           | 20           | \$4,242 |
| New                  | Grocery          | Space Boiler  | Heat         | Boiler Economizer                            | Economizer   | No Economizer                               | 0.05                          | 5.5%  | 40%                                 | 90%          | 20           | \$8,413 |
| New                  | Grocery          | Space Boiler  | Heat         | Commissioning - New Building Commissioning   | Commissioning - New Building Commissioning   | No Commissioning                            | 0.05                          | 12.5%   | 90%                                 | 40%          | 3            | \$15339 |
| New                  | Grocery          | Space Boiler  | Heat         | Direct Digital Control System-Optimization   | Premium-Efficiency EMS System  | High-Efficiency EMS System                  | 0.05                          | 10.0%   | 75%                                 | 80%          | 5            | \$11315 |
| New                  | Grocery          | Space Boiler  | Heat         | Duct Repair And Sealing                      | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 0.05                          | 2.5%  | 45%                                 | 45%          | 18           | \$8,405 |
| New                  | Grocery          | Space Boiler  | Heat         | Exhaust Air to Ventilation Air Heat Recovery | Exhaust Air Heat Recovery  | No Heat Recovery                            | 0.05                          | 15.0%   | 5%                                  | 94%          | 10           | \$19058 |
| New                  | Grocery          | Space Boiler  | Heat         | Exhaust Hood Makeup Air                      | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air) | 0.05                          | 4.5%  | 64%                                 | 85%          | 10           | \$5,726 |
| New                  | Grocery          | Space Boiler  | Heat         | Insulation (Ceiling)                         | R-38   | R-21 (Code)                                 | 0.05                          | 8.0%  | 75%                                 | 45%          | 25           | \$10927 |
| New                  | Grocery          | Space Boiler  | Heat         | Insulation (Ceiling)                         | R-49   | R-21 (Code)                                 | 0.05                          | 12.0%   | 75%                                 | 85%          | 25           | \$14499 |
| New                  | Grocery          | Space Boiler  | Heat         | Insulation (Wall)                            | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 0.05                          | 6.0%  | 95%                                 | 95%          | 25           | \$3,507 |
| New                  | Grocery          | Space Boiler  | Heat         | Insulation - Floor (Non-Slab)                | R-19   | R-10 (Code)                                 | 0.05                          | 5.0%  | 35%                                 | 45%          | 25           | \$1,891 |
| New                  | Grocery          | Space Boiler  | Heat         | Integrated Space Heating/Water Heating       | Integrated System  | Separate Boiler And HW Heater               | 0.05                          | 5.0%  | 50%                                 | 95%          | 15           | \$5,953 |
| New                  | Grocery          | Space Boiler  | Heat         | Leak Proof Duct Fittings                     | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                        | 0.05                          | 10.0%   | 40%                                 | 98%          | 25           | \$3,257 |
| New                  | Grocery          | Space Boiler  | Heat         | Sensible And Total Heat Recovery Devices     | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness | No Heat Recovery                            | 0.05                          | 25.0%   | 50%                                 | 98%          | 10           | \$44336 |
| New                  | Grocery          | Space Boiler  | Heat         | Thermostat - Programmable                    | Energy Star Programmable Thermostat  | Manual Thermostat                           | 0.05                          | 3.0%  | 95%                                 | 46%          | 15           | \$145   |
| New                  | Grocery          | Space Boiler  | Heat         | Windows                                      | U = 0.35   | U = 0.55 (Code)                             | 0.05                          | 3.7%  | 80%                                 | 85%          | 25           | \$13402 |
| New                  | Grocery          | Space Furnace | Heat         | Gas Furnace                                  | AFUE = 90% (Condensing Furnace)  | AFUE=80%                                    | 0.08                          | 11.1%   | NA                                  | NA           | 18           | \$2,160 |
| New                  | Grocery          | Space Furnace | Heat         | Gas Furnace                                  | AFUE = 94% (Condensing Furnace)  | AFUE=80%                                    | 0.08                          | 14.9%   | NA                                  | NA           | 18           | \$2,160 |

| Construction Vintage | Customer Segment | End Use            | Measure Name                                 | Measure Description  | Base Equipment   | Baseline therm (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------------|--|--|--|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Grocery          | Space Heat Furnace | Commissioning - New Building Commissioning   | Commissioning - New Building Commissioning                                     | No Commissioning   | 0.08                        | 12.5%                         | 90%   | 80%                                 | 3            | \$15339      |
| New                  | Grocery          | Space Heat Furnace | Duct Repair And Sealing                      | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses                      | 0.08                        | 2.5%                          | 45%   | 45%                                 | 18           | \$8,405      |
| New                  | Grocery          | Space Heat Furnace | Exhaust Air to Ventilation Air Heat Recovery | Exhaust Air Heat Recovery  | No Heat Recovery   | 0.08                        | 15.0%                         | 5%  | 94%                                 | 10           | \$19058      |
| New                  | Grocery          | Space Heat Furnace | Exhaust Hood Makeup Air                      | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air)                | 0.08                        | 4.5%                          | 64%   | 85%                                 | 10           | \$5,726      |
| New                  | Grocery          | Space Heat Furnace | Insulation (Ceiling)                         | R-38   | R-21 (Code)  | 0.08                        | 8.0%                          | 75%   | 45%                                 | 25           | \$10927      |
| New                  | Grocery          | Space Heat Furnace | Insulation (Ceiling)                         | R-49   | R-21 (Code)  | 0.08                        | 12.0%                         | 75%   | 85%                                 | 25           | \$14499      |
| New                  | Grocery          | Space Heat Furnace | Insulation (Wall)                            | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                                | 0.08                        | 6.0%                          | 95%   | 95%                                 | 25           | \$3,507      |
| New                  | Grocery          | Space Heat Furnace | Insulation - Floor (Non-Slab)                | R-19   | R-10 (Code)  | 0.08                        | 5.0%                          | 35%   | 45%                                 | 25           | \$1,891      |
| New                  | Grocery          | Space Heat Furnace | Leak Proof Duct Fittings                     | Quick connect fittings that do not require mastic or drawbands                 | Std duct workmanship                                       | 0.08                        | 10.0%                         | 40%   | 98%                                 | 25           | \$3,257      |
| New                  | Grocery          | Space Heat Furnace | Thermostat - Programmable                    | Energy Star Programmable Thermostat  | Manual Thermostat  | 0.08                        | 3.0%                          | 95%   | 46%                                 | 15           | \$145        |
| New                  | Grocery          | Space Heat Furnace | Windows                                      | U = 0.35   | U = 0.55 (Code)  | 0.08                        | 3.7%                          | 80%   | 85%                                 | 25           | \$13402      |
| New                  | Grocery          | Water Heat         | Water Heater - Condensing                    | EF = 0.90  | EF = 0.59  | 0.13                        | 34.4%                         | NA  | NA                                  | 13           | \$3,625      |
| New                  | Grocery          | Water Heat         | Clothes Washer - Ozonating                   | Ozonating Clothes Washer   | Standard Commercial Clothes Washer                         | 0.12                        | 15.1%                         | 5%  | 95%                                 | 10           | \$8,705      |
| New                  | Grocery          | Water Heat         | Clothes Washer Commercial                    | Energy Star Commercial Clothes Washer MEF=1.73                                 | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.12                        | 0.4%                          | 5%  | 75%                                 | 10           | \$305        |
| New                  | Grocery          | Water Heat         | Demand controlled Circulating Systems        | Demand Controlled Circulating Systems (VFD Control by Demand)                  | Constant Circulation                                       | 0.12                        | 5.0%                          | 90%   | 94%                                 | 15           | \$5,837      |
| New                  | Grocery          | Water Heat         | Dishwashing - Commercial - High Efficiency   | High Efficiency Dishwasher   | Standard Dishwasher  | 0.12                        | 3.0%                          | 75%   | 80%                                 | 13           | \$2,700      |
| New                  | Grocery          | Water Heat         | Dishwashing - Commercial Chemical System     | Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)                  | High Temp Commercial Dishwasher                            | 0.12                        | 6.0%                          | 75%   | 95%                                 | 10           | \$841        |
| New                  | Grocery          | Water Heat         | Dishwashing - Residential Sized System       | EF = 0.65 (ENERGY STAR)  | Existing Dishwasher (FED Std. EF=0.46)                     | 0.12                        | 0.3%                          | 45%   | 25%                                 | 13           | \$32         |
| New                  | Grocery          | Water Heat         | Dishwashing - Residential Sized System       | EF = 0.77  | Existing Dishwasher (FED Std. EF=0.46)                     | 0.12                        | 0.4%                          | 45%   | 55%                                 | 13           | \$630        |
| New                  | Grocery          | Water Heat         | Drainwater Heat Recovery (Power-Pipe or GFX) | Install Power-Pipe or GFX System   | No GFX or Power-Pipe System                                | 0.12                        | 20.0%                         | 25%   | 92%                                 | 25           | \$2,801      |

| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description   | Base Equipment                        | Baseline therm (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|---|---------------------------------------|----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Grocery          | Water Heat | Faucet Aerators   | 1.5 GPM Aerator   | 2.5 GPM Aerator (Federal Code)        | 0.12                       | 4.0%                          | 95%   | 25%                                 | 10           | \$0          |
| New                  | Grocery          | Water Heat | Integrated Space Heating/Water Heating                              | Integrated System   | Separate Boiler And HW Heater         | 0.12                       | 5.0%                          | 50%   | 95%                                 | 15           | \$5,953      |
| New                  | Grocery          | Water Heat | Low Flow Spray Heads  | 1.6 GPM   | 3.0 GPM                               | 0.12                       | 2.3%                          | 95%   | 40%                                 | 5            | \$6          |
| New                  | Grocery          | Water Heat | Low-Flow Showerheads  | 2.0 GPM Showerhead  | 2.5 GPM Showerhead (Federal Code)     | 0.12                       | 1.1%                          | 15%   | 75%                                 | 10           | \$6          |
| New                  | Grocery          | Water Heat | Refrigeration with Heat Recovery                                    | Heat Recovery from Refrigeration System. Applied to Water Heating     | No Heat Recovery                      | 0.12                       | 28.0%                         | 75%   | 55%                                 | 16           | \$10716      |
| New                  | Grocery          | Water Heat | Solar RE - Solar Water Heater                                       | Passive solar water heating   | Standard Water Heater EF = 0.93       | 0.12                       | 38.6%                         | 20%   | 95%                                 | 20           | \$20678      |
| New                  | Grocery          | Water Heat | Tankless Water Heater - Commercial                                  | EF = 0.82   | Thermal Efficiency = 80%              | 0.12                       | 30.0%                         | 25%   | 90%                                 | 14           | \$2,265      |
| New                  | Grocery          | Water Heat | Tankless Water Heater - Residential                                 | EF = 0.82   | EF = 0.59 (40 Gal)                    | 0.12                       | 28.0%                         | 25%   | 90%                                 | 20           | \$696        |
| New                  | Grocery          | Water Heat | Ultrasonic Faucet Control   | Install Ultrasonic Motion Faucet Control                              | No Faucet Control                     | 0.12                       | 3.3%                          | 95%   | 95%                                 | 10           | \$206        |
| New                  | Grocery          | Water Heat | Water Heater Thermostat Setback                                     | Thermostat Setback and Replcement (120 Degrees)                       | No Thermostat Setback (130 Degrees)   | 0.12                       | 7.7%                          | 75%   | 50%                                 | 11           | \$538        |
| Existing             | Hospital         | Cooking    | Broiler   | High-Efficiency Broiler (34% Efficient)                               | Standard Broiler (15% Efficient)      | 0.04                       | 1.9%                          | 95%   | 75%                                 | 10           | \$210        |
| Existing             | Hospital         | Cooking    | Fryers - Commercial Gas Cooking                                     | Energy Star Commercial Fryer (50% efficient)                          | Non-Energy Star Fryer (35% efficient) | 0.04                       | 3.1%                          | 45%   | 65%                                 | 8            | \$1,112      |
| Existing             | Hospital         | Cooking    | Griddle   | High-Efficiency Griddle (40% Efficient)                               | Standard Griddle (32% Efficient)      | 0.04                       | 0.3%                          | 45%   | 75%                                 | 12           | \$1,223      |
| Existing             | Hospital         | Cooking    | Oven - Convection   | Convection Oven   | Standard Oven                         | 0.04                       | 1.2%                          | 85%   | 55%                                 | 12           | \$420        |
| Existing             | Hospital         | Cooking    | Oven - Conveyor   | High-Efficiency Model (23% Efficient)                                 | Standard Model (15% Efficient)        | 0.04                       | 10.4%                         | 5%  | 85%                                 | 10           | \$3,541      |
| Existing             | Hospital         | Cooking    | Oven - Power Burner   | Power Burner Oven - Improved Atmospheric Burner (60% Efficient)       | Standard (40%-50% Efficiency)         | 0.04                       | 3.8%                          | 25%   | 90%                                 | 12           | \$5,358      |
| Existing             | Hospital         | Cooking    | Steam Cooker  | Energy Star Steam Cooker (38% Efficient)                              | Standard Cooker (30% Efficient)       | 0.04                       | 6.9%                          | 25%   | 75%                                 | 10           | \$2,181      |
| Existing             | Hospital         | Space Heat | Gas Boiler - Greater than 300 KBTUH                                 | 85% Thermal Efficiency  | 80% Thermal Efficiency (State Code)   | 0.32                       | 5.9%                          | NA  | NA                                  | 20           | \$4,453      |
| Existing             | Hospital         | Space Heat | Gas Boiler - Greater than 300 KBTUH                                 | 90% Thermal Efficiency  | 80% Thermal Efficiency (State Code)   | 0.32                       | 11.1%                         | NA  | NA                                  | 20           | \$9,084      |
| Existing             | Hospital         | Space Heat | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 Sensors)                           | Constant Ventilation                  | 0.33                       | 10.0%                         | 5%  | 94%                                 | 15           | \$13238      |
| Existing             | Hospital         | Space Heat | Boiler Economizer   | Economizer  | No Economizer                         | 0.33                       | 5.5%                          | 40%   | 90%                                 | 20           | \$18008      |
| Existing             | Hospital         | Space Heat | Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning                          | No Commissioning                      | 0.33                       | 12.5%                         | 90%   | 40%                                 | 3            | \$4,142      |
| Existing             | Hospital         | Space Heat | Direct Digital Control System-Installation                          | DDC Retrofit (Morning Warm-Up Control Logic Included in This Measure) | Pneumatic                             | 0.33                       | 5.0%                          | 35%   | 26%                                 | 15           | \$5,837      |

| Construction Vintage | Customer Segment | End Use      | Measure Name | Measure Description   | Base Equipment   | Baseline therm (UEC or EU)                  | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|--------------|--------------|---|--|---|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| Existing             | Hospital         | Space Boiler | Heat         | Direct Digital Control System-Optimization                    | Premium-Efficiency EMS System  | High-Efficiency EMS System                  | 0.33                          | 10.0%   | 75%                                 | 80%          | 5            | \$11315 |
| Existing             | Hospital         | Space Boiler | Heat         | Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control  | Pnuematic                                   | 0.33                          | 15.0%   | 75%                                 | 80%          | 5            | \$8,165 |
| Existing             | Hospital         | Space Boiler | Heat         | Duct Repair And Sealing                                       | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 0.33                          | 2.5%  | 45%                                 | 45%          | 18           | \$8,405 |
| Existing             | Hospital         | Space Boiler | Heat         | Exhaust Air to Ventilation Air Heat Recovery                  | Exhaust Air Heat Recovery  | No Heat Recovery                            | 0.33                          | 15.0%   | 5%                                  | 94%          | 10           | \$19058 |
| Existing             | Hospital         | Space Boiler | Heat         | Exhaust Hood Makeup Air                                       | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air) | 0.33                          | 4.5%  | 62%                                 | 85%          | 10           | \$5,726 |
| Existing             | Hospital         | Space Boiler | Heat         | Insulation (Ceiling)  | R-21 (Code)  | Existing Ceiling Insulation (Average R-9)   | 0.33                          | 3.6%  | 75%                                 | 13%          | 25           | \$6,409 |
| Existing             | Hospital         | Space Boiler | Heat         | Insulation (Ceiling)  | R-21 (Code)  | R-0   | 0.33                          | 10.0%   | 75%                                 | 0%           | 25           | \$6,409 |
| Existing             | Hospital         | Space Boiler | Heat         | Insulation (Ceiling)  | R-38   | R-21 (Code)                                 | 0.33                          | 4.0%  | 75%                                 | 45%          | 25           | \$5,463 |
| Existing             | Hospital         | Space Boiler | Heat         | Insulation (Ceiling)  | R-49   | R-21 (Code)                                 | 0.33                          | 6.0%  | 75%                                 | 85%          | 25           | \$7,249 |
| Existing             | Hospital         | Space Boiler | Heat         | Insulation (Duct) (Unconditioned Spaces)                      | Install New Duct Insulation (R-8)  | R-0   | 0.33                          | 4.4%  | 10%                                 | 15%          | 25           | \$2,349 |
| Existing             | Hospital         | Space Boiler | Heat         | Insulation (Duct) (Unconditioned Spaces)                      | R-4  | R-0   | 0.33                          | 2.4%  | 10%                                 | 15%          | 25           | \$2,448 |
| Existing             | Hospital         | Space Boiler | Heat         | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 0.33                          | 6.0%  | 10%                                 | 95%          | 25           | \$4,959 |
| Existing             | Hospital         | Space Boiler | Heat         | Insulation (Wall) - Existing to Code                          | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)              | 0.33                          | 21.1%   | 10%                                 | 35%          | 25           | \$5,371 |
| Existing             | Hospital         | Space Boiler | Heat         | Insulation (Wall) - Zero to Code                              | R-19 (2x6 Framing) - (Code)  | R-0   | 0.33                          | 25.0%   | 10%                                 | 0%           | 25           | \$5,371 |
| Existing             | Hospital         | Space Boiler | Heat         | Insulation - Floor (Non-Slab)                                 | R-10 (Code)  | R-0   | 0.33                          | 7.5%  | 35%                                 | 35%          | 25           | \$5,463 |
| Existing             | Hospital         | Space Boiler | Heat         | Insulation - Floor (Non-Slab)                                 | R-19   | R-10 (Code)                                 | 0.33                          | 2.5%  | 35%                                 | 35%          | 25           | \$946   |
| Existing             | Hospital         | Space Boiler | Heat         | Sensible And Total Heat Recovery Devices                      | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness | No Heat Recovery                            | 0.33                          | 25.0%   | 25%                                 | 98%          | 10           | \$44336 |
| Existing             | Hospital         | Space Boiler | Heat         | Steam Pipe Insulation   | R-4  | R-0   | 0.33                          | 12.1%   | 75%                                 | 65%          | 20           | \$2,152 |
| Existing             | Hospital         | Space Boiler | Heat         | Steam Trap Maintenance  | Actively stop steam trap leaks   | No Maintenance                              | 0.33                          | 17.0%   | 90%                                 | 45%          | 3            | \$2,837 |



| Construction Vintage | Customer Segment | End Use       | Measure Name | Measure Description   | Base Equipment   | Baseline therm (UEC or EUI)                 | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|---------------|--------------|---|--|---|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| Existing             | Hospital         | Space Boiler  | Heat         | Thermostat - Programmable   | Energy Star Programmable Thermostat  | Manual Thermostat                           | 0.33                          | 3.0%  | 95%                                 | 71%          | 15           | \$145   |
| Existing             | Hospital         | Space Boiler  | Heat         | Windows   | U = 0.35   | U = 0.55 (Code)                             | 0.33                          | 6.2%  | 80%                                 | 60%          | 25           | \$17468 |
| Existing             | Hospital         | Space Boiler  | Heat         | Windows - Existing to Code  | U = 0.55 (Code)  | Existing Windows (U=0.65)                   | 0.33                          | 4.1%  | 10%                                 | 60%          | 25           | \$49321 |
| Existing             | Hospital         | Space Furnace | Heat         | Gas Furnace   | AFUE = 90% (Condensing Furnace)  | AFUE=80%                                    | 0.48                          | 11.1%   | NA                                  | NA           | 18           | \$4,623 |
| Existing             | Hospital         | Space Furnace | Heat         | Gas Furnace   | AFUE = 94% (Condensing Furnace)  | AFUE=80%                                    | 0.48                          | 14.9%   | NA                                  | NA           | 18           | \$4,623 |
| Existing             | Hospital         | Space Furnace | Heat         | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 Sensors)  | Constant Ventilation                        | 0.48                          | 10.0%   | 5%                                  | 94%          | 15           | \$13238 |
| Existing             | Hospital         | Space Furnace | Heat         | Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning   | No Commissioning                            | 0.48                          | 12.5%   | 90%                                 | 80%          | 3            | \$4,142 |
| Existing             | Hospital         | Space Furnace | Heat         | Duct Repair And Sealing   | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 0.48                          | 2.5%  | 45%                                 | 45%          | 18           | \$8,405 |
| Existing             | Hospital         | Space Furnace | Heat         | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery  | No Heat Recovery                            | 0.48                          | 15.0%   | 5%                                  | 94%          | 10           | \$19058 |
| Existing             | Hospital         | Space Furnace | Heat         | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Hood Pulls Conditioned Air (No Make-up Air) | Hood Pulls Conditioned Air (No Make-up Air) | 0.48                          | 4.5%  | 62%                                 | 85%          | 10           | \$5,726 |
| Existing             | Hospital         | Space Furnace | Heat         | Insulation (Ceiling)  | R-21 (Code)  | Existing Ceiling Insulation (Average R-9)   | 0.48                          | 3.6%  | 75%                                 | 13%          | 25           | \$6,409 |
| Existing             | Hospital         | Space Furnace | Heat         | Insulation (Ceiling)  | R-21 (Code)  | R-0   | 0.48                          | 10.0%   | 75%                                 | 0%           | 25           | \$6,409 |
| Existing             | Hospital         | Space Furnace | Heat         | Insulation (Ceiling)  | R-38   | R-21 (Code)                                 | 0.48                          | 4.0%  | 75%                                 | 45%          | 25           | \$5,463 |
| Existing             | Hospital         | Space Furnace | Heat         | Insulation (Ceiling)  | R-49   | R-21 (Code)                                 | 0.48                          | 6.0%  | 75%                                 | 85%          | 25           | \$7,249 |
| Existing             | Hospital         | Space Furnace | Heat         | Insulation (Duct) (Unconditioned Spaces)                            | Install New Duct Insulation (R-8)  | R-0   | 0.48                          | 4.4%  | 10%                                 | 15%          | 25           | \$2,349 |
| Existing             | Hospital         | Space Furnace | Heat         | Insulation (Duct) (Unconditioned Spaces)                            | R-4  | R-0   | 0.48                          | 2.4%  | 10%                                 | 15%          | 25           | \$2,448 |
| Existing             | Hospital         | Space Furnace | Heat         | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 0.48                          | 6.0%  | 10%                                 | 95%          | 25           | \$4,959 |
| Existing             | Hospital         | Space Furnace | Heat         | Insulation (Wall) - Existing to Code                                | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)              | 0.48                          | 21.1%   | 10%                                 | 35%          | 25           | \$5,371 |
| Existing             | Hospital         | Space Furnace | Heat         | Insulation (Wall) - Zero to Code                                    | R-19 (2x6 Framing) - (Code)  | R-0   | 0.48                          | 25.0%   | 10%                                 | 0%           | 25           | \$5,371 |



| Construction Vintage | Customer Segment | End Use            | Measure Name                                 | Measure Description   | Base Equipment   | Baseline          | Savings               | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------------|--|---|--|-------------------|-----------------------|---|-------------------------------------|--------------|--------------|
|                      |                  |                    |  |   |  | therm (UEC or EU) | as Percent of End Use |   |                                     |              |              |
| Existing             | Hospital         | Space Heat Furnace | Insulation - Floor (Non-Slab)                | R-10 (Code)   | R-0  | 0.48              | 7.5%                  | 35%   | 35%                                 | 25           | \$5,463      |
| Existing             | Hospital         | Space Heat Furnace | Insulation - Floor (Non-Slab)                | R-19  | R-10 (Code)  | 0.48              | 2.5%                  | 35%   | 35%                                 | 25           | \$946        |
| Existing             | Hospital         | Space Heat Furnace | Thermostat - Programmable                    | Energy Star Programmable Thermostat                               | Manual Thermostat  | 0.48              | 3.0%                  | 95%   | 71%                                 | 15           | \$145        |
| Existing             | Hospital         | Space Heat Furnace | Windows                                      | U = 0.35  | U = 0.55 (Code)  | 0.48              | 6.2%                  | 80%   | 60%                                 | 25           | \$17468      |
| Existing             | Hospital         | Space Heat Furnace | Windows - Existing to Code                   | U = 0.55 (Code)   | Existing Windows (U=0.65)                                  | 0.48              | 4.1%                  | 10%   | 60%                                 | 25           | \$49321      |
| Existing             | Hospital         | Water Heat         | Water Heater - Condensing                    | EF = 0.90   | EF = 0.59  | 0.40              | 34.4%                 | NA  | NA                                  | 13           | \$12324      |
| Existing             | Hospital         | Water Heat         | Clothes Washer - Ozonating                   | Ozonating Clothes Washer  | Standard Commercial Clothes Washer                         | 0.41              | 15.1%                 | 15%   | 95%                                 | 10           | \$8,705      |
| Existing             | Hospital         | Water Heat         | Clothes Washer Commercial                    | Energy Star Commercial Clothes Washer MEF=1.73                    | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.41              | 0.3%                  | 15%   | 75%                                 | 10           | \$305        |
| Existing             | Hospital         | Water Heat         | Demand controlled Circulating Systems        | Demand Controlled Circulating Systems (VFD Control by Demand)     | Constant Circulation                                       | 0.41              | 5.0%                  | 55%   | 94%                                 | 15           | \$5,837      |
| Existing             | Hospital         | Water Heat         | Dishwashing - Commercial - High Efficiency   | High Efficiency Dishwasher  | Standard Dishwasher  | 0.41              | 3.0%                  | 25%   | 80%                                 | 13           | \$2,700      |
| Existing             | Hospital         | Water Heat         | Dishwashing - Commercial Chemical System     | Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)     | High Temp Commercial Dishwasher                            | 0.41              | 6.0%                  | 25%   | 95%                                 | 10           | \$841        |
| Existing             | Hospital         | Water Heat         | Dishwashing - Residential Sized System       | EF = 0.65 (ENERGY STAR)   | Existing Dishwasher (FED Std. EF=0.46)                     | 0.41              | 0.1%                  | 20%   | 25%                                 | 13           | \$32         |
| Existing             | Hospital         | Water Heat         | Dishwashing - Residential Sized System       | EF = 0.77   | Existing Dishwasher (FED Std. EF=0.46)                     | 0.41              | 0.1%                  | 20%   | 55%                                 | 13           | \$630        |
| Existing             | Hospital         | Water Heat         | Drainwater Heat Recovery (Power-Pipe or GFX) | Install Power-Pipe or GFX System                                  | No GFX or Power-Pipe System                                | 0.41              | 20.0%                 | 5%  | 92%                                 | 25           | \$9,525      |
| Existing             | Hospital         | Water Heat         | Faucet Aerators                              | 1.5 GPM Aerator   | 2.5 GPM Aerator (Federal Code)                             | 0.41              | 4.0%                  | 95%   | 25%                                 | 10           | \$0          |
| Existing             | Hospital         | Water Heat         | Faucet Aerators - Existing to Code           | 2.5 GPM Aerator (Federal Code)                                    | 4.0 GPM Aerator  | 0.41              | 3.8%                  | 95%   | 15%                                 | 10           | \$2          |
| Existing             | Hospital         | Water Heat         | Hot Water (SHW) Pipe Insulation              | Install Insulation (R-4)  | No Pipe Insulation   | 0.41              | 1.0%                  | 75%   | 70%                                 | 15           | \$223        |
| Existing             | Hospital         | Water Heat         | Low Flow Spray Heads                         | 1.6 GPM   | 3.0 GPM  | 0.41              | 2.3%                  | 50%   | 45%                                 | 5            | \$6          |
| Existing             | Hospital         | Water Heat         | Low-Flow Showerheads                         | 2.0 GPM Showerhead  | 2.5 GPM Showerhead (Federal Code)                          | 0.41              | 2.6%                  | 35%   | 75%                                 | 10           | \$6          |
| Existing             | Hospital         | Water Heat         | Low-Flow Showerheads - Existing to Code      | 2.5 GPM Showerhead (Federal Code)                                 | 4.5 GPM Showerhead   | 0.41              | 5.8%                  | 35%   | 20%                                 | 10           | \$11         |
| Existing             | Hospital         | Water Heat         | Refrigeration with Heat Recovery             | Heat Recovery from Refrigeration System. Applied to Water Heating | No Heat Recovery   | 0.41              | 28.0%                 | 75%   | 50%                                 | 16           | \$19121      |
| Existing             | Hospital         | Water Heat         | Solar RE - Solar Water Heater                | Passive solar water heating                                       | Standard Water Heater EF = 0.93                            | 0.41              | 66.6%                 | 20%   | 95%                                 | 20           | 120656       |
| Existing             | Hospital         | Water Heat         | Tankless Water Heater - Commercial           | EF = 0.82   | Thermal Efficiency = 80%                                   | 0.41              | 30.0%                 | 10%   | 90%                                 | 14           | \$2,267      |

| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description  | Base Equipment                              | Baseline therm (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|--|---|----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Hospital         | Water Heat | Tankless Water Heater - Residential                                 | EF = 0.82  | EF = 0.59 (40 Gal)                          | 0.41                       | 28.0%                         | 10%   | 90%                                 | 20           | \$696        |
| Existing             | Hospital         | Water Heat | Ultrasonic Faucet Control   | Install Ultrasonic Motion Faucet Control                                       | No Faucet Control                           | 0.41                       | 3.3%                          | 95%   | 90%                                 | 10           | \$206        |
| Existing             | Hospital         | Water Heat | Water Heater Thermostat Setback                                     | Thermostat Setback and Replacement (120 Degrees)                               | No Thermostat Setback (130 Degrees)         | 0.41                       | 7.7%                          | 75%   | 80%                                 | 11           | \$1,828      |
| New                  | Hospital         | Cooking    | Broiler   | High-Efficiency Broiler (34% Efficient)  | Standard Broiler (15% Efficient)            | 0.04                       | 1.9%                          | 95%   | 75%                                 | 10           | \$210        |
| New                  | Hospital         | Cooking    | Fryers - Commercial Gas Cooking                                     | Energy Star Commercial Fryer (50% efficient)                                   | Non-Energy Star Fryer (35% efficient)       | 0.04                       | 3.1%                          | 45%   | 65%                                 | 8            | \$1,112      |
| New                  | Hospital         | Cooking    | Griddle   | High-Efficiency Griddle (40% Efficient)  | Standard Griddle (32% Efficient)            | 0.04                       | 0.3%                          | 45%   | 75%                                 | 12           | \$1,223      |
| New                  | Hospital         | Cooking    | Oven - Convection   | Convection Oven  | Standard Oven                               | 0.04                       | 1.2%                          | 85%   | 55%                                 | 12           | \$420        |
| New                  | Hospital         | Cooking    | Oven - Conveyor   | High-Efficiency Model (23% Efficient)  | Standard Model (15% Efficient)              | 0.04                       | 10.4%                         | 5%  | 85%                                 | 10           | \$2,832      |
| New                  | Hospital         | Cooking    | Oven - Power Burner   | Power Burner Oven - Improved Atmospheric Burner (60% Efficient)                | Standard (40%-50% Efficiency)               | 0.04                       | 3.8%                          | 25%   | 90%                                 | 12           | \$5,358      |
| New                  | Hospital         | Cooking    | Steam Cooker  | Energy Star Steam Cooker (38% Efficient)                                       | Standard Cooker (30% Efficient)             | 0.04                       | 6.9%                          | 25%   | 75%                                 | 10           | \$2,181      |
| New                  | Hospital         | Space Heat | Gas Boiler - Greater than 300 KBTUH Boiler                          | 85% Thermal Efficiency   | 80% Thermal Efficiency (State Code)         | 0.32                       | 5.9%                          | NA  | NA                                  | 20           | \$4,453      |
| New                  | Hospital         | Space Heat | Gas Boiler - Greater than 300 KBTUH Boiler                          | 90% Thermal Efficiency   | 80% Thermal Efficiency (State Code)         | 0.32                       | 11.1%                         | NA  | NA                                  | 20           | \$9,084      |
| New                  | Hospital         | Space Heat | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 Sensors)                                    | Constant Ventilation                        | 0.32                       | 10.0%                         | 5%  | 94%                                 | 15           | \$13238      |
| New                  | Hospital         | Space Heat | Boiler Economizer   | Economizer   | No Economizer                               | 0.32                       | 5.5%                          | 40%   | 90%                                 | 20           | \$18008      |
| New                  | Hospital         | Space Heat | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning                                     | No Commissioning                            | 0.32                       | 12.5%                         | 90%   | 40%                                 | 3            | \$15339      |
| New                  | Hospital         | Space Heat | Direct Digital Control System-Optimization                          | Premium-Efficiency EMS System  | High-Efficiency EMS System                  | 0.32                       | 10.0%                         | 75%   | 80%                                 | 5            | \$11315      |
| New                  | Hospital         | Space Heat | Duct Repair And Sealing   | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 0.32                       | 2.5%                          | 45%   | 45%                                 | 18           | \$8,405      |
| New                  | Hospital         | Space Heat | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery  | No Heat Recovery                            | 0.32                       | 15.0%                         | 5%  | 94%                                 | 10           | \$19058      |
| New                  | Hospital         | Space Heat | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air) | 0.32                       | 4.5%                          | 62%   | 85%                                 | 10           | \$5,726      |
| New                  | Hospital         | Space Heat | Insulation (Ceiling)  | R-38   | R-21 (Code)                                 | 0.32                       | 4.0%                          | 75%   | 45%                                 | 25           | \$5,463      |
| New                  | Hospital         | Space Heat | Insulation (Ceiling)  | R-49   | R-21 (Code)                                 | 0.32                       | 6.0%                          | 75%   | 85%                                 | 25           | \$7,249      |

| Construction Vintage | Customer Segment | End Use       | Measure Name                                      | Measure Description  | Base Equipment                              | Baseline therm (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|---|--|---|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Hospital         | Space Boiler  | Heat Insulation (Wall)                            | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 0.32                        | 6.0%                          | 95%   | 95%                                 | 25           | \$4,959      |
| New                  | Hospital         | Space Boiler  | Heat Insulation - Floor (Non-Slab)                | R-19   | R-10 (Code)                                 | 0.32                        | 2.5%                          | 35%   | 35%                                 | 25           | \$946        |
| New                  | Hospital         | Space Boiler  | Heat Integrated Space Heating/Water Heating       | Integrated System  | Separate Boiler And HW Heater               | 0.32                        | 5.0%                          | 50%   | 95%                                 | 15           | \$12742      |
| New                  | Hospital         | Space Boiler  | Heat Leak Proof Duct Fittings                     | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                        | 0.32                        | 10.0%                         | 40%   | 98%                                 | 25           | \$3,257      |
| New                  | Hospital         | Space Boiler  | Heat Sensible And Total Heat Recovery Devices     | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness | No Heat Recovery                            | 0.32                        | 25.0%                         | 50%   | 98%                                 | 10           | \$44336      |
| New                  | Hospital         | Space Boiler  | Heat Thermostat - Programmable                    | Energy Star Programmable Thermostat  | Manual Thermostat                           | 0.32                        | 3.0%                          | 95%   | 71%                                 | 15           | \$145        |
| New                  | Hospital         | Space Boiler  | Heat Windows                                      | U = 0.35   | U = 0.55 (Code)                             | 0.32                        | 6.2%                          | 80%   | 60%                                 | 25           | \$17468      |
| New                  | Hospital         | Space Furnace | Heat Gas Furnace                                  | AFUE = 90% (Condensing Furnace)  | AFUE=80%                                    | 0.47                        | 11.1%                         | NA  | NA                                  | 18           | \$4,623      |
| New                  | Hospital         | Space Furnace | Heat Gas Furnace                                  | AFUE = 94% (Condensing Furnace)  | AFUE=80%                                    | 0.47                        | 14.9%                         | NA  | NA                                  | 18           | \$4,623      |
| New                  | Hospital         | Space Furnace | Heat Automated Ventilation Sensors / CO2 Sensors  | VFD Control (Occupancy Demand Controlled Ventilation (CO2 Sensors)   | Constant Ventilation                        | 0.47                        | 10.0%                         | 5%  | 94%                                 | 15           | \$13238      |
| New                  | Hospital         | Space Furnace | Heat Commissioning - New Building Commissioning   | Commissioning - New Building Commissioning   | No Commissioning                            | 0.47                        | 12.5%                         | 90%   | 80%                                 | 3            | \$15339      |
| New                  | Hospital         | Space Furnace | Heat Duct Repair And Sealing                      | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 0.47                        | 2.5%                          | 45%   | 45%                                 | 18           | \$8,405      |
| New                  | Hospital         | Space Furnace | Heat Exhaust Air to Ventilation Air Heat Recovery | Exhaust Air Heat Recovery  | No Heat Recovery                            | 0.47                        | 15.0%                         | 5%  | 94%                                 | 10           | \$19058      |
| New                  | Hospital         | Space Furnace | Heat Exhaust Hood Makeup Air                      | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air) | 0.47                        | 4.5%                          | 62%   | 85%                                 | 10           | \$5,726      |
| New                  | Hospital         | Space Furnace | Heat Insulation (Ceiling)                         | R-38   | R-21 (Code)                                 | 0.47                        | 4.0%                          | 75%   | 45%                                 | 25           | \$5,463      |
| New                  | Hospital         | Space Furnace | Heat Insulation (Ceiling)                         | R-49   | R-21 (Code)                                 | 0.47                        | 6.0%                          | 75%   | 85%                                 | 25           | \$7,249      |
| New                  | Hospital         | Space Furnace | Heat Insulation (Wall)                            | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 0.47                        | 6.0%                          | 95%   | 95%                                 | 25           | \$4,959      |
| New                  | Hospital         | Space Furnace | Heat Insulation - Floor (Non-Slab)                | R-19   | R-10 (Code)                                 | 0.47                        | 2.5%                          | 35%   | 35%                                 | 25           | \$946        |
| New                  | Hospital         | Space Furnace | Heat Leak Proof Duct Fittings                     | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                        | 0.47                        | 10.0%                         | 40%   | 98%                                 | 25           | \$3,257      |

| Construction Vintage | Customer Segment | End Use            | Measure Name                                 | Measure Description   | Base Equipment   | Baseline           | Savings               | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------------|--|---|--|--------------------|-----------------------|---|-------------------------------------|--------------|--------------|
|                      |                  |                    |  |   |  | therm (UEC or EUI) | as Percent of End Use |   |                                     |              |              |
| New                  | Hospital         | Space Heat Furnace | Thermostat - Programmable                    | Energy Star Programmable Thermostat                               | Manual Thermostat  | 0.47               | 3.0%                  | 95%   | 71%                                 | 15           | \$145        |
| New                  | Hospital         | Space Heat Furnace | Windows                                      | U = 0.35  | U = 0.55 (Code)  | 0.47               | 6.2%                  | 80%   | 60%                                 | 25           | \$17468      |
| New                  | Hospital         | Water Heat         | Water Heater - Condensing                    | EF = 0.90   | EF = 0.59  | 0.43               | 34.4%                 | NA  | NA                                  | 13           | \$12324      |
| New                  | Hospital         | Water Heat         | Clothes Washer - Ozonating                   | Ozonating Clothes Washer  | Standard Commercial Clothes Washer                         | 0.41               | 15.1%                 | 15%   | 95%                                 | 10           | \$8,705      |
| New                  | Hospital         | Water Heat         | Clothes Washer Commercial                    | Energy Star Commercial Clothes Washer MEF=1.73                    | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.41               | 0.3%                  | 15%   | 75%                                 | 10           | \$305        |
| New                  | Hospital         | Water Heat         | Demand controlled Circulating Systems        | Demand Controlled Circulating Systems (VFD Control by Demand)     | Constant Circulation                                       | 0.41               | 5.0%                  | 55%   | 94%                                 | 15           | \$5,837      |
| New                  | Hospital         | Water Heat         | Dishwashing - Commercial - High Efficiency   | High Efficiency Dishwasher  | Standard Dishwasher  | 0.41               | 3.0%                  | 25%   | 80%                                 | 13           | \$2,700      |
| New                  | Hospital         | Water Heat         | Dishwashing - Commercial Chemical System     | Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)     | High Temp Commercial Dishwasher                            | 0.41               | 6.0%                  | 25%   | 95%                                 | 10           | \$841        |
| New                  | Hospital         | Water Heat         | Dishwashing - Residential Sized System       | EF = 0.65 (ENERGY STAR)   | Existing Dishwasher (FED Std. EF=0.46)                     | 0.41               | 0.1%                  | 20%   | 25%                                 | 13           | \$32         |
| New                  | Hospital         | Water Heat         | Dishwashing - Residential Sized System       | EF = 0.77   | Existing Dishwasher (FED Std. EF=0.46)                     | 0.41               | 0.1%                  | 20%   | 55%                                 | 13           | \$630        |
| New                  | Hospital         | Water Heat         | Drainwater Heat Recovery (Power-Pipe or GFX) | Install Power-Pipe or GFX System                                  | No GFX or Power-Pipe System                                | 0.41               | 20.0%                 | 25%   | 92%                                 | 25           | \$9,525      |
| New                  | Hospital         | Water Heat         | Faucet Aerators                              | 1.5 GPM Aerator   | 2.5 GPM Aerator (Federal Code)                             | 0.41               | 4.0%                  | 95%   | 25%                                 | 10           | \$0          |
| New                  | Hospital         | Water Heat         | Integrated Space Heating/Water Heating       | Integrated System   | Separate Boiler And HW Heater                              | 0.41               | 5.0%                  | 50%   | 95%                                 | 15           | \$12742      |
| New                  | Hospital         | Water Heat         | Low Flow Spray Heads                         | 1.6 GPM   | 3.0 GPM  | 0.41               | 2.3%                  | 50%   | 45%                                 | 5            | \$6          |
| New                  | Hospital         | Water Heat         | Low-Flow Showerheads                         | 2.0 GPM Showerhead  | 2.5 GPM Showerhead (Federal Code)                          | 0.41               | 2.6%                  | 35%   | 75%                                 | 10           | \$6          |
| New                  | Hospital         | Water Heat         | Refrigeration with Heat Recovery             | Heat Recovery from Refrigeration System. Applied to Water Heating | No Heat Recovery   | 0.41               | 28.0%                 | 75%   | 50%                                 | 16           | \$10716      |
| New                  | Hospital         | Water Heat         | Solar RE - Solar Water Heater                | Passive solar water heating                                       | Standard Water Heater EF = 0.93                            | 0.41               | 66.6%                 | 20%   | 95%                                 | 20           | 120656       |
| New                  | Hospital         | Water Heat         | Tankless Water Heater - Commercial           | EF = 0.82   | Thermal Efficiency = 80%                                   | 0.41               | 30.0%                 | 10%   | 90%                                 | 14           | \$2,267      |
| New                  | Hospital         | Water Heat         | Tankless Water Heater - Residential          | EF = 0.82   | EF = 0.59 (40 Gal)   | 0.41               | 28.0%                 | 10%   | 90%                                 | 20           | \$696        |
| New                  | Hospital         | Water Heat         | Ultrasonic Faucet Control                    | Install Ultrasonic Motion Faucet Control                          | No Faucet Control  | 0.41               | 3.3%                  | 95%   | 90%                                 | 10           | \$206        |
| New                  | Hospital         | Water Heat         | Water Heater Thermostat Setback              | Thermostat Setback and Replecement (120 Degrees)                  | No Thermostat Setback (130 Degrees)                        | 0.41               | 7.7%                  | 75%   | 80%                                 | 11           | \$1,828      |
| Existing             | Hotel Motel      | Cooking            | Broiler                                      | High-Efficiency Broiler (34% Efficient)                           | Standard Broiler (15% Efficient)                           | 0.08               | 1.9%                  | 95%   | 75%                                 | 10           | \$210        |
| Existing             | Hotel Motel      | Cooking            | Fryers - Commercial Gas Cooking              | Energy Star Commercial Fryer (50% efficient)                      | Non-Energy Star Fryer (35% efficient)                      | 0.08               | 3.1%                  | 35%   | 65%                                 | 8            | \$1,112      |

| Construction Vintage | Customer Segment | End Use           | Measure Name  | Measure Description  | Base Equipment                              | Baseline therm (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-------------------|---|--|---|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Hotel Motel      | Cooking           | Griddle   | High-Efficiency Griddle (40% Efficient)  | Standard Griddle (32% Efficient)            | 0.08                        | 0.3%                          | 45%   | 75%                                 | 12           | \$1,225      |
| Existing             | Hotel Motel      | Cooking           | Oven - Convection   | Convection Oven  | Standard Oven                               | 0.08                        | 1.2%                          | 85%   | 55%                                 | 12           | \$421        |
| Existing             | Hotel Motel      | Cooking           | Oven - Conveyor   | High-Efficiency Model (23% Efficient)  | Standard Model (15% Efficient)              | 0.08                        | 10.4%                         | 5%  | 85%                                 | 10           | \$3,541      |
| Existing             | Hotel Motel      | Cooking           | Oven - Power Burner   | Power Burner Oven - Improved Atmospheric Burner (60% Efficient)                | Standard (40%-50% Efficiency)               | 0.08                        | 3.8%                          | 15%   | 90%                                 | 12           | \$5,358      |
| Existing             | Hotel Motel      | Cooking           | Steam Cooker  | Energy Star Steam Cooker (38% Efficient)                                       | Standard Cooker (30% Efficient)             | 0.08                        | 6.9%                          | 25%   | 75%                                 | 10           | \$2,180      |
| Existing             | Hotel Motel      | Pool Heat         | Solar RE - Installation of Solar Pool/Spa Heating Systems     | Solar Pool/Spa Heating Systems   | No Solar Pool Heating System                | 0.11                        | 10.1%                         | 30%   | 90%                                 | 12           | \$16506      |
| Existing             | Hotel Motel      | Pool Heat         | Swimming Pool/Spa Covers                                      | Plastic Or Foam Pool Covers (50-65% Energy Savings)                            | No Pool Covers                              | 0.11                        | 50.0%                         | 95%   | 35%                                 | 10           | \$2,237      |
| Existing             | Hotel Motel      | Space Heat Boiler | Gas Boiler - Less than 300 kBТУH                              | AFUE=85%   | AFUE=80%                                    | 0.17                        | 5.9%                          | NA  | NA                                  | 20           | \$3,421      |
| Existing             | Hotel Motel      | Space Heat Boiler | Gas Boiler - Less than 300 kBТУH                              | AFUE=90%   | AFUE=80%                                    | 0.17                        | 11.1%                         | NA  | NA                                  | 20           | \$6,842      |
| Existing             | Hotel Motel      | Space Heat Boiler | Automated Ventilation Sensors / CO2 Sensors                   | Demand Controlled Ventilation (CO2 Sensors)                                    | Constant Ventilation                        | 0.17                        | 2.0%                          | 50%   | 94%                                 | 15           | \$3,120      |
| Existing             | Hotel Motel      | Space Heat Boiler | Boiler Economizer   | Economizer   | No Economizer                               | 0.17                        | 5.5%                          | 40%   | 30%                                 | 20           | \$3,338      |
| Existing             | Hotel Motel      | Space Heat Boiler | Commissioning - Retro Building Commissioning                  | Commissioning - Retro Building Commissioning                                   | No Commissioning                            | 0.17                        | 12.5%                         | 90%   | 40%                                 | 3            | \$4,556      |
| Existing             | Hotel Motel      | Space Heat Boiler | Direct Digital Control System-Installation                    | DDC Retrofit (Morning Warm-Up Control Logic Included in This Measure)          | Pneumatic                                   | 0.17                        | 5.0%                          | 5%  | 52%                                 | 15           | \$6,421      |
| Existing             | Hotel Motel      | Space Heat Boiler | Direct Digital Control System-Optimization                    | Premium-Efficiency EMS System  | High-Efficiency EMS System                  | 0.17                        | 10.0%                         | 75%   | 80%                                 | 5            | \$12447      |
| Existing             | Hotel Motel      | Space Heat Boiler | Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control        | Pneumatic                                   | 0.17                        | 15.0%                         | 50%   | 80%                                 | 5            | \$8,982      |
| Existing             | Hotel Motel      | Space Heat Boiler | Duct Repair And Sealing                                       | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 0.17                        | 2.5%                          | 45%   | 45%                                 | 18           | \$9,246      |
| Existing             | Hotel Motel      | Space Heat Boiler | Exhaust Air to Ventilation Air Heat Recovery                  | Exhaust Air Heat Recovery  | No Heat Recovery                            | 0.17                        | 15.0%                         | 5%  | 94%                                 | 10           | \$20964      |
| Existing             | Hotel Motel      | Space Heat Boiler | Exhaust Hood Makeup Air                                       | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air) | 0.17                        | 4.5%                          | 58%   | 85%                                 | 10           | \$5,725      |
| Existing             | Hotel Motel      | Space Heat Boiler | Insulation (Ceiling)  | R-21 (Code)  | Existing Ceiling Insulation (Average R-9)   | 0.17                        | 3.6%                          | 75%   | 25%                                 | 25           | \$7,050      |
| Existing             | Hotel Motel      | Space Heat Boiler | Insulation (Ceiling)  | R-21 (Code)  | R-0   | 0.17                        | 10.0%                         | 75%   | 0%                                  | 25           | \$7,050      |
| Existing             | Hotel Motel      | Space Heat Boiler | Insulation (Ceiling)  | R-38   | R-21 (Code)                                 | 0.17                        | 4.0%                          | 75%   | 45%                                 | 25           | \$6,010      |

| Construction Vintage | Customer Segment | End Use       | Measure Name | Measure Description   | Base Equipment   | Baseline therm (UEC or EU)            | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|---------------|--------------|---|--|---------------------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| Existing             | Hotel Motel      | Space Boiler  | Heat         | Insulation (Ceiling)  | R-49   | R-21 (Code)                           | 0.17                          | 6.0%  | 75%                                 | 85%          | 25           | \$7,974 |
| Existing             | Hotel Motel      | Space Boiler  | Heat         | Insulation (Duct) (Unconditioned Spaces)                            | Install New Duct Insulation (R-8)  | R-0                                   | 0.17                          | 4.4%  | 10%                                 | 15%          | 25           | \$2,584 |
| Existing             | Hotel Motel      | Space Boiler  | Heat         | Insulation (Duct) (Unconditioned Spaces)                            | R-4  | R-0                                   | 0.17                          | 2.4%  | 10%                                 | 15%          | 25           | \$2,693 |
| Existing             | Hotel Motel      | Space Boiler  | Heat         | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)           | 0.17                          | 6.0%  | 10%                                 | 95%          | 25           | \$5,201 |
| Existing             | Hotel Motel      | Space Boiler  | Heat         | Insulation (Wall) - Existing to Code                                | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)        | 0.17                          | 21.1%   | 10%                                 | 35%          | 25           | \$5,633 |
| Existing             | Hotel Motel      | Space Boiler  | Heat         | Insulation (Wall) - Zero to Code                                    | R-19 (2x6 Framing) - (Code)  | R-0                                   | 0.17                          | 25.0%   | 10%                                 | 0%           | 25           | \$5,633 |
| Existing             | Hotel Motel      | Space Boiler  | Heat         | Insulation - Floor (Non-Slab)                                       | R-10 (Code)  | R-0                                   | 0.17                          | 7.5%  | 35%                                 | 45%          | 25           | \$6,010 |
| Existing             | Hotel Motel      | Space Boiler  | Heat         | Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)                           | 0.17                          | 2.5%  | 35%                                 | 45%          | 25           | \$1,040 |
| Existing             | Hotel Motel      | Space Boiler  | Heat         | Sensible And Total Heat Recovery Devices                            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness | No Heat Recovery                      | 0.17                          | 25.0%   | 25%                                 | 98%          | 10           | \$48770 |
| Existing             | Hotel Motel      | Space Boiler  | Heat         | Steam Pipe Insulation   | R-4  | R-0                                   | 0.17                          | 12.1%   | 75%                                 | 65%          | 20           | \$2,258 |
| Existing             | Hotel Motel      | Space Boiler  | Heat         | Steam Trap Maintenance  | Actively stop steam trap leaks   | No Maintenance                        | 0.17                          | 17.0%   | 90%                                 | 45%          | 3            | \$3,120 |
| Existing             | Hotel Motel      | Space Boiler  | Heat         | Thermostat - Programmable   | Energy Star Programmable Thermostat  | Manual Thermostat                     | 0.17                          | 3.0%  | 95%                                 | 78%          | 15           | \$146   |
| Existing             | Hotel Motel      | Space Boiler  | Heat         | Windows   | U = 0.35   | U = 0.55 (Code)                       | 0.17                          | 8.3%  | 80%                                 | 50%          | 25           | \$39564 |
| Existing             | Hotel Motel      | Space Boiler  | Heat         | Windows - Existing to Code  | U = 0.55 (Code)  | Existing Windows (U=0.65)             | 0.17                          | 5.5%  | 10%                                 | 50%          | 25           | 111702  |
| Existing             | Hotel Motel      | Space Furnace | Heat         | Gas Furnace   | AFUE = 90% (Condensing Furnace)  | AFUE=80%                              | 0.25                          | 11.1%   | NA                                  | NA           | 18           | \$2,570 |
| Existing             | Hotel Motel      | Space Furnace | Heat         | Gas Furnace   | AFUE = 94% (Condensing Furnace)  | AFUE=80%                              | 0.25                          | 14.9%   | NA                                  | NA           | 18           | \$2,570 |
| Existing             | Hotel Motel      | Space Furnace | Heat         | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 Sensors)  | Constant Ventilation                  | 0.25                          | 2.0%  | 50%                                 | 94%          | 15           | \$3,120 |
| Existing             | Hotel Motel      | Space Furnace | Heat         | Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning   | No Commissioning                      | 0.25                          | 12.5%   | 90%                                 | 80%          | 3            | \$4,556 |
| Existing             | Hotel Motel      | Space Furnace | Heat         | Duct Repair And Sealing   | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses | 0.25                          | 2.5%  | 45%                                 | 45%          | 18           | \$9,246 |

| Construction Vintage | Customer Segment | End Use            | Measure Name                                 | Measure Description  | Base Equipment   | Baseline therm (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------------|--|--|--|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Hotel Motel      | Space Heat Furnace | Exhaust Air to Ventilation Air Heat Recovery | Exhaust Air Heat Recovery  | No Heat Recovery   | 0.25                        | 15.0%                         | 5%  | 94%                                 | 10           | \$20964      |
| Existing             | Hotel Motel      | Space Heat Furnace | Exhaust Hood Makeup Air                      | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air)                | 0.25                        | 4.5%                          | 58%   | 85%                                 | 10           | \$5,725      |
| Existing             | Hotel Motel      | Space Heat Furnace | Insulation (Ceiling)                         | R-21 (Code)  | Existing Ceiling Insulation (Average R-9)                  | 0.25                        | 3.6%                          | 75%   | 25%                                 | 25           | \$7,050      |
| Existing             | Hotel Motel      | Space Heat Furnace | Insulation (Ceiling)                         | R-21 (Code)  | R-0  | 0.25                        | 10.0%                         | 75%   | 0%                                  | 25           | \$7,050      |
| Existing             | Hotel Motel      | Space Heat Furnace | Insulation (Ceiling)                         | R-38   | R-21 (Code)  | 0.25                        | 4.0%                          | 75%   | 45%                                 | 25           | \$6,010      |
| Existing             | Hotel Motel      | Space Heat Furnace | Insulation (Ceiling)                         | R-49   | R-21 (Code)  | 0.25                        | 6.0%                          | 75%   | 85%                                 | 25           | \$7,974      |
| Existing             | Hotel Motel      | Space Heat Furnace | Insulation (Duct) (Unconditioned Spaces)     | Install New Duct Insulation (R-8)  | R-0  | 0.25                        | 4.4%                          | 10%   | 15%                                 | 25           | \$2,584      |
| Existing             | Hotel Motel      | Space Heat Furnace | Insulation (Duct) (Unconditioned Spaces)     | R-4  | R-0  | 0.25                        | 2.4%                          | 10%   | 15%                                 | 25           | \$2,693      |
| Existing             | Hotel Motel      | Space Heat Furnace | Insulation (Wall)                            | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                                | 0.25                        | 6.0%                          | 10%   | 95%                                 | 25           | \$5,201      |
| Existing             | Hotel Motel      | Space Heat Furnace | Insulation (Wall) - Existing to Code         | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)                             | 0.25                        | 21.1%                         | 10%   | 35%                                 | 25           | \$5,633      |
| Existing             | Hotel Motel      | Space Heat Furnace | Insulation (Wall) - Zero to Code             | R-19 (2x6 Framing) - (Code)  | R-0  | 0.25                        | 25.0%                         | 10%   | 0%                                  | 25           | \$5,633      |
| Existing             | Hotel Motel      | Space Heat Furnace | Insulation - Floor (Non-Slab)                | R-10 (Code)  | R-0  | 0.25                        | 7.5%                          | 35%   | 45%                                 | 25           | \$6,010      |
| Existing             | Hotel Motel      | Space Heat Furnace | Insulation - Floor (Non-Slab)                | R-19   | R-10 (Code)  | 0.25                        | 2.5%                          | 35%   | 45%                                 | 25           | \$1,040      |
| Existing             | Hotel Motel      | Space Heat Furnace | Thermostat - Programmable                    | Energy Star Programmable Thermostat  | Manual Thermostat  | 0.25                        | 3.0%                          | 95%   | 78%                                 | 15           | \$146        |
| Existing             | Hotel Motel      | Space Heat Furnace | Windows                                      | U = 0.35   | U = 0.55 (Code)  | 0.25                        | 8.3%                          | 80%   | 50%                                 | 25           | \$39564      |
| Existing             | Hotel Motel      | Space Heat Furnace | Windows - Existing to Code                   | U = 0.55 (Code)  | Existing Windows (U=0.65)                                  | 0.25                        | 5.5%                          | 10%   | 50%                                 | 25           | 111702       |
| Existing             | Hotel Motel      | Water Heat         | Water Heater - Condensing                    | EF = 0.90  | EF = 0.59  | 0.30                        | 34.4%                         | NA  | NA                                  | 13           | \$12324      |
| Existing             | Hotel Motel      | Water Heat         | Clothes Washer - Ozonating                   | Ozonating Clothes Washer   | Standard Commercial Clothes Washer                         | 0.31                        | 15.1%                         | 35%   | 95%                                 | 10           | \$8,705      |
| Existing             | Hotel Motel      | Water Heat         | Clothes Washer Commercial                    | Energy Star Commercial Clothes Washer MEF=1.73                                 | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.31                        | 0.4%                          | 35%   | 75%                                 | 10           | \$305        |



| Construction Vintage | Customer Segment | End Use    | Measure Name                                 | Measure Description   | Base Equipment                         | Baseline therm (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|--|---|--|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Hotel Motel      | Water Heat | Demand controlled Circulating Systems        | Demand Controlled Circulating Systems (VFD Control by Demand)     | Constant Circulation                   | 0.31                        | 5.0%                          | 55%   | 80%                                 | 15           | \$6,421      |
| Existing             | Hotel Motel      | Water Heat | Dishwashing - Commercial - High Efficiency   | High Efficiency Dishwasher  | Standard Dishwasher                    | 0.31                        | 3.0%                          | 45%   | 80%                                 | 13           | \$2,700      |
| Existing             | Hotel Motel      | Water Heat | Dishwashing - Commercial Chemical System     | Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)     | High Temp Commercial Dishwasher        | 0.31                        | 6.0%                          | 45%   | 95%                                 | 10           | \$841        |
| Existing             | Hotel Motel      | Water Heat | Dishwashing - Residential Sized System       | EF = 0.65 (ENERGY STAR)   | Existing Dishwasher (FED Std. EF=0.46) | 0.31                        | 0.1%                          | 45%   | 25%                                 | 13           | \$32         |
| Existing             | Hotel Motel      | Water Heat | Dishwashing - Residential Sized System       | EF = 0.77   | Existing Dishwasher (FED Std. EF=0.46) | 0.31                        | 0.1%                          | 45%   | 55%                                 | 13           | \$631        |
| Existing             | Hotel Motel      | Water Heat | Drainwater Heat Recovery (Power-Pipe or GFX) | Install Power-Pipe or GFX System                                  | No GFX or Power-Pipe System            | 0.31                        | 20.0%                         | 5%  | 92%                                 | 25           | \$9,525      |
| Existing             | Hotel Motel      | Water Heat | Faucet Aerators                              | 1.5 GPM Aerator   | 2.5 GPM Aerator (Federal Code)         | 0.31                        | 4.0%                          | 95%   | 25%                                 | 10           | \$0          |
| Existing             | Hotel Motel      | Water Heat | Faucet Aerators - Existing to Code           | 2.5 GPM Aerator (Federal Code)                                    | 4.0 GPM Aerator                        | 0.31                        | 3.8%                          | 95%   | 15%                                 | 10           | \$2          |
| Existing             | Hotel Motel      | Water Heat | Hot Water (SHW) Pipe Insulation              | Install Insulation (R-4)  | No Pipe Insulation                     | 0.31                        | 1.0%                          | 75%   | 90%                                 | 15           | \$245        |
| Existing             | Hotel Motel      | Water Heat | Low Flow Spray Heads                         | 1.6 GPM   | 3.0 GPM                                | 0.31                        | 2.3%                          | 85%   | 50%                                 | 5            | \$5          |
| Existing             | Hotel Motel      | Water Heat | Low-Flow Showerheads                         | 2.0 GPM Showerhead  | 2.5 GPM Showerhead (Federal Code)      | 0.31                        | 7.5%                          | 100%  | 75%                                 | 10           | \$7          |
| Existing             | Hotel Motel      | Water Heat | Low-Flow Showerheads - Existing to Code      | 2.5 GPM Showerhead (Federal Code)                                 | 4.5 GPM Showerhead                     | 0.31                        | 16.7%                         | 100%  | 20%                                 | 10           | \$12         |
| Existing             | Hotel Motel      | Water Heat | Refrigeration with Heat Recovery             | Heat Recovery from Refrigeration System. Applied to Water Heating | No Heat Recovery                       | 0.31                        | 28.0%                         | 75%   | 35%                                 | 16           | \$21034      |
| Existing             | Hotel Motel      | Water Heat | Solar RE - Solar Water Heater                | Passive solar water heating                                       | Standard Water Heater EF = 0.93        | 0.31                        | 56.1%                         | 20%   | 95%                                 | 20           | 153827       |
| Existing             | Hotel Motel      | Water Heat | Tankless Water Heater - Commercial           | EF = 0.82   | Thermal Efficiency = 80%               | 0.31                        | 30.0%                         | 10%   | 90%                                 | 14           | \$2,265      |
| Existing             | Hotel Motel      | Water Heat | Tankless Water Heater - Residential          | EF = 0.82   | EF = 0.59 (40 Gal)                     | 0.31                        | 28.0%                         | 10%   | 90%                                 | 20           | \$696        |
| Existing             | Hotel Motel      | Water Heat | Ultrasonic Faucet Control                    | Install Ultrasonic Motion Faucet Control                          | No Faucet Control                      | 0.31                        | 3.3%                          | 95%   | 85%                                 | 10           | \$206        |
| Existing             | Hotel Motel      | Water Heat | Water Heater Thermostat Setback              | Thermostat Setback and Replacement (120 Degrees)                  | No Thermostat Setback (130 Degrees)    | 0.31                        | 7.7%                          | 75%   | 5%                                  | 11           | \$1,828      |
| New                  | Hotel Motel      | Cooking    | Broiler                                      | High-Efficiency Broiler (34% Efficient)                           | Standard Broiler (15% Efficient)       | 0.08                        | 1.9%                          | 95%   | 75%                                 | 10           | \$210        |
| New                  | Hotel Motel      | Cooking    | Fryers - Commercial Gas Cooking              | Energy Star Commercial Fryer (50% efficient)                      | Non-Energy Star Fryer (35% efficient)  | 0.08                        | 3.1%                          | 35%   | 65%                                 | 8            | \$1,112      |
| New                  | Hotel Motel      | Cooking    | Griddle                                      | High-Efficiency Griddle (40% Efficient)                           | Standard Griddle (32% Efficient)       | 0.08                        | 0.3%                          | 45%   | 75%                                 | 12           | \$1,225      |
| New                  | Hotel Motel      | Cooking    | Oven - Convection                            | Convection Oven   | Standard Oven                          | 0.08                        | 1.2%                          | 85%   | 55%                                 | 12           | \$421        |
| New                  | Hotel Motel      | Cooking    | Oven - Conveyor                              | High-Efficiency Model (23% Efficient)                             | Standard Model (15% Efficient)         | 0.08                        | 10.4%                         | 5%  | 85%                                 | 10           | \$2,834      |
| New                  | Hotel Motel      | Cooking    | Oven - Power Burner                          | Power Burner Oven - Improved Atmospheric Burner (60% Efficient)   | Standard (40%-50% Efficiency)          | 0.08                        | 3.8%                          | 15%   | 90%                                 | 12           | \$5,358      |
| New                  | Hotel Motel      | Cooking    | Steam Cooker                                 | Energy Star Steam Cooker (38% Efficient)                          | Standard Cooker (30% Efficient)        | 0.08                        | 6.9%                          | 25%   | 75%                                 | 10           | \$2,180      |

| Construction Vintage | Customer Segment | End Use      | Measure Name   | Measure Description  | Base Equipment                              | Baseline therm (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------|--|--|---|----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Hotel Motel      | Pool Heat    | Solar RE - Installation of Solar Pool/Spa Heating Systems                | Solar Pool/Spa Heating Systems   | No Solar Pool Heating System                | 0.06                       | 10.1%                         | 30%   | 90%                                 | 12           | \$16506      |
| New                  | Hotel Motel      | Pool Heat    | Swimming Pool/Spa Covers   | Plastic Or Foam Pool Covers (50-65% Energy Savings)  | No Pool Covers                              | 0.06                       | 50.0%                         | 95%   | 35%                                 | 10           | \$2,237      |
| New                  | Hotel Motel      | Space Boiler | Heat Gas Boiler - Less than 300 kBТУH                                    | AFUE=85%   | AFUE=80%                                    | 0.12                       | 5.9%                          | NA  | NA                                  | 20           | \$3,421      |
| New                  | Hotel Motel      | Space Boiler | Heat Gas Boiler - Less than 300 kBТУH                                    | AFUE=90%   | AFUE=80%                                    | 0.12                       | 11.1%                         | NA  | NA                                  | 20           | \$6,842      |
| New                  | Hotel Motel      | Space Boiler | Heat Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 Sensors)  | Constant Ventilation                        | 0.12                       | 2.0%                          | 50%   | 94%                                 | 15           | \$3,120      |
| New                  | Hotel Motel      | Space Boiler | Heat Boiler Economizer   | Economizer   | No Economizer                               | 0.12                       | 5.5%                          | 40%   | 30%                                 | 20           | \$3,338      |
| New                  | Hotel Motel      | Space Boiler | Heat Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning   | No Commissioning                            | 0.12                       | 12.5%                         | 90%   | 40%                                 | 3            | \$16873      |
| New                  | Hotel Motel      | Space Boiler | Heat Direct Digital Control System-Optimization                          | Premium-Efficiency EMS System  | High-Efficiency EMS System                  | 0.12                       | 10.0%                         | 75%   | 80%                                 | 5            | \$12447      |
| New                  | Hotel Motel      | Space Boiler | Heat Duct Repair And Sealing   | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 0.12                       | 2.5%                          | 45%   | 45%                                 | 18           | \$9,246      |
| New                  | Hotel Motel      | Space Boiler | Heat Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery  | No Heat Recovery                            | 0.12                       | 15.0%                         | 5%  | 94%                                 | 10           | \$20964      |
| New                  | Hotel Motel      | Space Boiler | Heat Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air) | 0.12                       | 4.5%                          | 58%   | 85%                                 | 10           | \$5,725      |
| New                  | Hotel Motel      | Space Boiler | Heat Insulation (Ceiling)  | R-38   | R-21 (Code)                                 | 0.12                       | 4.0%                          | 75%   | 45%                                 | 25           | \$6,010      |
| New                  | Hotel Motel      | Space Boiler | Heat Insulation (Ceiling)  | R-49   | R-21 (Code)                                 | 0.12                       | 6.0%                          | 75%   | 85%                                 | 25           | \$7,974      |
| New                  | Hotel Motel      | Space Boiler | Heat Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 0.12                       | 6.0%                          | 95%   | 95%                                 | 25           | \$5,201      |
| New                  | Hotel Motel      | Space Boiler | Heat Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)                                 | 0.12                       | 2.5%                          | 35%   | 45%                                 | 25           | \$1,040      |
| New                  | Hotel Motel      | Space Boiler | Heat Integrated Space Heating/Water Heating                              | Integrated System  | Separate Boiler And HW Heater               | 0.12                       | 5.0%                          | 50%   | 95%                                 | 15           | \$2,362      |
| New                  | Hotel Motel      | Space Boiler | Heat Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                        | 0.12                       | 10.0%                         | 40%   | 98%                                 | 25           | \$3,583      |
| New                  | Hotel Motel      | Space Boiler | Heat Sensible And Total Heat Recovery Devices                            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness | No Heat Recovery                            | 0.12                       | 25.0%                         | 50%   | 98%                                 | 10           | \$48770      |
| New                  | Hotel Motel      | Space Boiler | Heat Thermostat - Programmable   | Energy Star Programmable Thermostat  | Manual Thermostat                           | 0.12                       | 3.0%                          | 95%   | 78%                                 | 15           | \$146        |

| Construction Vintage | Customer Segment | End Use            | Measure Name                                 | Measure Description  | Base Equipment   | Baseline therm (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------------|--|--|--|----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Hotel Motel      | Space Heat Boiler  | Windows                                      | U = 0.35   | U = 0.55 (Code)  | 0.12                       | 8.3%                          | 80%   | 50%                                 | 25           | \$39564      |
| New                  | Hotel Motel      | Space Heat Furnace | Gas Furnace                                  | AFUE = 90% (Condensing Furnace)  | AFUE=80%   | 0.18                       | 11.1%                         | NA  | NA                                  | 18           | \$2,570      |
| New                  | Hotel Motel      | Space Heat Furnace | Gas Furnace                                  | AFUE = 94% (Condensing Furnace)  | AFUE=80%   | 0.18                       | 14.9%                         | NA  | NA                                  | 18           | \$2,570      |
| New                  | Hotel Motel      | Space Heat Furnace | Automated Ventilation Sensors / CO2 Sensors  | VFD Control (Occupancy Demand Controlled Ventilation (CO2 Sensors)             | Constant Ventilation                                       | 0.18                       | 2.0%                          | 50%   | 94%                                 | 15           | \$3,120      |
| New                  | Hotel Motel      | Space Heat Furnace | Commissioning - New Building                 | Commissioning - New Building Commissioning                                     | No Commissioning   | 0.18                       | 12.5%                         | 90%   | 80%                                 | 3            | \$16873      |
| New                  | Hotel Motel      | Space Heat Furnace | Duct Repair And Sealing                      | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses                      | 0.18                       | 2.5%                          | 45%   | 45%                                 | 18           | \$9,246      |
| New                  | Hotel Motel      | Space Heat Furnace | Exhaust Air to Ventilation Air Heat Recovery | Exhaust Air Heat Recovery  | No Heat Recovery   | 0.18                       | 15.0%                         | 5%  | 94%                                 | 10           | \$20964      |
| New                  | Hotel Motel      | Space Heat Furnace | Exhaust Hood Makeup Air                      | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air)                | 0.18                       | 4.5%                          | 58%   | 85%                                 | 10           | \$5,725      |
| New                  | Hotel Motel      | Space Heat Furnace | Insulation (Ceiling)                         | R-38   | R-21 (Code)  | 0.18                       | 4.0%                          | 75%   | 45%                                 | 25           | \$6,010      |
| New                  | Hotel Motel      | Space Heat Furnace | Insulation (Ceiling)                         | R-49   | R-21 (Code)  | 0.18                       | 6.0%                          | 75%   | 85%                                 | 25           | \$7,974      |
| New                  | Hotel Motel      | Space Heat Furnace | Insulation (Wall)                            | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                                | 0.18                       | 6.0%                          | 95%   | 95%                                 | 25           | \$5,201      |
| New                  | Hotel Motel      | Space Heat Furnace | Insulation - Floor (Non-Slab)                | R-19   | R-10 (Code)  | 0.18                       | 2.5%                          | 35%   | 45%                                 | 25           | \$1,040      |
| New                  | Hotel Motel      | Space Heat Furnace | Leak Proof Duct Fittings                     | Quick connect fittings that do not require mastic or drawbands                 | Std duct workmanship                                       | 0.18                       | 10.0%                         | 40%   | 98%                                 | 25           | \$3,583      |
| New                  | Hotel Motel      | Space Heat Furnace | Thermostat - Programmable                    | Energy Star Programmable Thermostat  | Manual Thermostat  | 0.18                       | 3.0%                          | 95%   | 78%                                 | 15           | \$146        |
| New                  | Hotel Motel      | Space Heat Furnace | Windows                                      | U = 0.35   | U = 0.55 (Code)  | 0.18                       | 8.3%                          | 80%   | 50%                                 | 25           | \$39564      |
| New                  | Hotel Motel      | Water Heat         | Water Heater - Condensing                    | EF = 0.90  | EF = 0.59  | 0.33                       | 34.4%                         | NA  | NA                                  | 13           | \$12324      |
| New                  | Hotel Motel      | Water Heat         | Clothes Washer - Ozonating                   | Ozonating Clothes Washer   | Standard Commercial Clothes Washer                         | 0.31                       | 15.1%                         | 35%   | 95%                                 | 10           | \$8,705      |
| New                  | Hotel Motel      | Water Heat         | Clothes Washer Commercial                    | Energy Star Commercial Clothes Washer MEF=1.73                                 | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.31                       | 0.4%                          | 35%   | 75%                                 | 10           | \$305        |
| New                  | Hotel Motel      | Water Heat         | Demand controlled Circulating Systems        | Demand Controlled Circulating Systems (VFD Control by Demand)                  | Constant Circulation                                       | 0.31                       | 5.0%                          | 55%   | 80%                                 | 15           | \$6,421      |
| New                  | Hotel Motel      | Water Heat         | Dishwashing - Commercial - High Efficiency   | High Efficiency Dishwasher   | Standard Dishwasher  | 0.31                       | 3.0%                          | 45%   | 80%                                 | 13           | \$2,700      |

| Construction Vintage | Customer Segment | End Use           | Measure Name  | Measure Description   | Base Equipment                         | Savings                     |                    | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-------------------|---|---|--|-----------------------------|--------------------|---|-------------------------------------|--------------|--------------|
|                      |                  |                   |   |   |  | Baseline therm (UEC or EUI) | Percent of End Use |   |                                     |              |              |
| New                  | Hotel Motel      | Water Heat        | Dishwashing - Commercial Chemical System                            | Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)         | High Temp Commercial Dishwasher        | 0.31                        | 6.0%               | 45%   | 95%                                 | 10           | \$841        |
| New                  | Hotel Motel      | Water Heat        | Dishwashing - Residential Sized System                              | EF = 0.65 (ENERGY STAR)   | Existing Dishwasher (FED Std. EF=0.46) | 0.31                        | 0.1%               | 45%   | 25%                                 | 13           | \$32         |
| New                  | Hotel Motel      | Water Heat        | Dishwashing - Residential Sized System                              | EF = 0.77   | Existing Dishwasher (FED Std. EF=0.46) | 0.31                        | 0.1%               | 45%   | 55%                                 | 13           | \$631        |
| New                  | Hotel Motel      | Water Heat        | Drainwater Heat Recovery (Power-Pipe or GFX)                        | Install Power-Pipe or GFX System                                      | No GFX or Power-Pipe System            | 0.31                        | 20.0%              | 25%   | 92%                                 | 25           | \$9,525      |
| New                  | Hotel Motel      | Water Heat        | Faucet Aerators   | 1.5 GPM Aerator   | 2.5 GPM Aerator (Federal Code)         | 0.31                        | 4.0%               | 95%   | 25%                                 | 10           | \$0          |
| New                  | Hotel Motel      | Water Heat        | Integrated Space Heating/Water Heating                              | Integrated System   | Separate Boiler And HW Heater          | 0.31                        | 5.0%               | 50%   | 95%                                 | 15           | \$2,362      |
| New                  | Hotel Motel      | Water Heat        | Low Flow Spray Heads  | 1.6 GPM   | 3.0 GPM                                | 0.31                        | 2.3%               | 85%   | 50%                                 | 5            | \$5          |
| New                  | Hotel Motel      | Water Heat        | Low-Flow Showerheads  | 2.0 GPM Showerhead  | 2.5 GPM Showerhead (Federal Code)      | 0.31                        | 7.5%               | 100%  | 75%                                 | 10           | \$7          |
| New                  | Hotel Motel      | Water Heat        | Refrigeration with Heat Recovery                                    | Heat Recovery from Refrigeration System. Applied to Water Heating     | No Heat Recovery                       | 0.31                        | 28.0%              | 75%   | 35%                                 | 16           | \$11788      |
| New                  | Hotel Motel      | Water Heat        | Solar RE - Solar Water Heater                                       | Passive solar water heating   | Standard Water Heater EF = 0.93        | 0.31                        | 56.1%              | 20%   | 95%                                 | 20           | 153827       |
| New                  | Hotel Motel      | Water Heat        | Tankless Water Heater - Commercial                                  | EF = 0.82   | Thermal Efficiency = 80%               | 0.31                        | 30.0%              | 10%   | 90%                                 | 14           | \$2,265      |
| New                  | Hotel Motel      | Water Heat        | Tankless Water Heater - Residential                                 | EF = 0.82   | EF = 0.59 (40 Gal)                     | 0.31                        | 28.0%              | 10%   | 90%                                 | 20           | \$696        |
| New                  | Hotel Motel      | Water Heat        | Ultrasonic Faucet Control   | Install Ultrasonic Motion Faucet Control                              | No Faucet Control                      | 0.31                        | 3.3%               | 95%   | 85%                                 | 10           | \$206        |
| New                  | Hotel Motel      | Water Heat        | Water Heater Thermostat Setback                                     | Thermostat Setback and Replecement (120 Degrees)                      | No Thermostat Setback (130 Degrees)    | 0.31                        | 7.7%               | 75%   | 5%                                  | 11           | \$1,828      |
| Existing             | Office           | Space Heat Boiler | Gas Boiler - Greater than 300 KBTUH                                 | 85% Thermal Efficiency  | 80% Thermal Efficiency (State Code)    | 0.23                        | 5.9%               | NA  | NA                                  | 20           | \$10979      |
| Existing             | Office           | Space Heat Boiler | Gas Boiler - Greater than 300 KBTUH                                 | 90% Thermal Efficiency  | 80% Thermal Efficiency (State Code)    | 0.23                        | 11.1%              | NA  | NA                                  | 20           | \$22399      |
| Existing             | Office           | Space Heat Boiler | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 Sensors)                           | Constant Ventilation                   | 0.23                        | 10.0%              | 75%   | 94%                                 | 15           | \$33095      |
| Existing             | Office           | Space Heat Boiler | Boiler Economizer   | Economizer  | No Economizer                          | 0.23                        | 5.5%               | 40%   | 45%                                 | 20           | \$39813      |
| Existing             | Office           | Space Heat Boiler | Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning                          | No Commissioning                       | 0.23                        | 12.5%              | 90%   | 40%                                 | 3            | \$10354      |
| Existing             | Office           | Space Heat Boiler | Direct Digital Control System-Installation                          | DDC Retrofit (Morning Warm-Up Control Logic Included in This Measure) | Pneumatic                              | 0.23                        | 5.0%               | 5%  | 28%                                 | 15           | \$14593      |
| Existing             | Office           | Space Heat Boiler | Direct Digital Control System-Optimization                          | Premium-Efficiency EMS System   | High-Efficiency EMS System             | 0.23                        | 10.0%              | 75%   | 80%                                 | 5            | \$28288      |

| Construction Vintage | Customer Segment | End Use      | Measure Name   | Measure Description  | Base Equipment                            | Baseline therm (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------|--|--|---|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Office           | Space Boiler | Heat Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control  | Pneumatic                                 | 0.23                        | 15.0%                         | 75%   | 80%                                 | 5            | \$20414      |
| Existing             | Office           | Space Boiler | Heat Duct Repair And Sealing                                       | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses     | 0.23                        | 2.5%                          | 45%   | 45%                                 | 18           | \$21013      |
| Existing             | Office           | Space Boiler | Heat Exhaust Air to Ventilation Air Heat Recovery                  | Exhaust Air Heat Recovery  | No Heat Recovery                          | 0.23                        | 15.0%                         | 5%  | 94%                                 | 10           | \$47646      |
| Existing             | Office           | Space Boiler | Heat Infiltration Control (Caulking, Weather Stripping, etc.)      | Install Caulking And Weatherstripping (ACH 0.65)   | Infiltration Conditions (ACH 1.0)         | 0.23                        | 10.0%                         | 40%   | 10%                                 | 10           | \$12298      |
| Existing             | Office           | Space Boiler | Heat Insulation (Ceiling)  | R-21 (Code)  | Existing Ceiling Insulation (Average R-9) | 0.23                        | 1.8%                          | 75%   | 4%                                  | 25           | \$8,011      |
| Existing             | Office           | Space Boiler | Heat Insulation (Ceiling)  | R-21 (Code)  | R-0                                       | 0.23                        | 5.0%                          | 75%   | 0%                                  | 25           | \$8,011      |
| Existing             | Office           | Space Boiler | Heat Insulation (Ceiling)  | R-38   | R-21 (Code)                               | 0.23                        | 2.0%                          | 75%   | 25%                                 | 25           | \$6,829      |
| Existing             | Office           | Space Boiler | Heat Insulation (Ceiling)  | R-49   | R-21 (Code)                               | 0.23                        | 3.0%                          | 75%   | 65%                                 | 25           | \$9,062      |
| Existing             | Office           | Space Boiler | Heat Insulation (Duct) (Unconditioned Spaces)                      | Install New Duct Insulation (R-8)  | R-0                                       | 0.23                        | 4.4%                          | 10%   | 15%                                 | 25           | \$5,873      |
| Existing             | Office           | Space Boiler | Heat Insulation (Duct) (Unconditioned Spaces)                      | R-4  | R-0                                       | 0.23                        | 2.4%                          | 10%   | 15%                                 | 25           | \$6,120      |
| Existing             | Office           | Space Boiler | Heat Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)               | 0.23                        | 6.0%                          | 10%   | 95%                                 | 25           | \$11089      |
| Existing             | Office           | Space Boiler | Heat Insulation (Wall) - Existing to Code                          | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)            | 0.23                        | 21.1%                         | 10%   | 35%                                 | 25           | \$12009      |
| Existing             | Office           | Space Boiler | Heat Insulation (Wall) - Zero to Code                              | R-19 (2x6 Framing) - (Code)  | R-0                                       | 0.23                        | 25.0%                         | 10%   | 0%                                  | 25           | \$12009      |
| Existing             | Office           | Space Boiler | Heat Insulation - Floor (Non-Slab)                                 | R-10 (Code)  | R-0                                       | 0.23                        | 3.8%                          | 35%   | 15%                                 | 25           | \$6,829      |
| Existing             | Office           | Space Boiler | Heat Insulation - Floor (Non-Slab)                                 | R-19   | R-10 (Code)                               | 0.23                        | 1.3%                          | 35%   | 15%                                 | 25           | \$1,182      |
| Existing             | Office           | Space Boiler | Heat Sensible And Total Heat Recovery Devices                      | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness | No Heat Recovery                          | 0.23                        | 25.0%                         | 25%   | 98%                                 | 10           | 110841       |
| Existing             | Office           | Space Boiler | Heat Steam Pipe Insulation   | R-4  | R-0                                       | 0.23                        | 12.1%                         | 75%   | 65%                                 | 20           | \$3,404      |
| Existing             | Office           | Space Boiler | Heat Steam Trap Maintenance  | Actively stop steam trap leaks   | No Maintenance                            | 0.23                        | 17.0%                         | 90%   | 45%                                 | 3            | \$7,092      |
| Existing             | Office           | Space Boiler | Heat Thermostat - Programmable                                     | Energy Star Programmable Thermostat  | Manual Thermostat                         | 0.23                        | 3.0%                          | 95%   | 67%                                 | 15           | \$147        |

| Construction Vintage | Customer Segment | End Use            | Measure Name   | Measure Description                              | Base Equipment                              | Baseline therm (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|--------------------|--|--|---|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| Existing             | Office           | Space Heat Boiler  | Windows  | U = 0.35   | U = 0.55 (Code)                             | 0.23                        | 4.8%                          | 80%   | 95%                                 | 25           | \$54732      |         |
| Existing             | Office           | Space Heat Boiler  | Windows - Existing to Code                               | U = 0.55 (Code)                                  | Existing Windows (U=0.65)                   | 0.23                        | 3.2%                          | 10%   | 95%                                 | 25           | 154536       |         |
| Existing             | Office           | Space Heat Furnace | Gas Furnace  | AFUE = 90% (Condensing Furnace)                  | AFUE=80%                                    | 0.34                        | 11.1%                         | NA  | NA                                  | 18           | \$11399      |         |
| Existing             | Office           | Space Heat Furnace | Gas Furnace  | AFUE = 94% (Condensing Furnace)                  | AFUE=80%                                    | 0.34                        | 14.9%                         | NA  | NA                                  | 18           | \$11399      |         |
| Existing             | Office           | Space Heat Furnace | Automated Ventilation Sensors / CO2 Sensors              | VFD Control (Occupancy Sensors / CO2 Sensors)    | Demand Controlled Ventilation (CO2 Sensors) | Constant Ventilation        | 0.34                          | 10.0%   | 75%                                 | 94%          | 15           | \$33095 |
| Existing             | Office           | Space Heat Furnace | Commissioning - Retro Building                           | Commissioning - Retro Building                   | Commissioning                               | No Commissioning            | 0.34                          | 12.5%   | 90%                                 | 80%          | 3            | \$10354 |
| Existing             | Office           | Space Heat Furnace | Duct Repair And Sealing                                  | Reduction In Duct Losses to 5%                   | No Repair or Sealing, 15% duct losses       | 0.34                        | 2.5%                          | 45%   | 45%                                 | 18           | \$21013      |         |
| Existing             | Office           | Space Heat Furnace | Exhaust Air to Ventilation                               | Air Heat Recovery                                | Exhaust Air Heat Recovery                   | No Heat Recovery            | 0.34                          | 15.0%   | 5%                                  | 94%          | 10           | \$47646 |
| Existing             | Office           | Space Heat Furnace | Infiltration Control (Caulking, Weather Stripping, etc.) | Install Caulking And Weatherstripping (ACH 0.65) | Infiltration Conditions (ACH 1.0)           | 0.34                        | 10.0%                         | 40%   | 10%                                 | 10           | \$12298      |         |
| Existing             | Office           | Space Heat Furnace | Insulation (Ceiling)                                     | R-21 (Code)                                      | Existing Ceiling Insulation (Average R-9)   | 0.34                        | 1.8%                          | 75%   | 4%                                  | 25           | \$8,011      |         |
| Existing             | Office           | Space Heat Furnace | Insulation (Ceiling)                                     | R-21 (Code)                                      | R-0   | 0.34                        | 5.0%                          | 75%   | 0%                                  | 25           | \$8,011      |         |
| Existing             | Office           | Space Heat Furnace | Insulation (Ceiling)                                     | R-38   | R-21 (Code)                                 | 0.34                        | 2.0%                          | 75%   | 25%                                 | 25           | \$6,829      |         |
| Existing             | Office           | Space Heat Furnace | Insulation (Ceiling)                                     | R-49   | R-21 (Code)                                 | 0.34                        | 3.0%                          | 75%   | 65%                                 | 25           | \$9,062      |         |
| Existing             | Office           | Space Heat Furnace | Insulation (Duct) (Unconditioned Spaces)                 | Install New Duct Insulation (R-8)                | R-0   | 0.34                        | 4.4%                          | 10%   | 15%                                 | 25           | \$5,873      |         |
| Existing             | Office           | Space Heat Furnace | Insulation (Duct) (Unconditioned Spaces)                 | R-4  | R-0   | 0.34                        | 2.4%                          | 10%   | 15%                                 | 25           | \$6,120      |         |
| Existing             | Office           | Space Heat Furnace | Insulation (Wall)  | R-25 (2x6 Framing) - Advanced                    | R-19 (2x6 Framing) - (Code)                 | 0.34                        | 6.0%                          | 10%   | 95%                                 | 25           | \$11089      |         |
| Existing             | Office           | Space Heat Furnace | Insulation (Wall) - Existing to Code                     | R-19 (2x6 Framing) - (Code)                      | Existing R-value (Average R-3)              | 0.34                        | 21.1%                         | 10%   | 35%                                 | 25           | \$12009      |         |
| Existing             | Office           | Space Heat Furnace | Insulation (Wall) - Zero to Code                         | R-19 (2x6 Framing) - (Code)                      | R-0   | 0.34                        | 25.0%                         | 10%   | 0%                                  | 25           | \$12009      |         |
| Existing             | Office           | Space Heat Furnace | Insulation - Floor (Non-Slab)                            | R-10 (Code)                                      | R-0   | 0.34                        | 3.8%                          | 35%   | 15%                                 | 25           | \$6,829      |         |

| Construction Vintage | Customer Segment | End Use            | Measure Name                                 | Measure Description   | Base Equipment   | Baseline therm (UEC or EUI) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------------|--|---|--|-----------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Office           | Space Heat Furnace | Insulation - Floor (Non-Slab)                | R-19  | R-10 (Code)  | 0.34                        | 1.3%                      | 35%   | 15%                                 | 25           | \$1,182      |
| Existing             | Office           | Space Heat Furnace | Thermostat - Programmable                    | Energy Star Programmable Thermostat                               | Manual Thermostat  | 0.34                        | 3.0%                      | 95%   | 67%                                 | 15           | \$147        |
| Existing             | Office           | Space Heat Furnace | Windows                                      | U = 0.35  | U = 0.55 (Code)  | 0.34                        | 4.8%                      | 80%   | 95%                                 | 25           | \$54732      |
| Existing             | Office           | Space Heat Furnace | Windows - Existing to Code                   | U = 0.55 (Code)   | Existing Windows (U=0.65)                                  | 0.34                        | 3.2%                      | 10%   | 95%                                 | 25           | 154536       |
| Existing             | Office           | Water Heat         | Water Heater - Condensing                    | EF = 0.90   | EF = 0.59  | 0.04                        | 34.4%                     | NA  | NA                                  | 13           | \$5,437      |
| Existing             | Office           | Water Heat         | Clothes Washer - Ozonating                   | Ozonating Clothes Washer  | Standard Commercial Clothes Washer                         | 0.04                        | 15.1%                     | 5%  | 95%                                 | 10           | \$8,704      |
| Existing             | Office           | Water Heat         | Clothes Washer Commercial                    | Energy Star Commercial Clothes Washer MEF=1.73                    | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.04                        | 0.6%                      | 5%  | 75%                                 | 10           | \$305        |
| Existing             | Office           | Water Heat         | Demand controlled Circulating Systems        | Demand Controlled Circulating Systems (VFD Control by Demand)     | Constant Circulation                                       | 0.04                        | 5.0%                      | 55%   | 80%                                 | 15           | \$14593      |
| Existing             | Office           | Water Heat         | Dishwashing - Commercial - High Efficiency   | High Efficiency Dishwasher  | Standard Dishwasher  | 0.04                        | 3.0%                      | 10%   | 80%                                 | 13           | \$2,700      |
| Existing             | Office           | Water Heat         | Dishwashing - Commercial Chemical System     | Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)     | High Temp Commercial Dishwasher                            | 0.04                        | 6.0%                      | 10%   | 95%                                 | 10           | \$841        |
| Existing             | Office           | Water Heat         | Dishwashing - Residential Sized System       | EF = 0.65 (ENERGY STAR)   | Existing Dishwasher (FED Std. EF=0.46)                     | 0.04                        | 0.4%                      | 15%   | 25%                                 | 13           | \$32         |
| Existing             | Office           | Water Heat         | Dishwashing - Residential Sized System       | EF = 0.77   | Existing Dishwasher (FED Std. EF=0.46)                     | 0.04                        | 0.6%                      | 15%   | 55%                                 | 13           | \$630        |
| Existing             | Office           | Water Heat         | Drainwater Heat Recovery (Power-Pipe or GFX) | Install Power-Pipe or GFX System                                  | No GFX or Power-Pipe System                                | 0.04                        | 20.0%                     | 5%  | 92%                                 | 25           | \$4,203      |
| Existing             | Office           | Water Heat         | Faucet Aerators                              | 1.5 GPM Aerator   | 2.5 GPM Aerator (Federal Code)                             | 0.04                        | 4.0%                      | 95%   | 25%                                 | 10           | \$0          |
| Existing             | Office           | Water Heat         | Faucet Aerators - Existing to Code           | 2.5 GPM Aerator (Federal Code)                                    | 4.0 GPM Aerator  | 0.04                        | 3.8%                      | 95%   | 15%                                 | 10           | \$0          |
| Existing             | Office           | Water Heat         | Hot Water (SHW) Pipe Insulation              | Install Insulation (R-4)  | No Pipe Insulation   | 0.04                        | 1.0%                      | 75%   | 30%                                 | 15           | \$557        |
| Existing             | Office           | Water Heat         | Low-Flow Showerheads                         | 2.0 GPM Showerhead  | 2.5 GPM Showerhead (Federal Code)                          | 0.04                        | 1.1%                      | 15%   | 75%                                 | 10           | \$5          |
| Existing             | Office           | Water Heat         | Low-Flow Showerheads - Existing to Code      | 2.5 GPM Showerhead (Federal Code)                                 | 4.5 GPM Showerhead   | 0.04                        | 2.5%                      | 15%   | 20%                                 | 10           | \$11         |
| Existing             | Office           | Water Heat         | Refrigeration with Heat Recovery             | Heat Recovery from Refrigeration System. Applied to Water Heating | No Heat Recovery   | 0.04                        | 28.0%                     | 75%   | 92%                                 | 16           | \$47803      |
| Existing             | Office           | Water Heat         | Solar RE - Solar Water Heater                | Passive solar water heating                                       | Standard Water Heater EF = 0.93                            | 0.04                        | 55.8%                     | 20%   | 95%                                 | 20           | \$93758      |
| Existing             | Office           | Water Heat         | Tankless Water Heater - Commercial           | EF = 0.82   | Thermal Efficiency = 80%                                   | 0.04                        | 30.0%                     | 25%   | 90%                                 | 14           | \$2,264      |
| Existing             | Office           | Water Heat         | Tankless Water Heater - Residential          | EF = 0.82   | EF = 0.59 (40 Gal)   | 0.04                        | 28.0%                     | 25%   | 90%                                 | 20           | \$699        |
| Existing             | Office           | Water Heat         | Ultrasonic Faucet Control                    | Install Ultrasonic Motion Faucet Control                          | No Faucet Control  | 0.04                        | 3.3%                      | 95%   | 85%                                 | 10           | \$205        |

| Construction Vintage | Customer Segment | End Use            | Measure Name  | Measure Description  | Base Equipment                        | Baseline therm (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------------|---|--|---------------------------------------|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Office           | Water Heat         | Water Heater Thermostat Setback                                     | Thermostat Setback and Replcement (120 Degrees)  | No Thermostat Setback (130 Degrees)   | 0.04                        | 7.7%                          | 75%   | 40%                                 | 11           | \$809        |
| New                  | Office           | Space Heat Boiler  | Gas Boiler - Greater than 300 kBTUH                                 | 85% Thermal Efficiency   | 80% Thermal Efficiency (State Code)   | 0.11                        | 5.9%                          | NA  | NA                                  | 20           | \$10979      |
| New                  | Office           | Space Heat Boiler  | Gas Boiler - Greater than 300 kBTUH                                 | 90% Thermal Efficiency   | 80% Thermal Efficiency (State Code)   | 0.11                        | 11.1%                         | NA  | NA                                  | 20           | \$22399      |
| New                  | Office           | Space Heat Boiler  | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 Sensors)  | Constant Ventilation                  | 0.11                        | 10.0%                         | 75%   | 94%                                 | 15           | \$33095      |
| New                  | Office           | Space Heat Boiler  | Boiler Economizer   | Economizer   | No Economizer                         | 0.11                        | 5.5%                          | 40%   | 45%                                 | 20           | \$39813      |
| New                  | Office           | Space Heat Boiler  | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning   | No Commissioning                      | 0.11                        | 12.5%                         | 90%   | 40%                                 | 3            | \$38348      |
| New                  | Office           | Space Heat Boiler  | Direct Digital Control System-Optimization                          | Premium-Efficiency EMS System  | High-Efficiency EMS System            | 0.11                        | 10.0%                         | 75%   | 80%                                 | 5            | \$28288      |
| New                  | Office           | Space Heat Boiler  | Duct Repair And Sealing   | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses | 0.11                        | 2.5%                          | 45%   | 45%                                 | 18           | \$21013      |
| New                  | Office           | Space Heat Boiler  | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery  | No Heat Recovery                      | 0.11                        | 15.0%                         | 5%  | 94%                                 | 10           | \$47646      |
| New                  | Office           | Space Heat Boiler  | Insulation (Ceiling)  | R-38   | R-21 (Code)                           | 0.11                        | 2.0%                          | 75%   | 25%                                 | 25           | \$6,829      |
| New                  | Office           | Space Heat Boiler  | Insulation (Ceiling)  | R-49   | R-21 (Code)                           | 0.11                        | 3.0%                          | 75%   | 65%                                 | 25           | \$9,062      |
| New                  | Office           | Space Heat Boiler  | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)           | 0.11                        | 6.0%                          | 95%   | 95%                                 | 25           | \$11089      |
| New                  | Office           | Space Heat Boiler  | Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)                           | 0.11                        | 1.3%                          | 35%   | 15%                                 | 25           | \$1,182      |
| New                  | Office           | Space Heat Boiler  | Integrated Space Heating/Water Heating                              | Integrated System  | Separate Boiler And HW Heater         | 0.11                        | 5.0%                          | 50%   | 95%                                 | 15           | \$31419      |
| New                  | Office           | Space Heat Boiler  | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                  | 0.11                        | 10.0%                         | 40%   | 98%                                 | 25           | \$8,142      |
| New                  | Office           | Space Heat Boiler  | Sensible And Total Heat Recovery Devices                            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness | No Heat Recovery                      | 0.11                        | 25.0%                         | 50%   | 98%                                 | 10           | 110841       |
| New                  | Office           | Space Heat Boiler  | Thermostat - Programmable   | Energy Star Programmable Thermostat  | Manual Thermostat                     | 0.11                        | 3.0%                          | 95%   | 67%                                 | 15           | \$147        |
| New                  | Office           | Space Heat Boiler  | Windows   | U = 0.35   | U = 0.55 (Code)                       | 0.11                        | 4.8%                          | 80%   | 95%                                 | 25           | \$54732      |
| New                  | Office           | Space Heat Furnace | Gas Furnace   | AFUE = 90% (Condensing Furnace)  | AFUE=80%                              | 0.17                        | 11.1%                         | NA  | NA                                  | 18           | \$11399      |



| Construction Vintage | Customer Segment | End Use            | Measure Name  | Measure Description  | Base Equipment   | Baseline therm (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------------|---|--|--|----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Office           | Space Heat Furnace | Gas Furnace   | AFUE = 94% (Condensing Furnace)                                | AFUE=80%   | 0.17                       | 14.9%                         | NA  | NA                                  | 18           | \$11399      |
| New                  | Office           | Space Heat Furnace | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 Sensors)                    | Constant Ventilation                                       | 0.17                       | 10.0%                         | 75%   | 94%                                 | 15           | \$33095      |
| New                  | Office           | Space Heat Furnace | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning                     | No Commissioning   | 0.17                       | 12.5%                         | 90%   | 80%                                 | 3            | \$38348      |
| New                  | Office           | Space Heat Furnace | Duct Repair And Sealing   | Reduction In Duct Losses to 5%                                 | No Repair or Sealing, 15% duct losses                      | 0.17                       | 2.5%                          | 45%   | 45%                                 | 18           | \$21013      |
| New                  | Office           | Space Heat Furnace | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery                                      | No Heat Recovery   | 0.17                       | 15.0%                         | 5%  | 94%                                 | 10           | \$47646      |
| New                  | Office           | Space Heat Furnace | Insulation (Ceiling)  | R-38   | R-21 (Code)  | 0.17                       | 2.0%                          | 75%   | 25%                                 | 25           | \$6,829      |
| New                  | Office           | Space Heat Furnace | Insulation (Ceiling)  | R-49   | R-21 (Code)  | 0.17                       | 3.0%                          | 75%   | 65%                                 | 25           | \$9,062      |
| New                  | Office           | Space Heat Furnace | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced                                  | R-19 (2x6 Framing) - (Code)                                | 0.17                       | 6.0%                          | 95%   | 95%                                 | 25           | \$11089      |
| New                  | Office           | Space Heat Furnace | Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)  | 0.17                       | 1.3%                          | 35%   | 15%                                 | 25           | \$1,182      |
| New                  | Office           | Space Heat Furnace | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands | Std duct workmanship                                       | 0.17                       | 10.0%                         | 40%   | 98%                                 | 25           | \$8,142      |
| New                  | Office           | Space Heat Furnace | Thermostat - Programmable   | Energy Star Programmable Thermostat                            | Manual Thermostat  | 0.17                       | 3.0%                          | 95%   | 67%                                 | 15           | \$147        |
| New                  | Office           | Space Heat Furnace | Windows   | U = 0.35   | U = 0.55 (Code)  | 0.17                       | 4.8%                          | 80%   | 95%                                 | 25           | \$54732      |
| New                  | Office           | Water Heat         | Water Heater - Condensing   | EF = 0.90  | EF = 0.59  | 0.04                       | 34.4%                         | NA  | NA                                  | 13           | \$5,437      |
| New                  | Office           | Water Heat         | Clothes Washer - Ozonating  | Ozonating Clothes Washer                                       | Standard Commercial Clothes Washer                         | 0.04                       | 15.1%                         | 5%  | 95%                                 | 10           | \$8,704      |
| New                  | Office           | Water Heat         | Clothes Washer Commercial   | Energy Star Commercial Clothes Washer MEF=1.73                 | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.04                       | 0.6%                          | 5%  | 75%                                 | 10           | \$305        |
| New                  | Office           | Water Heat         | Demand controlled Circulating Systems                               | Demand Controlled Circulating Systems (VFD Control by Demand)  | Constant Circulation                                       | 0.04                       | 5.0%                          | 55%   | 80%                                 | 15           | \$14593      |
| New                  | Office           | Water Heat         | Dishwashing - Commercial - High Efficiency                          | High Efficiency Dishwasher                                     | Standard Dishwasher  | 0.04                       | 3.0%                          | 10%   | 80%                                 | 13           | \$2,700      |
| New                  | Office           | Water Heat         | Dishwashing - Commercial Chemical System                            | Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)  | High Temp Commercial Dishwasher                            | 0.04                       | 6.0%                          | 10%   | 95%                                 | 10           | \$841        |
| New                  | Office           | Water Heat         | Dishwashing - Residential Sized System                              | EF = 0.65 (ENERGY STAR)  | Existing Dishwasher (FED Std. EF=0.46)                     | 0.04                       | 0.4%                          | 15%   | 25%                                 | 13           | \$32         |
| New                  | Office           | Water Heat         | Dishwashing - Residential Sized System                              | EF = 0.77  | Existing Dishwasher (FED Std. EF=0.46)                     | 0.04                       | 0.5%                          | 15%   | 55%                                 | 13           | \$630        |

| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description   | Base Equipment                        | Baseline therm (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|---|---------------------------------------|----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Office           | Water Heat | Drainwater Heat Recovery (Power-Pipe or GFX)                        | Install Power-Pipe or GFX System                                      | No GFX or Power-Pipe System           | 0.04                       | 20.0%                         | 25%   | 92%                                 | 25           | \$4,203      |
| New                  | Office           | Water Heat | Faucet Aerators   | 1.5 GPM Aerator   | 2.5 GPM Aerator (Federal Code)        | 0.04                       | 4.0%                          | 95%   | 25%                                 | 10           | \$0          |
| New                  | Office           | Water Heat | Integrated Space Heating/Water Heating                              | Integrated System   | Separate Boiler And HW Heater         | 0.04                       | 5.0%                          | 50%   | 95%                                 | 15           | \$31419      |
| New                  | Office           | Water Heat | Low-Flow Showerheads  | 2.0 GPM Showerhead  | 2.5 GPM Showerhead (Federal Code)     | 0.04                       | 1.1%                          | 15%   | 75%                                 | 10           | \$5          |
| New                  | Office           | Water Heat | Refrigeration with Heat Recovery                                    | Heat Recovery from Refrigeration System. Applied to Water Heating     | No Heat Recovery                      | 0.04                       | 28.0%                         | 75%   | 92%                                 | 16           | \$26791      |
| New                  | Office           | Water Heat | Solar RE - Solar Water Heater                                       | Passive solar water heating   | Standard Water Heater EF = 0.93       | 0.04                       | 55.8%                         | 20%   | 95%                                 | 20           | \$93758      |
| New                  | Office           | Water Heat | Tankless Water Heater - Commercial                                  | EF = 0.82   | Thermal Efficiency = 80%              | 0.04                       | 30.0%                         | 25%   | 90%                                 | 14           | \$2,264      |
| New                  | Office           | Water Heat | Tankless Water Heater - Residential                                 | EF = 0.82   | EF = 0.59 (40 Gal)                    | 0.04                       | 28.0%                         | 25%   | 90%                                 | 20           | \$699        |
| New                  | Office           | Water Heat | Ultrasonic Faucet Control   | Install Ultrasonic Motion Faucet Control                              | No Faucet Control                     | 0.04                       | 3.3%                          | 95%   | 85%                                 | 10           | \$205        |
| New                  | Office           | Water Heat | Water Heater Thermostat Setback                                     | Thermostat Setback and Replcement (120 Degrees)                       | No Thermostat Setback (130 Degrees)   | 0.04                       | 7.7%                          | 75%   | 40%                                 | 11           | \$809        |
| Existing             | Other            | Cooking    | Broiler   | High-Efficiency Broiler (34% Efficient)                               | Standard Broiler (15% Efficient)      | 0.04                       | 1.9%                          | 95%   | 75%                                 | 10           | \$210        |
| Existing             | Other            | Cooking    | Fryers - Commercial Gas Cooking                                     | Energy Star Commercial Fryer (50% efficient)                          | Non-Energy Star Fryer (35% efficient) | 0.04                       | 3.1%                          | 20%   | 65%                                 | 8            | \$1,112      |
| Existing             | Other            | Cooking    | Griddle   | High-Efficiency Griddle (40% Efficient)                               | Standard Griddle (32% Efficient)      | 0.04                       | 0.3%                          | 20%   | 75%                                 | 12           | \$1,225      |
| Existing             | Other            | Cooking    | Oven - Convection   | Convection Oven   | Standard Oven                         | 0.04                       | 1.2%                          | 85%   | 85%                                 | 12           | \$419        |
| Existing             | Other            | Cooking    | Oven - Conveyor   | High-Efficiency Model (23% Efficient)                                 | Standard Model (15% Efficient)        | 0.04                       | 10.4%                         | 5%  | 85%                                 | 10           | \$3,541      |
| Existing             | Other            | Cooking    | Oven - Power Burner   | Power Burner Oven - Improved Atmospheric Burner (60% Efficient)       | Standard (40%-50% Efficiency)         | 0.04                       | 3.8%                          | 5%  | 90%                                 | 12           | \$5,359      |
| Existing             | Other            | Cooking    | Steam Cooker  | Energy Star Steam Cooker (38% Efficient)                              | Standard Cooker (30% Efficient)       | 0.04                       | 6.9%                          | 15%   | 75%                                 | 10           | \$2,180      |
| Existing             | Other            | Space Heat | Gas Boiler - Greater than 300 KBTUH                                 | 85% Thermal Efficiency  | 80% Thermal Efficiency (State Code)   | 0.15                       | 5.9%                          | NA  | NA                                  | 20           | \$1,902      |
| Existing             | Other            | Space Heat | Gas Boiler - Greater than 300 KBTUH                                 | 90% Thermal Efficiency  | 80% Thermal Efficiency (State Code)   | 0.15                       | 11.1%                         | NA  | NA                                  | 20           | \$3,881      |
| Existing             | Other            | Space Heat | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 Sensors)                           | Constant Ventilation                  | 0.15                       | 10.0%                         | 50%   | 94%                                 | 15           | \$13900      |
| Existing             | Other            | Space Heat | Boiler Economizer   | Economizer  | No Economizer                         | 0.15                       | 5.5%                          | 40%   | 90%                                 | 20           | \$7,696      |
| Existing             | Other            | Space Heat | Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning                          | No Commissioning                      | 0.15                       | 12.5%                         | 90%   | 40%                                 | 3            | \$4,349      |
| Existing             | Other            | Space Heat | Direct Digital Control System-Installation                          | DDC Retrofit (Morning Warm-Up Control Logic Included in This Measure) | Pneumatic                             | 0.15                       | 5.0%                          | 45%   | 66%                                 | 15           | \$6,129      |

| Construction Vintage | Customer Segment | End Use      | Measure Name | Measure Description   | Base Equipment   | Baseline therm (UEC or EU)                  | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|--------------|--------------|---|--|---|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| Existing             | Other            | Space Boiler | Heat         | Direct Digital Control System-Optimization                    | Premium-Efficiency EMS System  | High-Efficiency EMS System                  | 0.15                          | 10.0%   | 75%                                 | 80%          | 5            | \$11881 |
| Existing             | Other            | Space Boiler | Heat         | Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control  | Pneumatic                                   | 0.15                          | 15.0%   | 50%                                 | 80%          | 5            | \$8,574 |
| Existing             | Other            | Space Boiler | Heat         | Duct Repair And Sealing                                       | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 0.15                          | 2.5%  | 45%                                 | 45%          | 18           | \$8,825 |
| Existing             | Other            | Space Boiler | Heat         | Exhaust Air to Ventilation Air Heat Recovery                  | Exhaust Air Heat Recovery  | No Heat Recovery                            | 0.15                          | 15.0%   | 5%                                  | 94%          | 10           | \$20011 |
| Existing             | Other            | Space Boiler | Heat         | Exhaust Hood Makeup Air                                       | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air) | 0.15                          | 4.5%  | 5%                                  | 85%          | 10           | \$5,725 |
| Existing             | Other            | Space Boiler | Heat         | Infiltration Control (Caulking, Weather Stripping, etc.)      | Install Caulking And Weatherstripping (ACH 0.65)   | Infiltration Conditions (ACH 1.0)           | 0.15                          | 10.0%   | 40%                                 | 10%          | 10           | \$5,165 |
| Existing             | Other            | Space Boiler | Heat         | Insulation (Ceiling)  | R-21 (Code)  | Existing Ceiling Insulation (Average R-9)   | 0.15                          | 7.2%  | 75%                                 | 30%          | 25           | \$13459 |
| Existing             | Other            | Space Boiler | Heat         | Insulation (Ceiling)  | R-21 (Code)  | R-0   | 0.15                          | 20.0%   | 75%                                 | 0%           | 25           | \$13459 |
| Existing             | Other            | Space Boiler | Heat         | Insulation (Ceiling)  | R-38   | R-21 (Code)                                 | 0.15                          | 8.0%  | 75%                                 | 45%          | 25           | \$11473 |
| Existing             | Other            | Space Boiler | Heat         | Insulation (Ceiling)  | R-49   | R-21 (Code)                                 | 0.15                          | 12.0%   | 75%                                 | 85%          | 25           | \$15224 |
| Existing             | Other            | Space Boiler | Heat         | Insulation (Duct) (Unconditioned Spaces)                      | Install New Duct Insulation (R-8)  | R-0   | 0.15                          | 4.4%  | 10%                                 | 15%          | 25           | \$2,467 |
| Existing             | Other            | Space Boiler | Heat         | Insulation (Duct) (Unconditioned Spaces)                      | R-4  | R-0   | 0.15                          | 2.4%  | 10%                                 | 15%          | 25           | \$2,570 |
| Existing             | Other            | Space Boiler | Heat         | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 0.15                          | 6.0%  | 10%                                 | 95%          | 25           | \$3,594 |
| Existing             | Other            | Space Boiler | Heat         | Insulation (Wall) - Existing to Code                          | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)              | 0.15                          | 21.1%   | 10%                                 | 35%          | 25           | \$3,892 |
| Existing             | Other            | Space Boiler | Heat         | Insulation (Wall) - Zero to Code                              | R-19 (2x6 Framing) - (Code)  | R-0   | 0.15                          | 25.0%   | 10%                                 | 0%           | 25           | \$3,892 |
| Existing             | Other            | Space Boiler | Heat         | Insulation - Floor (Non-Slab)                                 | R-10 (Code)  | R-0   | 0.15                          | 15.0%   | 35%                                 | 50%          | 25           | \$11473 |
| Existing             | Other            | Space Boiler | Heat         | Insulation - Floor (Non-Slab)                                 | R-19   | R-10 (Code)                                 | 0.15                          | 5.0%  | 35%                                 | 50%          | 25           | \$1,986 |
| Existing             | Other            | Space Boiler | Heat         | Sensible And Total Heat Recovery Devices                      | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness | No Heat Recovery                            | 0.15                          | 25.0%   | 25%                                 | 98%          | 10           | \$46553 |
| Existing             | Other            | Space Boiler | Heat         | Steam Pipe Insulation   | R-4  | R-0   | 0.15                          | 12.1%   | 75%                                 | 65%          | 20           | \$2,206 |

| Construction Vintage | Customer Segment | End Use       | Measure Name | Measure Description   | Base Equipment   | Baseline therm (UEC or EU)                  | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|---------------|--------------|---|--|---|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| Existing             | Other            | Space Boiler  | Heat         | Steam Trap Maintenance  | Actively stop steam trap leaks   | No Maintenance                              | 0.15                          | 17.0%   | 90%                                 | 45%          | 3            | \$2,979 |
| Existing             | Other            | Space Boiler  | Heat         | Thermostat - Programmable   | Energy Star Programmable Thermostat  | Manual Thermostat                           | 0.15                          | 3.0%  | 95%                                 | 63%          | 15           | \$146   |
| Existing             | Other            | Space Boiler  | Heat         | Windows   | U = 0.35   | U = 0.55 (Code)                             | 0.15                          | 3.5%  | 80%                                 | 70%          | 25           | \$10884 |
| Existing             | Other            | Space Boiler  | Heat         | Windows - Existing to Code  | U = 0.55 (Code)  | Existing Windows (U=0.65)                   | 0.15                          | 2.3%  | 10%                                 | 70%          | 25           | \$30732 |
| Existing             | Other            | Space Furnace | Heat         | Gas Furnace   | AFUE = 90% (Condensing Furnace)  | AFUE=80%                                    | 0.22                          | 11.1%   | NA                                  | NA           | 18           | \$1,975 |
| Existing             | Other            | Space Furnace | Heat         | Gas Furnace   | AFUE = 94% (Condensing Furnace)  | AFUE=80%                                    | 0.22                          | 14.9%   | NA                                  | NA           | 18           | \$1,975 |
| Existing             | Other            | Space Furnace | Heat         | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 Sensors)                                    | Constant Ventilation                        | 0.21                          | 10.0%   | 50%                                 | 94%          | 15           | \$13900 |
| Existing             | Other            | Space Furnace | Heat         | Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning                                   | No Commissioning                            | 0.21                          | 12.5%   | 90%                                 | 80%          | 3            | \$4,349 |
| Existing             | Other            | Space Furnace | Heat         | Duct Repair And Sealing   | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 0.21                          | 2.5%  | 45%                                 | 45%          | 18           | \$8,825 |
| Existing             | Other            | Space Furnace | Heat         | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery  | No Heat Recovery                            | 0.21                          | 15.0%   | 5%                                  | 94%          | 10           | \$20011 |
| Existing             | Other            | Space Furnace | Heat         | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air) | 0.21                          | 4.5%  | 5%                                  | 85%          | 10           | \$5,725 |
| Existing             | Other            | Space Furnace | Heat         | Infiltration Control (Caulking, Weather Stripping, etc.)            | Install Caulking And Weatherstripping (ACH 0.65)                               | Infiltration Conditions (ACH 1.0)           | 0.21                          | 10.0%   | 40%                                 | 10%          | 10           | \$5,165 |
| Existing             | Other            | Space Furnace | Heat         | Insulation (Ceiling)  | R-21 (Code)  | Existing Ceiling Insulation (Average R-9)   | 0.21                          | 7.2%  | 75%                                 | 30%          | 25           | \$13459 |
| Existing             | Other            | Space Furnace | Heat         | Insulation (Ceiling)  | R-21 (Code)  | R-0   | 0.21                          | 20.0%   | 75%                                 | 0%           | 25           | \$13459 |
| Existing             | Other            | Space Furnace | Heat         | Insulation (Ceiling)  | R-38   | R-21 (Code)                                 | 0.21                          | 8.0%  | 75%                                 | 45%          | 25           | \$11473 |
| Existing             | Other            | Space Furnace | Heat         | Insulation (Ceiling)  | R-49   | R-21 (Code)                                 | 0.21                          | 12.0%   | 75%                                 | 85%          | 25           | \$15224 |
| Existing             | Other            | Space Furnace | Heat         | Insulation (Duct) (Unconditioned Spaces)                            | Install New Duct Insulation (R-8)  | R-0   | 0.21                          | 4.4%  | 10%                                 | 15%          | 25           | \$2,467 |
| Existing             | Other            | Space Furnace | Heat         | Insulation (Duct) (Unconditioned Spaces)                            | R-4  | R-0   | 0.21                          | 2.4%  | 10%                                 | 15%          | 25           | \$2,570 |
| Existing             | Other            | Space Furnace | Heat         | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 0.21                          | 6.0%  | 10%                                 | 95%          | 25           | \$3,594 |

| Construction Vintage | Customer Segment | End Use            | Measure Name                                 | Measure Description   | Base Equipment   | Baseline therm (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------------|--|---|--|----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Other            | Space Heat Furnace | Insulation (Wall) - Existing to Code         | R-19 (2x6 Framing) - (Code)                                   | Existing R-value (Average R-3)                             | 0.21                       | 21.1%                         | 10%   | 35%                                 | 25           | \$3,892      |
| Existing             | Other            | Space Heat Furnace | Insulation (Wall) - Zero to Code             | R-19 (2x6 Framing) - (Code)                                   | R-0  | 0.21                       | 25.0%                         | 10%   | 0%                                  | 25           | \$3,892      |
| Existing             | Other            | Space Heat Furnace | Insulation - Floor (Non-Slab)                | R-10 (Code)   | R-0  | 0.21                       | 15.0%                         | 35%   | 50%                                 | 25           | \$11473      |
| Existing             | Other            | Space Heat Furnace | Insulation - Floor (Non-Slab)                | R-19  | R-10 (Code)  | 0.21                       | 5.0%                          | 35%   | 50%                                 | 25           | \$1,986      |
| Existing             | Other            | Space Heat Furnace | Thermostat - Programmable                    | Energy Star Programmable Thermostat                           | Manual Thermostat  | 0.21                       | 3.0%                          | 95%   | 63%                                 | 15           | \$146        |
| Existing             | Other            | Space Heat Furnace | Windows                                      | U = 0.35  | U = 0.55 (Code)  | 0.21                       | 3.5%                          | 80%   | 70%                                 | 25           | \$10884      |
| Existing             | Other            | Space Heat Furnace | Windows - Existing to Code                   | U = 0.55 (Code)   | Existing Windows (U=0.65)                                  | 0.21                       | 2.3%                          | 10%   | 70%                                 | 25           | \$30732      |
| Existing             | Other            | Water Heat         | Water Heater - Condensing                    | EF = 0.90   | EF = 0.59  | 0.03                       | 34.4%                         | NA  | NA                                  | 13           | \$3,444      |
| Existing             | Other            | Water Heat         | Clothes Washer - Ozonating                   | Ozonating Clothes Washer                                      | Standard Commercial Clothes Washer                         | 0.03                       | 15.1%                         | 5%  | 95%                                 | 10           | \$8,704      |
| Existing             | Other            | Water Heat         | Clothes Washer Commercial                    | Energy Star Commercial Clothes Washer MEF=1.73                | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.03                       | 1.7%                          | 5%  | 75%                                 | 10           | \$304        |
| Existing             | Other            | Water Heat         | Demand controlled Circulating Systems        | Demand Controlled Circulating Systems (VFD Control by Demand) | Constant Circulation                                       | 0.03                       | 5.0%                          | 75%   | 94%                                 | 15           | \$6,129      |
| Existing             | Other            | Water Heat         | Dishwashing - Commercial - High Efficiency   | High Efficiency Dishwasher                                    | Standard Dishwasher  | 0.03                       | 3.0%                          | 10%   | 80%                                 | 13           | \$2,701      |
| Existing             | Other            | Water Heat         | Dishwashing - Commercial Chemical System     | Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost) | High Temp Commercial Dishwasher                            | 0.03                       | 6.0%                          | 10%   | 95%                                 | 10           | \$841        |
| Existing             | Other            | Water Heat         | Dishwashing - Residential Sized System       | EF = 0.65 (ENERGY STAR)                                       | Existing Dishwasher (FED Std. EF=0.46)                     | 0.03                       | 1.1%                          | 10%   | 25%                                 | 13           | \$31         |
| Existing             | Other            | Water Heat         | Dishwashing - Residential Sized System       | EF = 0.77   | Existing Dishwasher (FED Std. EF=0.46)                     | 0.03                       | 1.5%                          | 10%   | 55%                                 | 13           | \$631        |
| Existing             | Other            | Water Heat         | Drainwater Heat Recovery (Power-Pipe or GFX) | Install Power-Pipe or GFX System                              | No GFX or Power-Pipe System                                | 0.03                       | 20.0%                         | 5%  | 92%                                 | 25           | \$2,661      |
| Existing             | Other            | Water Heat         | Faucet Aerators                              | 1.5 GPM Aerator   | 2.5 GPM Aerator (Federal Code)                             | 0.03                       | 4.0%                          | 95%   | 25%                                 | 10           | \$0          |
| Existing             | Other            | Water Heat         | Faucet Aerators - Existing to Code           | 2.5 GPM Aerator (Federal Code)                                | 4.0 GPM Aerator  | 0.03                       | 3.8%                          | 95%   | 15%                                 | 10           | \$2          |
| Existing             | Other            | Water Heat         | Hot Water (SHW) Pipe Insulation              | Install Insulation (R-4)                                      | No Pipe Insulation   | 0.03                       | 1.0%                          | 75%   | 90%                                 | 15           | \$234        |
| Existing             | Other            | Water Heat         | Low Flow Spray Heads                         | 1.6 GPM   | 3.0 GPM  | 0.03                       | 2.3%                          | 50%   | 50%                                 | 5            | \$4          |
| Existing             | Other            | Water Heat         | Low-Flow Showerheads                         | 2.0 GPM Showerhead  | 2.5 GPM Showerhead (Federal Code)                          | 0.03                       | 1.1%                          | 15%   | 75%                                 | 10           | \$7          |
| Existing             | Other            | Water Heat         | Low-Flow Showerheads - Existing to Code      | 2.5 GPM Showerhead (Federal Code)                             | 4.5 GPM Showerhead   | 0.03                       | 2.5%                          | 15%   | 20%                                 | 10           | \$11         |

| Construction Vintage | Customer Segment | End Use           | Measure Name  | Measure Description  | Base Equipment                              | Baseline therm (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-------------------|---|--|---|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Other            | Water Heat        | Refrigeration with Heat Recovery                                    | Heat Recovery from Refrigeration System. Applied to Water Heating              | No Heat Recovery                            | 0.03                        | 28.0%                         | 75%   | 100%                                | 16           | \$20077      |
| Existing             | Other            | Water Heat        | Solar RE - Solar Water Heater                                       | Passive solar water heating  | Standard Water Heater EF = 0.93             | 0.03                        | 62.3%                         | 20%   | 95%                                 | 20           | \$35056      |
| Existing             | Other            | Water Heat        | Tankless Water Heater - Commercial                                  | EF = 0.82  | Thermal Efficiency = 80%                    | 0.03                        | 30.0%                         | 25%   | 90%                                 | 14           | \$2,266      |
| Existing             | Other            | Water Heat        | Tankless Water Heater - Residential                                 | EF = 0.82  | EF = 0.59 (40 Gal)                          | 0.03                        | 28.0%                         | 25%   | 90%                                 | 20           | \$697        |
| Existing             | Other            | Water Heat        | Ultrasonic Faucet Control   | Install Ultrasonic Motion Faucet Control                                       | No Faucet Control                           | 0.03                        | 3.3%                          | 95%   | 95%                                 | 10           | \$207        |
| Existing             | Other            | Water Heat        | Water Heater Thermostat Setback                                     | Thermostat Setback and Replcement (120 Degrees)                                | No Thermostat Setback (130 Degrees)         | 0.03                        | 7.7%                          | 75%   | 55%                                 | 11           | \$510        |
| New                  | Other            | Cooking           | Broiler   | High-Efficiency Broiler (34% Efficient)  | Standard Broiler (15% Efficient)            | 0.04                        | 1.9%                          | 95%   | 75%                                 | 10           | \$210        |
| New                  | Other            | Cooking           | Fryers - Commercial Gas Cooking                                     | Energy Star Commercial Fryer (50% efficient)                                   | Non-Energy Star Fryer (35% efficient)       | 0.04                        | 3.1%                          | 20%   | 65%                                 | 8            | \$1,112      |
| New                  | Other            | Cooking           | Griddle   | High-Efficiency Griddle (40% Efficient)  | Standard Griddle (32% Efficient)            | 0.04                        | 0.3%                          | 20%   | 75%                                 | 12           | \$1,225      |
| New                  | Other            | Cooking           | Oven - Convection   | Convection Oven  | Standard Oven                               | 0.04                        | 1.2%                          | 85%   | 85%                                 | 12           | \$419        |
| New                  | Other            | Cooking           | Oven - Conveyor   | High-Efficiency Model (23% Efficient)  | Standard Model (15% Efficient)              | 0.04                        | 10.4%                         | 5%  | 85%                                 | 10           | \$2,833      |
| New                  | Other            | Cooking           | Oven - Power Burner   | Power Burner Oven - Improved Atmospheric Burner (60% Efficient)                | Standard (40%-50% Efficiency)               | 0.04                        | 3.8%                          | 5%  | 90%                                 | 12           | \$5,359      |
| New                  | Other            | Cooking           | Steam Cooker  | Energy Star Steam Cooker (38% Efficient)                                       | Standard Cooker (30% Efficient)             | 0.04                        | 6.9%                          | 15%   | 75%                                 | 10           | \$2,180      |
| New                  | Other            | Space Heat Boiler | Gas Boiler - Greater than 300 kBTUH                                 | 85% Thermal Efficiency   | 80% Thermal Efficiency (State Code)         | 0.08                        | 5.9%                          | NA  | NA                                  | 20           | \$1,902      |
| New                  | Other            | Space Heat Boiler | Gas Boiler - Greater than 300 kBTUH                                 | 90% Thermal Efficiency   | 80% Thermal Efficiency (State Code)         | 0.08                        | 11.1%                         | NA  | NA                                  | 20           | \$3,881      |
| New                  | Other            | Space Heat Boiler | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 Sensors)                                    | Constant Ventilation                        | 0.07                        | 10.0%                         | 50%   | 94%                                 | 15           | \$13900      |
| New                  | Other            | Space Heat Boiler | Boiler Economizer   | Economizer   | No Economizer                               | 0.07                        | 5.5%                          | 40%   | 90%                                 | 20           | \$7,696      |
| New                  | Other            | Space Heat Boiler | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning                                     | No Commissioning                            | 0.07                        | 12.5%                         | 90%   | 40%                                 | 3            | \$16106      |
| New                  | Other            | Space Heat Boiler | Direct Digital Control System-Optimization                          | Premium-Efficiency EMS System  | High-Efficiency EMS System                  | 0.07                        | 10.0%                         | 75%   | 80%                                 | 5            | \$11881      |
| New                  | Other            | Space Heat Boiler | Duct Repair And Sealing   | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 0.07                        | 2.5%                          | 45%   | 45%                                 | 18           | \$8,825      |
| New                  | Other            | Space Heat Boiler | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery  | No Heat Recovery                            | 0.07                        | 15.0%                         | 5%  | 94%                                 | 10           | \$20011      |
| New                  | Other            | Space Heat Boiler | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air) | 0.07                        | 4.5%                          | 5%  | 85%                                 | 10           | \$5,725      |

| Construction Vintage | Customer Segment | End Use       | Measure Name   | Measure Description  | Base Equipment                              | Baseline therm (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|--|--|---|----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Other            | Space Boiler  | Heat Insulation (Ceiling)  | R-38   | R-21 (Code)                                 | 0.07                       | 8.0%                          | 75%   | 45%                                 | 25           | \$11473      |
| New                  | Other            | Space Boiler  | Heat Insulation (Ceiling)  | R-49   | R-21 (Code)                                 | 0.07                       | 12.0%                         | 75%   | 85%                                 | 25           | \$15224      |
| New                  | Other            | Space Boiler  | Heat Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 0.07                       | 6.0%                          | 95%   | 95%                                 | 25           | \$3,594      |
| New                  | Other            | Space Boiler  | Heat Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)                                 | 0.07                       | 5.0%                          | 35%   | 50%                                 | 25           | \$1,986      |
| New                  | Other            | Space Boiler  | Heat Integrated Space Heating/Water Heating                              | Integrated System  | Separate Boiler And HW Heater               | 0.07                       | 5.0%                          | 50%   | 95%                                 | 15           | \$5,445      |
| New                  | Other            | Space Boiler  | Heat Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                        | 0.07                       | 10.0%                         | 40%   | 98%                                 | 25           | \$3,420      |
| New                  | Other            | Space Boiler  | Heat Sensible And Total Heat Recovery Devices                            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness | No Heat Recovery                            | 0.07                       | 25.0%                         | 50%   | 98%                                 | 10           | \$46553      |
| New                  | Other            | Space Boiler  | Heat Thermostat - Programmable   | Energy Star Programmable Thermostat  | Manual Thermostat                           | 0.07                       | 3.0%                          | 95%   | 63%                                 | 15           | \$146        |
| New                  | Other            | Space Boiler  | Heat Windows   | U = 0.35   | U = 0.55 (Code)                             | 0.07                       | 3.5%                          | 80%   | 70%                                 | 25           | \$10884      |
| New                  | Other            | Space Furnace | Heat Gas Furnace   | AFUE = 90% (Condensing Furnace)  | AFUE=80%                                    | 0.11                       | 11.1%                         | NA  | NA                                  | 18           | \$1,975      |
| New                  | Other            | Space Furnace | Heat Gas Furnace   | AFUE = 94% (Condensing Furnace)  | AFUE=80%                                    | 0.11                       | 14.9%                         | NA  | NA                                  | 18           | \$1,975      |
| New                  | Other            | Space Furnace | Heat Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 Sensors)  | Constant Ventilation                        | 0.11                       | 10.0%                         | 50%   | 94%                                 | 15           | \$13900      |
| New                  | Other            | Space Furnace | Heat Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning   | No Commissioning                            | 0.11                       | 12.5%                         | 90%   | 80%                                 | 3            | \$16106      |
| New                  | Other            | Space Furnace | Heat Duct Repair And Sealing   | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 0.11                       | 2.5%                          | 45%   | 45%                                 | 18           | \$8,825      |
| New                  | Other            | Space Furnace | Heat Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery  | No Heat Recovery                            | 0.11                       | 15.0%                         | 5%  | 94%                                 | 10           | \$20011      |
| New                  | Other            | Space Furnace | Heat Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air) | 0.11                       | 4.5%                          | 5%  | 85%                                 | 10           | \$5,725      |
| New                  | Other            | Space Furnace | Heat Insulation (Ceiling)  | R-38   | R-21 (Code)                                 | 0.11                       | 8.0%                          | 75%   | 45%                                 | 25           | \$11473      |
| New                  | Other            | Space Furnace | Heat Insulation (Ceiling)  | R-49   | R-21 (Code)                                 | 0.11                       | 12.0%                         | 75%   | 85%                                 | 25           | \$15224      |
| New                  | Other            | Space Furnace | Heat Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 0.11                       | 6.0%                          | 95%   | 95%                                 | 25           | \$3,594      |

| Construction Vintage | Customer Segment | End Use            | Measure Name                                 | Measure Description   | Base Equipment   | Baseline therm (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------------|--|---|--|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Other            | Space Heat Furnace | Insulation - Floor (Non-Slab)                | R-19  | R-10 (Code)  | 0.11                        | 5.0%                          | 35%   | 50%                                 | 25           | \$1,986      |
| New                  | Other            | Space Heat Furnace | Leak Proof Duct Fittings                     | Quick connect fittings that do not require mastic or drawbands    | Std duct workmanship                                       | 0.11                        | 10.0%                         | 40%   | 98%                                 | 25           | \$3,420      |
| New                  | Other            | Space Heat Furnace | Thermostat - Programmable                    | Energy Star Programmable Thermostat                               | Manual Thermostat  | 0.11                        | 3.0%                          | 95%   | 63%                                 | 15           | \$146        |
| New                  | Other            | Space Heat Furnace | Windows                                      | U = 0.35  | U = 0.55 (Code)  | 0.11                        | 3.5%                          | 80%   | 70%                                 | 25           | \$10884      |
| New                  | Other            | Water Heat         | Water Heater - Condensing                    | EF = 0.90   | EF = 0.59  | 0.03                        | 34.4%                         | NA  | NA                                  | 13           | \$3,444      |
| New                  | Other            | Water Heat         | Clothes Washer - Ozonating                   | Ozonating Clothes Washer  | Standard Commercial Clothes Washer                         | 0.03                        | 15.1%                         | 5%  | 95%                                 | 10           | \$8,704      |
| New                  | Other            | Water Heat         | Clothes Washer Commercial                    | Energy Star Commercial Clothes Washer MEF=1.73                    | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.03                        | 1.7%                          | 5%  | 75%                                 | 10           | \$304        |
| New                  | Other            | Water Heat         | Demand controlled Circulating Systems        | Demand Controlled Circulating Systems (VFD Control by Demand)     | Constant Circulation                                       | 0.03                        | 5.0%                          | 90%   | 94%                                 | 15           | \$6,129      |
| New                  | Other            | Water Heat         | Dishwashing - Commercial - High Efficiency   | High Efficiency Dishwasher  | Standard Dishwasher  | 0.03                        | 3.0%                          | 10%   | 80%                                 | 13           | \$2,701      |
| New                  | Other            | Water Heat         | Dishwashing - Commercial Chemical System     | Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)     | High Temp Commercial Dishwasher                            | 0.03                        | 6.0%                          | 10%   | 95%                                 | 10           | \$841        |
| New                  | Other            | Water Heat         | Dishwashing - Residential Sized System       | EF = 0.65 (ENERGY STAR)   | Existing Dishwasher (FED Std. EF=0.46)                     | 0.03                        | 1.1%                          | 10%   | 25%                                 | 13           | \$31         |
| New                  | Other            | Water Heat         | Dishwashing - Residential Sized System       | EF = 0.77   | Existing Dishwasher (FED Std. EF=0.46)                     | 0.03                        | 1.5%                          | 10%   | 55%                                 | 13           | \$631        |
| New                  | Other            | Water Heat         | Drainwater Heat Recovery (Power-Pipe or GFX) | Install Power-Pipe or GFX System                                  | No GFX or Power-Pipe System                                | 0.03                        | 20.0%                         | 25%   | 92%                                 | 25           | \$2,661      |
| New                  | Other            | Water Heat         | Faucet Aerators                              | 1.5 GPM Aerator   | 2.5 GPM Aerator (Federal Code)                             | 0.03                        | 4.0%                          | 95%   | 25%                                 | 10           | \$0          |
| New                  | Other            | Water Heat         | Integrated Space Heating/Water Heating       | Integrated System   | Separate Boiler And HW Heater                              | 0.03                        | 5.0%                          | 50%   | 95%                                 | 15           | \$5,445      |
| New                  | Other            | Water Heat         | Low Flow Spray Heads                         | 1.6 GPM   | 3.0 GPM  | 0.03                        | 2.3%                          | 50%   | 50%                                 | 5            | \$4          |
| New                  | Other            | Water Heat         | Low-Flow Showerheads                         | 2.0 GPM Showerhead  | 2.5 GPM Showerhead (Federal Code)                          | 0.03                        | 1.1%                          | 15%   | 75%                                 | 10           | \$7          |
| New                  | Other            | Water Heat         | Refrigeration with Heat Recovery             | Heat Recovery from Refrigeration System. Applied to Water Heating | No Heat Recovery   | 0.03                        | 28.0%                         | 75%   | 100%                                | 16           | \$11252      |
| New                  | Other            | Water Heat         | Solar RE - Solar Water Heater                | Passive solar water heating                                       | Standard Water Heater EF = 0.93                            | 0.03                        | 62.3%                         | 20%   | 95%                                 | 20           | \$35056      |
| New                  | Other            | Water Heat         | Tankless Water Heater - Commercial           | EF = 0.82   | Thermal Efficiency = 80%                                   | 0.03                        | 30.0%                         | 25%   | 90%                                 | 14           | \$2,266      |
| New                  | Other            | Water Heat         | Tankless Water Heater - Residential          | EF = 0.82   | EF = 0.59 (40 Gal)   | 0.03                        | 28.0%                         | 25%   | 90%                                 | 20           | \$697        |
| New                  | Other            | Water Heat         | Ultrasonic Faucet Control                    | Install Ultrasonic Motion Faucet Control                          | No Faucet Control  | 0.03                        | 3.3%                          | 95%   | 95%                                 | 10           | \$207        |
| New                  | Other            | Water Heat         | Water Heater Thermostat Setback              | Thermostat Setback and Replecement (120 Degrees)                  | No Thermostat Setback (130 Degrees)                        | 0.03                        | 7.7%                          | 75%   | 55%                                 | 11           | \$510        |



| Construction Vintage | Customer Segment | End Use            | Measure Name   | Measure Description  | Base Equipment                              | Baseline therm (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------------|--|--|---|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Restaurant       | Cooking            | Broiler  | High-Efficiency Broiler (34% Efficient)  | Standard Broiler (15% Efficient)            | 1.61                        | 1.9%                          | 95%   | 75%                                 | 10           | \$210        |
| Existing             | Restaurant       | Cooking            | Fryers - Commercial Gas Cooking                          | Energy Star Commercial Fryer (50% efficient)                                   | Non-Energy Star Fryer (35% efficient)       | 1.61                        | 6.2%                          | 65%   | 65%                                 | 8            | \$1,111      |
| Existing             | Restaurant       | Cooking            | Griddle  | High-Efficiency Griddle (40% Efficient)  | Standard Griddle (32% Efficient)            | 1.61                        | 0.5%                          | 75%   | 75%                                 | 12           | \$1,224      |
| Existing             | Restaurant       | Cooking            | Oven - Convection  | Convection Oven  | Standard Oven                               | 1.61                        | 1.2%                          | 85%   | 85%                                 | 12           | \$420        |
| Existing             | Restaurant       | Cooking            | Oven - Conveyor  | High-Efficiency Model (23% Efficient)  | Standard Model (15% Efficient)              | 1.61                        | 10.4%                         | 35%   | 85%                                 | 10           | \$3,541      |
| Existing             | Restaurant       | Cooking            | Oven - Power Burner                                      | Power Burner Oven - Improved Atmospheric Burner (60% Efficient)                | Standard (40%-50% Efficiency)               | 1.61                        | 3.8%                          | 45%   | 80%                                 | 12           | \$5,358      |
| Existing             | Restaurant       | Cooking            | Steam Cooker   | Energy Star Steam Cooker (38% Efficient)                                       | Standard Cooker (30% Efficient)             | 1.61                        | 6.9%                          | 65%   | 75%                                 | 10           | \$2,180      |
| Existing             | Restaurant       | Space Heat Furnace | Gas Furnace  | AFUE = 90% (Condensing Furnace)  | AFUE=80%                                    | 0.06                        | 11.1%                         | NA  | NA                                  | 18           | \$1,414      |
| Existing             | Restaurant       | Space Heat Furnace | Gas Furnace  | AFUE = 94% (Condensing Furnace)  | AFUE=80%                                    | 0.06                        | 14.9%                         | NA  | NA                                  | 18           | \$1,414      |
| Existing             | Restaurant       | Space Heat Furnace | Commissioning - Retro Building Commissioning             | Commissioning - Retro Building Commissioning                                   | No Commissioning                            | 0.06                        | 12.5%                         | 90%   | 80%                                 | 3            | \$663        |
| Existing             | Restaurant       | Space Heat Furnace | Duct Repair And Sealing                                  | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 0.06                        | 2.5%                          | 45%   | 45%                                 | 18           | \$1,345      |
| Existing             | Restaurant       | Space Heat Furnace | Exhaust Air to Ventilation Air Heat Recovery             | Exhaust Air Heat Recovery  | No Heat Recovery                            | 0.06                        | 15.0%                         | 5%  | 94%                                 | 10           | \$5,783      |
| Existing             | Restaurant       | Space Heat Furnace | Exhaust Hood Makeup Air                                  | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air) | 0.06                        | 4.5%                          | 100%  | 85%                                 | 10           | \$5,726      |
| Existing             | Restaurant       | Space Heat Furnace | Infiltration Control (Caulking, Weather Stripping, etc.) | Install Caulking And Weatherstripping (ACH 0.65)                               | Infiltration Conditions (ACH 1.0)           | 0.06                        | 10.0%                         | 40%   | 10%                                 | 10           | \$787        |
| Existing             | Restaurant       | Space Heat Furnace | Insulation (Ceiling)                                     | R-21 (Code)  | Existing Ceiling Insulation (Average R-9)   | 0.06                        | 7.2%                          | 75%   | 85%                                 | 25           | \$2,051      |
| Existing             | Restaurant       | Space Heat Furnace | Insulation (Ceiling)                                     | R-21 (Code)  | R-0   | 0.06                        | 20.0%                         | 75%   | 0%                                  | 25           | \$2,051      |
| Existing             | Restaurant       | Space Heat Furnace | Insulation (Ceiling)                                     | R-38   | R-21 (Code)                                 | 0.06                        | 8.0%                          | 75%   | 95%                                 | 25           | \$1,748      |
| Existing             | Restaurant       | Space Heat Furnace | Insulation (Ceiling)                                     | R-49   | R-21 (Code)                                 | 0.06                        | 12.0%                         | 75%   | 98%                                 | 25           | \$2,320      |
| Existing             | Restaurant       | Space Heat Furnace | Insulation (Duct) (Unconditioned Spaces)                 | Install New Duct Insulation (R-8)  | R-0   | 0.06                        | 4.4%                          | 10%   | 15%                                 | 25           | \$376        |
| Existing             | Restaurant       | Space Heat Furnace | Insulation (Duct) (Unconditioned Spaces)                 | R-4  | R-0   | 0.06                        | 2.4%                          | 10%   | 15%                                 | 25           | \$392        |
| Existing             | Restaurant       | Space Heat Furnace | Insulation (Wall)  | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 0.06                        | 6.0%                          | 10%   | 95%                                 | 25           | \$1,403      |

| Construction Vintage | Customer Segment | End Use            | Measure Name                                 | Measure Description   | Base Equipment   | Baseline therm (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------------|--|---|--|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Restaurant       | Space Heat Furnace | Insulation (Wall) - Existing to Code         | R-19 (2x6 Framing) - (Code)                                   | Existing R-value (Average R-3)                             | 0.06                        | 21.1%                         | 10%   | 35%                                 | 25           | \$1,519      |
| Existing             | Restaurant       | Space Heat Furnace | Insulation (Wall) - Zero to Code             | R-19 (2x6 Framing) - (Code)                                   | R-0  | 0.06                        | 25.0%                         | 10%   | 0%                                  | 25           | \$1,519      |
| Existing             | Restaurant       | Space Heat Furnace | Insulation - Floor (Non-Slab)                | R-10 (Code)   | R-0  | 0.06                        | 15.0%                         | 35%   | 90%                                 | 25           | \$1,748      |
| Existing             | Restaurant       | Space Heat Furnace | Insulation - Floor (Non-Slab)                | R-19  | R-10 (Code)  | 0.06                        | 5.0%                          | 35%   | 90%                                 | 25           | \$303        |
| Existing             | Restaurant       | Space Heat Furnace | Thermostat - Programmable                    | Energy Star Programmable Thermostat                           | Manual Thermostat  | 0.06                        | 3.0%                          | 95%   | 42%                                 | 15           | \$146        |
| Existing             | Restaurant       | Space Heat Furnace | Windows                                      | U = 0.35  | U = 0.55 (Code)  | 0.06                        | 5.0%                          | 80%   | 80%                                 | 25           | \$4,401      |
| Existing             | Restaurant       | Space Heat Furnace | Windows - Existing to Code                   | U = 0.55 (Code)   | Existing Windows (U=0.65)                                  | 0.06                        | 3.3%                          | 10%   | 80%                                 | 25           | \$12425      |
| Existing             | Restaurant       | Water Heat         | Water Heater - Condensing                    | EF = 0.90   | EF = 0.59  | 0.41                        | 34.4%                         | NA  | NA                                  | 13           | \$2,356      |
| Existing             | Restaurant       | Water Heat         | Clothes Washer - Ozonating                   | Ozonating Clothes Washer                                      | Standard Commercial Clothes Washer                         | 0.42                        | 15.1%                         | 5%  | 95%                                 | 10           | \$8,705      |
| Existing             | Restaurant       | Water Heat         | Clothes Washer Commercial                    | Energy Star Commercial Clothes Washer MEF=1.73                | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.42                        | 0.8%                          | 5%  | 75%                                 | 10           | \$305        |
| Existing             | Restaurant       | Water Heat         | Demand controlled Circulating Systems        | Demand Controlled Circulating Systems (VFD Control by Demand) | Constant Circulation                                       | 0.42                        | 5.0%                          | 75%   | 94%                                 | 15           | \$934        |
| Existing             | Restaurant       | Water Heat         | Dishwashing - Commercial - High Efficiency   | High Efficiency Dishwasher                                    | Standard Dishwasher  | 0.42                        | 3.0%                          | 100%  | 80%                                 | 13           | \$2,700      |
| Existing             | Restaurant       | Water Heat         | Dishwashing - Commercial Chemical System     | Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost) | High Temp Commercial Dishwasher                            | 0.42                        | 6.0%                          | 100%  | 95%                                 | 10           | \$841        |
| Existing             | Restaurant       | Water Heat         | Dishwashing - Residential Sized System       | EF = 0.65 (ENERGY STAR)                                       | Existing Dishwasher (FED Std. EF=0.46)                     | 0.42                        | 0.5%                          | 85%   | 25%                                 | 13           | \$32         |
| Existing             | Restaurant       | Water Heat         | Dishwashing - Residential Sized System       | EF = 0.77   | Existing Dishwasher (FED Std. EF=0.46)                     | 0.42                        | 0.7%                          | 85%   | 55%                                 | 13           | \$630        |
| Existing             | Restaurant       | Water Heat         | Drainwater Heat Recovery (Power-Pipe or GFX) | Install Power-Pipe or GFX System                              | No GFX or Power-Pipe System                                | 0.42                        | 20.0%                         | 5%  | 92%                                 | 25           | \$1,821      |
| Existing             | Restaurant       | Water Heat         | Faucet Aerators                              | 1.5 GPM Aerator   | 2.5 GPM Aerator (Federal Code)                             | 0.42                        | 4.0%                          | 95%   | 25%                                 | 10           | \$0          |
| Existing             | Restaurant       | Water Heat         | Faucet Aerators - Existing to Code           | 2.5 GPM Aerator (Federal Code)                                | 4.0 GPM Aerator  | 0.42                        | 3.8%                          | 95%   | 15%                                 | 10           | \$2          |
| Existing             | Restaurant       | Water Heat         | Hot Water (SHW) Pipe Insulation              | Install Insulation (R-4)                                      | No Pipe Insulation   | 0.42                        | 1.0%                          | 75%   | 90%                                 | 15           | \$36         |
| Existing             | Restaurant       | Water Heat         | Low Flow Spray Heads                         | 1.6 GPM   | 3.0 GPM  | 0.42                        | 2.3%                          | 95%   | 25%                                 | 5            | \$5          |
| Existing             | Restaurant       | Water Heat         | Low-Flow Showerheads                         | 2.0 GPM Showerhead  | 2.5 GPM Showerhead (Federal Code)                          | 0.42                        | 1.1%                          | 15%   | 75%                                 | 10           | \$6          |
| Existing             | Restaurant       | Water Heat         | Low-Flow Showerheads - Existing to Code      | 2.5 GPM Showerhead (Federal Code)                             | 4.5 GPM Showerhead   | 0.42                        | 2.5%                          | 15%   | 20%                                 | 10           | \$11         |

| Construction Vintage | Customer Segment | End Use            | Measure Name                                 | Measure Description  | Base Equipment                              | Baseline therm (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------------|--|--|---|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Restaurant       | Water Heat         | Refrigeration with Heat Recovery             | Heat Recovery from Refrigeration System. Applied to Water Heating              | No Heat Recovery                            | 0.42                        | 28.0%                         | 75%   | 100%                                | 16           | \$3,059      |
| Existing             | Restaurant       | Water Heat         | Solar RE - Solar Water Heater                | Passive solar water heating  | Standard Water Heater EF = 0.93             | 0.42                        | 39.5%                         | 20%   | 95%                                 | 20           | \$72978      |
| Existing             | Restaurant       | Water Heat         | Tankless Water Heater - Commercial           | EF = 0.82  | Thermal Efficiency = 80%                    | 0.42                        | 30.0%                         | 25%   | 90%                                 | 14           | \$2,266      |
| Existing             | Restaurant       | Water Heat         | Tankless Water Heater - Residential          | EF = 0.82  | EF = 0.59 (40 Gal)                          | 0.42                        | 28.0%                         | 25%   | 90%                                 | 20           | \$697        |
| Existing             | Restaurant       | Water Heat         | Ultrasonic Faucet Control                    | Install Ultrasonic Motion Faucet Control                                       | No Faucet Control                           | 0.42                        | 3.3%                          | 95%   | 75%                                 | 10           | \$206        |
| Existing             | Restaurant       | Water Heat         | Water Heater Thermostat Setback              | Thermostat Setback and Replcement (120 Degrees)                                | No Thermostat Setback (130 Degrees)         | 0.42                        | 7.7%                          | 75%   | 75%                                 | 11           | \$349        |
| New                  | Restaurant       | Cooking            | Broiler                                      | High-Efficiency Broiler (34% Efficient)  | Standard Broiler (15% Efficient)            | 1.61                        | 1.9%                          | 95%   | 75%                                 | 10           | \$210        |
| New                  | Restaurant       | Cooking            | Fryers - Commercial Gas Cooking              | Energy Star Commercial Fryer (50% efficient)                                   | Non-Energy Star Fryer (35% efficient)       | 1.61                        | 6.2%                          | 65%   | 65%                                 | 8            | \$1,111      |
| New                  | Restaurant       | Cooking            | Griddle                                      | High-Efficiency Griddle (40% Efficient)  | Standard Griddle (32% Efficient)            | 1.61                        | 0.5%                          | 75%   | 75%                                 | 12           | \$1,224      |
| New                  | Restaurant       | Cooking            | Oven - Convection                            | Convection Oven  | Standard Oven                               | 1.61                        | 1.2%                          | 85%   | 85%                                 | 12           | \$420        |
| New                  | Restaurant       | Cooking            | Oven - Conveyor                              | High-Efficiency Model (23% Efficient)  | Standard Model (15% Efficient)              | 1.61                        | 10.4%                         | 35%   | 85%                                 | 10           | \$2,833      |
| New                  | Restaurant       | Cooking            | Oven - Power Burner                          | Power Burner Oven - Improved Atmospheric Burner (60% Efficient)                | Standard (40%-50% Efficiency)               | 1.61                        | 3.8%                          | 45%   | 80%                                 | 12           | \$5,358      |
| New                  | Restaurant       | Cooking            | Steam Cooker                                 | Energy Star Steam Cooker (38% Efficient)                                       | Standard Cooker (30% Efficient)             | 1.61                        | 6.9%                          | 65%   | 75%                                 | 10           | \$2,180      |
| New                  | Restaurant       | Space Heat Furnace | Gas Furnace                                  | AFUE = 90% (Condensing Furnace)  | AFUE=80%                                    | 0.05                        | 11.1%                         | NA  | NA                                  | 18           | \$1,414      |
| New                  | Restaurant       | Space Heat Furnace | Gas Furnace                                  | AFUE = 94% (Condensing Furnace)  | AFUE=80%                                    | 0.05                        | 14.9%                         | NA  | NA                                  | 18           | \$1,414      |
| New                  | Restaurant       | Space Heat Furnace | Commissioning - New Building Commissioning   | Commissioning - New Building Commissioning                                     | No Commissioning                            | 0.05                        | 12.5%                         | 90%   | 80%                                 | 3            | \$2,454      |
| New                  | Restaurant       | Space Heat Furnace | Duct Repair And Sealing                      | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 0.05                        | 2.5%                          | 45%   | 45%                                 | 18           | \$1,345      |
| New                  | Restaurant       | Space Heat Furnace | Exhaust Air to Ventilation Air Heat Recovery | Exhaust Air Heat Recovery  | No Heat Recovery                            | 0.05                        | 15.0%                         | 5%  | 94%                                 | 10           | \$5,783      |
| New                  | Restaurant       | Space Heat Furnace | Exhaust Hood Makeup Air                      | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air) | 0.05                        | 4.5%                          | 100%  | 85%                                 | 10           | \$5,726      |
| New                  | Restaurant       | Space Heat Furnace | Insulation (Ceiling)                         | R-38   | R-21 (Code)                                 | 0.05                        | 8.0%                          | 75%   | 95%                                 | 25           | \$1,748      |
| New                  | Restaurant       | Space Heat Furnace | Insulation (Ceiling)                         | R-49   | R-21 (Code)                                 | 0.05                        | 12.0%                         | 75%   | 98%                                 | 25           | \$2,320      |
| New                  | Restaurant       | Space Heat Furnace | Insulation (Wall)                            | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 0.05                        | 6.0%                          | 95%   | 95%                                 | 25           | \$1,403      |

| Construction Vintage | Customer Segment | End Use            | Measure Name                                 | Measure Description   | Base Equipment   | Baseline therm (UEC or EUI) | Savings as Percent of Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------------|--|---|--|-----------------------------|---------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Restaurant       | Space Heat Furnace | Insulation - Floor (Non-Slab)                | R-19  | R-10 (Code)  | 0.05                        | 5.0%                      | 35%   | 90%                                 | 25           | \$303        |
| New                  | Restaurant       | Space Heat Furnace | Leak Proof Duct Fittings                     | Quick connect fittings that do not require mastic or drawbands    | Std duct workmanship                                       | 0.05                        | 10.0%                     | 40%   | 98%                                 | 25           | \$521        |
| New                  | Restaurant       | Space Heat Furnace | Thermostat - Programmable                    | Energy Star Programmable Thermostat                               | Manual Thermostat  | 0.05                        | 3.0%                      | 95%   | 42%                                 | 15           | \$146        |
| New                  | Restaurant       | Space Heat Furnace | Windows                                      | U = 0.35  | U = 0.55 (Code)  | 0.05                        | 5.0%                      | 80%   | 80%                                 | 25           | \$4,401      |
| New                  | Restaurant       | Water Heat         | Water Heater - Condensing                    | EF = 0.90   | EF = 0.59  | 0.44                        | 34.4%                     | NA  | NA                                  | 13           | \$2,356      |
| New                  | Restaurant       | Water Heat         | Clothes Washer - Ozonating                   | Ozonating Clothes Washer  | Standard Commercial Clothes Washer                         | 0.42                        | 15.1%                     | 5%  | 95%                                 | 10           | \$8,705      |
| New                  | Restaurant       | Water Heat         | Clothes Washer Commercial                    | Energy Star Commercial Clothes Washer MEF=1.73                    | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.42                        | 0.8%                      | 5%  | 75%                                 | 10           | \$305        |
| New                  | Restaurant       | Water Heat         | Demand controlled Circulating Systems        | Demand Controlled Circulating Systems (VFD Control by Demand)     | Constant Circulation                                       | 0.42                        | 5.0%                      | 90%   | 94%                                 | 15           | \$934        |
| New                  | Restaurant       | Water Heat         | Dishwashing - Commercial - High Efficiency   | High Efficiency Dishwasher  | Standard Dishwasher  | 0.42                        | 3.0%                      | 100%  | 80%                                 | 13           | \$2,700      |
| New                  | Restaurant       | Water Heat         | Dishwashing - Commercial Chemical System     | Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)     | High Temp Commercial Dishwasher                            | 0.42                        | 6.0%                      | 100%  | 95%                                 | 10           | \$841        |
| New                  | Restaurant       | Water Heat         | Dishwashing - Residential Sized System       | EF = 0.65 (ENERGY STAR)   | Existing Dishwasher (FED Std. EF=0.46)                     | 0.42                        | 0.5%                      | 85%   | 25%                                 | 13           | \$32         |
| New                  | Restaurant       | Water Heat         | Dishwashing - Residential Sized System       | EF = 0.77   | Existing Dishwasher (FED Std. EF=0.46)                     | 0.42                        | 0.7%                      | 85%   | 55%                                 | 13           | \$630        |
| New                  | Restaurant       | Water Heat         | Drainwater Heat Recovery (Power-Pipe or GFX) | Install Power-Pipe or GFX System                                  | No GFX or Power-Pipe System                                | 0.42                        | 20.0%                     | 25%   | 92%                                 | 25           | \$1,821      |
| New                  | Restaurant       | Water Heat         | Faucet Aerators                              | 1.5 GPM Aerator   | 2.5 GPM Aerator (Federal Code)                             | 0.42                        | 4.0%                      | 95%   | 25%                                 | 10           | \$0          |
| New                  | Restaurant       | Water Heat         | Integrated Space Heating/Water Heating       | Integrated System   | Separate Boiler And HW Heater                              | 0.42                        | 5.0%                      | 50%   | 95%                                 | 15           | \$1,299      |
| New                  | Restaurant       | Water Heat         | Low Flow Spray Heads                         | 1.6 GPM   | 3.0 GPM  | 0.42                        | 2.3%                      | 95%   | 25%                                 | 5            | \$5          |
| New                  | Restaurant       | Water Heat         | Low-Flow Showerheads                         | 2.0 GPM Showerhead  | 2.5 GPM Showerhead (Federal Code)                          | 0.42                        | 1.1%                      | 15%   | 75%                                 | 10           | \$6          |
| New                  | Restaurant       | Water Heat         | Refrigeration with Heat Recovery             | Heat Recovery from Refrigeration System. Applied to Water Heating | No Heat Recovery   | 0.42                        | 28.0%                     | 75%   | 100%                                | 16           | \$1,715      |
| New                  | Restaurant       | Water Heat         | Solar RE - Solar Water Heater                | Passive solar water heating                                       | Standard Water Heater EF = 0.93                            | 0.42                        | 39.5%                     | 20%   | 95%                                 | 20           | \$72978      |
| New                  | Restaurant       | Water Heat         | Tankless Water Heater - Commercial           | EF = 0.82   | Thermal Efficiency = 80%                                   | 0.42                        | 30.0%                     | 25%   | 90%                                 | 14           | \$2,266      |
| New                  | Restaurant       | Water Heat         | Tankless Water Heater - Residential          | EF = 0.82   | EF = 0.59 (40 Gal)   | 0.42                        | 28.0%                     | 25%   | 90%                                 | 20           | \$697        |
| New                  | Restaurant       | Water Heat         | Ultrasonic Faucet Control                    | Install Ultrasonic Motion Faucet Control                          | No Faucet Control  | 0.42                        | 3.3%                      | 95%   | 75%                                 | 10           | \$206        |
| New                  | Restaurant       | Water Heat         | Water Heater Thermostat Setback              | Thermostat Setback and Replecement (120 Degrees)                  | No Thermostat Setback (130 Degrees)                        | 0.42                        | 7.7%                      | 75%   | 75%                                 | 11           | \$349        |

| Construction Vintage | Customer Segment | End Use           | Measure Name  | Measure Description  | Base Equipment                              | Baseline therm (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-------------------|---|--|---|----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | School           | Cooking           | Broiler   | High-Efficiency Broiler (34% Efficient)  | Standard Broiler (15% Efficient)            | 0.02                       | 1.9%                          | 95%   | 75%                                 | 10           | \$209        |
| Existing             | School           | Cooking           | Fryers - Commercial Gas Cooking                                     | Energy Star Commercial Fryer (50% efficient)                                   | Non-Energy Star Fryer (35% efficient)       | 0.02                       | 3.1%                          | 45%   | 65%                                 | 8            | \$1,107      |
| Existing             | School           | Cooking           | Griddle   | High-Efficiency Griddle (40% Efficient)  | Standard Griddle (32% Efficient)            | 0.02                       | 0.3%                          | 65%   | 75%                                 | 12           | \$1,221      |
| Existing             | School           | Cooking           | Oven - Convection   | Convection Oven  | Standard Oven                               | 0.02                       | 1.2%                          | 85%   | 40%                                 | 12           | \$419        |
| Existing             | School           | Cooking           | Oven - Conveyor   | High-Efficiency Model (23% Efficient)  | Standard Model (15% Efficient)              | 0.02                       | 10.4%                         | 5%  | 85%                                 | 10           | \$3,540      |
| Existing             | School           | Cooking           | Oven - Power Burner   | Power Burner Oven - Improved Atmospheric Burner (60% Efficient)                | Standard (40%-50% Efficiency)               | 0.02                       | 3.8%                          | 25%   | 90%                                 | 12           | \$5,354      |
| Existing             | School           | Cooking           | Steam Cooker  | Energy Star Steam Cooker (38% Efficient)                                       | Standard Cooker (30% Efficient)             | 0.02                       | 6.9%                          | 25%   | 75%                                 | 10           | \$2,180      |
| Existing             | School           | Pool Heat         | Solar RE - Installation of Solar Pool/Spa Heating Systems           | Solar Pool/Spa Heating Systems   | No Solar Pool Heating System                | 0.17                       | 10.1%                         | 5%  | 90%                                 | 12           | \$35761      |
| Existing             | School           | Pool Heat         | Swimming Pool/Spa Covers  | Plastic Or Foam Pool Covers (50-65% Energy Savings)                            | No Pool Covers                              | 0.17                       | 50.0%                         | 95%   | 35%                                 | 10           | \$2,241      |
| Existing             | School           | Space Heat Boiler | Gas Boiler - Greater than 300 KBTUH                                 | 85% Thermal Efficiency   | 80% Thermal Efficiency (State Code)         | 0.11                       | 5.9%                          | NA  | NA                                  | 20           | \$12705      |
| Existing             | School           | Space Heat Boiler | Gas Boiler - Greater than 300 KBTUH                                 | 90% Thermal Efficiency   | 80% Thermal Efficiency (State Code)         | 0.11                       | 11.1%                         | NA  | NA                                  | 20           | \$25916      |
| Existing             | School           | Space Heat Boiler | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 Sensors)                                    | Constant Ventilation                        | 0.11                       | 10.0%                         | 25%   | 94%                                 | 15           | \$54937      |
| Existing             | School           | Space Heat Boiler | Boiler Economizer   | Economizer   | No Economizer                               | 0.11                       | 5.5%                          | 40%   | 65%                                 | 20           | \$46077      |
| Existing             | School           | Space Heat Boiler | Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning                                   | No Commissioning                            | 0.11                       | 12.5%                         | 90%   | 40%                                 | 3            | \$17187      |
| Existing             | School           | Space Heat Boiler | Direct Digital Control System-Installation                          | DDC Retrofit (Morning Warm-Up Control Logic Included in This Measure)          | Pneumatic                                   | 0.11                       | 5.0%                          | 5%  | 34%                                 | 15           | \$24225      |
| Existing             | School           | Space Heat Boiler | Direct Digital Control System-Optimization                          | Premium-Efficiency EMS System  | High-Efficiency EMS System                  | 0.11                       | 10.0%                         | 75%   | 80%                                 | 5            | \$46958      |
| Existing             | School           | Space Heat Boiler | Direct Digital Control System-Wireless Performance Monitoring       | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control        | Pneumatic                                   | 0.11                       | 15.0%                         | 50%   | 80%                                 | 5            | \$33887      |
| Existing             | School           | Space Heat Boiler | Duct Repair And Sealing   | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 0.11                       | 2.5%                          | 45%   | 45%                                 | 18           | \$34881      |
| Existing             | School           | Space Heat Boiler | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery  | No Heat Recovery                            | 0.11                       | 15.0%                         | 5%  | 94%                                 | 10           | \$79092      |
| Existing             | School           | Space Heat Boiler | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air) | 0.11                       | 4.5%                          | 73%   | 85%                                 | 10           | \$5,729      |
| Existing             | School           | Space Heat Boiler | Insulation (Ceiling)  | R-21 (Code)  | Existing Ceiling Insulation (Average R-9)   | 0.11                       | 3.6%                          | 75%   | 15%                                 | 25           | \$26597      |

| Construction Vintage | Customer Segment | End Use       | Measure Name   | Measure Description  | Base Equipment                 | Baseline therm (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|--|--|--------------------------------|----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | School           | Space Boiler  | Heat Insulation (Ceiling)  | R-21 (Code)  | R-0                            | 0.11                       | 10.0%                         | 75%   | 0%                                  | 25           | \$26597      |
| Existing             | School           | Space Boiler  | Heat Insulation (Ceiling)  | R-38   | R-21 (Code)                    | 0.11                       | 4.0%                          | 75%   | 45%                                 | 25           | \$22672      |
| Existing             | School           | Space Boiler  | Heat Insulation (Ceiling)  | R-49   | R-21 (Code)                    | 0.11                       | 6.0%                          | 75%   | 85%                                 | 25           | \$30085      |
| Existing             | School           | Space Boiler  | Heat Insulation (Duct) (Unconditioned Spaces)                            | Install New Duct Insulation (R-8)  | R-0                            | 0.11                       | 4.4%                          | 10%   | 15%                                 | 25           | \$9,749      |
| Existing             | School           | Space Boiler  | Heat Insulation (Duct) (Unconditioned Spaces)                            | R-4  | R-0                            | 0.11                       | 2.4%                          | 10%   | 15%                                 | 25           | \$10159      |
| Existing             | School           | Space Boiler  | Heat Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)    | 0.11                       | 6.0%                          | 10%   | 95%                                 | 25           | \$10098      |
| Existing             | School           | Space Boiler  | Heat Insulation (Wall) - Existing to Code                                | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3) | 0.11                       | 21.1%                         | 10%   | 35%                                 | 25           | \$10944      |
| Existing             | School           | Space Boiler  | Heat Insulation (Wall) - Zero to Code                                    | R-19 (2x6 Framing) - (Code)  | R-0                            | 0.11                       | 25.0%                         | 10%   | 0%                                  | 25           | \$10944      |
| Existing             | School           | Space Boiler  | Heat Insulation - Floor (Non-Slab)                                       | R-10 (Code)  | R-0                            | 0.11                       | 7.5%                          | 35%   | 35%                                 | 25           | \$22672      |
| Existing             | School           | Space Boiler  | Heat Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)                    | 0.11                       | 2.5%                          | 35%   | 35%                                 | 25           | \$3,924      |
| Existing             | School           | Space Boiler  | Heat Sensible And Total Heat Recovery Devices                            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness | No Heat Recovery               | 0.11                       | 25.0%                         | 25%   | 98%                                 | 10           | 183996       |
| Existing             | School           | Space Boiler  | Heat Steam Pipe Insulation   | R-4  | R-0                            | 0.11                       | 12.1%                         | 75%   | 65%                                 | 20           | \$4,386      |
| Existing             | School           | Space Boiler  | Heat Steam Trap Maintenance  | Actively stop steam trap leaks   | No Maintenance                 | 0.11                       | 17.0%                         | 90%   | 45%                                 | 3            | \$11772      |
| Existing             | School           | Space Boiler  | Heat Thermostat - Programmable   | Energy Star Programmable Thermostat  | Manual Thermostat              | 0.11                       | 3.0%                          | 95%   | 79%                                 | 15           | \$148        |
| Existing             | School           | Space Boiler  | Heat Windows   | U = 0.35   | U = 0.55 (Code)                | 0.11                       | 10.9%                         | 80%   | 60%                                 | 25           | \$73738      |
| Existing             | School           | Space Boiler  | Heat Windows - Existing to Code  | U = 0.55 (Code)  | Existing Windows (U=0.65)      | 0.11                       | 7.3%                          | 10%   | 60%                                 | 25           | 208203       |
| Existing             | School           | Space Furnace | Heat Gas Furnace   | AFUE = 90% (Condensing Furnace)  | AFUE=80%                       | 0.17                       | 11.1%                         | NA  | NA                                  | 18           | \$13194      |
| Existing             | School           | Space Furnace | Heat Gas Furnace   | AFUE = 94% (Condensing Furnace)  | AFUE=80%                       | 0.17                       | 14.9%                         | NA  | NA                                  | 18           | \$13194      |
| Existing             | School           | Space Furnace | Heat Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 Sensors)  | Constant Ventilation           | 0.17                       | 10.0%                         | 25%   | 94%                                 | 15           | \$54937      |

| Construction Vintage | Customer Segment | End Use            | Measure Name                                 | Measure Description  | Base Equipment                              | Baseline therm (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|--------------------|--|--|---|----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| Existing             | School           | Space Heat Furnace | Commissioning - Retro Building               | Commissioning - Retro Building Commissioning                                   | Commissioning - Retro Building              | No Commissioning           | 0.17                          | 12.5%   | 90%                                 | 80%          | 3            | \$17187 |
| Existing             | School           | Space Heat Furnace | Duct Repair And Sealing                      | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 0.17                       | 2.5%                          | 45%   | 45%                                 | 18           | \$34881      |         |
| Existing             | School           | Space Heat Furnace | Exhaust Air to Ventilation Air Heat Recovery | Exhaust Air Heat Recovery  | No Heat Recovery                            | 0.17                       | 15.0%                         | 5%  | 94%                                 | 10           | \$79092      |         |
| Existing             | School           | Space Heat Furnace | Exhaust Hood Makeup Air                      | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air) | 0.17                       | 4.5%                          | 73%   | 85%                                 | 10           | \$5,729      |         |
| Existing             | School           | Space Heat Furnace | Insulation (Ceiling)                         | R-21 (Code)  | Existing Ceiling Insulation (Average R-9)   | 0.17                       | 3.6%                          | 75%   | 15%                                 | 25           | \$26597      |         |
| Existing             | School           | Space Heat Furnace | Insulation (Ceiling)                         | R-21 (Code)  | R-0   | 0.17                       | 10.0%                         | 75%   | 0%                                  | 25           | \$26597      |         |
| Existing             | School           | Space Heat Furnace | Insulation (Ceiling)                         | R-38   | R-21 (Code)                                 | 0.17                       | 4.0%                          | 75%   | 45%                                 | 25           | \$22672      |         |
| Existing             | School           | Space Heat Furnace | Insulation (Ceiling)                         | R-49   | R-21 (Code)                                 | 0.17                       | 6.0%                          | 75%   | 85%                                 | 25           | \$30085      |         |
| Existing             | School           | Space Heat Furnace | Insulation (Duct) (Unconditioned Spaces)     | Install New Duct Insulation (R-8)  | R-0   | 0.17                       | 4.4%                          | 10%   | 15%                                 | 25           | \$9,749      |         |
| Existing             | School           | Space Heat Furnace | Insulation (Duct) (Unconditioned Spaces)     | R-4  | R-0   | 0.17                       | 2.4%                          | 10%   | 15%                                 | 25           | \$10159      |         |
| Existing             | School           | Space Heat Furnace | Insulation (Wall)                            | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 0.17                       | 6.0%                          | 10%   | 95%                                 | 25           | \$10098      |         |
| Existing             | School           | Space Heat Furnace | Insulation (Wall) - Existing to Code         | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)              | 0.17                       | 21.1%                         | 10%   | 35%                                 | 25           | \$10944      |         |
| Existing             | School           | Space Heat Furnace | Insulation (Wall) - Zero to Code             | R-19 (2x6 Framing) - (Code)  | R-0   | 0.17                       | 25.0%                         | 10%   | 0%                                  | 25           | \$10944      |         |
| Existing             | School           | Space Heat Furnace | Insulation - Floor (Non-Slab)                | R-10 (Code)  | R-0   | 0.17                       | 7.5%                          | 35%   | 35%                                 | 25           | \$22672      |         |
| Existing             | School           | Space Heat Furnace | Insulation - Floor (Non-Slab)                | R-19   | R-10 (Code)                                 | 0.17                       | 2.5%                          | 35%   | 35%                                 | 25           | \$3,924      |         |
| Existing             | School           | Space Heat Furnace | Thermostat - Programmable                    | Energy Star Programmable Thermostat  | Manual Thermostat                           | 0.17                       | 3.0%                          | 95%   | 79%                                 | 15           | \$148        |         |
| Existing             | School           | Space Heat Furnace | Windows                                      | U = 0.35   | U = 0.55 (Code)                             | 0.17                       | 10.9%                         | 80%   | 60%                                 | 25           | \$73738      |         |
| Existing             | School           | Space Heat Furnace | Windows - Existing to Code                   | U = 0.55 (Code)  | Existing Windows (U=0.65)                   | 0.17                       | 7.3%                          | 10%   | 60%                                 | 25           | 208203       |         |
| Existing             | School           | Water Heat         | Water Heater - Condensing                    | EF = 0.90  | EF = 0.59                                   | 0.05                       | 34.4%                         | NA  | NA                                  | 13           | \$10691      |         |

| Construction Vintage | Customer Segment | End Use    | Measure Name                                 | Measure Description   | Base Equipment   | Baseline           | Savings               | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|--|---|--|--------------------|-----------------------|---|-------------------------------------|--------------|--------------|
|                      |                  |            |  |   |  | therm (UEC or EUI) | as Percent of End Use |   |                                     |              |              |
| Existing             | School           | Water Heat | Clothes Washer - Ozonating                   | Ozonating Clothes Washer  | Standard Commercial Clothes Washer                         | 0.06               | 15.1%                 | 35%   | 95%                                 | 10           | \$8,703      |
| Existing             | School           | Water Heat | Clothes Washer Commercial                    | Energy Star Commercial Clothes Washer MEF=1.73                    | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.06               | 0.6%                  | 35%   | 75%                                 | 10           | \$305        |
| Existing             | School           | Water Heat | Demand controlled Circulating Systems        | Demand Controlled Circulating Systems (VFD Control by Demand)     | Constant Circulation                                       | 0.06               | 5.0%                  | 55%   | 94%                                 | 15           | \$24225      |
| Existing             | School           | Water Heat | Dishwashing - Commercial - High Efficiency   | High Efficiency Dishwasher  | Standard Dishwasher  | 0.06               | 3.0%                  | 85%   | 80%                                 | 13           | \$2,703      |
| Existing             | School           | Water Heat | Dishwashing - Commercial Chemical System     | Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)     | High Temp Commercial Dishwasher                            | 0.06               | 6.0%                  | 85%   | 95%                                 | 10           | \$837        |
| Existing             | School           | Water Heat | Dishwashing - Residential Sized System       | EF = 0.65 (ENERGY STAR)   | Existing Dishwasher (FED Std. EF=0.46)                     | 0.06               | 0.1%                  | 65%   | 25%                                 | 13           | \$35         |
| Existing             | School           | Water Heat | Dishwashing - Residential Sized System       | EF = 0.77   | Existing Dishwasher (FED Std. EF=0.46)                     | 0.06               | 0.2%                  | 65%   | 55%                                 | 13           | \$628        |
| Existing             | School           | Water Heat | Drainwater Heat Recovery (Power-Pipe or GFX) | Install Power-Pipe or GFX System                                  | No GFX or Power-Pipe System                                | 0.06               | 20.0%                 | 5%  | 92%                                 | 25           | \$8,267      |
| Existing             | School           | Water Heat | Faucet Aerators                              | 1.5 GPM Aerator   | 2.5 GPM Aerator (Federal Code)                             | 0.06               | 4.0%                  | 95%   | 25%                                 | 10           | \$0          |
| Existing             | School           | Water Heat | Faucet Aerators - Existing to Code           | 2.5 GPM Aerator (Federal Code)                                    | 4.0 GPM Aerator  | 0.06               | 3.8%                  | 95%   | 15%                                 | 10           | \$0          |
| Existing             | School           | Water Heat | Hot Water (SHW) Pipe Insulation              | Install Insulation (R-4)  | No Pipe Insulation   | 0.06               | 1.0%                  | 75%   | 70%                                 | 15           | \$924        |
| Existing             | School           | Water Heat | Low Flow Spray Heads                         | 1.6 GPM   | 3.0 GPM  | 0.06               | 2.3%                  | 95%   | 25%                                 | 5            | \$9          |
| Existing             | School           | Water Heat | Low-Flow Showerheads                         | 2.0 GPM Showerhead  | 2.5 GPM Showerhead (Federal Code)                          | 0.06               | 3.4%                  | 45%   | 75%                                 | 10           | \$9          |
| Existing             | School           | Water Heat | Low-Flow Showerheads - Existing to Code      | 2.5 GPM Showerhead (Federal Code)                                 | 4.5 GPM Showerhead   | 0.06               | 7.5%                  | 45%   | 20%                                 | 10           | \$9          |
| Existing             | School           | Water Heat | Refrigeration with Heat Recovery             | Heat Recovery from Refrigeration System. Applied to Water Heating | No Heat Recovery   | 0.06               | 28.0%                 | 75%   | 93%                                 | 16           | \$79354      |
| Existing             | School           | Water Heat | Solar RE - Solar Water Heater                | Passive solar water heating                                       | Standard Water Heater EF = 0.93                            | 0.06               | 7.2%                  | 20%   | 95%                                 | 20           | \$66657      |
| Existing             | School           | Water Heat | Tankless Water Heater - Commercial           | EF = 0.82   | Thermal Efficiency = 80%                                   | 0.06               | 30.0%                 | 10%   | 90%                                 | 14           | \$2,267      |
| Existing             | School           | Water Heat | Tankless Water Heater - Residential          | EF = 0.82   | EF = 0.59 (40 Gal)   | 0.06               | 28.0%                 | 10%   | 90%                                 | 20           | \$698        |
| Existing             | School           | Water Heat | Ultrasonic Faucet Control                    | Install Ultrasonic Motion Faucet Control                          | No Faucet Control  | 0.06               | 3.3%                  | 95%   | 75%                                 | 10           | \$209        |
| Existing             | School           | Water Heat | Water Heater Thermostat Setback              | Thermostat Setback and Replacement (120 Degrees)                  | No Thermostat Setback (130 Degrees)                        | 0.06               | 7.7%                  | 75%   | 15%                                 | 11           | \$1,587      |
| New                  | School           | Cooking    | Broiler                                      | High-Efficiency Broiler (34% Efficient)                           | Standard Broiler (15% Efficient)                           | 0.02               | 1.9%                  | 95%   | 75%                                 | 10           | \$209        |
| New                  | School           | Cooking    | Fryers - Commercial Gas Cooking              | Energy Star Commercial Fryer (50% efficient)                      | Non-Energy Star Fryer (35% efficient)                      | 0.02               | 3.1%                  | 45%   | 65%                                 | 8            | \$1,107      |
| New                  | School           | Cooking    | Griddle                                      | High-Efficiency Griddle (40% Efficient)                           | Standard Griddle (32% Efficient)                           | 0.02               | 0.3%                  | 65%   | 75%                                 | 12           | \$1,221      |
| New                  | School           | Cooking    | Oven - Convection                            | Convection Oven   | Standard Oven  | 0.02               | 1.2%                  | 85%   | 40%                                 | 12           | \$419        |



| Construction Vintage | Customer Segment | End Use           | Measure Name  | Measure Description  | Base Equipment                              | Baseline therm (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-------------------|---|--|---|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | School           | Cooking           | Oven - Conveyor   | High-Efficiency Model (23% Efficient)  | Standard Model (15% Efficient)              | 0.02                        | 10.4%                         | 5%  | 85%                                 | 10           | \$2,834      |
| New                  | School           | Cooking           | Oven - Power Burner   | Power Burner Oven - Improved Atmospheric Burner (60% Efficient)                | Standard (40%-50% Efficiency)               | 0.02                        | 3.8%                          | 25%   | 90%                                 | 12           | \$5,354      |
| New                  | School           | Cooking           | Steam Cooker  | Energy Star Steam Cooker (38% Efficient)                                       | Standard Cooker (30% Efficient)             | 0.02                        | 6.9%                          | 25%   | 75%                                 | 10           | \$2,180      |
| New                  | School           | Pool Heat         | Solar RE - Installation of Solar Pool/Spa Heating Systems           | Solar Pool/Spa Heating Systems   | No Solar Pool Heating System                | 0.03                        | 10.1%                         | 5%  | 90%                                 | 12           | \$35761      |
| New                  | School           | Pool Heat         | Swimming Pool/Spa Covers  | Plastic Or Foam Pool Covers (50-65% Energy Savings)                            | No Pool Covers                              | 0.03                        | 50.0%                         | 95%   | 35%                                 | 10           | \$2,241      |
| New                  | School           | Space Heat Boiler | Gas Boiler - Greater than 300 KBTUH                                 | 85% Thermal Efficiency   | 80% Thermal Efficiency (State Code)         | 0.10                        | 5.9%                          | NA  | NA                                  | 20           | \$12705      |
| New                  | School           | Space Heat Boiler | Gas Boiler - Greater than 300 KBTUH                                 | 90% Thermal Efficiency   | 80% Thermal Efficiency (State Code)         | 0.10                        | 11.1%                         | NA  | NA                                  | 20           | \$25916      |
| New                  | School           | Space Heat Boiler | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 Sensors)                                    | Constant Ventilation                        | 0.10                        | 10.0%                         | 25%   | 94%                                 | 15           | \$54937      |
| New                  | School           | Space Heat Boiler | Boiler Economizer   | Economizer   | No Economizer                               | 0.10                        | 5.5%                          | 40%   | 65%                                 | 20           | \$46077      |
| New                  | School           | Space Heat Boiler | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning                                     | No Commissioning                            | 0.10                        | 12.5%                         | 90%   | 40%                                 | 3            | \$63657      |
| New                  | School           | Space Heat Boiler | Direct Digital Control System-Optimization                          | Premium-Efficiency EMS System  | High-Efficiency EMS System                  | 0.10                        | 10.0%                         | 75%   | 80%                                 | 5            | \$46958      |
| New                  | School           | Space Heat Boiler | Duct Repair And Sealing   | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 0.10                        | 2.5%                          | 45%   | 45%                                 | 18           | \$34881      |
| New                  | School           | Space Heat Boiler | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery  | No Heat Recovery                            | 0.10                        | 15.0%                         | 5%  | 94%                                 | 10           | \$79092      |
| New                  | School           | Space Heat Boiler | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air) | 0.10                        | 4.5%                          | 73%   | 85%                                 | 10           | \$5,729      |
| New                  | School           | Space Heat Boiler | Insulation (Ceiling)  | R-38   | R-21 (Code)                                 | 0.10                        | 4.0%                          | 75%   | 45%                                 | 25           | \$22672      |
| New                  | School           | Space Heat Boiler | Insulation (Ceiling)  | R-49   | R-21 (Code)                                 | 0.10                        | 6.0%                          | 75%   | 85%                                 | 25           | \$30085      |
| New                  | School           | Space Heat Boiler | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 0.10                        | 6.0%                          | 95%   | 95%                                 | 25           | \$10098      |
| New                  | School           | Space Heat Boiler | Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)                                 | 0.10                        | 2.5%                          | 35%   | 35%                                 | 25           | \$3,924      |
| New                  | School           | Space Heat Boiler | Integrated Space Heating/Water Heating                              | Integrated System  | Separate Boiler And HW Heater               | 0.10                        | 5.0%                          | 50%   | 95%                                 | 15           | \$36363      |
| New                  | School           | Space Heat Boiler | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands                 | Std duct workmanship                        | 0.10                        | 10.0%                         | 40%   | 98%                                 | 25           | \$13516      |

| Construction Vintage | Customer Segment | End Use            | Measure Name  | Measure Description  | Base Equipment                              | Baseline therm (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------------|---|--|---|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | School           | Space Heat Boiler  | Sensible And Total Heat Recovery Devices                            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness | No Heat Recovery                            | 0.10                        | 25.0%                         | 50%   | 98%                                 | 10           | 183996       |
| New                  | School           | Space Heat Boiler  | Thermostat - Programmable   | Energy Star Programmable Thermostat  | Manual Thermostat                           | 0.10                        | 3.0%                          | 95%   | 79%                                 | 15           | \$148        |
| New                  | School           | Space Heat Boiler  | Windows   | U = 0.35   | U = 0.55 (Code)                             | 0.10                        | 10.9%                         | 80%   | 60%                                 | 25           | \$73738      |
| New                  | School           | Space Heat Furnace | Gas Furnace   | AFUE = 90% (Condensing Furnace)  | AFUE=80%                                    | 0.14                        | 11.1%                         | NA  | NA                                  | 18           | \$13194      |
| New                  | School           | Space Heat Furnace | Gas Furnace   | AFUE = 94% (Condensing Furnace)  | AFUE=80%                                    | 0.14                        | 14.9%                         | NA  | NA                                  | 18           | \$13194      |
| New                  | School           | Space Heat Furnace | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 Sensors)  | Constant Ventilation                        | 0.14                        | 10.0%                         | 25%   | 94%                                 | 15           | \$54937      |
| New                  | School           | Space Heat Furnace | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning   | No Commissioning                            | 0.14                        | 12.5%                         | 90%   | 80%                                 | 3            | \$63657      |
| New                  | School           | Space Heat Furnace | Duct Repair And Sealing   | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 0.14                        | 2.5%                          | 45%   | 45%                                 | 18           | \$34881      |
| New                  | School           | Space Heat Furnace | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery  | No Heat Recovery                            | 0.14                        | 15.0%                         | 5%  | 94%                                 | 10           | \$79092      |
| New                  | School           | Space Heat Furnace | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air) | 0.14                        | 4.5%                          | 73%   | 85%                                 | 10           | \$5,729      |
| New                  | School           | Space Heat Furnace | Insulation (Ceiling)  | R-38   | R-21 (Code)                                 | 0.14                        | 4.0%                          | 75%   | 45%                                 | 25           | \$22672      |
| New                  | School           | Space Heat Furnace | Insulation (Ceiling)  | R-49   | R-21 (Code)                                 | 0.14                        | 6.0%                          | 75%   | 85%                                 | 25           | \$30085      |
| New                  | School           | Space Heat Furnace | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 0.14                        | 6.0%                          | 95%   | 95%                                 | 25           | \$10098      |
| New                  | School           | Space Heat Furnace | Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)                                 | 0.14                        | 2.5%                          | 35%   | 35%                                 | 25           | \$3,924      |
| New                  | School           | Space Heat Furnace | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                        | 0.14                        | 10.0%                         | 40%   | 98%                                 | 25           | \$13516      |
| New                  | School           | Space Heat Furnace | Thermostat - Programmable   | Energy Star Programmable Thermostat  | Manual Thermostat                           | 0.14                        | 3.0%                          | 95%   | 79%                                 | 15           | \$148        |
| New                  | School           | Space Heat Furnace | Windows   | U = 0.35   | U = 0.55 (Code)                             | 0.14                        | 10.9%                         | 80%   | 60%                                 | 25           | \$73738      |
| New                  | School           | Water Heat         | Water Heater - Condensing   | EF = 0.90  | EF = 0.59                                   | 0.06                        | 34.4%                         | NA  | NA                                  | 13           | \$10691      |
| New                  | School           | Water Heat         | Clothes Washer - Ozonating  | Ozonating Clothes Washer   | Standard Commercial Clothes Washer          | 0.06                        | 15.1%                         | 35%   | 95%                                 | 10           | \$8,703      |

| Construction Vintage | Customer Segment | End Use    | Measure Name                                 | Measure Description   | Base Equipment   | Baseline therm (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|--|---|--|----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | School           | Water Heat | Clothes Washer Commercial                    | Energy Star Commercial Clothes Washer MEF=1.73                    | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.06                       | 0.6%                          | 35%   | 75%                                 | 10           | \$305        |
| New                  | School           | Water Heat | Demand controlled Circulating Systems        | Demand Controlled Circulating Systems (VFD Control by Demand)     | Constant Circulation                                       | 0.06                       | 5.0%                          | 55%   | 94%                                 | 15           | \$24225      |
| New                  | School           | Water Heat | Dishwashing - Commercial - High Efficiency   | High Efficiency Dishwasher  | Standard Dishwasher  | 0.06                       | 3.0%                          | 85%   | 80%                                 | 13           | \$2,703      |
| New                  | School           | Water Heat | Dishwashing - Commercial Chemical System     | Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)     | High Temp Commercial Dishwasher                            | 0.06                       | 6.0%                          | 85%   | 95%                                 | 10           | \$837        |
| New                  | School           | Water Heat | Dishwashing - Residential Sized System       | EF = 0.65 (ENERGY STAR)   | Existing Dishwasher (FED Std. EF=0.46)                     | 0.06                       | 0.1%                          | 65%   | 25%                                 | 13           | \$35         |
| New                  | School           | Water Heat | Dishwashing - Residential Sized System       | EF = 0.77   | Existing Dishwasher (FED Std. EF=0.46)                     | 0.06                       | 0.2%                          | 65%   | 55%                                 | 13           | \$628        |
| New                  | School           | Water Heat | Drainwater Heat Recovery (Power-Pipe or GFX) | Install Power-Pipe or GFX System                                  | No GFX or Power-Pipe System                                | 0.06                       | 20.0%                         | 25%   | 92%                                 | 25           | \$8,267      |
| New                  | School           | Water Heat | Faucet Aerators                              | 1.5 GPM Aerator   | 2.5 GPM Aerator (Federal Code)                             | 0.06                       | 4.0%                          | 95%   | 25%                                 | 10           | \$0          |
| New                  | School           | Water Heat | Integrated Space Heating/Water Heating       | Integrated System   | Separate Boiler And HW Heater                              | 0.06                       | 5.0%                          | 50%   | 95%                                 | 15           | \$36363      |
| New                  | School           | Water Heat | Low Flow Spray Heads                         | 1.6 GPM   | 3.0 GPM  | 0.06                       | 2.3%                          | 95%   | 25%                                 | 5            | \$9          |
| New                  | School           | Water Heat | Low-Flow Showerheads                         | 2.0 GPM Showerhead  | 2.5 GPM Showerhead (Federal Code)                          | 0.06                       | 3.4%                          | 45%   | 75%                                 | 10           | \$9          |
| New                  | School           | Water Heat | Refrigeration with Heat Recovery             | Heat Recovery from Refrigeration System. Applied to Water Heating | No Heat Recovery   | 0.06                       | 28.0%                         | 75%   | 93%                                 | 16           | \$44473      |
| New                  | School           | Water Heat | Solar RE - Solar Water Heater                | Passive solar water heating                                       | Standard Water Heater EF = 0.93                            | 0.06                       | 7.2%                          | 20%   | 95%                                 | 20           | \$66657      |
| New                  | School           | Water Heat | Tankless Water Heater - Commercial           | EF = 0.82   | Thermal Efficiency = 80%                                   | 0.06                       | 30.0%                         | 10%   | 90%                                 | 14           | \$2,267      |
| New                  | School           | Water Heat | Tankless Water Heater - Residential          | EF = 0.82   | EF = 0.59 (40 Gal)   | 0.06                       | 28.0%                         | 10%   | 90%                                 | 20           | \$698        |
| New                  | School           | Water Heat | Ultrasonic Faucet Control                    | Install Ultrasonic Motion Faucet Control                          | No Faucet Control  | 0.06                       | 3.3%                          | 95%   | 75%                                 | 10           | \$209        |
| New                  | School           | Water Heat | Water Heater Thermostat Setback              | Thermostat Setback and Replacement (120 Degrees)                  | No Thermostat Setback (130 Degrees)                        | 0.06                       | 7.7%                          | 75%   | 15%                                 | 11           | \$1,587      |
| Existing             | University       | Cooking    | Broiler                                      | High-Efficiency Broiler (34% Efficient)                           | Standard Broiler (15% Efficient)                           | 0.05                       | 1.9%                          | 95%   | 75%                                 | 10           | \$214        |
| Existing             | University       | Cooking    | Fryers - Commercial Gas Cooking              | Energy Star Commercial Fryer (50% efficient)                      | Non-Energy Star Fryer (35% efficient)                      | 0.05                       | 3.1%                          | 45%   | 65%                                 | 8            | \$1,109      |
| Existing             | University       | Cooking    | Griddle                                      | High-Efficiency Griddle (40% Efficient)                           | Standard Griddle (32% Efficient)                           | 0.05                       | 0.3%                          | 65%   | 75%                                 | 12           | \$1,223      |
| Existing             | University       | Cooking    | Oven - Convection                            | Convection Oven   | Standard Oven  | 0.05                       | 1.2%                          | 85%   | 40%                                 | 12           | \$416        |
| Existing             | University       | Cooking    | Oven - Conveyor                              | High-Efficiency Model (23% Efficient)                             | Standard Model (15% Efficient)                             | 0.05                       | 10.4%                         | 5%  | 85%                                 | 10           | \$3,543      |
| Existing             | University       | Cooking    | Oven - Power Burner                          | Power Burner Oven - Improved Atmospheric Burner (60% Efficient)   | Standard (40%-50% Efficiency)                              | 0.05                       | 3.8%                          | 25%   | 90%                                 | 12           | \$5,358      |
| Existing             | University       | Cooking    | Steam Cooker                                 | Energy Star Steam Cooker (38% Efficient)                          | Standard Cooker (30% Efficient)                            | 0.05                       | 6.9%                          | 25%   | 75%                                 | 10           | \$2,181      |

| Construction Vintage | Customer Segment | End Use           | Measure Name  | Measure Description  | Base Equipment                              | Baseline therm (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-------------------|---|--|---|----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | University       | Pool Heat         | Solar RE - Installation of Solar Pool/Spa Heating Systems           | Solar Pool/Spa Heating Systems   | No Solar Pool Heating System                | 0.13                       | 10.1%                         | 50%   | 90%                                 | 12           | \$35503      |
| Existing             | University       | Pool Heat         | Swimming Pool/Spa Covers  | Plastic Or Foam Pool Covers (50-65% Energy Savings)                            | No Pool Covers                              | 0.13                       | 50.0%                         | 95%   | 35%                                 | 10           | \$2,232      |
| Existing             | University       | Space Heat Boiler | Gas Boiler - Greater than 300 KBTUH                                 | 85% Thermal Efficiency   | 80% Thermal Efficiency (State Code)         | 0.22                       | 5.9%                          | NA  | NA                                  | 20           | \$18369      |
| Existing             | University       | Space Heat Boiler | Gas Boiler - Greater than 300 KBTUH                                 | 90% Thermal Efficiency   | 80% Thermal Efficiency (State Code)         | 0.22                       | 11.1%                         | NA  | NA                                  | 20           | \$37469      |
| Existing             | University       | Space Heat Boiler | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 Sensors)                                    | Constant Ventilation                        | 0.23                       | 10.0%                         | 25%   | 94%                                 | 15           | \$79427      |
| Existing             | University       | Space Heat Boiler | Boiler Economizer   | Economizer   | No Economizer                               | 0.23                       | 5.5%                          | 40%   | 90%                                 | 20           | \$66618      |
| Existing             | University       | Space Heat Boiler | Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning                                   | No Commissioning                            | 0.23                       | 12.5%                         | 90%   | 40%                                 | 3            | \$24849      |
| Existing             | University       | Space Heat Boiler | Direct Digital Control System-Installation                          | DDC Retrofit (Morning Warm-Up Control Logic Included in This Measure)          | Pneumatic                                   | 0.23                       | 5.0%                          | 5%  | 34%                                 | 15           | \$35024      |
| Existing             | University       | Space Heat Boiler | Direct Digital Control System-Optimization                          | Premium-Efficiency EMS System  | High-Efficiency EMS System                  | 0.23                       | 10.0%                         | 75%   | 80%                                 | 5            | \$67891      |
| Existing             | University       | Space Heat Boiler | Direct Digital Control System-Wireless Performance Monitoring       | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control        | Pneumatic                                   | 0.23                       | 15.0%                         | 50%   | 80%                                 | 5            | \$48993      |
| Existing             | University       | Space Heat Boiler | Duct Repair And Sealing   | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 0.23                       | 2.5%                          | 45%   | 45%                                 | 18           | \$50430      |
| Existing             | University       | Space Heat Boiler | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery  | No Heat Recovery                            | 0.23                       | 15.0%                         | 5%  | 94%                                 | 10           | 114350       |
| Existing             | University       | Space Heat Boiler | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air) | 0.23                       | 4.5%                          | 73%   | 85%                                 | 10           | \$5,724      |
| Existing             | University       | Space Heat Boiler | Insulation (Ceiling)  | R-21 (Code)  | Existing Ceiling Insulation (Average R-9)   | 0.23                       | 3.6%                          | 75%   | 13%                                 | 25           | \$38453      |
| Existing             | University       | Space Heat Boiler | Insulation (Ceiling)  | R-21 (Code)  | R-0   | 0.23                       | 10.0%                         | 75%   | 0%                                  | 25           | \$38453      |
| Existing             | University       | Space Heat Boiler | Insulation (Ceiling)  | R-38   | R-21 (Code)                                 | 0.23                       | 4.0%                          | 75%   | 45%                                 | 25           | \$32780      |
| Existing             | University       | Space Heat Boiler | Insulation (Ceiling)  | R-49   | R-21 (Code)                                 | 0.23                       | 6.0%                          | 75%   | 85%                                 | 25           | \$43496      |
| Existing             | University       | Space Heat Boiler | Insulation (Duct) (Unconditioned Spaces)                            | Install New Duct Insulation (R-8)  | R-0   | 0.23                       | 4.4%                          | 10%   | 15%                                 | 25           | \$14095      |
| Existing             | University       | Space Heat Boiler | Insulation (Duct) (Unconditioned Spaces)                            | R-4  | R-0   | 0.23                       | 2.4%                          | 10%   | 15%                                 | 25           | \$14688      |

| Construction Vintage | Customer Segment | End Use       | Measure Name   | Measure Description  | Base Equipment                              | Baseline therm (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|--|--|---|----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | University       | Space Boiler  | Heat Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 0.23                       | 6.0%                          | 10%   | 95%                                 | 25           | \$12141      |
| Existing             | University       | Space Boiler  | Heat Insulation (Wall) - Existing to Code                                | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)              | 0.23                       | 21.1%                         | 10%   | 35%                                 | 25           | \$13162      |
| Existing             | University       | Space Boiler  | Heat Insulation (Wall) - Zero to Code                                    | R-19 (2x6 Framing) - (Code)  | R-0   | 0.23                       | 25.0%                         | 10%   | 0%                                  | 25           | \$13162      |
| Existing             | University       | Space Boiler  | Heat Insulation - Floor (Non-Slab)                                       | R-10 (Code)  | R-0   | 0.23                       | 7.5%                          | 35%   | 35%                                 | 25           | \$32780      |
| Existing             | University       | Space Boiler  | Heat Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)                                 | 0.23                       | 2.5%                          | 35%   | 35%                                 | 25           | \$5,673      |
| Existing             | University       | Space Boiler  | Heat Sensible And Total Heat Recovery Devices                            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness | No Heat Recovery                            | 0.23                       | 25.0%                         | 25%   | 98%                                 | 10           | 266018       |
| Existing             | University       | Space Boiler  | Heat Steam Pipe Insulation   | R-4  | R-0   | 0.23                       | 12.1%                         | 75%   | 65%                                 | 20           | \$5,270      |
| Existing             | University       | Space Boiler  | Heat Steam Trap Maintenance  | Actively stop steam trap leaks   | No Maintenance                              | 0.23                       | 17.0%                         | 90%   | 45%                                 | 3            | \$17020      |
| Existing             | University       | Space Boiler  | Heat Thermostat - Programmable   | Energy Star Programmable Thermostat  | Manual Thermostat                           | 0.23                       | 3.0%                          | 95%   | 66%                                 | 15           | \$151        |
| Existing             | University       | Space Boiler  | Heat Windows   | U = 0.35   | U = 0.55 (Code)                             | 0.23                       | 10.9%                         | 80%   | 60%                                 | 25           | 106609       |
| Existing             | University       | Space Boiler  | Heat Windows - Existing to Code  | U = 0.55 (Code)  | Existing Windows (U=0.65)                   | 0.23                       | 7.3%                          | 10%   | 60%                                 | 25           | 301017       |
| Existing             | University       | Space Furnace | Heat Gas Furnace   | AFUE = 90% (Condensing Furnace)  | AFUE=80%                                    | 0.33                       | 11.1%                         | NA  | NA                                  | 18           | \$19075      |
| Existing             | University       | Space Furnace | Heat Gas Furnace   | AFUE = 94% (Condensing Furnace)  | AFUE=80%                                    | 0.33                       | 14.9%                         | NA  | NA                                  | 18           | \$19075      |
| Existing             | University       | Space Furnace | Heat Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 Sensors)  | Constant Ventilation                        | 0.33                       | 10.0%                         | 25%   | 94%                                 | 15           | \$79427      |
| Existing             | University       | Space Furnace | Heat Commissioning - Retro Building Commissioning                        | Commissioning - Retro Building Commissioning   | No Commissioning                            | 0.33                       | 12.5%                         | 90%   | 80%                                 | 3            | \$24849      |
| Existing             | University       | Space Furnace | Heat Duct Repair And Sealing   | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 0.33                       | 2.5%                          | 45%   | 45%                                 | 18           | \$50430      |
| Existing             | University       | Space Furnace | Heat Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery  | No Heat Recovery                            | 0.33                       | 15.0%                         | 5%  | 94%                                 | 10           | 114350       |
| Existing             | University       | Space Furnace | Heat Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air) | 0.33                       | 4.5%                          | 73%   | 85%                                 | 10           | \$5,724      |
| Existing             | University       | Space Furnace | Heat Insulation (Ceiling)  | R-21 (Code)  | Existing Ceiling Insulation (Average R-9)   | 0.33                       | 3.6%                          | 75%   | 13%                                 | 25           | \$38453      |

| Construction Vintage | Customer Segment | End Use            | Measure Name                               | Measure Description   | Base Equipment   | Baseline therm (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------------|--|---|--|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | University       | Space Heat Furnace | Insulation (Ceiling)                       | R-21 (Code)   | R-0  | 0.33                        | 10.0%                         | 75%   | 0%                                  | 25           | \$38453      |
| Existing             | University       | Space Heat Furnace | Insulation (Ceiling)                       | R-38  | R-21 (Code)  | 0.33                        | 4.0%                          | 75%   | 45%                                 | 25           | \$32780      |
| Existing             | University       | Space Heat Furnace | Insulation (Ceiling)                       | R-49  | R-21 (Code)  | 0.33                        | 6.0%                          | 75%   | 85%                                 | 25           | \$43496      |
| Existing             | University       | Space Heat Furnace | Insulation (Duct) (Unconditioned Spaces)   | Install New Duct Insulation (R-8)                             | R-0  | 0.33                        | 4.4%                          | 10%   | 15%                                 | 25           | \$14095      |
| Existing             | University       | Space Heat Furnace | Insulation (Duct) (Unconditioned Spaces)   | R-4   | R-0  | 0.33                        | 2.4%                          | 10%   | 15%                                 | 25           | \$14688      |
| Existing             | University       | Space Heat Furnace | Insulation (Wall)                          | R-25 (2x6 Framing) - Advanced                                 | R-19 (2x6 Framing) - (Code)                                | 0.33                        | 6.0%                          | 10%   | 95%                                 | 25           | \$12141      |
| Existing             | University       | Space Heat Furnace | Insulation (Wall) - Existing to Code       | R-19 (2x6 Framing) - (Code)                                   | Existing R-value (Average R-3)                             | 0.33                        | 21.1%                         | 10%   | 35%                                 | 25           | \$13162      |
| Existing             | University       | Space Heat Furnace | Insulation (Wall) - Zero to Code           | R-19 (2x6 Framing) - (Code)                                   | R-0  | 0.33                        | 25.0%                         | 10%   | 0%                                  | 25           | \$13162      |
| Existing             | University       | Space Heat Furnace | Insulation - Floor (Non-Slab)              | R-10 (Code)   | R-0  | 0.33                        | 7.5%                          | 35%   | 35%                                 | 25           | \$32780      |
| Existing             | University       | Space Heat Furnace | Insulation - Floor (Non-Slab)              | R-19  | R-10 (Code)  | 0.33                        | 2.5%                          | 35%   | 35%                                 | 25           | \$5,673      |
| Existing             | University       | Space Heat Furnace | Thermostat - Programmable                  | Energy Star Programmable Thermostat                           | Manual Thermostat  | 0.33                        | 3.0%                          | 95%   | 66%                                 | 15           | \$151        |
| Existing             | University       | Space Heat Furnace | Windows                                    | U = 0.35  | U = 0.55 (Code)  | 0.33                        | 10.9%                         | 80%   | 60%                                 | 25           | 106609       |
| Existing             | University       | Space Heat Furnace | Windows - Existing to Code                 | U = 0.55 (Code)   | Existing Windows (U=0.65)                                  | 0.33                        | 7.3%                          | 10%   | 60%                                 | 25           | 301017       |
| Existing             | University       | Water Heat         | Water Heater - Condensing                  | EF = 0.90   | EF = 0.59  | 0.09                        | 34.4%                         | NA  | NA                                  | 13           | \$18117      |
| Existing             | University       | Water Heat         | Clothes Washer - Ozonating                 | Ozonating Clothes Washer                                      | Standard Commercial Clothes Washer                         | 0.09                        | 15.1%                         | 35%   | 95%                                 | 10           | \$8,699      |
| Existing             | University       | Water Heat         | Clothes Washer Commercial                  | Energy Star Commercial Clothes Washer MEF=1.73                | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.09                        | 0.2%                          | 35%   | 75%                                 | 10           | \$303        |
| Existing             | University       | Water Heat         | Demand controlled Circulating Systems      | Demand Controlled Circulating Systems (VFD Control by Demand) | Constant Circulation                                       | 0.09                        | 5.0%                          | 55%   | 94%                                 | 15           | \$35024      |
| Existing             | University       | Water Heat         | Dishwashing - Commercial - High Efficiency | High Efficiency Dishwasher                                    | Standard Dishwasher  | 0.09                        | 3.0%                          | 85%   | 80%                                 | 13           | \$2,698      |
| Existing             | University       | Water Heat         | Dishwashing - Commercial Chemical System   | Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost) | High Temp Commercial Dishwasher                            | 0.09                        | 6.0%                          | 85%   | 95%                                 | 10           | \$845        |
| Existing             | University       | Water Heat         | Dishwashing - Residential Sized System     | EF = 0.65 (ENERGY STAR)                                       | Existing Dishwasher (FED Std. EF=0.46)                     | 0.09                        | 0.1%                          | 65%   | 25%                                 | 13           | \$25         |

| Construction Vintage | Customer Segment | End Use    | Measure Name  | Measure Description   | Base Equipment                         | Baseline therm (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|---|---|--|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | University       | Water Heat | Dishwashing - Residential Sized System                    | EF = 0.77   | Existing Dishwasher (FED Std. EF=0.46) | 0.09                        | 0.1%                          | 65%   | 55%                                 | 13           | \$630        |
| Existing             | University       | Water Heat | Drainwater Heat Recovery (Power-Pipe or GFX)              | Install Power-Pipe or GFX System                                  | No GFX or Power-Pipe System            | 0.09                        | 20.0%                         | 5%  | 92%                                 | 25           | \$14007      |
| Existing             | University       | Water Heat | Faucet Aerators   | 1.5 GPM Aerator   | 2.5 GPM Aerator (Federal Code)         | 0.09                        | 4.0%                          | 95%   | 25%                                 | 10           | \$0          |
| Existing             | University       | Water Heat | Faucet Aerators - Existing to Code                        | 2.5 GPM Aerator (Federal Code)                                    | 4.0 GPM Aerator                        | 0.09                        | 3.8%                          | 95%   | 15%                                 | 10           | \$0          |
| Existing             | University       | Water Heat | Hot Water (SHW) Pipe Insulation                           | Install Insulation (R-4)  | No Pipe Insulation                     | 0.09                        | 1.0%                          | 75%   | 70%                                 | 15           | \$1,336      |
| Existing             | University       | Water Heat | Low Flow Spray Heads                                      | 1.6 GPM   | 3.0 GPM                                | 0.09                        | 2.3%                          | 95%   | 45%                                 | 5            | \$0          |
| Existing             | University       | Water Heat | Low-Flow Showerheads                                      | 2.0 GPM Showerhead  | 2.5 GPM Showerhead (Federal Code)      | 0.09                        | 3.4%                          | 45%   | 75%                                 | 10           | \$0          |
| Existing             | University       | Water Heat | Low-Flow Showerheads - Existing to Code                   | 2.5 GPM Showerhead (Federal Code)                                 | 4.5 GPM Showerhead                     | 0.09                        | 7.5%                          | 45%   | 20%                                 | 10           | \$13         |
| Existing             | University       | Water Heat | Refrigeration with Heat Recovery                          | Heat Recovery from Refrigeration System. Applied to Water Heating | No Heat Recovery                       | 0.09                        | 28.0%                         | 75%   | 100%                                | 16           | 114728       |
| Existing             | University       | Water Heat | Solar RE - Solar Water Heater                             | Passive solar water heating                                       | Standard Water Heater EF = 0.93        | 0.09                        | 6.9%                          | 20%   | 95%                                 | 20           | \$99246      |
| Existing             | University       | Water Heat | Tankless Water Heater - Commercial                        | EF = 0.82   | Thermal Efficiency = 80%               | 0.09                        | 30.0%                         | 10%   | 90%                                 | 14           | \$2,269      |
| Existing             | University       | Water Heat | Tankless Water Heater - Residential                       | EF = 0.82   | EF = 0.59 (40 Gal)                     | 0.09                        | 28.0%                         | 10%   | 90%                                 | 20           | \$693        |
| Existing             | University       | Water Heat | Ultrasonic Faucet Control                                 | Install Ultrasonic Motion Faucet Control                          | No Faucet Control                      | 0.09                        | 3.3%                          | 95%   | 75%                                 | 10           | \$202        |
| Existing             | University       | Water Heat | Water Heater Thermostat Setback                           | Thermostat Setback and Replcement (120 Degrees)                   | No Thermostat Setback (130 Degrees)    | 0.09                        | 7.7%                          | 75%   | 15%                                 | 11           | \$2,685      |
| New                  | University       | Cooking    | Broiler   | High-Efficiency Broiler (34% Efficient)                           | Standard Broiler (15% Efficient)       | 0.05                        | 1.9%                          | 95%   | 75%                                 | 10           | \$214        |
| New                  | University       | Cooking    | Fryers - Commercial Gas Cooking                           | Energy Star Commercial Fryer (50% efficient)                      | Non-Energy Star Fryer (35% efficient)  | 0.05                        | 3.1%                          | 45%   | 65%                                 | 8            | \$1,109      |
| New                  | University       | Cooking    | Griddle   | High-Efficiency Griddle (40% Efficient)                           | Standard Griddle (32% Efficient)       | 0.05                        | 0.3%                          | 65%   | 75%                                 | 12           | \$1,223      |
| New                  | University       | Cooking    | Oven - Convection   | Convection Oven   | Standard Oven                          | 0.05                        | 1.2%                          | 85%   | 40%                                 | 12           | \$416        |
| New                  | University       | Cooking    | Oven - Conveyor   | High-Efficiency Model (23% Efficient)                             | Standard Model (15% Efficient)         | 0.05                        | 10.4%                         | 5%  | 85%                                 | 10           | \$2,837      |
| New                  | University       | Cooking    | Oven - Power Burner                                       | Power Burner Oven - Improved Atmospheric Burner (60% Efficient)   | Standard (40%-50% Efficiency)          | 0.05                        | 3.8%                          | 25%   | 90%                                 | 12           | \$5,358      |
| New                  | University       | Cooking    | Steam Cooker  | Energy Star Steam Cooker (38% Efficient)                          | Standard Cooker (30% Efficient)        | 0.05                        | 6.9%                          | 25%   | 75%                                 | 10           | \$2,181      |
| New                  | University       | Pool Heat  | Solar RE - Installation of Solar Pool/Spa Heating Systems | Solar Pool/Spa Heating Systems                                    | No Solar Pool Heating System           | 0.04                        | 10.1%                         | 50%   | 90%                                 | 12           | \$35503      |
| New                  | University       | Pool Heat  | Swimming Pool/Spa Covers                                  | Plastic Or Foam Pool Covers (50-65% Energy Savings)               | No Pool Covers                         | 0.04                        | 50.0%                         | 95%   | 35%                                 | 10           | \$2,232      |
| New                  | University       | Space Heat | Gas Boiler - Greater than 300 KBTUH Boiler                | 85% Thermal Efficiency  | 80% Thermal Efficiency (State Code)    | 0.19                        | 5.9%                          | NA  | NA                                  | 20           | \$18369      |
| New                  | University       | Space Heat | Gas Boiler - Greater than 300 KBTUH Boiler                | 90% Thermal Efficiency  | 80% Thermal Efficiency (State Code)    | 0.19                        | 11.1%                         | NA  | NA                                  | 20           | \$37469      |

| Construction Vintage | Customer Segment | End Use       | Measure Name | Measure Description   | Base Equipment   | Baseline therm (UEC or EUI)                 | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|---------------|--------------|---|--|---|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| New                  | University       | Space Boiler  | Heat         | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 Sensors)  | Constant Ventilation                        | 0.19                          | 10.0%   | 25%                                 | 94%          | 15           | \$79427 |
| New                  | University       | Space Boiler  | Heat         | Boiler Economizer   | Economizer   | No Economizer                               | 0.19                          | 5.5%  | 40%                                 | 90%          | 20           | \$66618 |
| New                  | University       | Space Boiler  | Heat         | Commissioning - New Building Commissioning                          | Commissioning - New Building Commissioning   | No Commissioning                            | 0.19                          | 12.5%   | 90%                                 | 40%          | 3            | \$92035 |
| New                  | University       | Space Boiler  | Heat         | Direct Digital Control System-Optimization                          | Premium-Efficiency EMS System  | High-Efficiency EMS System                  | 0.19                          | 10.0%   | 75%                                 | 80%          | 5            | \$67891 |
| New                  | University       | Space Boiler  | Heat         | Duct Repair And Sealing   | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses       | 0.19                          | 2.5%  | 45%                                 | 45%          | 18           | \$50430 |
| New                  | University       | Space Boiler  | Heat         | Exhaust Air to Ventilation Air Heat Recovery                        | Exhaust Air Heat Recovery  | No Heat Recovery                            | 0.19                          | 15.0%   | 5%                                  | 94%          | 10           | 114350  |
| New                  | University       | Space Boiler  | Heat         | Exhaust Hood Makeup Air   | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air   | Hood Pulls Conditioned Air (No Make-up Air) | 0.19                          | 4.5%  | 73%                                 | 85%          | 10           | \$5,724 |
| New                  | University       | Space Boiler  | Heat         | Insulation (Ceiling)  | R-38   | R-21 (Code)                                 | 0.19                          | 4.0%  | 75%                                 | 45%          | 25           | \$32780 |
| New                  | University       | Space Boiler  | Heat         | Insulation (Ceiling)  | R-49   | R-21 (Code)                                 | 0.19                          | 6.0%  | 75%                                 | 85%          | 25           | \$43496 |
| New                  | University       | Space Boiler  | Heat         | Insulation (Wall)   | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                 | 0.19                          | 6.0%  | 95%                                 | 95%          | 25           | \$12141 |
| New                  | University       | Space Boiler  | Heat         | Insulation - Floor (Non-Slab)                                       | R-19   | R-10 (Code)                                 | 0.19                          | 2.5%  | 35%                                 | 35%          | 25           | \$5,673 |
| New                  | University       | Space Boiler  | Heat         | Integrated Space Heating/Water Heating                              | Integrated System  | Separate Boiler And HW Heater               | 0.19                          | 5.0%  | 50%                                 | 95%          | 15           | \$52573 |
| New                  | University       | Space Boiler  | Heat         | Leak Proof Duct Fittings  | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                        | 0.19                          | 10.0%   | 40%                                 | 98%          | 25           | \$19542 |
| New                  | University       | Space Boiler  | Heat         | Sensible And Total Heat Recovery Devices                            | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness | No Heat Recovery                            | 0.19                          | 25.0%   | 50%                                 | 98%          | 10           | 266018  |
| New                  | University       | Space Boiler  | Heat         | Thermostat - Programmable   | Energy Star Programmable Thermostat  | Manual Thermostat                           | 0.19                          | 3.0%  | 95%                                 | 66%          | 15           | \$151   |
| New                  | University       | Space Boiler  | Heat         | Windows   | U = 0.35   | U = 0.55 (Code)                             | 0.19                          | 10.9%   | 80%                                 | 60%          | 25           | 106609  |
| New                  | University       | Space Furnace | Heat         | Gas Furnace   | AFUE = 90% (Condensing Furnace)  | AFUE=80%                                    | 0.28                          | 11.1%   | NA                                  | NA           | 18           | \$19075 |
| New                  | University       | Space Furnace | Heat         | Gas Furnace   | AFUE = 94% (Condensing Furnace)  | AFUE=80%                                    | 0.28                          | 14.9%   | NA                                  | NA           | 18           | \$19075 |
| New                  | University       | Space Furnace | Heat         | Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors) | Demand Controlled Ventilation (CO2 Sensors)  | Constant Ventilation                        | 0.28                          | 10.0%   | 25%                                 | 94%          | 15           | \$79427 |



| Construction Vintage | Customer Segment | End Use            | Measure Name                                 | Measure Description  | Base Equipment   | Baseline therm (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------------|--|--|--|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | University       | Space Heat Furnace | Commissioning - New Building Commissioning   | Commissioning - New Building Commissioning                                     | No Commissioning   | 0.28                        | 12.5%                         | 90%   | 80%                                 | 3            | \$92035      |
| New                  | University       | Space Heat Furnace | Duct Repair And Sealing                      | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses                      | 0.28                        | 2.5%                          | 45%   | 45%                                 | 18           | \$50430      |
| New                  | University       | Space Heat Furnace | Exhaust Air to Ventilation Air Heat Recovery | Exhaust Air Heat Recovery  | No Heat Recovery   | 0.28                        | 15.0%                         | 5%  | 94%                                 | 10           | 114350       |
| New                  | University       | Space Heat Furnace | Exhaust Hood Makeup Air                      | Provide Makeup Air Directly at Exhaust Hood Instead of Pulling Conditioned Air | Hood Pulls Conditioned Air (No Make-up Air)                | 0.28                        | 4.5%                          | 73%   | 85%                                 | 10           | \$5,724      |
| New                  | University       | Space Heat Furnace | Insulation (Ceiling)                         | R-38   | R-21 (Code)  | 0.28                        | 4.0%                          | 75%   | 45%                                 | 25           | \$32780      |
| New                  | University       | Space Heat Furnace | Insulation (Ceiling)                         | R-49   | R-21 (Code)  | 0.28                        | 6.0%                          | 75%   | 85%                                 | 25           | \$43496      |
| New                  | University       | Space Heat Furnace | Insulation (Wall)                            | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)                                | 0.28                        | 6.0%                          | 95%   | 95%                                 | 25           | \$12141      |
| New                  | University       | Space Heat Furnace | Insulation - Floor (Non-Slab)                | R-19   | R-10 (Code)  | 0.28                        | 2.5%                          | 35%   | 35%                                 | 25           | \$5,673      |
| New                  | University       | Space Heat Furnace | Leak Proof Duct Fittings                     | Quick connect fittings that do not require mastic or drawbands                 | Std duct workmanship                                       | 0.28                        | 10.0%                         | 40%   | 98%                                 | 25           | \$19542      |
| New                  | University       | Space Heat Furnace | Thermostat - Programmable                    | Energy Star Programmable Thermostat  | Manual Thermostat  | 0.28                        | 3.0%                          | 95%   | 66%                                 | 15           | \$151        |
| New                  | University       | Space Heat Furnace | Windows                                      | U = 0.35   | U = 0.55 (Code)  | 0.28                        | 10.9%                         | 80%   | 60%                                 | 25           | 106609       |
| New                  | University       | Water Heat         | Water Heater - Condensing                    | EF = 0.90  | EF = 0.59  | 0.10                        | 34.4%                         | NA  | NA                                  | 13           | \$18117      |
| New                  | University       | Water Heat         | Clothes Washer - Ozonating                   | Ozonating Clothes Washer   | Standard Commercial Clothes Washer                         | 0.09                        | 15.1%                         | 35%   | 95%                                 | 10           | \$8,699      |
| New                  | University       | Water Heat         | Clothes Washer Commercial                    | Energy Star Commercial Clothes Washer MEF=1.73                                 | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.09                        | 0.2%                          | 35%   | 75%                                 | 10           | \$303        |
| New                  | University       | Water Heat         | Demand controlled Circulating Systems        | Demand Controlled Circulating Systems (VFD Control by Demand)                  | Constant Circulation                                       | 0.09                        | 5.0%                          | 55%   | 94%                                 | 15           | \$35024      |
| New                  | University       | Water Heat         | Dishwashing - Commercial - High Efficiency   | High Efficiency Dishwasher   | Standard Dishwasher  | 0.09                        | 3.0%                          | 85%   | 80%                                 | 13           | \$2,698      |
| New                  | University       | Water Heat         | Dishwashing - Commercial Chemical System     | Low-Temp Commercial Dishwasher (Includes Extra Chemical Cost)                  | High Temp Commercial Dishwasher                            | 0.09                        | 6.0%                          | 85%   | 95%                                 | 10           | \$845        |
| New                  | University       | Water Heat         | Dishwashing - Residential Sized System       | EF = 0.65 (ENERGY STAR)  | Existing Dishwasher (FED Std. EF=0.46)                     | 0.09                        | 0.1%                          | 65%   | 25%                                 | 13           | \$25         |
| New                  | University       | Water Heat         | Dishwashing - Residential Sized System       | EF = 0.77  | Existing Dishwasher (FED Std. EF=0.46)                     | 0.09                        | 0.1%                          | 65%   | 55%                                 | 13           | \$630        |
| New                  | University       | Water Heat         | Drainwater Heat Recovery (Power-Pipe or GFX) | Install Power-Pipe or GFX System   | No GFX or Power-Pipe System                                | 0.09                        | 20.0%                         | 25%   | 92%                                 | 25           | \$14007      |

| Construction Vintage | Customer Segment | End Use           | Measure Name  | Measure Description   | Base Equipment                            | Baseline therm (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|-------------------|---|---|---|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | University       | Water Heat        | Faucet Aerators   | 1.5 GPM Aerator   | 2.5 GPM Aerator (Federal Code)            | 0.09                        | 4.0%                          | 95%   | 25%                                 | 10           | \$0          |
| New                  | University       | Water Heat        | Integrated Space Heating/Water Heating                        | Integrated System   | Separate Boiler And HW Heater             | 0.09                        | 5.0%                          | 50%   | 95%                                 | 15           | \$52573      |
| New                  | University       | Water Heat        | Low Flow Spray Heads  | 1.6 GPM   | 3.0 GPM                                   | 0.09                        | 2.3%                          | 95%   | 45%                                 | 5            | \$0          |
| New                  | University       | Water Heat        | Low-Flow Showerheads  | 2.0 GPM Showerhead  | 2.5 GPM Showerhead (Federal Code)         | 0.09                        | 3.4%                          | 45%   | 75%                                 | 10           | \$0          |
| New                  | University       | Water Heat        | Refrigeration with Heat Recovery                              | Heat Recovery from Refrigeration System. Applied to Water Heating       | No Heat Recovery                          | 0.09                        | 28.0%                         | 75%   | 100%                                | 16           | \$64298      |
| New                  | University       | Water Heat        | Solar RE - Solar Water Heater                                 | Passive solar water heating   | Standard Water Heater EF = 0.93           | 0.09                        | 6.9%                          | 20%   | 95%                                 | 20           | \$99246      |
| New                  | University       | Water Heat        | Tankless Water Heater - Commercial                            | EF = 0.82   | Thermal Efficiency = 80%                  | 0.09                        | 30.0%                         | 10%   | 90%                                 | 14           | \$2,269      |
| New                  | University       | Water Heat        | Tankless Water Heater - Residential                           | EF = 0.82   | EF = 0.59 (40 Gal)                        | 0.09                        | 28.0%                         | 10%   | 90%                                 | 20           | \$693        |
| New                  | University       | Water Heat        | Ultrasonic Faucet Control                                     | Install Ultrasonic Motion Faucet Control                                | No Faucet Control                         | 0.09                        | 3.3%                          | 95%   | 75%                                 | 10           | \$202        |
| New                  | University       | Water Heat        | Water Heater Thermostat Setback                               | Thermostat Setback and Replecement (120 Degrees)                        | No Thermostat Setback (130 Degrees)       | 0.09                        | 7.7%                          | 75%   | 15%                                 | 11           | \$2,685      |
| Existing             | Warehouse        | Space Heat Boiler | Gas Boiler - Greater than 300 kBTUH                           | 85% Thermal Efficiency  | 80% Thermal Efficiency (State Code)       | 0.09                        | 5.9%                          | NA  | NA                                  | 20           | \$11670      |
| Existing             | Warehouse        | Space Heat Boiler | Gas Boiler - Greater than 300 kBTUH                           | 90% Thermal Efficiency  | 80% Thermal Efficiency (State Code)       | 0.09                        | 11.1%                         | NA  | NA                                  | 20           | \$23805      |
| Existing             | Warehouse        | Space Heat Boiler | Boiler Economizer   | Economizer  | No Economizer                             | 0.09                        | 5.5%                          | 40%   | 90%                                 | 20           | \$42306      |
| Existing             | Warehouse        | Space Heat Boiler | Commissioning - Retro Building Commissioning                  | Commissioning - Retro Building Commissioning                            | No Commissioning                          | 0.09                        | 12.5%                         | 90%   | 40%                                 | 3            | \$15531      |
| Existing             | Warehouse        | Space Heat Boiler | Direct Digital Control System-Installation                    | DDC Retrofit (Morning Warm-Up Control Logic Included in This Measure)   | Pneumatic                                 | 0.09                        | 5.0%                          | 5%  | 93%                                 | 15           | \$21890      |
| Existing             | Warehouse        | Space Heat Boiler | Direct Digital Control System-Optimization                    | Premium-Efficiency EMS System   | High-Efficiency EMS System                | 0.09                        | 10.0%                         | 75%   | 98%                                 | 5            | \$42432      |
| Existing             | Warehouse        | Space Heat Boiler | Direct Digital Control System-Wireless Performance Monitoring | DDC Retrofit - Wireless Performance Monitoring, Diagnostics And Control | Pneumatic                                 | 0.09                        | 15.0%                         | 75%   | 98%                                 | 5            | \$30620      |
| Existing             | Warehouse        | Space Heat Boiler | Duct Repair And Sealing                                       | Reduction In Duct Losses to 5%  | No Repair or Sealing, 15% duct losses     | 0.09                        | 2.5%                          | 45%   | 45%                                 | 18           | \$31519      |
| Existing             | Warehouse        | Space Heat Boiler | Exhaust Air to Ventilation Air Heat Recovery                  | Exhaust Air Heat Recovery   | No Heat Recovery                          | 0.09                        | 15.0%                         | 5%  | 94%                                 | 10           | \$71469      |
| Existing             | Warehouse        | Space Heat Boiler | Insulation (Ceiling)  | R-21 (Code)   | Existing Ceiling Insulation (Average R-9) | 0.09                        | 7.2%                          | 75%   | 10%                                 | 25           | \$48066      |
| Existing             | Warehouse        | Space Heat Boiler | Insulation (Ceiling)  | R-21 (Code)   | R-0                                       | 0.09                        | 20.0%                         | 75%   | 0%                                  | 25           | \$48066      |

| Construction Vintage | Customer Segment | End Use       | Measure Name | Measure Description                          | Base Equipment   | Baseline therm (UEC or EU)            | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |         |
|----------------------|------------------|---------------|--------------|--|--|---------------------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|---------|
| Existing             | Warehouse        | Space Boiler  | Heat         | Insulation (Ceiling)                         | R-38   | R-21 (Code)                           | 0.09                          | 8.0%  | 75%                                 | 45%          | 25           | \$40974 |
| Existing             | Warehouse        | Space Boiler  | Heat         | Insulation (Ceiling)                         | R-49   | R-21 (Code)                           | 0.09                          | 12.0%   | 75%                                 | 85%          | 25           | \$54370 |
| Existing             | Warehouse        | Space Boiler  | Heat         | Insulation (Duct) (Unconditioned Spaces)     | Install New Duct Insulation (R-8)  | R-0                                   | 0.09                          | 4.4%  | 10%                                 | 15%          | 25           | \$8,809 |
| Existing             | Warehouse        | Space Boiler  | Heat         | Insulation (Duct) (Unconditioned Spaces)     | R-4  | R-0                                   | 0.09                          | 2.4%  | 10%                                 | 15%          | 25           | \$9,180 |
| Existing             | Warehouse        | Space Boiler  | Heat         | Insulation (Wall)                            | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)           | 0.09                          | 6.0%  | 10%                                 | 95%          | 25           | \$6,792 |
| Existing             | Warehouse        | Space Boiler  | Heat         | Insulation (Wall) - Existing to Code         | R-19 (2x6 Framing) - (Code)  | Existing R-value (Average R-3)        | 0.09                          | 21.1%   | 10%                                 | 35%          | 25           | \$7,352 |
| Existing             | Warehouse        | Space Boiler  | Heat         | Insulation (Wall) - Zero to Code             | R-19 (2x6 Framing) - (Code)  | R-0                                   | 0.09                          | 25.0%   | 10%                                 | 0%           | 25           | \$7,352 |
| Existing             | Warehouse        | Space Boiler  | Heat         | Insulation - Floor (Non-Slab)                | R-10 (Code)  | R-0                                   | 0.09                          | 15.0%   | 35%                                 | 45%          | 25           | \$40974 |
| Existing             | Warehouse        | Space Boiler  | Heat         | Insulation - Floor (Non-Slab)                | R-19   | R-10 (Code)                           | 0.09                          | 5.0%  | 35%                                 | 45%          | 25           | \$7,092 |
| Existing             | Warehouse        | Space Boiler  | Heat         | Sensible And Total Heat Recovery Devices     | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness | No Heat Recovery                      | 0.09                          | 25.0%   | 25%                                 | 98%          | 10           | 166261  |
| Existing             | Warehouse        | Space Boiler  | Heat         | Steam Pipe Insulation                        | R-4  | R-0                                   | 0.09                          | 12.1%   | 75%                                 | 65%          | 20           | \$4,168 |
| Existing             | Warehouse        | Space Boiler  | Heat         | Steam Trap Maintenance                       | Actively stop steam trap leaks   | No Maintenance                        | 0.09                          | 17.0%   | 90%                                 | 45%          | 3            | \$10638 |
| Existing             | Warehouse        | Space Boiler  | Heat         | Thermostat - Programmable                    | Energy Star Programmable Thermostat  | Manual Thermostat                     | 0.09                          | 3.0%  | 95%                                 | 20%          | 15           | \$142   |
| Existing             | Warehouse        | Space Boiler  | Heat         | Windows                                      | U = 0.35   | U = 0.55 (Code)                       | 0.09                          | 1.5%  | 80%                                 | 98%          | 25           | \$17816 |
| Existing             | Warehouse        | Space Boiler  | Heat         | Windows - Existing to Code                   | U = 0.55 (Code)  | Existing Windows (U=0.65)             | 0.09                          | 1.0%  | 10%                                 | 98%          | 25           | \$50296 |
| Existing             | Warehouse        | Space Furnace | Heat         | Gas Furnace                                  | AFUE = 90% (Condensing Furnace)  | AFUE=80%                              | 0.13                          | 11.1%   | NA                                  | NA           | 18           | \$12119 |
| Existing             | Warehouse        | Space Furnace | Heat         | Gas Furnace                                  | AFUE = 94% (Condensing Furnace)  | AFUE=80%                              | 0.13                          | 14.9%   | NA                                  | NA           | 18           | \$12119 |
| Existing             | Warehouse        | Space Furnace | Heat         | Commissioning - Retro Building Commissioning | Commissioning - Retro Building Commissioning   | No Commissioning                      | 0.13                          | 12.5%   | 90%                                 | 80%          | 3            | \$15531 |
| Existing             | Warehouse        | Space Furnace | Heat         | Duct Repair And Sealing                      | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses | 0.13                          | 2.5%  | 45%                                 | 45%          | 18           | \$31519 |

| Construction Vintage | Customer Segment | End Use            | Measure Name                                 | Measure Description   | Base Equipment   | Baseline therm (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------------|--|---|--|----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Warehouse        | Space Heat Furnace | Exhaust Air to Ventilation Air Heat Recovery | Exhaust Air Heat Recovery                                     | No Heat Recovery   | 0.13                       | 15.0%                         | 5%  | 94%                                 | 10           | \$71469      |
| Existing             | Warehouse        | Space Heat Furnace | Insulation (Ceiling)                         | R-21 (Code)   | Existing Ceiling Insulation (Average R-9)                  | 0.13                       | 7.2%                          | 75%   | 10%                                 | 25           | \$48066      |
| Existing             | Warehouse        | Space Heat Furnace | Insulation (Ceiling)                         | R-21 (Code)   | R-0  | 0.13                       | 20.0%                         | 75%   | 0%                                  | 25           | \$48066      |
| Existing             | Warehouse        | Space Heat Furnace | Insulation (Ceiling)                         | R-38  | R-21 (Code)  | 0.13                       | 8.0%                          | 75%   | 45%                                 | 25           | \$40974      |
| Existing             | Warehouse        | Space Heat Furnace | Insulation (Ceiling)                         | R-49  | R-21 (Code)  | 0.13                       | 12.0%                         | 75%   | 85%                                 | 25           | \$54370      |
| Existing             | Warehouse        | Space Heat Furnace | Insulation (Duct) (Unconditioned Spaces)     | Install New Duct Insulation (R-8)                             | R-0  | 0.13                       | 4.4%                          | 10%   | 15%                                 | 25           | \$8,809      |
| Existing             | Warehouse        | Space Heat Furnace | Insulation (Duct) (Unconditioned Spaces)     | R-4   | R-0  | 0.13                       | 2.4%                          | 10%   | 15%                                 | 25           | \$9,180      |
| Existing             | Warehouse        | Space Heat Furnace | Insulation (Wall)                            | R-25 (2x6 Framing) - Advanced                                 | R-19 (2x6 Framing) - (Code)                                | 0.13                       | 6.0%                          | 10%   | 95%                                 | 25           | \$6,792      |
| Existing             | Warehouse        | Space Heat Furnace | Insulation (Wall) - Existing to Code         | R-19 (2x6 Framing) - (Code)                                   | Existing R-value (Average R-3)                             | 0.13                       | 21.1%                         | 10%   | 35%                                 | 25           | \$7,352      |
| Existing             | Warehouse        | Space Heat Furnace | Insulation (Wall) - Zero to Code             | R-19 (2x6 Framing) - (Code)                                   | R-0  | 0.13                       | 25.0%                         | 10%   | 0%                                  | 25           | \$7,352      |
| Existing             | Warehouse        | Space Heat Furnace | Insulation - Floor (Non-Slab)                | R-10 (Code)   | R-0  | 0.13                       | 15.0%                         | 35%   | 45%                                 | 25           | \$40974      |
| Existing             | Warehouse        | Space Heat Furnace | Insulation - Floor (Non-Slab)                | R-19  | R-10 (Code)  | 0.13                       | 5.0%                          | 35%   | 45%                                 | 25           | \$7,092      |
| Existing             | Warehouse        | Space Heat Furnace | Thermostat - Programmable                    | Energy Star Programmable Thermostat                           | Manual Thermostat  | 0.13                       | 3.0%                          | 95%   | 20%                                 | 15           | \$142        |
| Existing             | Warehouse        | Space Heat Furnace | Windows                                      | U = 0.35  | U = 0.55 (Code)  | 0.13                       | 1.5%                          | 80%   | 98%                                 | 25           | \$17816      |
| Existing             | Warehouse        | Space Heat Furnace | Windows - Existing to Code                   | U = 0.55 (Code)   | Existing Windows (U=0.65)                                  | 0.13                       | 1.0%                          | 10%   | 98%                                 | 25           | \$50296      |
| Existing             | Warehouse        | Water Heat         | Water Heater - Condensing                    | EF = 0.90   | EF = 0.59  | 0.02                       | 34.4%                         | NA  | NA                                  | 13           | \$1,450      |
| Existing             | Warehouse        | Water Heat         | Clothes Washer - Ozonating                   | Ozonating Clothes Washer                                      | Standard Commercial Clothes Washer                         | 0.02                       | 15.1%                         | 5%  | 95%                                 | 10           | \$8,707      |
| Existing             | Warehouse        | Water Heat         | Clothes Washer Commercial                    | Energy Star Commercial Clothes Washer MEF=1.73                | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.02                       | 0.8%                          | 5%  | 75%                                 | 10           | \$307        |
| Existing             | Warehouse        | Water Heat         | Demand controlled Circulating Systems        | Demand Controlled Circulating Systems (VFD Control by Demand) | Constant Circulation                                       | 0.02                       | 5.0%                          | 55%   | 94%                                 | 15           | \$21890      |

| Construction Vintage | Customer Segment | End Use    | Measure Name                                 | Measure Description   | Base Equipment                         | Baseline therm (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|------------|--|---|--|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| Existing             | Warehouse        | Water Heat | Dishwashing - Residential Sized System       | EF = 0.65 (ENERGY STAR)   | Existing Dishwasher (FED Std. EF=0.46) | 0.02                        | 0.5%                          | 5%  | 25%                                 | 13           | \$32         |
| Existing             | Warehouse        | Water Heat | Dishwashing - Residential Sized System       | EF = 0.77   | Existing Dishwasher (FED Std. EF=0.46) | 0.02                        | 0.7%                          | 5%  | 55%                                 | 13           | \$630        |
| Existing             | Warehouse        | Water Heat | Drainwater Heat Recovery (Power-Pipe or GFX) | Install Power-Pipe or GFX System                                  | No GFX or Power-Pipe System            | 0.02                        | 20.0%                         | 5%  | 92%                                 | 25           | \$1,119      |
| Existing             | Warehouse        | Water Heat | Faucet Aerators                              | 1.5 GPM Aerator   | 2.5 GPM Aerator (Federal Code)         | 0.02                        | 4.0%                          | 95%   | 25%                                 | 10           | \$0          |
| Existing             | Warehouse        | Water Heat | Faucet Aerators - Existing to Code           | 2.5 GPM Aerator (Federal Code)                                    | 4.0 GPM Aerator                        | 0.02                        | 3.8%                          | 95%   | 15%                                 | 10           | \$0          |
| Existing             | Warehouse        | Water Heat | Hot Water (SHW) Pipe Insulation              | Install Insulation (R-4)  | No Pipe Insulation                     | 0.02                        | 1.0%                          | 75%   | 90%                                 | 15           | \$835        |
| Existing             | Warehouse        | Water Heat | Low-Flow Showerheads                         | 2.0 GPM Showerhead  | 2.5 GPM Showerhead (Federal Code)      | 0.02                        | 1.1%                          | 15%   | 75%                                 | 10           | \$8          |
| Existing             | Warehouse        | Water Heat | Low-Flow Showerheads - Existing to Code      | 2.5 GPM Showerhead (Federal Code)                                 | 4.5 GPM Showerhead                     | 0.02                        | 2.5%                          | 15%   | 20%                                 | 10           | \$8          |
| Existing             | Warehouse        | Water Heat | Refrigeration with Heat Recovery             | Heat Recovery from Refrigeration System. Applied to Water Heating | No Heat Recovery                       | 0.02                        | 28.0%                         | 75%   | 49%                                 | 16           | \$71705      |
| Existing             | Warehouse        | Water Heat | Solar RE - Solar Water Heater                | Passive solar water heating                                       | Standard Water Heater EF = 0.93        | 0.02                        | 32.7%                         | 20%   | 95%                                 | 20           | \$43819      |
| Existing             | Warehouse        | Water Heat | Tankless Water Heater - Commercial           | EF = 0.82   | Thermal Efficiency = 80%               | 0.02                        | 30.0%                         | 25%   | 90%                                 | 14           | \$2,269      |
| Existing             | Warehouse        | Water Heat | Tankless Water Heater - Residential          | EF = 0.82   | EF = 0.59 (40 Gal)                     | 0.02                        | 28.0%                         | 25%   | 90%                                 | 20           | \$693        |
| Existing             | Warehouse        | Water Heat | Ultrasonic Faucet Control                    | Install Ultrasonic Motion Faucet Control                          | No Faucet Control                      | 0.02                        | 3.3%                          | 95%   | 95%                                 | 10           | \$205        |
| Existing             | Warehouse        | Water Heat | Water Heater Thermostat Setback              | Thermostat Setback and Replecement (120 Degrees)                  | No Thermostat Setback (130 Degrees)    | 0.02                        | 7.7%                          | 75%   | 45%                                 | 11           | \$213        |
| New                  | Warehouse        | Space Heat | Gas Boiler - Greater than 300 kBTUH          | 85% Thermal Efficiency  | 80% Thermal Efficiency (State Code)    | 0.05                        | 5.9%                          | NA  | NA                                  | 20           | \$11670      |
| New                  | Warehouse        | Space Heat | Gas Boiler - Greater than 300 kBTUH          | 90% Thermal Efficiency  | 80% Thermal Efficiency (State Code)    | 0.05                        | 11.1%                         | NA  | NA                                  | 20           | \$23805      |
| New                  | Warehouse        | Space Heat | Boiler Economizer                            | Economizer  | No Economizer                          | 0.05                        | 5.5%                          | 40%   | 90%                                 | 20           | \$42306      |
| New                  | Warehouse        | Space Heat | Commissioning - New Building Commissioning   | Commissioning - New Building Commissioning                        | No Commissioning                       | 0.05                        | 12.5%                         | 90%   | 40%                                 | 3            | \$57522      |
| New                  | Warehouse        | Space Heat | Direct Digital Control System-Optimization   | Premium-Efficiency EMS System                                     | High-Efficiency EMS System             | 0.05                        | 10.0%                         | 75%   | 98%                                 | 5            | \$42432      |
| New                  | Warehouse        | Space Heat | Duct Repair And Sealing                      | Reduction In Duct Losses to 5%                                    | No Repair or Sealing, 15% duct losses  | 0.05                        | 2.5%                          | 45%   | 45%                                 | 18           | \$31519      |
| New                  | Warehouse        | Space Heat | Exhaust Air to Ventilation Air Heat Recovery | Exhaust Air Heat Recovery   | No Heat Recovery                       | 0.05                        | 15.0%                         | 5%  | 94%                                 | 10           | \$71469      |
| New                  | Warehouse        | Space Heat | Insulation (Ceiling)                         | R-38  | R-21 (Code)                            | 0.05                        | 8.0%                          | 75%   | 45%                                 | 25           | \$40974      |

| Construction Vintage | Customer Segment | End Use       | Measure Name                                      | Measure Description  | Base Equipment                        | Baseline therm (UEC or EU) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|---------------|---|--|---------------------------------------|----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Warehouse        | Space Boiler  | Heat Insulation (Ceiling)                         | R-49   | R-21 (Code)                           | 0.05                       | 12.0%                         | 75%   | 85%                                 | 25           | \$54370      |
| New                  | Warehouse        | Space Boiler  | Heat Insulation (Wall)                            | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)           | 0.05                       | 6.0%                          | 95%   | 95%                                 | 25           | \$6,792      |
| New                  | Warehouse        | Space Boiler  | Heat Insulation - Floor (Non-Slab)                | R-19   | R-10 (Code)                           | 0.05                       | 5.0%                          | 35%   | 45%                                 | 25           | \$7,092      |
| New                  | Warehouse        | Space Boiler  | Heat Integrated Space Heating/Water Heating       | Integrated System  | Separate Boiler And HW Heater         | 0.05                       | 5.0%                          | 50%   | 95%                                 | 15           | \$33386      |
| New                  | Warehouse        | Space Boiler  | Heat Leak Proof Duct Fittings                     | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                  | 0.05                       | 10.0%                         | 40%   | 98%                                 | 25           | \$12214      |
| New                  | Warehouse        | Space Boiler  | Heat Sensible And Total Heat Recovery Devices     | Install Heat Recovery Devices - rotary air-to-air enthalpy heat recovery- 70% sensible and latent recovery effectiveness | No Heat Recovery                      | 0.05                       | 25.0%                         | 50%   | 98%                                 | 10           | 166261       |
| New                  | Warehouse        | Space Boiler  | Heat Thermostat - Programmable                    | Energy Star Programmable Thermostat  | Manual Thermostat                     | 0.05                       | 3.0%                          | 95%   | 20%                                 | 15           | \$142        |
| New                  | Warehouse        | Space Boiler  | Heat Windows                                      | U = 0.35   | U = 0.55 (Code)                       | 0.05                       | 1.5%                          | 80%   | 98%                                 | 25           | \$17816      |
| New                  | Warehouse        | Space Furnace | Heat Gas Furnace                                  | AFUE = 90% (Condensing Furnace)  | AFUE=80%                              | 0.07                       | 11.1%                         | NA  | NA                                  | 18           | \$12119      |
| New                  | Warehouse        | Space Furnace | Heat Gas Furnace                                  | AFUE = 94% (Condensing Furnace)  | AFUE=80%                              | 0.07                       | 14.9%                         | NA  | NA                                  | 18           | \$12119      |
| New                  | Warehouse        | Space Furnace | Heat Commissioning - New Building Commissioning   | Commissioning - New Building Commissioning   | No Commissioning                      | 0.07                       | 12.5%                         | 90%   | 80%                                 | 3            | \$57522      |
| New                  | Warehouse        | Space Furnace | Heat Duct Repair And Sealing                      | Reduction In Duct Losses to 5%   | No Repair or Sealing, 15% duct losses | 0.07                       | 2.5%                          | 45%   | 45%                                 | 18           | \$31519      |
| New                  | Warehouse        | Space Furnace | Heat Exhaust Air to Ventilation Air Heat Recovery | Exhaust Air Heat Recovery  | No Heat Recovery                      | 0.07                       | 15.0%                         | 5%  | 94%                                 | 10           | \$71469      |
| New                  | Warehouse        | Space Furnace | Heat Insulation (Ceiling)                         | R-38   | R-21 (Code)                           | 0.07                       | 8.0%                          | 75%   | 45%                                 | 25           | \$40974      |
| New                  | Warehouse        | Space Furnace | Heat Insulation (Ceiling)                         | R-49   | R-21 (Code)                           | 0.07                       | 12.0%                         | 75%   | 85%                                 | 25           | \$54370      |
| New                  | Warehouse        | Space Furnace | Heat Insulation (Wall)                            | R-25 (2x6 Framing) - Advanced  | R-19 (2x6 Framing) - (Code)           | 0.07                       | 6.0%                          | 95%   | 95%                                 | 25           | \$6,792      |
| New                  | Warehouse        | Space Furnace | Heat Insulation - Floor (Non-Slab)                | R-19   | R-10 (Code)                           | 0.07                       | 5.0%                          | 35%   | 45%                                 | 25           | \$7,092      |
| New                  | Warehouse        | Space Furnace | Heat Leak Proof Duct Fittings                     | Quick connect fittings that do not require mastic or drawbands   | Std duct workmanship                  | 0.07                       | 10.0%                         | 40%   | 98%                                 | 25           | \$12214      |
| New                  | Warehouse        | Space Furnace | Heat Thermostat - Programmable                    | Energy Star Programmable Thermostat  | Manual Thermostat                     | 0.07                       | 3.0%                          | 95%   | 20%                                 | 15           | \$142        |

| Construction Vintage | Customer Segment | End Use            | Measure Name                                 | Measure Description   | Base Equipment   | Baseline therm (UEC or EUI) | Savings as Percent of End Use | Percent of Installations Technically Feasible | Percent of Installations Incomplete | Measure Life | Measure Cost |
|----------------------|------------------|--------------------|--|---|--|-----------------------------|-------------------------------|---|-------------------------------------|--------------|--------------|
| New                  | Warehouse        | Space Heat Furnace | Windows                                      | U = 0.35  | U = 0.55 (Code)  | 0.07                        | 1.5%                          | 80%   | 98%                                 | 25           | \$17816      |
| New                  | Warehouse        | Water Heat         | Water Heater - Condensing                    | EF = 0.90   | EF = 0.59  | 0.02                        | 34.4%                         | NA  | NA                                  | 13           | \$1,450      |
| New                  | Warehouse        | Water Heat         | Clothes Washer - Ozonating                   | Ozonating Clothes Washer  | Standard Commercial Clothes Washer                         | 0.02                        | 15.1%                         | 5%  | 95%                                 | 10           | \$8,707      |
| New                  | Warehouse        | Water Heat         | Clothes Washer Commercial                    | Energy Star Commercial Clothes Washer MEF=1.73                    | Standard Commercial Clothes Washer MEF=1.26 (Federal Code) | 0.02                        | 0.8%                          | 5%  | 75%                                 | 10           | \$307        |
| New                  | Warehouse        | Water Heat         | Demand controlled Circulating Systems        | Demand Controlled Circulating Systems (VFD Control by Demand)     | Constant Circulation                                       | 0.02                        | 5.0%                          | 55%   | 94%                                 | 15           | \$21890      |
| New                  | Warehouse        | Water Heat         | Dishwashing - Residential Sized System       | EF = 0.65 (ENERGY STAR)   | Existing Dishwasher (FED Std. EF=0.46)                     | 0.02                        | 0.5%                          | 5%  | 25%                                 | 13           | \$32         |
| New                  | Warehouse        | Water Heat         | Dishwashing - Residential Sized System       | EF = 0.77   | Existing Dishwasher (FED Std. EF=0.46)                     | 0.02                        | 0.7%                          | 5%  | 55%                                 | 13           | \$630        |
| New                  | Warehouse        | Water Heat         | Drainwater Heat Recovery (Power-Pipe or GFX) | Install Power-Pipe or GFX System                                  | No GFX or Power-Pipe System                                | 0.02                        | 20.0%                         | 25%   | 92%                                 | 25           | \$1,119      |
| New                  | Warehouse        | Water Heat         | Faucet Aerators                              | 1.5 GPM Aerator   | 2.5 GPM Aerator (Federal Code)                             | 0.02                        | 4.0%                          | 95%   | 25%                                 | 10           | \$0          |
| New                  | Warehouse        | Water Heat         | Integrated Space Heating/Water Heating       | Integrated System   | Separate Boiler And HW Heater                              | 0.02                        | 5.0%                          | 50%   | 95%                                 | 15           | \$33386      |
| New                  | Warehouse        | Water Heat         | Low-Flow Showerheads                         | 2.0 GPM Showerhead  | 2.5 GPM Showerhead (Federal Code)                          | 0.02                        | 1.1%                          | 15%   | 75%                                 | 10           | \$8          |
| New                  | Warehouse        | Water Heat         | Refrigeration with Heat Recovery             | Heat Recovery from Refrigeration System. Applied to Water Heating | No Heat Recovery   | 0.02                        | 28.0%                         | 75%   | 49%                                 | 16           | \$40186      |
| New                  | Warehouse        | Water Heat         | Solar RE - Solar Water Heater                | Passive solar water heating                                       | Standard Water Heater EF = 0.93                            | 0.02                        | 32.7%                         | 20%   | 95%                                 | 20           | \$43819      |
| New                  | Warehouse        | Water Heat         | Tankless Water Heater - Commercial           | EF = 0.82   | Thermal Efficiency = 80%                                   | 0.02                        | 30.0%                         | 25%   | 90%                                 | 14           | \$2,269      |
| New                  | Warehouse        | Water Heat         | Tankless Water Heater - Residential          | EF = 0.82   | EF = 0.59 (40 Gal)   | 0.02                        | 28.0%                         | 25%   | 90%                                 | 20           | \$693        |
| New                  | Warehouse        | Water Heat         | Ultrasonic Faucet Control                    | Install Ultrasonic Motion Faucet Control                          | No Faucet Control  | 0.02                        | 3.3%                          | 95%   | 95%                                 | 10           | \$205        |
| New                  | Warehouse        | Water Heat         | Water Heater Thermostat Setback              | Thermostat Setback and Replecement (120 Degrees)                  | No Thermostat Setback (130 Degrees)                        | 0.02                        | 7.7%                          | 75%   | 45%                                 | 11           | \$213        |

# Industrial Electric Measures

| Construction Vintage | Customer Segment        | End Use         | Measure Name          | Baseline MWh (UEC or EUJ) | Savings as Percent of End Use | Measure Life | Measure Cost |
|----------------------|-------------------------|-----------------|-----------------------|---------------------------|-------------------------------|--------------|--------------|
| Existing             | Chemical Mfg            | Fans            | Motor Improvements    | 105,893                   | 2.6%                          | 15           | \$298        |
| Existing             | Chemical Mfg            | Fans            | Motor O&M             | 105,893                   | 5.5%                          | 2            | \$53         |
| Existing             | Chemical Mfg            | HVAC            | HVAC Improvements     | 89,911                    | 12.1%                         | 15           | \$415        |
| Existing             | Chemical Mfg            | HVAC            | HVAC O&M              | 89,911                    | 12.0%                         | 2            | \$432        |
| Existing             | Chemical Mfg            | Lighting        | Lighting Improvements | 66,306                    | 5.0%                          | 10           | \$321        |
| Existing             | Chemical Mfg            | Motors Other    | Motor Improvements    | 237,600                   | 2.6%                          | 15           | \$669        |
| Existing             | Chemical Mfg            | Motors Other    | Motor O&M             | 237,600                   | 5.5%                          | 2            | \$120        |
| Existing             | Chemical Mfg            | Other           | Bldg Improvements     | 26,703                    | 12.1%                         | 15           | \$774        |
| Existing             | Chemical Mfg            | Process AirComp | Air Comp Improvements | 246,511                   | 3.9%                          | 15           | \$414        |
| Existing             | Chemical Mfg            | Process AirComp | Air Comp O&M          | 246,511                   | 4.6%                          | 2            | \$231        |
| Existing             | Chemical Mfg            | Process AirComp | Motor Improvements    | 246,511                   | 2.6%                          | 15           | \$694        |
| Existing             | Chemical Mfg            | Process AirComp | Motor O&M             | 246,511                   | 5.5%                          | 2            | \$125        |
| Existing             | Chemical Mfg            | Process Cool    | Cool Improvements     | 130,817                   | 9.2%                          | 15           | \$1,380      |
| Existing             | Chemical Mfg            | Process Heat    | Heat Improvements     | 51,321                    | 12.2%                         | 15           | \$633        |
| Existing             | Chemical Mfg            | Process Heat    | Heat O&M              | 51,321                    | 8.0%                          | 2            | \$70         |
| Existing             | Chemical Mfg            | Process Heat    | Steam Distribution    | 51,321                    | 29.1%                         | 15           | \$981        |
| Existing             | Chemical Mfg            | Process Other   | Other Improvements    | 2,029                     | 44.1%                         | 15           | \$270        |
| Existing             | Chemical Mfg            | Process Other   | Other O&M             | 2,029                     | 2.5%                          | 2            | \$2          |
| Existing             | Chemical Mfg            | Process Refrig  | Motor Improvements    | 68,530                    | 2.6%                          | 15           | \$193        |
| Existing             | Chemical Mfg            | Process Refrig  | Motor O&M             | 68,530                    | 5.5%                          | 2            | \$35         |
| Existing             | Chemical Mfg            | Pumps           | Motor Improvements    | 231,373                   | 2.6%                          | 15           | \$651        |
| Existing             | Chemical Mfg            | Pumps           | Motor O&M             | 231,373                   | 5.5%                          | 2            | \$117        |
| Existing             | Computer Electronic Mfg | Fans            | Motor Improvements    | 16,024                    | 3.7%                          | 15           | \$47         |
| Existing             | Computer Electronic Mfg | Fans            | Motor O&M             | 16,024                    | 0.3%                          | 2            | \$11         |
| Existing             | Computer Electronic Mfg | HVAC            | HVAC Improvements     | 101,509                   | 11.7%                         | 15           | \$1,065      |
| Existing             | Computer Electronic Mfg | HVAC            | HVAC O&M              | 101,509                   | 6.8%                          | 2            | \$60         |
| Existing             | Computer Electronic Mfg | Lighting        | Lighting Improvements | 45,454                    | 8.7%                          | 10           | \$499        |
| Existing             | Computer Electronic Mfg | Motors Other    | Motor Improvements    | 31,721                    | 3.7%                          | 15           | \$93         |
| Existing             | Computer Electronic Mfg | Motors Other    | Motor O&M             | 31,721                    | 0.3%                          | 2            | \$21         |



| Construction Vintage | Customer Segment         | End Use         | Measure Name          | Baseline MWh (UEC or EU) | Savings as Percent of End Use | Measure Life | Measure Cost |
|----------------------|--------------------------|-----------------|-----------------------|--------------------------|-------------------------------|--------------|--------------|
| Existing             | Computer Electronic Mfg  | Other           | Bldg Improvements     | 40,204                   | 0.8%                          | 15           | \$56         |
| Existing             | Computer Electronic Mfg  | Process AirComp | Air Comp Improvements | 3,723                    | 23.6%                         | 15           | \$52         |
| Existing             | Computer Electronic Mfg  | Process AirComp | Air Comp O&M          | 3,723                    | 31.7%                         | 2            | \$42         |
| Existing             | Computer Electronic Mfg  | Process AirComp | Motor Improvements    | 3,723                    | 3.7%                          | 15           | \$11         |
| Existing             | Computer Electronic Mfg  | Process AirComp | Motor O&M             | 3,723                    | 0.3%                          | 2            | \$3          |
| Existing             | Computer Electronic Mfg  | Process Cool    | Cool Improvements     | 31,899                   | 12.4%                         | 15           | \$946        |
| Existing             | Computer Electronic Mfg  | Process Heat    | Heat Improvements     | 40,101                   | 0.8%                          | 15           | \$29         |
| Existing             | Computer Electronic Mfg  | Process Heat    | Heat O&M              | 40,101                   | 32.9%                         | 2            | \$87         |
| Existing             | Computer Electronic Mfg  | Process Heat    | Steam Distribution    | 40,101                   | 1.1%                          | 15           | \$30         |
| Existing             | Computer Electronic Mfg  | Process Other   | Other Improvements    | 9,811                    | 12.4%                         | 15           | \$115        |
| Existing             | Computer Electronic Mfg  | Process Other   | Other O&M             | 9,811                    | 26.4%                         | 2            | \$78         |
| Existing             | Computer Electronic Mfg  | Process Refrig  | Motor Improvements    | 4,046                    | 3.7%                          | 15           | \$12         |
| Existing             | Computer Electronic Mfg  | Process Refrig  | Motor O&M             | 4,046                    | 0.3%                          | 2            | \$3          |
| Existing             | Computer Electronic Mfg  | Pumps           | Motor Improvements    | 25,409                   | 3.7%                          | 15           | \$74         |
| Existing             | Computer Electronic Mfg  | Pumps           | Motor O&M             | 25,409                   | 0.3%                          | 2            | \$17         |
| Existing             | Electrical Equipment Mfg | Fans            | Motor Improvements    | 5,860                    | 2.4%                          | 15           | \$11         |
| Existing             | Electrical Equipment Mfg | Fans            | Motor O&M             | 5,860                    | 2.9%                          | 2            | \$6          |
| Existing             | Electrical Equipment Mfg | HVAC            | HVAC Improvements     | 23,487                   | 14.9%                         | 15           | \$234        |
| Existing             | Electrical Equipment Mfg | HVAC            | HVAC O&M              | 23,487                   | 12.1%                         | 2            | \$10         |
| Existing             | Electrical Equipment Mfg | Lighting        | Lighting Improvements | 17,790                   | 6.2%                          | 10           | \$104        |
| Existing             | Electrical Equipment Mfg | Motors Other    | Motor Improvements    | 13,149                   | 2.4%                          | 15           | \$25         |
| Existing             | Electrical Equipment Mfg | Motors Other    | Motor O&M             | 13,149                   | 2.9%                          | 2            | \$14         |
| Existing             | Electrical Equipment Mfg | Other           | Bldg Improvements     | 10,432                   | 1.4%                          | 15           | \$7          |
| Existing             | Electrical Equipment Mfg | Process AirComp | Air Comp Improvements | 13,642                   | 8.8%                          | 15           | \$67         |
| Existing             | Electrical Equipment Mfg | Process AirComp | Air Comp O&M          | 13,642                   | 8.8%                          | 2            | \$35         |
| Existing             | Electrical Equipment Mfg | Process AirComp | Motor Improvements    | 13,642                   | 2.4%                          | 15           | \$26         |
| Existing             | Electrical Equipment Mfg | Process AirComp | Motor O&M             | 13,642                   | 2.9%                          | 2            | \$14         |
| Existing             | Electrical Equipment Mfg | Process Cool    | Cool Improvements     | 6,072                    | 11.3%                         | 15           | \$32         |
| Existing             | Electrical Equipment Mfg | Process Heat    | Heat Improvements     | 25,682                   | 5.4%                          | 15           | \$30         |
| Existing             | Electrical Equipment Mfg | Process Heat    | Heat O&M              | 25,682                   | 2.4%                          | 2            | \$9          |
| Existing             | Electrical Equipment Mfg | Process Heat    | Steam Distribution    | 25,682                   | 2.2%                          | 15           | \$10         |

| Construction Vintage | Customer Segment          | End Use         | Measure Name          | Baseline MWh (UEC or EU) | Savings as Percent of End Use | Measure Life | Measure Cost |
|----------------------|---------------------------|-----------------|-----------------------|--------------------------|-------------------------------|--------------|--------------|
| Existing             | Electrical Equipment Mfg  | Process Other   | Other Improvements    | 831                      | 40.1%                         | 15           | \$30         |
| Existing             | Electrical Equipment Mfg  | Process Other   | Other O&M             | 831                      | 18.7%                         | 2            | \$16         |
| Existing             | Electrical Equipment Mfg  | Process Refrig  | Motor Improvements    | 3,792                    | 2.4%                          | 15           | \$7          |
| Existing             | Electrical Equipment Mfg  | Process Refrig  | Motor O&M             | 3,792                    | 2.9%                          | 2            | \$4          |
| Existing             | Electrical Equipment Mfg  | Process Refrig  | Refrig Improvements   | 3,792                    | 16.4%                         | 15           | \$38         |
| Existing             | Electrical Equipment Mfg  | Pumps           | Motor Improvements    | 12,804                   | 2.4%                          | 15           | \$24         |
| Existing             | Electrical Equipment Mfg  | Pumps           | Motor O&M             | 12,804                   | 2.9%                          | 2            | \$14         |
| Existing             | Fabricated Metal Products | Fans            | Motor Improvements    | 22,481                   | 4.2%                          | 15           | \$122        |
| Existing             | Fabricated Metal Products | Fans            | Motor O&M             | 22,481                   | 7.3%                          | 2            | \$30         |
| Existing             | Fabricated Metal Products | HVAC            | HVAC Improvements     | 37,690                   | 10.0%                         | 15           | \$528        |
| Existing             | Fabricated Metal Products | HVAC            | HVAC O&M              | 37,690                   | 11.2%                         | 2            | \$281        |
| Existing             | Fabricated Metal Products | Lighting        | Lighting Improvements | 35,135                   | 8.9%                          | 10           | \$344        |
| Existing             | Fabricated Metal Products | Motors Other    | Motor Improvements    | 63,998                   | 4.2%                          | 15           | \$347        |
| Existing             | Fabricated Metal Products | Motors Other    | Motor O&M             | 63,998                   | 7.3%                          | 2            | \$87         |
| Existing             | Fabricated Metal Products | Other           | Bldg Improvements     | 33,684                   | 5.5%                          | 15           | \$551        |
| Existing             | Fabricated Metal Products | Process AirComp | Air Comp Improvements | 25,929                   | 10.9%                         | 15           | \$100        |
| Existing             | Fabricated Metal Products | Process AirComp | Air Comp O&M          | 25,929                   | 14.2%                         | 2            | \$62         |
| Existing             | Fabricated Metal Products | Process AirComp | Motor Improvements    | 25,929                   | 4.2%                          | 15           | \$141        |
| Existing             | Fabricated Metal Products | Process AirComp | Motor O&M             | 25,929                   | 7.3%                          | 2            | \$35         |
| Existing             | Fabricated Metal Products | Process Cool    | Cool Improvements     | 12,899                   | 12.1%                         | 15           | \$182        |
| Existing             | Fabricated Metal Products | Process Heat    | Heat Improvements     | 85,352                   | 6.2%                          | 15           | \$159        |
| Existing             | Fabricated Metal Products | Process Heat    | Heat O&M              | 85,352                   | 4.7%                          | 2            | \$75         |
| Existing             | Fabricated Metal Products | Process Heat    | Steam Distribution    | 85,352                   | 33.3%                         | 15           | \$245        |
| Existing             | Fabricated Metal Products | Process Other   | Other Improvements    | 691                      | 44.8%                         | 15           | \$55         |
| Existing             | Fabricated Metal Products | Process Other   | Other O&M             | 691                      | 27.4%                         | 2            | \$22         |
| Existing             | Fabricated Metal Products | Process Refrig  | Motor Improvements    | 10,995                   | 4.2%                          | 15           | \$60         |
| Existing             | Fabricated Metal Products | Process Refrig  | Motor O&M             | 10,995                   | 7.3%                          | 2            | \$15         |
| Existing             | Fabricated Metal Products | Process Refrig  | Refrig Improvements   | 10,995                   | 11.5%                         | 15           | \$14         |
| Existing             | Fabricated Metal Products | Pumps           | Motor Improvements    | 40,695                   | 4.2%                          | 15           | \$221        |
| Existing             | Fabricated Metal Products | Pumps           | Motor O&M             | 40,695                   | 7.3%                          | 2            | \$55         |
| Existing             | Food Mfg                  | Fans            | Motor Improvements    | 19,516                   | 3.3%                          | 15           | \$61         |

| Construction Vintage | Customer Segment     | End Use         | Measure Name          | Baseline MWh (UEC or EUJ) | Savings as Percent of End Use | Measure Life | Measure Cost |
|----------------------|----------------------|-----------------|-----------------------|---------------------------|-------------------------------|--------------|--------------|
| Existing             | Food Mfg             | Fans            | Motor O&M             | 19,516                    | 1.6%                          | 2            | \$5          |
| Existing             | Food Mfg             | HVAC            | HVAC Improvements     | 35,927                    | 9.2%                          | 15           | \$376        |
| Existing             | Food Mfg             | HVAC            | HVAC O&M              | 35,927                    | 10.9%                         | 2            | \$70         |
| Existing             | Food Mfg             | Lighting        | Lighting Improvements | 34,421                    | 7.8%                          | 10           | \$263        |
| Existing             | Food Mfg             | Motors Other    | Motor Improvements    | 101,472                   | 3.3%                          | 15           | \$315        |
| Existing             | Food Mfg             | Motors Other    | Motor O&M             | 101,472                   | 1.6%                          | 2            | \$24         |
| Existing             | Food Mfg             | Other           | Bldg Improvements     | 37,401                    | 0.6%                          | 15           | \$27         |
| Existing             | Food Mfg             | Process AirComp | Air Comp Improvements | 20,032                    | 10.2%                         | 15           | \$84         |
| Existing             | Food Mfg             | Process AirComp | Air Comp O&M          | 20,032                    | 13.0%                         | 2            | \$58         |
| Existing             | Food Mfg             | Process AirComp | Motor Improvements    | 20,032                    | 3.3%                          | 15           | \$62         |
| Existing             | Food Mfg             | Process AirComp | Motor O&M             | 20,032                    | 1.6%                          | 2            | \$5          |
| Existing             | Food Mfg             | Process Cool    | Cool Improvements     | 129,766                   | 11.9%                         | 15           | \$2,450      |
| Existing             | Food Mfg             | Process Heat    | Heat Improvements     | 15,900                    | 33.0%                         | 15           | \$906        |
| Existing             | Food Mfg             | Process Heat    | Heat O&M              | 15,900                    | 8.9%                          | 2            | \$67         |
| Existing             | Food Mfg             | Process Heat    | Steam Distribution    | 15,900                    | 22.6%                         | 15           | \$804        |
| Existing             | Food Mfg             | Process Other   | Other Improvements    | 1,334                     | 29.5%                         | 15           | \$37         |
| Existing             | Food Mfg             | Process Other   | Other O&M             | 1,334                     | 28.1%                         | 2            | \$100        |
| Existing             | Food Mfg             | Process Refrig  | Motor Improvements    | 76,496                    | 3.3%                          | 15           | \$238        |
| Existing             | Food Mfg             | Process Refrig  | Motor O&M             | 76,496                    | 1.6%                          | 2            | \$18         |
| Existing             | Food Mfg             | Process Refrig  | Refrig Improvements   | 76,496                    | 15.6%                         | 15           | \$855        |
| Existing             | Food Mfg             | Pumps           | Motor Improvements    | 42,668                    | 3.3%                          | 15           | \$133        |
| Existing             | Food Mfg             | Pumps           | Motor O&M             | 42,668                    | 1.6%                          | 2            | \$10         |
| Existing             | Industrial Machinery | Fans            | Motor Improvements    | 10,864                    | 3.1%                          | 15           | \$29         |
| Existing             | Industrial Machinery | Fans            | Motor O&M             | 10,864                    | 1.0%                          | 2            | \$5          |
| Existing             | Industrial Machinery | HVAC            | HVAC Improvements     | 30,134                    | 12.8%                         | 15           | \$521        |
| Existing             | Industrial Machinery | HVAC            | HVAC O&M              | 30,134                    | 7.5%                          | 2            | \$91         |
| Existing             | Industrial Machinery | Lighting        | Lighting Improvements | 22,418                    | 6.9%                          | 10           | \$166        |
| Existing             | Industrial Machinery | Motors Other    | Motor Improvements    | 30,926                    | 3.1%                          | 15           | \$84         |
| Existing             | Industrial Machinery | Motors Other    | Motor O&M             | 30,926                    | 1.0%                          | 2            | \$15         |
| Existing             | Industrial Machinery | Other           | Bldg Improvements     | 11,525                    | 9.3%                          | 15           | \$225        |
| Existing             | Industrial Machinery | Process AirComp | Air Comp Improvements | 12,529                    | 11.9%                         | 15           | \$129        |

| Construction Vintage | Customer Segment     | End Use         | Measure Name          | Baseline MWh (UEC or EUJ) | Savings as Percent of End Use | Measure Life | Measure Cost |
|----------------------|----------------------|-----------------|-----------------------|---------------------------|-------------------------------|--------------|--------------|
| Existing             | Industrial Machinery | Process AirComp | Air Comp O&M          | 12,529                    | 15.5%                         | 2            | \$48         |
| Existing             | Industrial Machinery | Process AirComp | Motor Improvements    | 12,529                    | 3.1%                          | 15           | \$34         |
| Existing             | Industrial Machinery | Process AirComp | Motor O&M             | 12,529                    | 1.0%                          | 2            | \$6          |
| Existing             | Industrial Machinery | Process Cool    | Cool Improvements     | 5,338                     | 31.5%                         | 15           | \$190        |
| Existing             | Industrial Machinery | Process Heat    | Heat Improvements     | 12,146                    | 6.4%                          | 15           | \$92         |
| Existing             | Industrial Machinery | Process Heat    | Heat O&M              | 12,146                    | 8.5%                          | 2            | \$57         |
| Existing             | Industrial Machinery | Process Heat    | Steam Distribution    | 12,146                    | 6.7%                          | 15           | \$11         |
| Existing             | Industrial Machinery | Process Other   | Other Improvements    | 888                       | 39.0%                         | 15           | \$40         |
| Existing             | Industrial Machinery | Process Other   | Other O&M             | 888                       | 17.3%                         | 2            | \$58         |
| Existing             | Industrial Machinery | Process Refrig  | Motor Improvements    | 5,314                     | 3.1%                          | 15           | \$14         |
| Existing             | Industrial Machinery | Process Refrig  | Motor O&M             | 5,314                     | 1.0%                          | 2            | \$3          |
| Existing             | Industrial Machinery | Process Refrig  | Refrig Improvements   | 5,314                     | 9.5%                          | 15           | \$52         |
| Existing             | Industrial Machinery | Pumps           | Motor Improvements    | 19,666                    | 3.1%                          | 15           | \$53         |
| Existing             | Industrial Machinery | Pumps           | Motor O&M             | 19,666                    | 1.0%                          | 2            | \$10         |
| Existing             | Miscellaneous Mfg    | Fans            | Motor Improvements    | 9,058                     | 4.4%                          | 15           | \$71         |
| Existing             | Miscellaneous Mfg    | Fans            | Motor O&M             | 9,058                     | 2.4%                          | 2            | \$2          |
| Existing             | Miscellaneous Mfg    | HVAC            | HVAC Improvements     | 33,107                    | 8.7%                          | 15           | \$844        |
| Existing             | Miscellaneous Mfg    | HVAC            | HVAC O&M              | 33,107                    | 9.5%                          | 2            | \$18         |
| Existing             | Miscellaneous Mfg    | Lighting        | Lighting Improvements | 23,729                    | 6.3%                          | 10           | \$145        |
| Existing             | Miscellaneous Mfg    | Motors Other    | Motor Improvements    | 36,470                    | 4.4%                          | 15           | \$285        |
| Existing             | Miscellaneous Mfg    | Motors Other    | Motor O&M             | 36,470                    | 2.4%                          | 2            | \$8          |
| Existing             | Miscellaneous Mfg    | Other           | Bldg Improvements     | 6,914                     | 6.8%                          | 15           | \$37         |
| Existing             | Miscellaneous Mfg    | Process AirComp | Air Comp Improvements | 8,466                     | 11.8%                         | 15           | \$102        |
| Existing             | Miscellaneous Mfg    | Process AirComp | Air Comp O&M          | 8,466                     | 13.3%                         | 2            | \$27         |
| Existing             | Miscellaneous Mfg    | Process AirComp | Motor Improvements    | 8,466                     | 4.4%                          | 15           | \$66         |
| Existing             | Miscellaneous Mfg    | Process AirComp | Motor O&M             | 8,466                     | 2.4%                          | 2            | \$2          |
| Existing             | Miscellaneous Mfg    | Process Cool    | Cool Improvements     | 9,725                     | 23.2%                         | 15           | \$188        |
| Existing             | Miscellaneous Mfg    | Process Heat    | Heat O&M              | 15,045                    | 4.9%                          | 2            | \$38         |
| Existing             | Miscellaneous Mfg    | Process Heat    | Steam Distribution    | 15,045                    | 15.3%                         | 15           | \$41         |
| Existing             | Miscellaneous Mfg    | Process Other   | Other Improvements    | 710                       | 22.5%                         | 15           | \$20         |
| Existing             | Miscellaneous Mfg    | Process Other   | Other O&M             | 710                       | 27.1%                         | 2            | \$5          |

| Construction Vintage | Customer Segment             | End Use         | Measure Name          | Baseline MWh (UEC or EU) | Savings as Percent of End Use | Measure Life | Measure Cost |
|----------------------|------------------------------|-----------------|-----------------------|--------------------------|-------------------------------|--------------|--------------|
| Existing             | Miscellaneous Mfg            | Process Refrig  | Motor Improvements    | 59                       | 4.4%                          | 15           | \$0          |
| Existing             | Miscellaneous Mfg            | Process Refrig  | Motor O&M             | 59                       | 2.4%                          | 2            | \$0          |
| Existing             | Miscellaneous Mfg            | Pumps           | Motor Improvements    | 5,150                    | 4.4%                          | 15           | \$40         |
| Existing             | Miscellaneous Mfg            | Pumps           | Motor O&M             | 5,150                    | 2.4%                          | 2            | \$1          |
| Existing             | Nonmetallic Mineral Products | Fans            | Motor Improvements    | 34,135                   | 3.0%                          | 15           | \$106        |
| Existing             | Nonmetallic Mineral Products | Fans            | Motor O&M             | 34,135                   | 1.2%                          | 2            | \$21         |
| Existing             | Nonmetallic Mineral Products | HVAC            | HVAC Improvements     | 26,038                   | 10.0%                         | 15           | \$97         |
| Existing             | Nonmetallic Mineral Products | HVAC            | HVAC O&M              | 26,038                   | 8.5%                          | 2            | \$145        |
| Existing             | Nonmetallic Mineral Products | Lighting        | Lighting Improvements | 20,223                   | 8.0%                          | 10           | \$160        |
| Existing             | Nonmetallic Mineral Products | Motors Other    | Motor Improvements    | 97,170                   | 3.0%                          | 15           | \$302        |
| Existing             | Nonmetallic Mineral Products | Motors Other    | Motor O&M             | 97,170                   | 1.2%                          | 2            | \$59         |
| Existing             | Nonmetallic Mineral Products | Other           | Bldg Improvements     | 18,578                   | 17.9%                         | 15           | \$439        |
| Existing             | Nonmetallic Mineral Products | Process AirComp | Air Comp Improvements | 39,367                   | 10.0%                         | 15           | \$245        |
| Existing             | Nonmetallic Mineral Products | Process AirComp | Air Comp O&M          | 39,367                   | 5.7%                          | 2            | \$41         |
| Existing             | Nonmetallic Mineral Products | Process AirComp | Motor Improvements    | 39,367                   | 3.0%                          | 15           | \$122        |
| Existing             | Nonmetallic Mineral Products | Process AirComp | Motor O&M             | 39,367                   | 1.2%                          | 2            | \$24         |
| Existing             | Nonmetallic Mineral Products | Process Cool    | Cool Improvements     | 14,508                   | 9.2%                          | 15           | \$104        |
| Existing             | Nonmetallic Mineral Products | Process Heat    | Heat Improvements     | 84,841                   | 8.7%                          | 15           | \$446        |
| Existing             | Nonmetallic Mineral Products | Process Heat    | Heat O&M              | 84,841                   | 4.8%                          | 2            | \$138        |
| Existing             | Nonmetallic Mineral Products | Process Other   | Other Improvements    | 2,539                    | 18.0%                         | 15           | \$13         |
| Existing             | Nonmetallic Mineral Products | Process Other   | Other O&M             | 2,539                    | 17.8%                         | 2            | \$23         |
| Existing             | Nonmetallic Mineral Products | Process Refrig  | Motor Improvements    | 16,695                   | 3.0%                          | 15           | \$52         |
| Existing             | Nonmetallic Mineral Products | Process Refrig  | Motor O&M             | 16,695                   | 1.2%                          | 2            | \$10         |
| Existing             | Nonmetallic Mineral Products | Pumps           | Motor Improvements    | 61,789                   | 3.0%                          | 15           | \$192        |
| Existing             | Nonmetallic Mineral Products | Pumps           | Motor O&M             | 61,789                   | 1.2%                          | 2            | \$37         |
| Existing             | Paper Mfg                    | Fans            | Motor Improvements    | 303,153                  | 1.4%                          | 15           | \$302        |
| Existing             | Paper Mfg                    | Fans            | Motor O&M             | 303,153                  | 1.2%                          | 2            | \$127        |
| Existing             | Paper Mfg                    | HVAC            | HVAC Improvements     | 77,029                   | 6.0%                          | 15           | \$482        |
| Existing             | Paper Mfg                    | HVAC            | HVAC O&M              | 77,029                   | 9.6%                          | 2            | \$439        |
| Existing             | Paper Mfg                    | Indirect Boiler | Boiler Improvements   | 55,154                   | 11.8%                         | 15           | \$3,798      |
| Existing             | Paper Mfg                    | Lighting        | Lighting Improvements | 74,623                   | 12.7%                         | 10           | \$969        |

| Construction Vintage | Customer Segment        | End Use         | Measure Name          | Baseline MWh (UEC or EUJ) | Savings as Percent of End Use | Measure Life | Measure Cost |
|----------------------|-------------------------|-----------------|-----------------------|---------------------------|-------------------------------|--------------|--------------|
| Existing             | Paper Mfg               | Motors Other    | Motor Improvements    | 600,185                   | 1.4%                          | 15           | \$597        |
| Existing             | Paper Mfg               | Motors Other    | Motor O&M             | 600,185                   | 1.2%                          | 2            | \$251        |
| Existing             | Paper Mfg               | Other           | Bldg Improvements     | 39,832                    | 1.2%                          | 15           | \$83         |
| Existing             | Paper Mfg               | Process AirComp | Air Comp Improvements | 70,435                    | 14.1%                         | 15           | \$382        |
| Existing             | Paper Mfg               | Process AirComp | Air Comp O&M          | 70,435                    | 11.6%                         | 2            | \$188        |
| Existing             | Paper Mfg               | Process AirComp | Motor Improvements    | 70,435                    | 1.4%                          | 15           | \$70         |
| Existing             | Paper Mfg               | Process AirComp | Motor O&M             | 70,435                    | 1.2%                          | 2            | \$29         |
| Existing             | Paper Mfg               | Process Cool    | Cool Improvements     | 28,367                    | 17.6%                         | 15           | \$171        |
| Existing             | Paper Mfg               | Process Heat    | Heat Improvements     | 47,089                    | 23.8%                         | 15           | \$3,363      |
| Existing             | Paper Mfg               | Process Heat    | Heat O&M              | 47,089                    | 14.0%                         | 2            | \$207        |
| Existing             | Paper Mfg               | Process Other   | Other Improvements    | 9,151                     | 33.3%                         | 15           | \$103        |
| Existing             | Paper Mfg               | Process Other   | Other O&M             | 9,151                     | 13.2%                         | 2            | \$41         |
| Existing             | Paper Mfg               | Process Refrig  | Motor Improvements    | 76,556                    | 1.4%                          | 15           | \$76         |
| Existing             | Paper Mfg               | Process Refrig  | Motor O&M             | 76,556                    | 1.2%                          | 2            | \$32         |
| Existing             | Paper Mfg               | Process Refrig  | Refrig Improvements   | 76,556                    | 18.8%                         | 15           | \$256        |
| Existing             | Paper Mfg               | Pumps           | Motor Improvements    | 480,747                   | 1.4%                          | 15           | \$479        |
| Existing             | Paper Mfg               | Pumps           | Motor O&M             | 480,747                   | 1.2%                          | 2            | \$201        |
| Existing             | Petroleum Coal Products | Fans            | Motor Improvements    | 3,387,337                 | 1.5%                          | 15           | \$5,993      |
| Existing             | Petroleum Coal Products | Fans            | Motor O&M             | 3,387,337                 | 10.8%                         | 2            | \$4,166      |
| Existing             | Petroleum Coal Products | HVAC            | HVAC Improvements     | 984,388                   | 32.9%                         | 15           | \$47772      |
| Existing             | Petroleum Coal Products | HVAC            | HVAC O&M              | 984,388                   | 11.7%                         | 2            | \$4,658      |
| Existing             | Petroleum Coal Products | Lighting        | Lighting Improvements | 755,361                   | 6.4%                          | 10           | \$4,178      |
| Existing             | Petroleum Coal Products | Motors Other    | Motor Improvements    | 9,642,720                 | 1.5%                          | 15           | \$17059      |
| Existing             | Petroleum Coal Products | Motors Other    | Motor O&M             | 9,642,720                 | 10.8%                         | 2            | \$11860      |
| Existing             | Petroleum Coal Products | Process AirComp | Air Comp Improvements | 3,906,629                 | 23.2%                         | 15           | \$41975      |
| Existing             | Petroleum Coal Products | Process AirComp | Air Comp O&M          | 3,906,629                 | 13.7%                         | 2            | \$9,559      |
| Existing             | Petroleum Coal Products | Process AirComp | Motor Improvements    | 3,906,629                 | 1.5%                          | 15           | \$6,911      |
| Existing             | Petroleum Coal Products | Process AirComp | Motor O&M             | 3,906,629                 | 10.8%                         | 2            | \$4,805      |
| Existing             | Petroleum Coal Products | Process Cool    | Cool Improvements     | 1,710,356                 | 3.8%                          | 15           | \$4,717      |
| Existing             | Petroleum Coal Products | Process Refrig  | Motor Improvements    | 1,656,467                 | 1.5%                          | 15           | \$2,931      |
| Existing             | Petroleum Coal Products | Process Refrig  | Motor O&M             | 1,656,467                 | 10.8%                         | 2            | \$2,037      |

| Construction Vintage | Customer Segment         | End Use         | Measure Name          | Baseline MWh (UEC or EUJ) | Savings as Percent of End Use | Measure Life | Measure Cost |
|----------------------|--------------------------|-----------------|-----------------------|---------------------------|-------------------------------|--------------|--------------|
| Existing             | Petroleum Coal Products  | Pumps           | Motor Improvements    | 6,131,683                 | 1.5%                          | 15           | \$10848      |
| Existing             | Petroleum Coal Products  | Pumps           | Motor O&M             | 6,131,683                 | 10.8%                         | 2            | \$7,542      |
| Existing             | Plastics Rubber Products | Fans            | Motor Improvements    | 69,629                    | 4.4%                          | 15           | \$379        |
| Existing             | Plastics Rubber Products | Fans            | Motor O&M             | 69,629                    | 1.6%                          | 2            | \$115        |
| Existing             | Plastics Rubber Products | HVAC            | HVAC Improvements     | 93,747                    | 10.6%                         | 15           | \$831        |
| Existing             | Plastics Rubber Products | HVAC            | HVAC O&M              | 93,747                    | 7.0%                          | 2            | \$323        |
| Existing             | Plastics Rubber Products | Lighting        | Lighting Improvements | 76,701                    | 6.4%                          | 10           | \$485        |
| Existing             | Plastics Rubber Products | Motors Other    | Motor Improvements    | 198,215                   | 4.4%                          | 15           | \$1,080      |
| Existing             | Plastics Rubber Products | Motors Other    | Motor O&M             | 198,215                   | 1.6%                          | 2            | \$327        |
| Existing             | Plastics Rubber Products | Other           | Bldg Improvements     | 24,929                    | 26.6%                         | 15           | \$1,777      |
| Existing             | Plastics Rubber Products | Process AirComp | Air Comp Improvements | 80,302                    | 8.5%                          | 15           | \$207        |
| Existing             | Plastics Rubber Products | Process AirComp | Air Comp O&M          | 80,302                    | 10.6%                         | 2            | \$166        |
| Existing             | Plastics Rubber Products | Process AirComp | Motor Improvements    | 80,302                    | 4.4%                          | 15           | \$438        |
| Existing             | Plastics Rubber Products | Process AirComp | Motor O&M             | 80,302                    | 1.6%                          | 2            | \$133        |
| Existing             | Plastics Rubber Products | Process Cool    | Cool Improvements     | 78,021                    | 15.5%                         | 15           | \$779        |
| Existing             | Plastics Rubber Products | Process Heat    | Heat Improvements     | 145,953                   | 12.6%                         | 15           | \$971        |
| Existing             | Plastics Rubber Products | Process Heat    | Heat O&M              | 145,953                   | 8.7%                          | 2            | \$288        |
| Existing             | Plastics Rubber Products | Process Heat    | Steam Distribution    | 145,953                   | 1.4%                          | 15           | \$41         |
| Existing             | Plastics Rubber Products | Process Other   | Other Improvements    | 8,355                     | 21.6%                         | 15           | \$168        |
| Existing             | Plastics Rubber Products | Process Other   | Other O&M             | 8,355                     | 16.6%                         | 2            | \$96         |
| Existing             | Plastics Rubber Products | Process Refrig  | Motor Improvements    | 34,056                    | 4.4%                          | 15           | \$186        |
| Existing             | Plastics Rubber Products | Process Refrig  | Motor O&M             | 34,056                    | 1.6%                          | 2            | \$56         |
| Existing             | Plastics Rubber Products | Pumps           | Motor Improvements    | 126,049                   | 4.4%                          | 15           | \$687        |
| Existing             | Plastics Rubber Products | Pumps           | Motor O&M             | 126,049                   | 1.6%                          | 2            | \$208        |
| Existing             | Primary Metal Mfg        | Fans            | Motor Improvements    | 17,015                    | 3.5%                          | 15           | \$112        |
| Existing             | Primary Metal Mfg        | Fans            | Motor O&M             | 17,015                    | 3.0%                          | 2            | \$34         |
| Existing             | Primary Metal Mfg        | HVAC            | HVAC Improvements     | 12,703                    | 7.6%                          | 15           | \$60         |
| Existing             | Primary Metal Mfg        | HVAC            | HVAC O&M              | 12,703                    | 9.6%                          | 2            | \$41         |
| Existing             | Primary Metal Mfg        | Indirect Boiler | Boiler Improvements   | 623                       | 25.0%                         | 15           | \$1          |
| Existing             | Primary Metal Mfg        | Lighting        | Lighting Improvements | 10,174                    | 11.2%                         | 10           | \$157        |
| Existing             | Primary Metal Mfg        | Motors Other    | Motor Improvements    | 68,504                    | 3.5%                          | 15           | \$453        |

| Construction Vintage | Customer Segment         | End Use         | Measure Name          | Baseline MWh (UEC or EUJ) | Savings as Percent of End Use | Measure Life | Measure Cost |
|----------------------|--------------------------|-----------------|-----------------------|---------------------------|-------------------------------|--------------|--------------|
| Existing             | Primary Metal Mfg        | Motors Other    | Motor O&M             | 68,504                    | 3.0%                          | 2            | \$136        |
| Existing             | Primary Metal Mfg        | Other           | Bldg Improvements     | 4,554                     | 2.9%                          | 15           | \$22         |
| Existing             | Primary Metal Mfg        | Process AirComp | Air Comp Improvements | 15,904                    | 11.3%                         | 15           | \$31         |
| Existing             | Primary Metal Mfg        | Process AirComp | Air Comp O&M          | 15,904                    | 11.6%                         | 2            | \$29         |
| Existing             | Primary Metal Mfg        | Process AirComp | Motor Improvements    | 15,904                    | 3.5%                          | 15           | \$105        |
| Existing             | Primary Metal Mfg        | Process AirComp | Motor O&M             | 15,904                    | 3.0%                          | 2            | \$32         |
| Existing             | Primary Metal Mfg        | Process Cool    | Cool Improvements     | 2,831                     | 40.9%                         | 15           | \$24         |
| Existing             | Primary Metal Mfg        | Process Heat    | Heat Improvements     | 97,170                    | 12.7%                         | 15           | \$531        |
| Existing             | Primary Metal Mfg        | Process Heat    | Heat O&M              | 97,170                    | 6.0%                          | 2            | \$304        |
| Existing             | Primary Metal Mfg        | Process Heat    | Steam Distribution    | 97,170                    | 7.2%                          | 15           | \$304        |
| Existing             | Primary Metal Mfg        | Process Other   | Other Improvements    | 467                       | 45.7%                         | 15           | \$88         |
| Existing             | Primary Metal Mfg        | Process Other   | Other O&M             | 467                       | 35.1%                         | 2            | \$9          |
| Existing             | Primary Metal Mfg        | Process Refrig  | Motor Improvements    | 111                       | 3.5%                          | 15           | \$1          |
| Existing             | Primary Metal Mfg        | Process Refrig  | Motor O&M             | 111                       | 3.0%                          | 2            | \$0          |
| Existing             | Primary Metal Mfg        | Pumps           | Motor Improvements    | 9,675                     | 3.5%                          | 15           | \$64         |
| Existing             | Primary Metal Mfg        | Pumps           | Motor O&M             | 9,675                     | 3.0%                          | 2            | \$19         |
| Existing             | Printing Related Support | Fans            | Motor Improvements    | 5,617                     | 3.2%                          | 15           | \$17         |
| Existing             | Printing Related Support | Fans            | Motor O&M             | 5,617                     | 2.5%                          | 2            | \$13         |
| Existing             | Printing Related Support | HVAC            | HVAC Improvements     | 15,020                    | 11.5%                         | 15           | \$207        |
| Existing             | Printing Related Support | HVAC            | HVAC O&M              | 15,020                    | 11.8%                         | 2            | \$123        |
| Existing             | Printing Related Support | Lighting        | Lighting Improvements | 9,395                     | 10.5%                         | 10           | \$107        |
| Existing             | Printing Related Support | Motors Other    | Motor Improvements    | 15,991                    | 3.2%                          | 15           | \$47         |
| Existing             | Printing Related Support | Motors Other    | Motor O&M             | 15,991                    | 2.5%                          | 2            | \$37         |
| Existing             | Printing Related Support | Other           | Bldg Improvements     | 11,998                    | 47.9%                         | 15           | \$8          |
| Existing             | Printing Related Support | Process AirComp | Air Comp Improvements | 6,478                     | 9.3%                          | 15           | \$23         |
| Existing             | Printing Related Support | Process AirComp | Air Comp O&M          | 6,478                     | 12.7%                         | 2            | \$14         |
| Existing             | Printing Related Support | Process AirComp | Motor Improvements    | 6,478                     | 3.2%                          | 15           | \$19         |
| Existing             | Printing Related Support | Process AirComp | Motor O&M             | 6,478                     | 2.5%                          | 2            | \$15         |
| Existing             | Printing Related Support | Process Cool    | Cool Improvements     | 3,701                     | 41.3%                         | 15           | \$241        |
| Existing             | Printing Related Support | Process Heat    | Heat Improvements     | 2,088                     | 18.8%                         | 15           | \$32         |
| Existing             | Printing Related Support | Process Heat    | Heat O&M              | 2,088                     | 18.7%                         | 2            | \$57         |



| Construction Vintage | Customer Segment             | End Use         | Measure Name          | Baseline MWh (UEC or EU) | Savings as Percent of End Use | Measure Life | Measure Cost |
|----------------------|------------------------------|-----------------|-----------------------|--------------------------|-------------------------------|--------------|--------------|
| Existing             | Printing Related Support     | Process Other   | Other Improvements    | 153                      | 30.3%                         | 15           | \$8          |
| Existing             | Printing Related Support     | Process Refrig  | Motor Improvements    | 2,747                    | 3.2%                          | 15           | \$8          |
| Existing             | Printing Related Support     | Process Refrig  | Motor O&M             | 2,747                    | 2.5%                          | 2            | \$6          |
| Existing             | Printing Related Support     | Process Refrig  | Refrig Improvements   | 2,747                    | 20.4%                         | 15           | \$120        |
| Existing             | Printing Related Support     | Pumps           | Motor Improvements    | 10,169                   | 3.2%                          | 15           | \$30         |
| Existing             | Printing Related Support     | Pumps           | Motor O&M             | 10,169                   | 2.5%                          | 2            | \$24         |
| Existing             | Transportation Equipment Mfg | Fans            | Motor Improvements    | 60,863                   | 2.4%                          | 15           | \$161        |
| Existing             | Transportation Equipment Mfg | Fans            | Motor O&M             | 60,863                   | 2.4%                          | 2            | \$86         |
| Existing             | Transportation Equipment Mfg | HVAC            | HVAC Improvements     | 224,719                  | 13.2%                         | 15           | \$2,119      |
| Existing             | Transportation Equipment Mfg | HVAC            | HVAC O&M              | 224,719                  | 2.1%                          | 2            | \$243        |
| Existing             | Transportation Equipment Mfg | Indirect Boiler | Boiler Improvements   | 2,307                    | 33.4%                         | 15           | \$472        |
| Existing             | Transportation Equipment Mfg | Lighting        | Lighting Improvements | 175,929                  | 8.2%                          | 10           | \$1,275      |
| Existing             | Transportation Equipment Mfg | Motors Other    | Motor Improvements    | 136,552                  | 2.4%                          | 15           | \$361        |
| Existing             | Transportation Equipment Mfg | Motors Other    | Motor O&M             | 136,552                  | 2.4%                          | 2            | \$193        |
| Existing             | Transportation Equipment Mfg | Other           | Bldg Improvements     | 48,813                   | 38.8%                         | 15           | \$177        |
| Existing             | Transportation Equipment Mfg | Process AirComp | Air Comp Improvements | 141,664                  | 8.2%                          | 15           | \$362        |
| Existing             | Transportation Equipment Mfg | Process AirComp | Air Comp O&M          | 141,664                  | 9.6%                          | 2            | \$378        |
| Existing             | Transportation Equipment Mfg | Process AirComp | Motor Improvements    | 141,664                  | 2.4%                          | 15           | \$374        |
| Existing             | Transportation Equipment Mfg | Process AirComp | Motor O&M             | 141,664                  | 2.4%                          | 2            | \$200        |
| Existing             | Transportation Equipment Mfg | Process Cool    | Cool Improvements     | 53,115                   | 15.2%                         | 15           | \$973        |
| Existing             | Transportation Equipment Mfg | Process Heat    | Heat Improvements     | 112,903                  | 7.1%                          | 15           | \$315        |
| Existing             | Transportation Equipment Mfg | Process Heat    | Heat O&M              | 112,903                  | 9.5%                          | 2            | \$154        |
| Existing             | Transportation Equipment Mfg | Process Heat    | Steam Distribution    | 112,903                  | 8.6%                          | 15           | \$293        |
| Existing             | Transportation Equipment Mfg | Process Other   | Other Improvements    | 15,361                   | 22.3%                         | 15           | \$139        |
| Existing             | Transportation Equipment Mfg | Process Other   | Other O&M             | 15,361                   | 23.4%                         | 2            | \$114        |
| Existing             | Transportation Equipment Mfg | Process Refrig  | Motor Improvements    | 39,377                   | 2.4%                          | 15           | \$104        |
| Existing             | Transportation Equipment Mfg | Process Refrig  | Motor O&M             | 39,377                   | 2.4%                          | 2            | \$56         |
| Existing             | Transportation Equipment Mfg | Process Refrig  | Refrig Improvements   | 39,377                   | 37.9%                         | 15           | \$2,421      |
| Existing             | Transportation Equipment Mfg | Pumps           | Motor Improvements    | 132,979                  | 2.4%                          | 15           | \$351        |
| Existing             | Transportation Equipment Mfg | Pumps           | Motor O&M             | 132,979                  | 2.4%                          | 2            | \$187        |
| Existing             | Wood Product Mfg             | Fans            | Motor Improvements    | 39,578                   | 3.4%                          | 15           | \$122        |

| Construction Vintage | Customer Segment | End Use         | Measure Name          | Baseline MWh (UEC or EUJ) | Savings as Percent of End Use | Measure Life | Measure Cost |
|----------------------|------------------|-----------------|-----------------------|---------------------------|-------------------------------|--------------|--------------|
| Existing             | Wood Product Mfg | Fans            | Motor O&M             | 39,578                    | 2.0%                          | 2            | \$27         |
| Existing             | Wood Product Mfg | HVAC            | HVAC Improvements     | 27,116                    | 19.0%                         | 15           | \$1,468      |
| Existing             | Wood Product Mfg | HVAC            | HVAC O&M              | 27,116                    | 1.2%                          | 2            | \$19         |
| Existing             | Wood Product Mfg | Lighting        | Lighting Improvements | 28,702                    | 7.3%                          | 10           | \$146        |
| Existing             | Wood Product Mfg | Motors Other    | Motor Improvements    | 112,670                   | 3.4%                          | 15           | \$348        |
| Existing             | Wood Product Mfg | Motors Other    | Motor O&M             | 112,670                   | 0.4%                          | 2            | \$514        |
| Existing             | Wood Product Mfg | Other           | Bldg Improvements     | 31,237                    | 32.2%                         | 15           | \$241        |
| Existing             | Wood Product Mfg | Process AirComp | Air Comp Improvements | 45,646                    | 6.9%                          | 15           | \$127        |
| Existing             | Wood Product Mfg | Process AirComp | Air Comp O&M          | 45,646                    | 9.6%                          | 2            | \$82         |
| Existing             | Wood Product Mfg | Process AirComp | Motor Improvements    | 45,646                    | 3.4%                          | 15           | \$141        |
| Existing             | Wood Product Mfg | Process AirComp | Motor O&M             | 45,646                    | 2.0%                          | 2            | \$31         |
| Existing             | Wood Product Mfg | Process Cool    | Cool Improvements     | 2,535                     | 34.9%                         | 15           | \$8          |
| Existing             | Wood Product Mfg | Process Heat    | Heat Improvements     | 21,024                    | 27.0%                         | 15           | \$39         |
| Existing             | Wood Product Mfg | Process Heat    | Heat O&M              | 21,024                    | 21.4%                         | 2            | \$82         |
| Existing             | Wood Product Mfg | Process Heat    | Steam Distribution    | 21,024                    | 23.6%                         | 15           | \$229        |
| Existing             | Wood Product Mfg | Process Other   | Other Improvements    | 693                       | 1.2%                          | 15           | \$9          |
| Existing             | Wood Product Mfg | Process Other   | Other O&M             | 693                       | 26.8%                         | 2            | \$22         |
| Existing             | Wood Product Mfg | Process Refrig  | Motor Improvements    | 19,354                    | 3.4%                          | 15           | \$60         |
| Existing             | Wood Product Mfg | Process Refrig  | Motor O&M             | 19,354                    | 0.4%                          | 2            | \$88         |
| Existing             | Wood Product Mfg | Pumps           | Motor Improvements    | 71,648                    | 3.4%                          | 15           | \$221        |
| Existing             | Wood Product Mfg | Pumps           | Motor O&M             | 71,648                    | 2.0%                          | 2            | \$49         |

## Industrial Gas Measures

| Construction Vintage | Customer Segment          | End Use         | Measure Name        | Baseline decatherms (UEC or EU) | Savings as Percent of End Use | Measure Life | Measure Cost |
|----------------------|---------------------------|-----------------|---------------------|---------------------------------|-------------------------------|--------------|--------------|
| Existing             | Chemical Mfg              | HVAC            | HVAC Improvements   | 294                             | 20.5%                         | 15           | \$60         |
| Existing             | Chemical Mfg              | HVAC            | HVAC O&M            | 294                             | 13.7%                         | 2            | \$47         |
| Existing             | Chemical Mfg              | Indirect Boiler | Boiler Improvements | 8,291                           | 2.2%                          | 15           | \$51         |
| Existing             | Chemical Mfg              | Indirect Boiler | Boiler O&M          | 8,291                           | 3.3%                          | 2            | \$47         |
| Existing             | Chemical Mfg              | Process Heat    | Boiler Improvements | 5,261                           | 20.7%                         | 15           | \$74         |
| Existing             | Chemical Mfg              | Process Heat    | Heat Improvements   | 5,261                           | 10.5%                         | 15           | \$210        |
| Existing             | Chemical Mfg              | Process Heat    | Heat O&M            | 5,261                           | 0.6%                          | 2            | \$17         |
| Existing             | Chemical Mfg              | Process Heat    | Steam Distribution  | 5,261                           | 14.3%                         | 15           | \$43         |
| Existing             | Chemical Mfg              | Process Other   | Other O&M           | 863                             | 9.7%                          | 2            | \$25         |
| Existing             | Computer Electronic Mfg   | HVAC            | HVAC Improvements   | 749                             | 11.0%                         | 15           | \$65         |
| Existing             | Computer Electronic Mfg   | HVAC            | HVAC O&M            | 749                             | 13.7%                         | 2            | \$41         |
| Existing             | Computer Electronic Mfg   | Indirect Boiler | Boiler Improvements | 974                             | 11.7%                         | 15           | \$140        |
| Existing             | Computer Electronic Mfg   | Indirect Boiler | Boiler O&M          | 974                             | 8.9%                          | 2            | \$12         |
| Existing             | Computer Electronic Mfg   | Process Heat    | Boiler Improvements | 337                             | 4.4%                          | 15           | \$26         |
| Existing             | Computer Electronic Mfg   | Process Heat    | Heat Improvements   | 337                             | 23.9%                         | 15           | \$31         |
| Existing             | Computer Electronic Mfg   | Process Heat    | Heat O&M            | 337                             | 4.3%                          | 2            | \$9          |
| Existing             | Computer Electronic Mfg   | Process Heat    | Steam Distribution  | 337                             | 9.7%                          | 15           | \$17         |
| Existing             | Electrical Equipment Mfg  | HVAC            | HVAC Improvements   | 439                             | 10.4%                         | 15           | \$29         |
| Existing             | Electrical Equipment Mfg  | HVAC            | HVAC O&M            | 439                             | 4.6%                          | 2            | \$4          |
| Existing             | Electrical Equipment Mfg  | Indirect Boiler | Boiler Improvements | 176                             | 12.0%                         | 15           | \$25         |
| Existing             | Electrical Equipment Mfg  | Indirect Boiler | Boiler O&M          | 176                             | 12.8%                         | 2            | \$5          |
| Existing             | Electrical Equipment Mfg  | Process Heat    | Boiler Improvements | 790                             | 7.3%                          | 15           | \$32         |
| Existing             | Electrical Equipment Mfg  | Process Heat    | Heat Improvements   | 790                             | 17.1%                         | 15           | \$80         |
| Existing             | Electrical Equipment Mfg  | Process Heat    | Heat O&M            | 790                             | 2.5%                          | 2            | \$9          |
| Existing             | Electrical Equipment Mfg  | Process Heat    | Steam Distribution  | 790                             | 6.3%                          | 15           | \$18         |
| Existing             | Fabricated Metal Products | HVAC            | HVAC Improvements   | 1,158                           | 14.5%                         | 15           | \$216        |
| Existing             | Fabricated Metal Products | HVAC            | HVAC O&M            | 1,158                           | 13.0%                         | 2            | \$109        |
| Existing             | Fabricated Metal Products | Indirect Boiler | Boiler Improvements | 883                             | 17.3%                         | 15           | \$252        |
| Existing             | Fabricated Metal Products | Indirect Boiler | Boiler O&M          | 883                             | 11.8%                         | 2            | \$12         |

| Construction Vintage | Customer Segment          | End Use         | Measure Name        | Baseline decatherms<br>(UEC or EUJ) | Savings as Percent of<br>End Use | Measure Life | Measure Cost |
|----------------------|---------------------------|-----------------|---------------------|-------------------------------------|----------------------------------|--------------|--------------|
| Existing             | Fabricated Metal Products | Process Heat    | Boiler Improvements | 3,475                               | 6.0%                             | 15           | \$103        |
| Existing             | Fabricated Metal Products | Process Heat    | Heat Improvements   | 3,475                               | 6.8%                             | 15           | \$227        |
| Existing             | Fabricated Metal Products | Process Heat    | Heat O&M            | 3,475                               | 3.5%                             | 2            | \$61         |
| Existing             | Fabricated Metal Products | Process Heat    | Steam Distribution  | 3,475                               | 5.2%                             | 15           | \$123        |
| Existing             | Fabricated Metal Products | Process Other   | Other O&M           | 55                                  | 12.4%                            | 2            | \$4          |
| Existing             | Food Mfg                  | HVAC            | HVAC Improvements   | 856                                 | 20.4%                            | 15           | \$107        |
| Existing             | Food Mfg                  | HVAC            | HVAC O&M            | 856                                 | 5.6%                             | 2            | \$11         |
| Existing             | Food Mfg                  | Indirect Boiler | Boiler Improvements | 6,372                               | 6.0%                             | 15           | \$327        |
| Existing             | Food Mfg                  | Indirect Boiler | Boiler O&M          | 6,372                               | 4.1%                             | 2            | \$99         |
| Existing             | Food Mfg                  | Process Heat    | Boiler Improvements | 4,731                               | 7.1%                             | 15           | \$112        |
| Existing             | Food Mfg                  | Process Heat    | Heat Improvements   | 4,731                               | 12.9%                            | 15           | \$324        |
| Existing             | Food Mfg                  | Process Heat    | Heat O&M            | 4,731                               | 3.5%                             | 2            | \$61         |
| Existing             | Food Mfg                  | Process Heat    | Steam Distribution  | 4,731                               | 5.2%                             | 15           | \$119        |
| Existing             | Food Mfg                  | Process Other   | Other O&M           | 594                                 | 28.1%                            | 2            | \$24         |
| Existing             | Industrial Machinery      | HVAC            | HVAC Improvements   | 1,327                               | 14.4%                            | 15           | \$164        |
| Existing             | Industrial Machinery      | HVAC            | HVAC O&M            | 1,327                               | 14.6%                            | 2            | \$70         |
| Existing             | Industrial Machinery      | Indirect Boiler | Boiler Improvements | 641                                 | 18.8%                            | 15           | \$131        |
| Existing             | Industrial Machinery      | Indirect Boiler | Boiler O&M          | 641                                 | 15.1%                            | 2            | \$18         |
| Existing             | Industrial Machinery      | Process Heat    | Boiler Improvements | 1,327                               | 2.1%                             | 15           | \$32         |
| Existing             | Industrial Machinery      | Process Heat    | Heat Improvements   | 1,327                               | 13.2%                            | 15           | \$94         |
| Existing             | Industrial Machinery      | Process Heat    | Heat O&M            | 1,327                               | 9.7%                             | 2            | \$77         |
| Existing             | Industrial Machinery      | Process Heat    | Steam Distribution  | 1,327                               | 6.2%                             | 15           | \$31         |
| Existing             | Miscellaneous Mfg         | HVAC            | HVAC Improvements   | 754                                 | 16.6%                            | 15           | \$92         |
| Existing             | Miscellaneous Mfg         | HVAC            | HVAC O&M            | 754                                 | 20.2%                            | 2            | \$7          |
| Existing             | Miscellaneous Mfg         | Indirect Boiler | Boiler Improvements | 679                                 | 14.3%                            | 15           | \$60         |
| Existing             | Miscellaneous Mfg         | Indirect Boiler | Boiler O&M          | 679                                 | 5.5%                             | 2            | \$8          |
| Existing             | Miscellaneous Mfg         | Process Heat    | Boiler Improvements | 603                                 | 4.4%                             | 15           | \$29         |
| Existing             | Miscellaneous Mfg         | Process Heat    | Heat Improvements   | 603                                 | 8.1%                             | 15           | \$24         |
| Existing             | Miscellaneous Mfg         | Process Heat    | Heat O&M            | 603                                 | 3.5%                             | 2            | \$7          |
| Existing             | Miscellaneous Mfg         | Process Heat    | Steam Distribution  | 603                                 | 11.7%                            | 15           | \$16         |
| New                  | Miscellaneous Mfg         | HVAC            | HVAC Improvements   | 754                                 | 16.6%                            | 15           | \$92         |

| Construction Vintage | Customer Segment             | End Use         | Measure Name        | Baseline decatherms<br>(UEC or EU) | Savings as Percent of<br>End Use | Measure Life | Measure Cost |
|----------------------|------------------------------|-----------------|---------------------|------------------------------------|----------------------------------|--------------|--------------|
| New                  | Miscellaneous Mfg            | HVAC            | HVAC O&M            | 754                                | 20.2%                            | 2            | \$7          |
| New                  | Miscellaneous Mfg            | Indirect Boiler | Boiler Improvements | 679                                | 14.3%                            | 15           | \$60         |
| New                  | Miscellaneous Mfg            | Indirect Boiler | Boiler O&M          | 679                                | 5.5%                             | 2            | \$8          |
| New                  | Miscellaneous Mfg            | Process Heat    | Boiler Improvements | 603                                | 4.4%                             | 15           | \$29         |
| New                  | Miscellaneous Mfg            | Process Heat    | Heat Improvements   | 603                                | 8.1%                             | 15           | \$24         |
| New                  | Miscellaneous Mfg            | Process Heat    | Heat O&M            | 603                                | 3.5%                             | 2            | \$7          |
| New                  | Miscellaneous Mfg            | Process Heat    | Steam Distribution  | 603                                | 11.7%                            | 15           | \$16         |
| Existing             | Nonmetallic Mineral Products | HVAC            | HVAC Improvements   | 3,832                              | 10.8%                            | 15           | \$502        |
| Existing             | Nonmetallic Mineral Products | HVAC            | HVAC O&M            | 3,832                              | 1.9%                             | 2            | \$36         |
| Existing             | Nonmetallic Mineral Products | Indirect Boiler | Boiler O&M          | 2,299                              | 4.5%                             | 2            | \$7          |
| Existing             | Nonmetallic Mineral Products | Process Heat    | Boiler Improvements | 66,686                             | 21.8%                            | 15           | \$3,054      |
| Existing             | Nonmetallic Mineral Products | Process Heat    | Heat Improvements   | 66,686                             | 12.9%                            | 15           | \$8,142      |
| Existing             | Nonmetallic Mineral Products | Process Heat    | Heat O&M            | 66,686                             | 3.0%                             | 2            | \$642        |
| Existing             | Nonmetallic Mineral Products | Process Heat    | Steam Distribution  | 66,686                             | 4.6%                             | 15           | \$1,330      |
| Existing             | Nonmetallic Mineral Products | Process Other   | Other O&M           | 383                                | 15.3%                            | 2            | \$120        |
| Existing             | Paper Mfg                    | HVAC            | HVAC Improvements   | 7,319                              | 18.3%                            | 15           | \$934        |
| Existing             | Paper Mfg                    | HVAC            | HVAC O&M            | 7,319                              | 22.0%                            | 2            | \$232        |
| Existing             | Paper Mfg                    | Indirect Boiler | Boiler Improvements | 114,806                            | 7.8%                             | 15           | \$4,456      |
| Existing             | Paper Mfg                    | Indirect Boiler | Boiler O&M          | 114,806                            | 4.1%                             | 2            | \$605        |
| Existing             | Paper Mfg                    | Process Heat    | Boiler Improvements | 48,543                             | 6.2%                             | 15           | \$1,544      |
| Existing             | Paper Mfg                    | Process Heat    | Heat Improvements   | 48,543                             | 10.4%                            | 15           | \$3,596      |
| Existing             | Paper Mfg                    | Process Heat    | Heat O&M            | 48,543                             | 3.1%                             | 2            | \$382        |
| Existing             | Paper Mfg                    | Process Heat    | Steam Distribution  | 48,543                             | 3.8%                             | 15           | \$341        |
| Existing             | Paper Mfg                    | Process Other   | Other O&M           | 8,861                              | 20.0%                            | 2            | \$1,235      |
| Existing             | Petroleum Coal Products      | Indirect Boiler | Boiler Improvements | 54,472                             | 8.8%                             | 15           | \$4,614      |
| Existing             | Petroleum Coal Products      | Indirect Boiler | Boiler O&M          | 54,472                             | 5.8%                             | 2            | \$569        |
| Existing             | Petroleum Coal Products      | Process Heat    | Boiler Improvements | 99,253                             | 1.9%                             | 15           | \$1,532      |
| Existing             | Petroleum Coal Products      | Process Heat    | Heat Improvements   | 99,253                             | 4.8%                             | 15           | \$3,757      |
| Existing             | Petroleum Coal Products      | Process Heat    | Heat O&M            | 99,253                             | 2.3%                             | 2            | \$457        |
| Existing             | Petroleum Coal Products      | Process Heat    | Steam Distribution  | 99,253                             | 3.0%                             | 15           | \$157        |
| Existing             | Plastics Rubber Products     | HVAC            | HVAC Improvements   | 1,322                              | 9.3%                             | 15           | \$81         |

| Construction Vintage | Customer Segment             | End Use         | Measure Name        | Baseline decatherms<br>(UEC or EUJ) | Savings as Percent of<br>End Use | Measure Life | Measure Cost |
|----------------------|------------------------------|-----------------|---------------------|-------------------------------------|----------------------------------|--------------|--------------|
| Existing             | Plastics Rubber Products     | HVAC            | HVAC O&M            | 1,322                               | 12.4%                            | 2            | \$5,385      |
| Existing             | Plastics Rubber Products     | Indirect Boiler | Boiler Improvements | 2,644                               | 12.4%                            | 15           | \$106        |
| Existing             | Plastics Rubber Products     | Indirect Boiler | Boiler O&M          | 2,644                               | 6.4%                             | 2            | \$40         |
| Existing             | Plastics Rubber Products     | Process Heat    | Boiler Improvements | 1,983                               | 10.3%                            | 15           | \$135        |
| Existing             | Plastics Rubber Products     | Process Heat    | Heat Improvements   | 1,983                               | 13.1%                            | 15           | \$172        |
| Existing             | Plastics Rubber Products     | Process Heat    | Heat O&M            | 1,983                               | 8.4%                             | 2            | \$109        |
| Existing             | Plastics Rubber Products     | Process Heat    | Steam Distribution  | 1,983                               | 6.8%                             | 15           | \$22         |
| Existing             | Plastics Rubber Products     | Process Other   | Other O&M           | 165                                 | 16.6%                            | 2            | \$6          |
| Existing             | Primary Metal Mfg            | HVAC            | HVAC Improvements   | 9,682                               | 13.9%                            | 15           | \$655        |
| Existing             | Primary Metal Mfg            | Indirect Boiler | Boiler Improvements | 15,537                              | 17.7%                            | 15           | \$2,839      |
| Existing             | Primary Metal Mfg            | Indirect Boiler | Boiler O&M          | 15,537                              | 13.5%                            | 2            | \$322        |
| Existing             | Primary Metal Mfg            | Process Heat    | Boiler Improvements | 116,190                             | 7.8%                             | 15           | \$4,113      |
| Existing             | Primary Metal Mfg            | Process Heat    | Heat Improvements   | 116,190                             | 8.3%                             | 15           | \$7,569      |
| Existing             | Primary Metal Mfg            | Process Heat    | Heat O&M            | 116,190                             | 1.6%                             | 2            | \$978        |
| Existing             | Primary Metal Mfg            | Process Heat    | Steam Distribution  | 116,190                             | 4.2%                             | 15           | \$1,983      |
| Existing             | Printing Related Support     | HVAC            | HVAC Improvements   | 386                                 | 17.4%                            | 15           | \$31         |
| Existing             | Printing Related Support     | HVAC            | HVAC O&M            | 386                                 | 30.9%                            | 2            | \$41         |
| Existing             | Printing Related Support     | Indirect Boiler | Boiler Improvements | 232                                 | 12.4%                            | 15           | \$31         |
| Existing             | Printing Related Support     | Indirect Boiler | Boiler O&M          | 232                                 | 10.3%                            | 2            | \$3          |
| Existing             | Printing Related Support     | Process Heat    | Boiler Improvements | 463                                 | 16.3%                            | 15           | \$138        |
| Existing             | Printing Related Support     | Process Heat    | Heat Improvements   | 463                                 | 4.7%                             | 15           | \$10         |
| Existing             | Printing Related Support     | Process Heat    | Heat O&M            | 463                                 | 4.4%                             | 2            | \$13         |
| Existing             | Printing Related Support     | Process Heat    | Steam Distribution  | 463                                 | 17.3%                            | 15           | \$30         |
| Existing             | Printing Related Support     | Process Other   | Other O&M           | 26                                  | 16.6%                            | 2            | \$5          |
| Existing             | Transportation Equipment Mfg | HVAC            | HVAC Improvements   | 11,987                              | 7.3%                             | 15           | \$910        |
| Existing             | Transportation Equipment Mfg | HVAC            | HVAC O&M            | 11,987                              | 13.7%                            | 2            | \$319        |
| Existing             | Transportation Equipment Mfg | Indirect Boiler | Boiler Improvements | 9,826                               | 18.9%                            | 15           | \$1,935      |
| Existing             | Transportation Equipment Mfg | Indirect Boiler | Boiler O&M          | 9,826                               | 6.2%                             | 2            | \$458        |
| Existing             | Transportation Equipment Mfg | Process Heat    | Boiler Improvements | 11,987                              | 15.1%                            | 15           | \$469        |
| Existing             | Transportation Equipment Mfg | Process Heat    | Heat Improvements   | 11,987                              | 19.6%                            | 15           | \$792        |
| Existing             | Transportation Equipment Mfg | Process Heat    | Heat O&M            | 11,987                              | 3.4%                             | 2            | \$318        |

| Construction Vintage | Customer Segment             | End Use         | Measure Name        | Baseline decatherms<br>(UEC or EUJ) | Savings as Percent of<br>End Use | Measure Life | Measure Cost |
|----------------------|------------------------------|-----------------|---------------------|-------------------------------------|----------------------------------|--------------|--------------|
| Existing             | Transportation Equipment Mfg | Process Heat    | Steam Distribution  | 11,987                              | 5.3%                             | 15           | \$5,564      |
| Existing             | Transportation Equipment Mfg | Process Other   | Other O&M           | 786                                 | 17.4%                            | 2            | \$60         |
| Existing             | Wood Product Mfg             | HVAC            | HVAC Improvements   | 2,944                               | 9.8%                             | 15           | \$332        |
| Existing             | Wood Product Mfg             | HVAC            | HVAC O&M            | 2,944                               | 4.5%                             | 2            | \$24         |
| Existing             | Wood Product Mfg             | Indirect Boiler | Boiler Improvements | 6,308                               | 12.1%                            | 15           | \$384        |
| Existing             | Wood Product Mfg             | Indirect Boiler | Boiler O&M          | 6,308                               | 3.6%                             | 2            | \$19         |
| Existing             | Wood Product Mfg             | Process Heat    | Boiler Improvements | 11,354                              | 11.4%                            | 15           | \$463        |
| Existing             | Wood Product Mfg             | Process Heat    | Heat Improvements   | 11,354                              | 8.0%                             | 15           | \$2,113      |
| Existing             | Wood Product Mfg             | Process Heat    | Heat O&M            | 11,354                              | 5.8%                             | 2            | \$77         |
| Existing             | Wood Product Mfg             | Process Heat    | Steam Distribution  | 11,354                              | 1.5%                             | 15           | \$14         |
| Existing             | Wood Product Mfg             | Process Other   | Other O&M           | 841                                 | 6.9%                             | 2            | \$10         |

## Appendix C.3: Detailed Results

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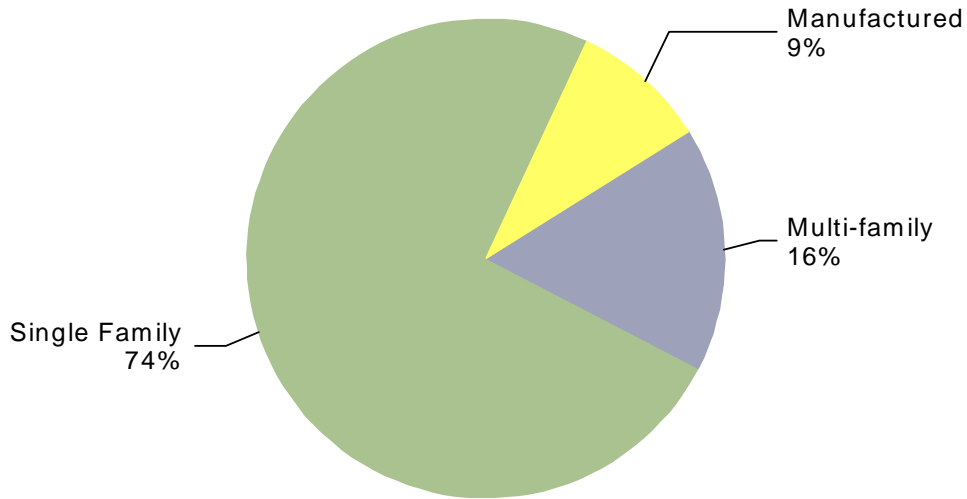
The following pie charts show how the technical and achievable technical potential are distributed by fuel, sector, segment, and end use.



**Residential Electric  
Technical Potential**

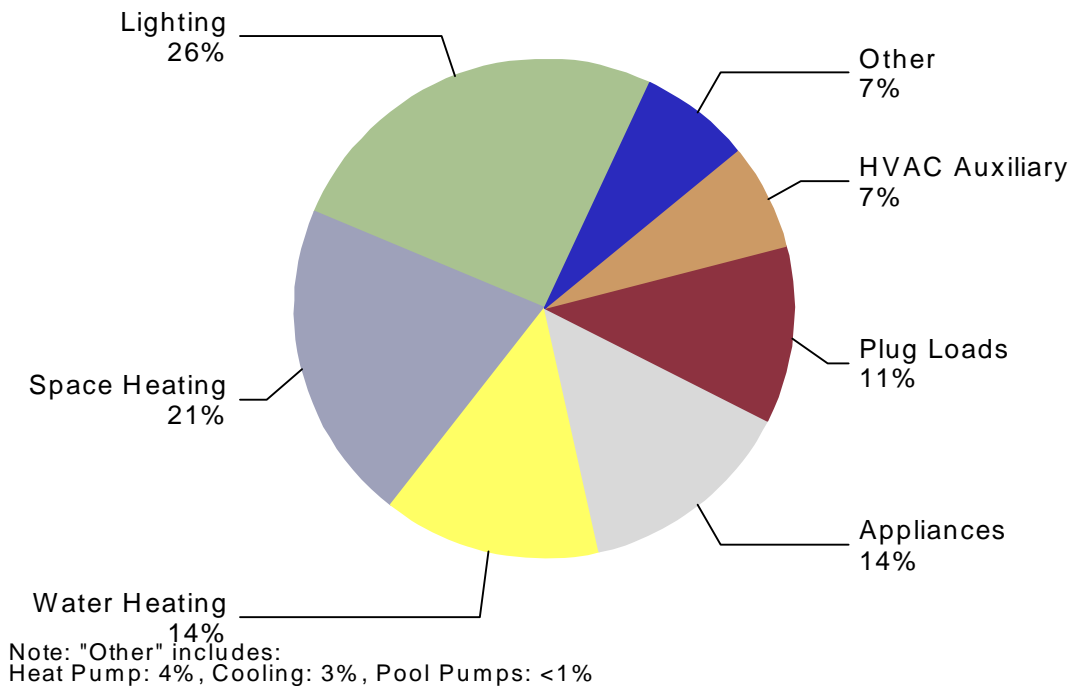
**Figure 1: Residential Technical Potential in 2029 by Segment**

Total: 343 aMW



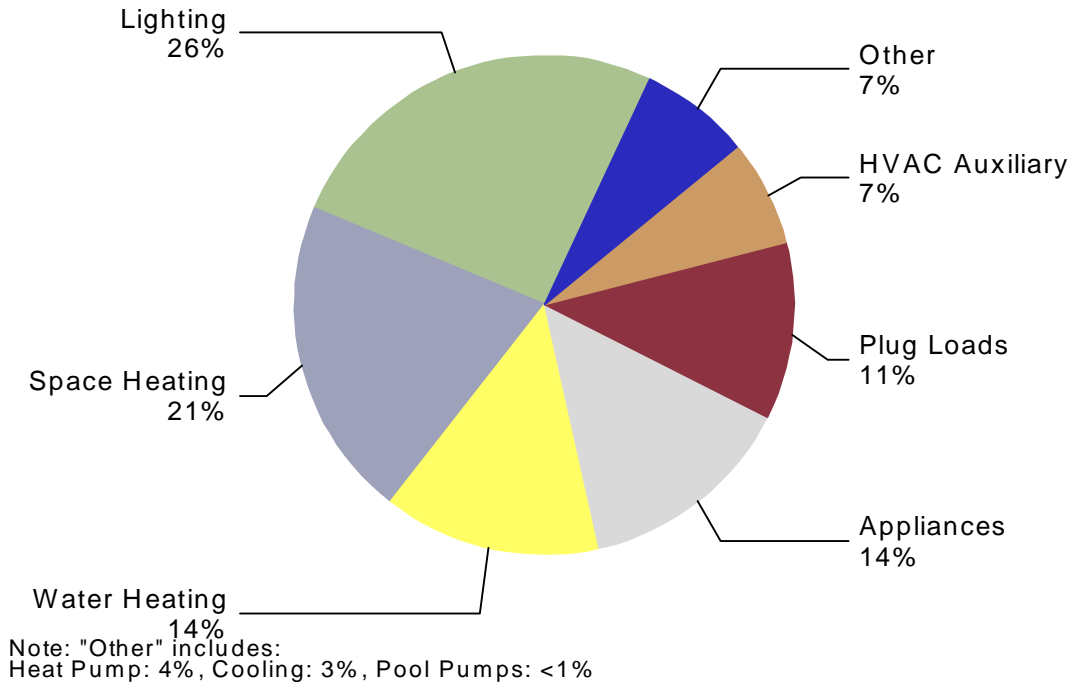
**Figure 2: Residential Technical Potential in 2029 by End Use**

Total: 343 aMW



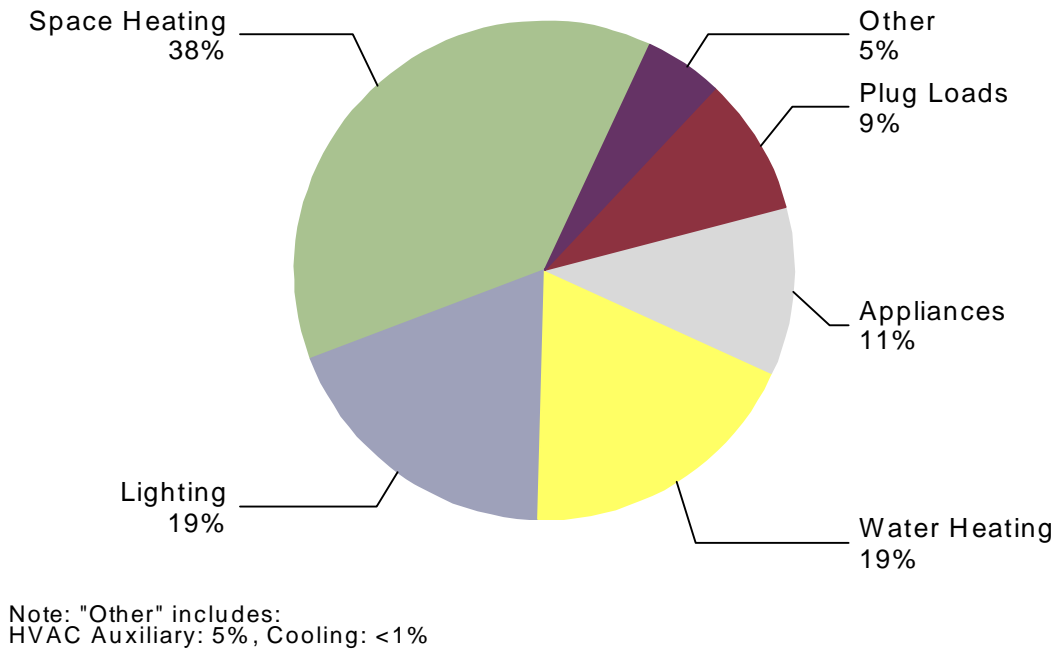
**Figure 3: Residential Technical Potential in 2029 by End Use, Manufactured**

Total: 343 aMW



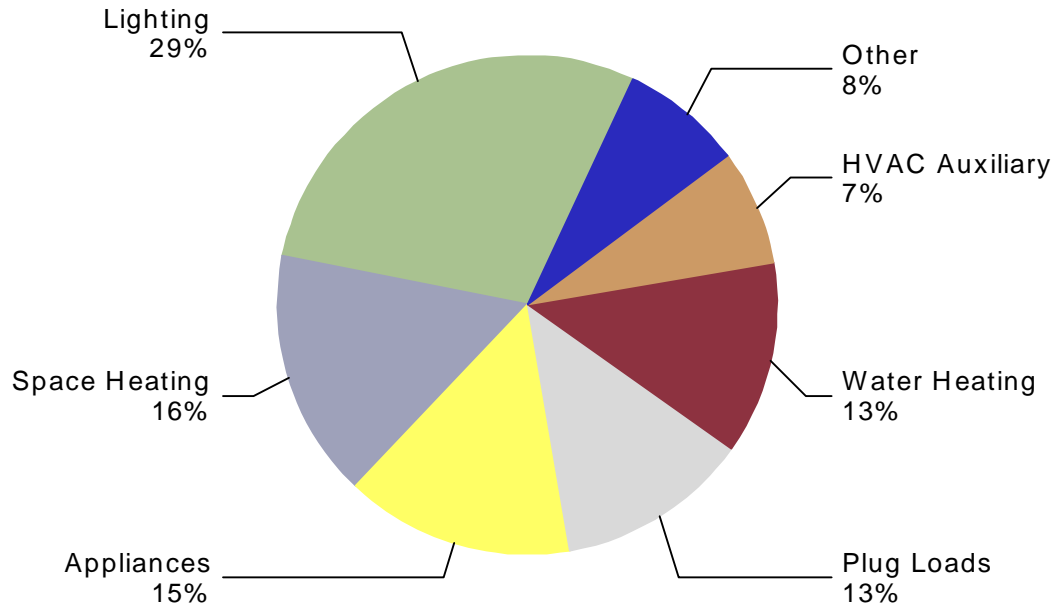
**Figure 4: Residential Technical Potential in 2029 by End Use, Multifamily**

Total: 57 aMW



**Figure 5: Residential Technical Potential in 2029 by End Use, Single Family**

Total: 255 aMW

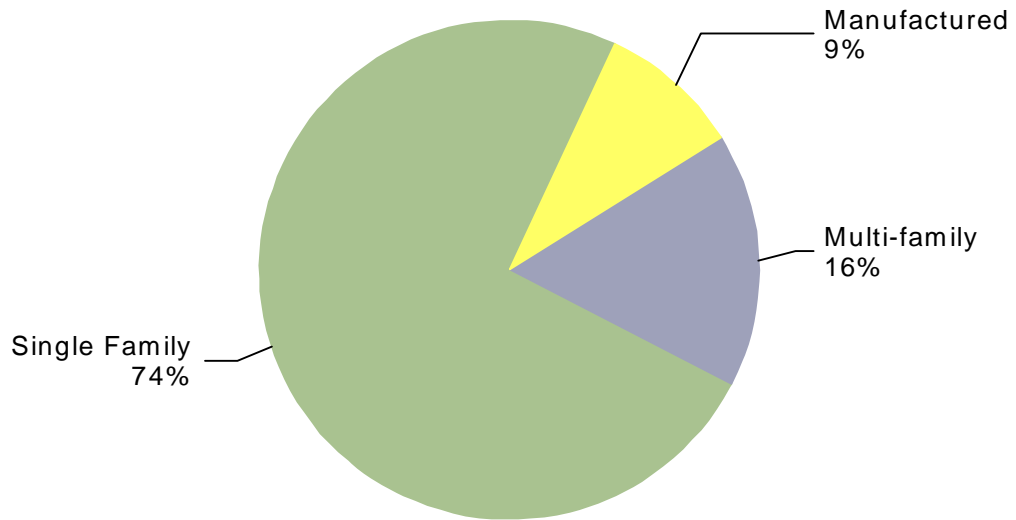


Note: "Other" includes:  
Heat Pump: 4%, Cooling: 3%, Pool Pumps: <1%

**Achievable Technical Potential**

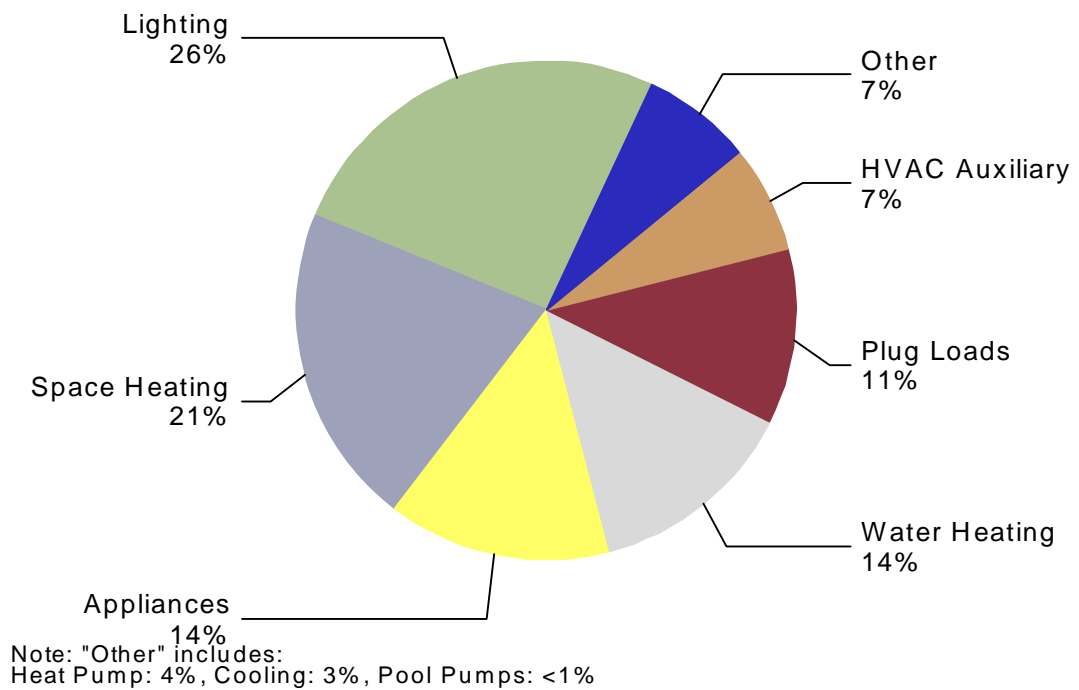
**Figure 6: Residential Achievable Technical Potential in 2029 by Segment**

Total: 273 aMW



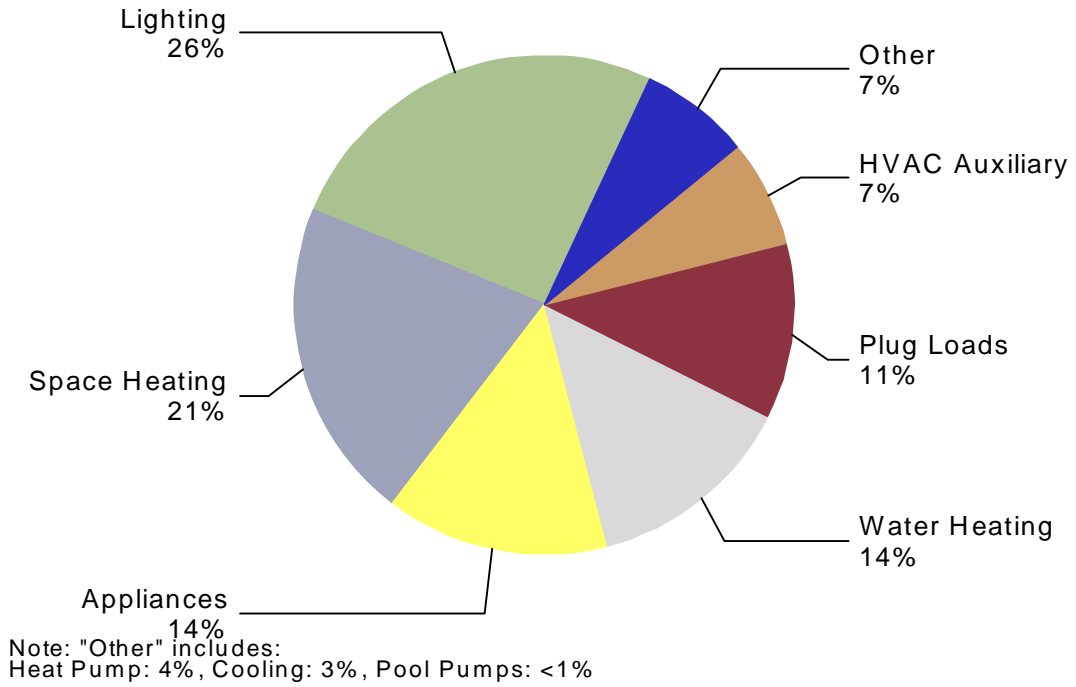
**Figure 7: Residential Achievable Technical Potential in 2029 by End Use**

Total: 273 aMW



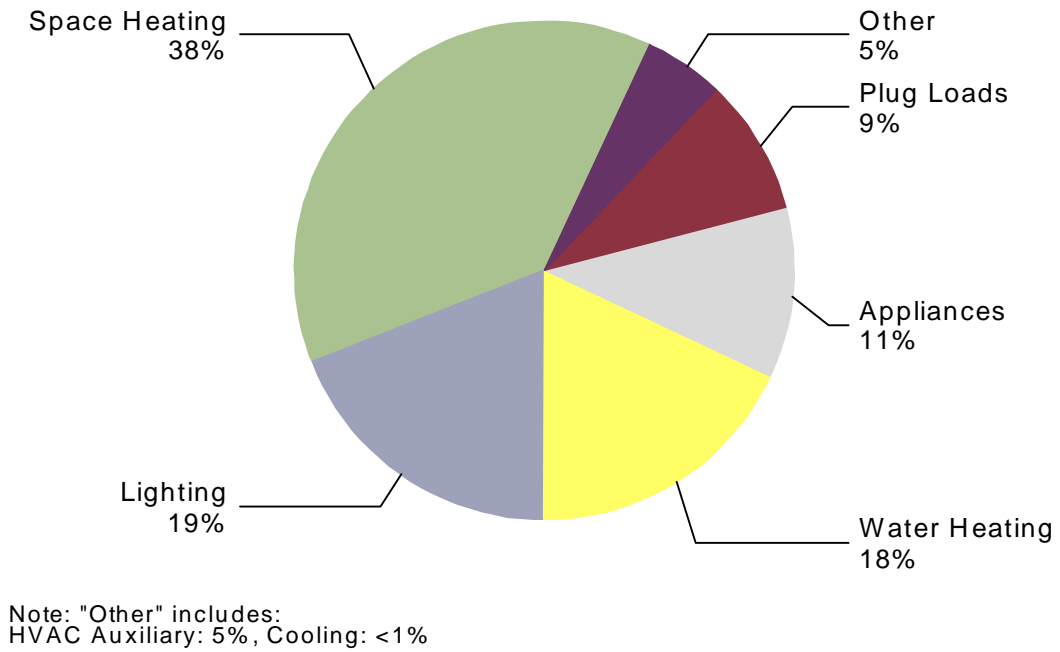
**Figure 8: Residential Achievable Technical Potential in 2029 by End Use, Manufactured**

Total: 273 aMW



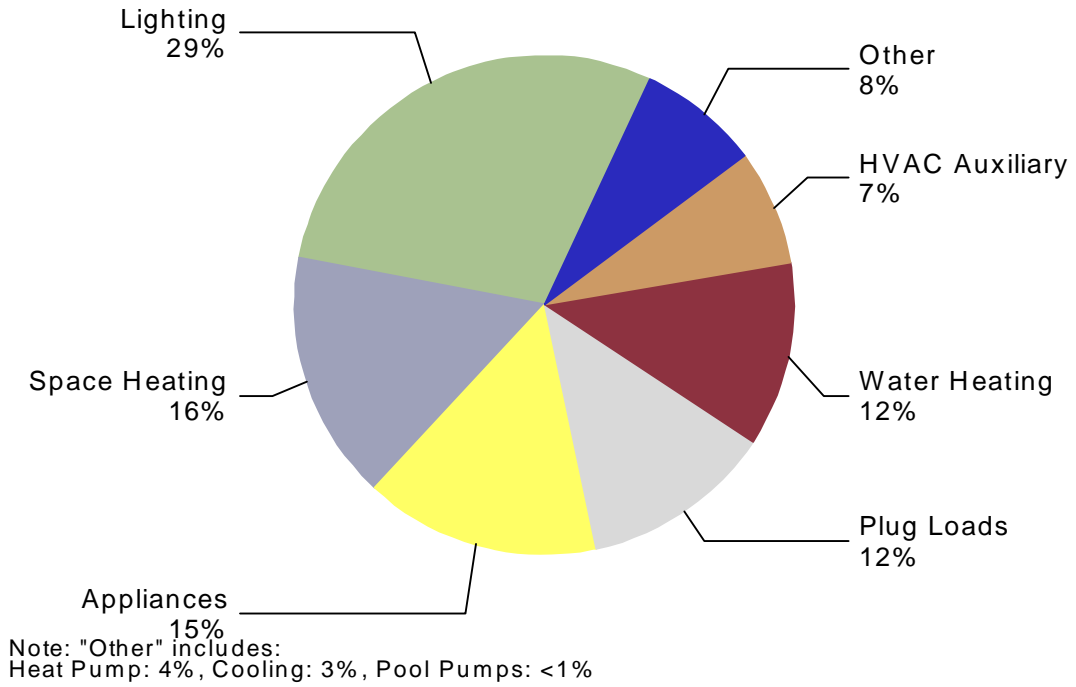
**Figure 9: Residential Achievable Technical Potential in 2029 by End Use, Multifamily**

Total: 45 aMW



**Figure 10: Residential Achievable Technical Potential in 2029 by End Use, Single Family**

Total: 203 aMW

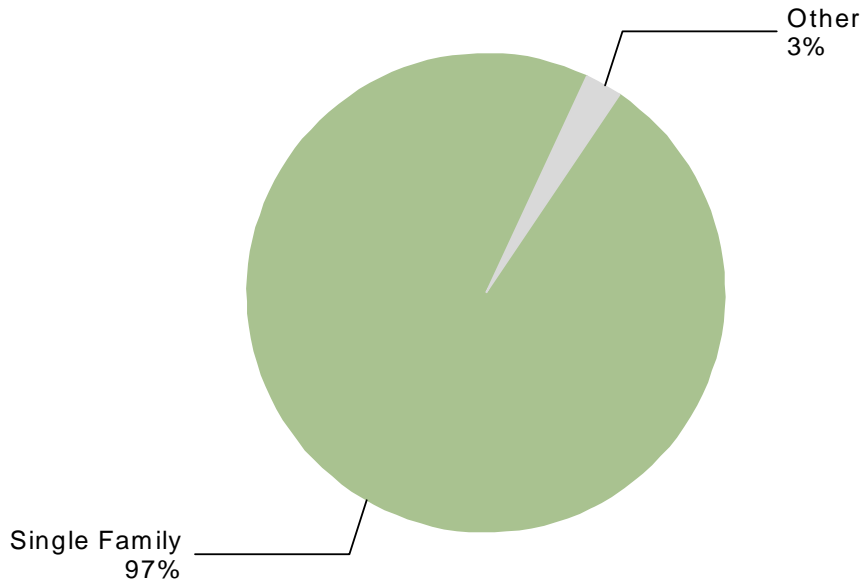


**Residential Gas  
Technical Potential**

**Figure 1: Residential Technical Potential in 2029 by Segment**

Error! Bookmark not defined.

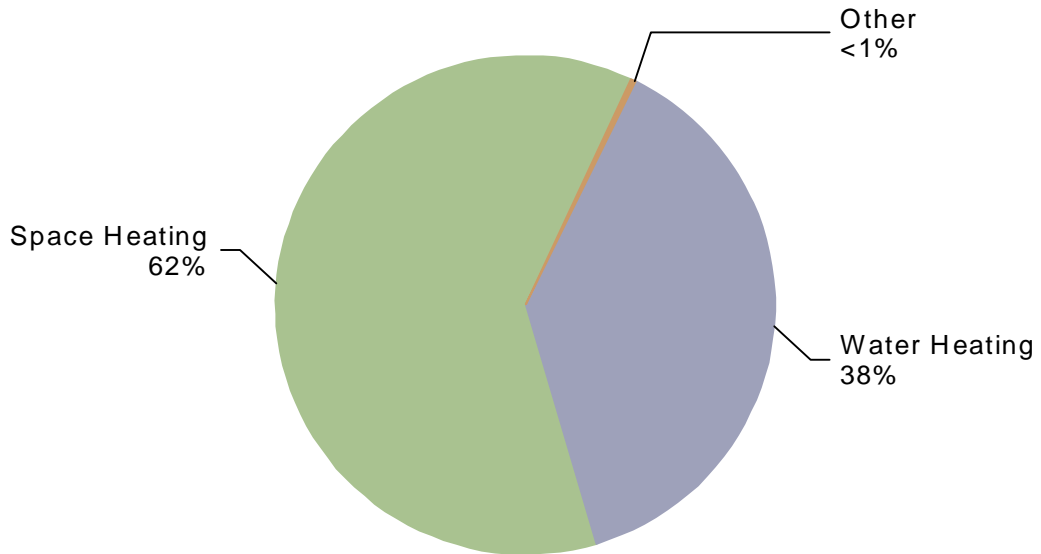
Total: 263,471,136 therms



Note: "Other" includes:  
Multi-family: 2%, Manufactured: <1%

**Figure 2: Residential Technical Potential in 2029 by End Use**

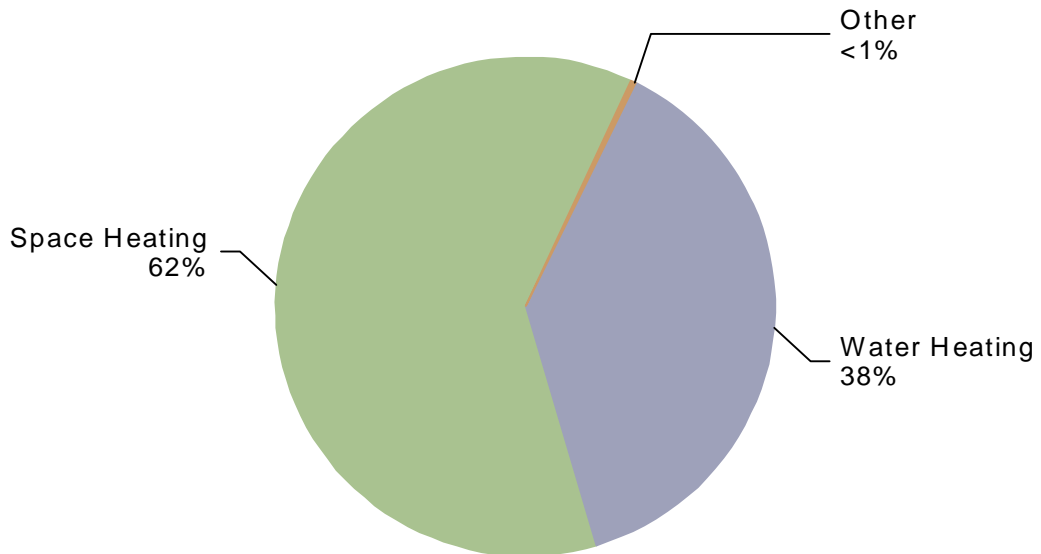
Total: 263,471,136 therms



Note: "Other" includes:  
Cooking: <1%, Dryer: <1%, Pool Heating: <1%

**Figure 3: Residential Technical Potential in 2029 by End Use, Manufactured**

Total: 263,471,136 therms

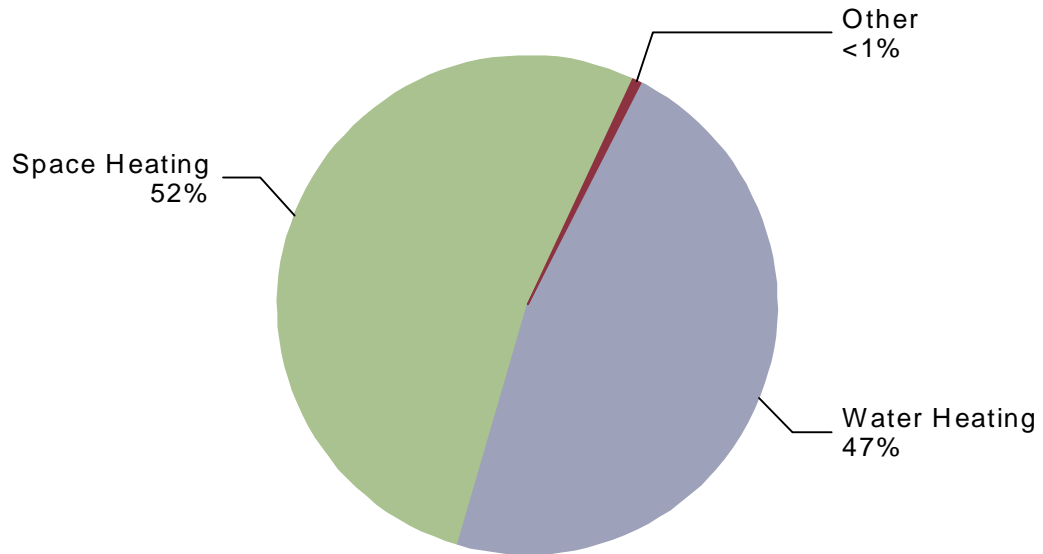


Note: "Other" includes:  
Cooking: <1%, Dryer: <1%, Pool Heating: <1%



**Figure 4: Residential Technical Potential in 2029 by End Use, Multifamily**

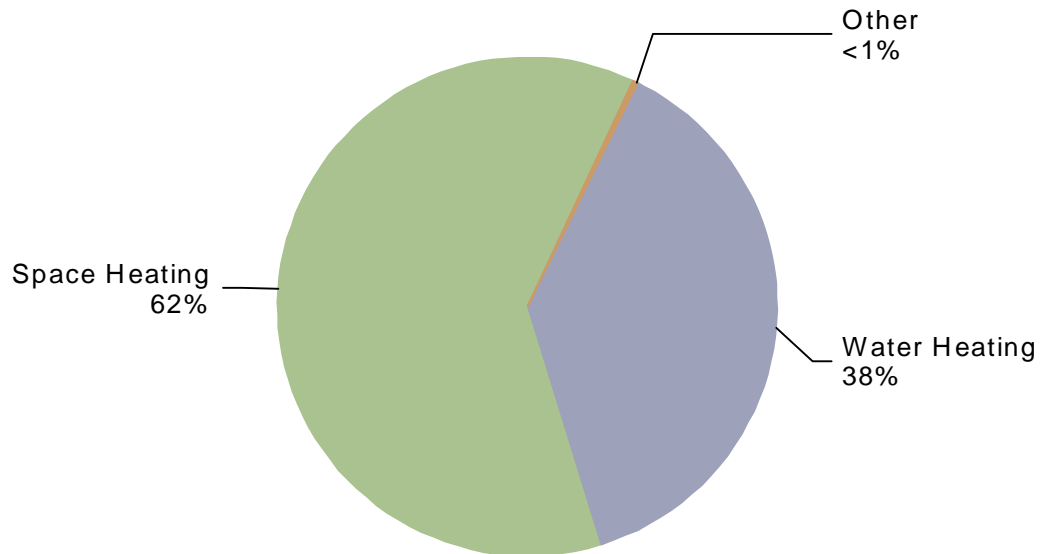
Total: 5,624,901 therms



Note: "Other" includes:  
Cooking: <1%, Dryer: <1%

**Figure 5: Residential Technical Potential in 2029 by End Use, Single Family**

Total: 256,822,562 therms

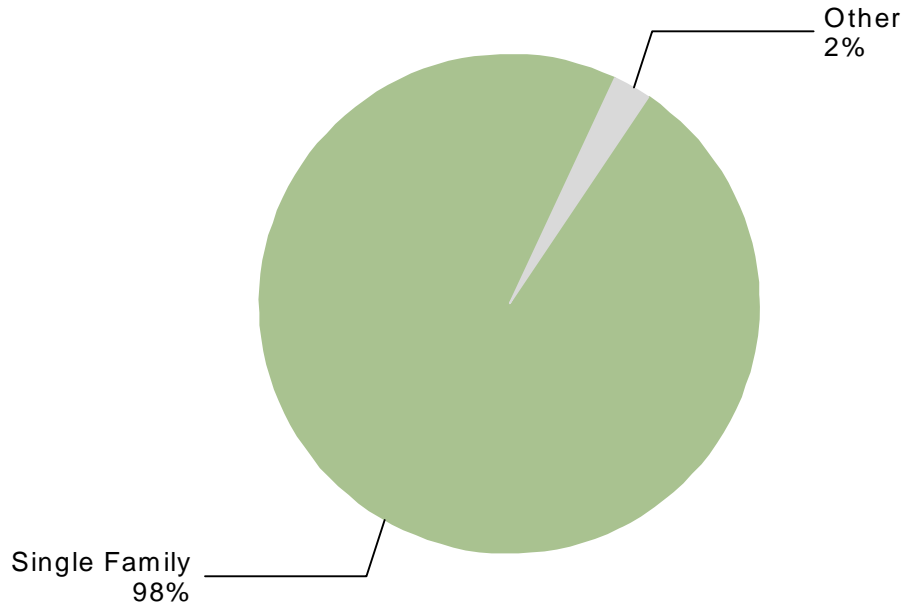


Note: "Other" includes:  
Cooking: <1%, Dryer: <1%, Pool Heating: <1%

**Achievable Technical Potential**

**Figure 6: Residential Achievable Technical Potential in 2029 by Segment**

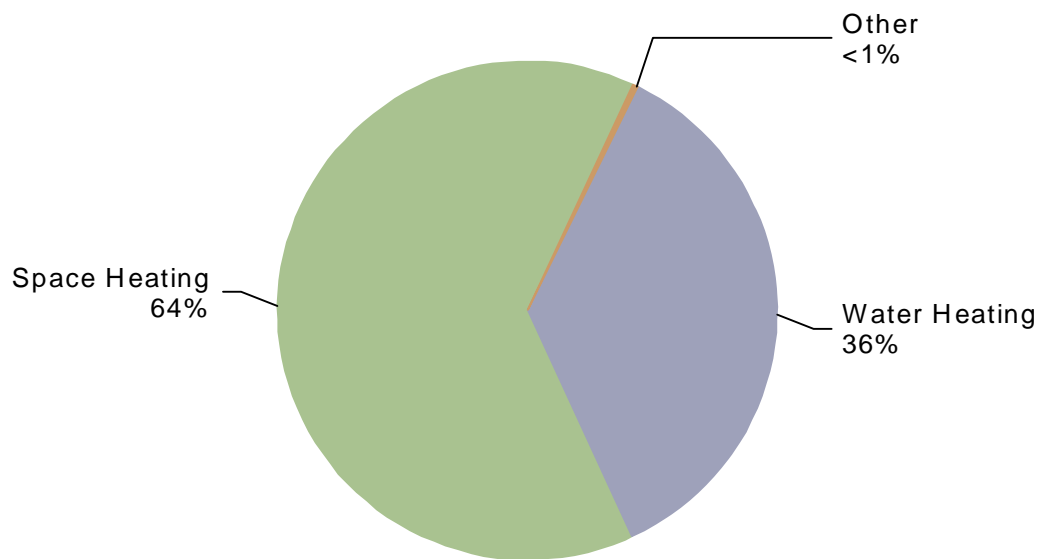
Total: 161,583,795 therms



Note: "Other" includes:  
Multi-family: 2%, Manufactured: <1%

**Figure 7: Residential Achievable Technical Potential in 2029 by End Use**

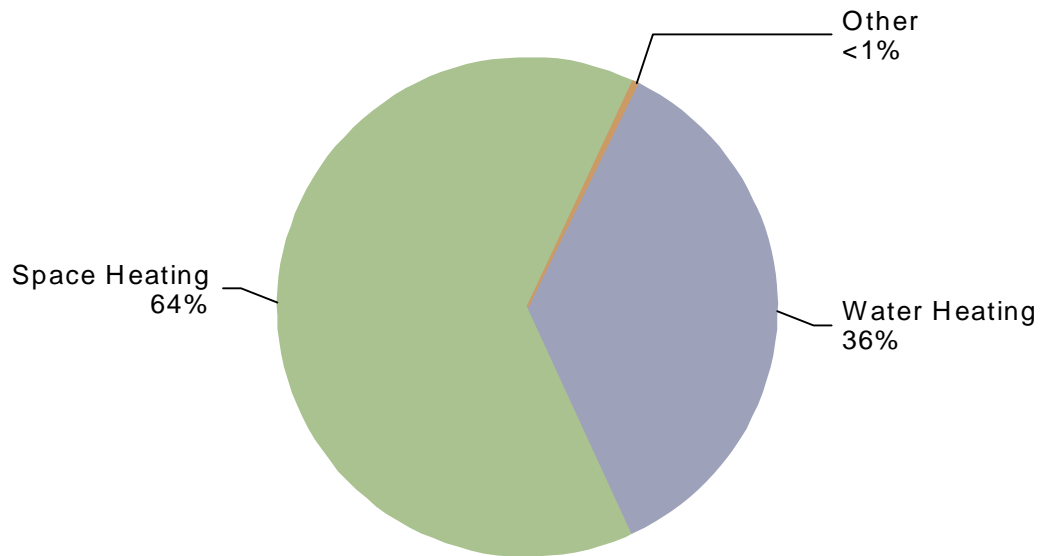
Total: 161,583,795 therms



Note: "Other" includes:  
Cooking: <1%, Dryer: <1%, Pool Heating: <1%

**Figure 8: Residential Achievable Technical Potential in 2029 by End Use, Manufactured**

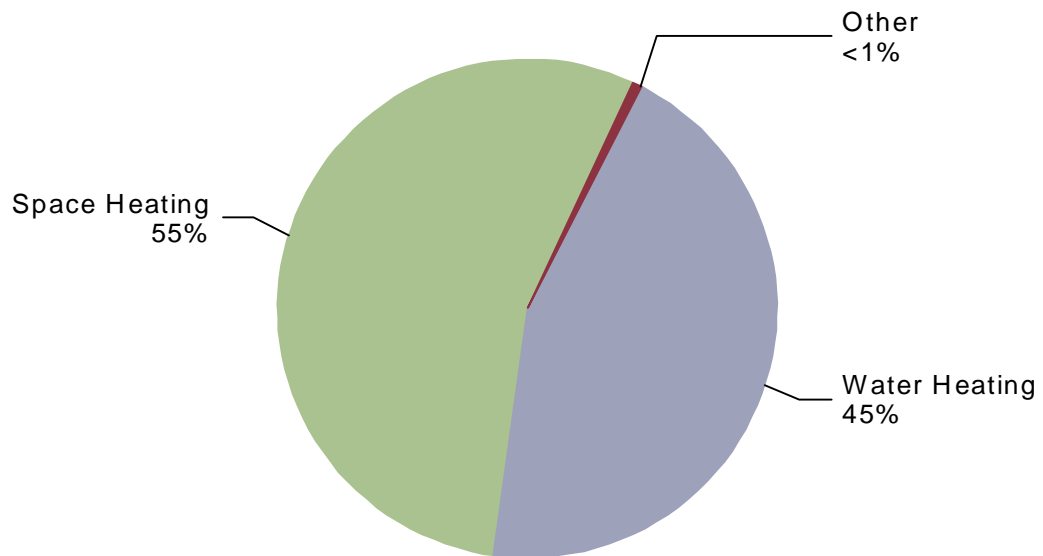
Total: 161,583,795 therms



Note: "Other" includes:  
Cooking: <1%, Dryer: <1%, Pool Heating: <1%

**Figure 9: Residential Achievable Technical Potential in 2029 by End Use, Multifamily**

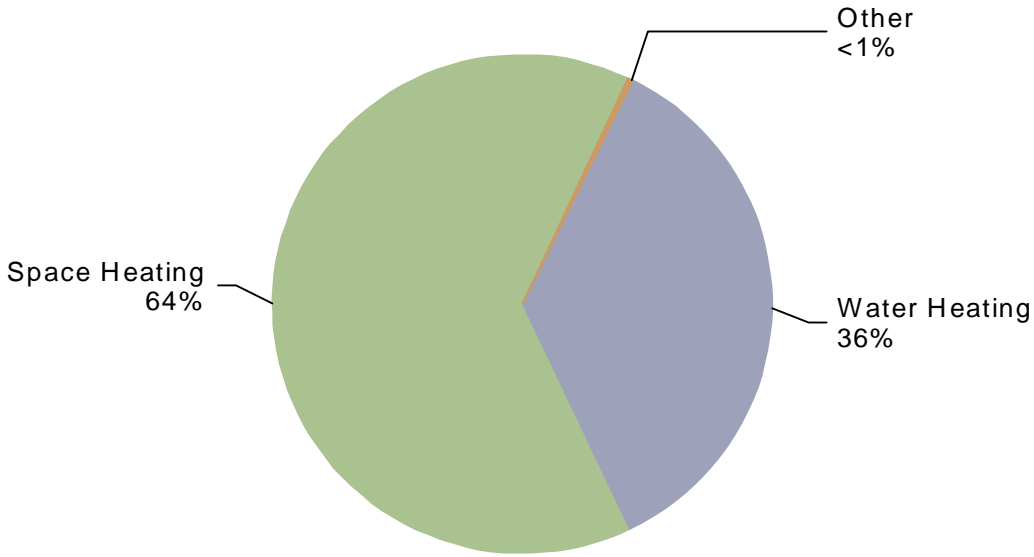
Total: 3,392,630 therms



Note: "Other" includes:  
Cooking: <1%, Dryer: <1%

**Figure 10: Residential Achievable Technical Potential in 2029 by End Use, Single Family**

Total: 157,567,807 therms



Note: "Other" includes:  
Cooking: <1%, Dryer: <1%, Pool Heating: <1%

## Commercial Electric

### Technical Potential

Figure 1: Commercial Technical Potential in 2029 by Segment

Total: 378 aMW

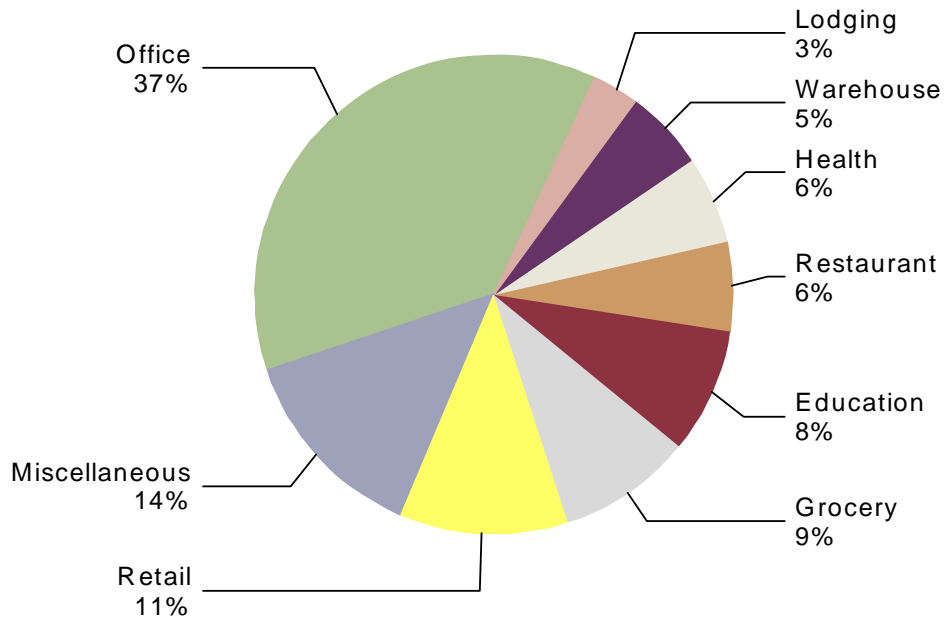
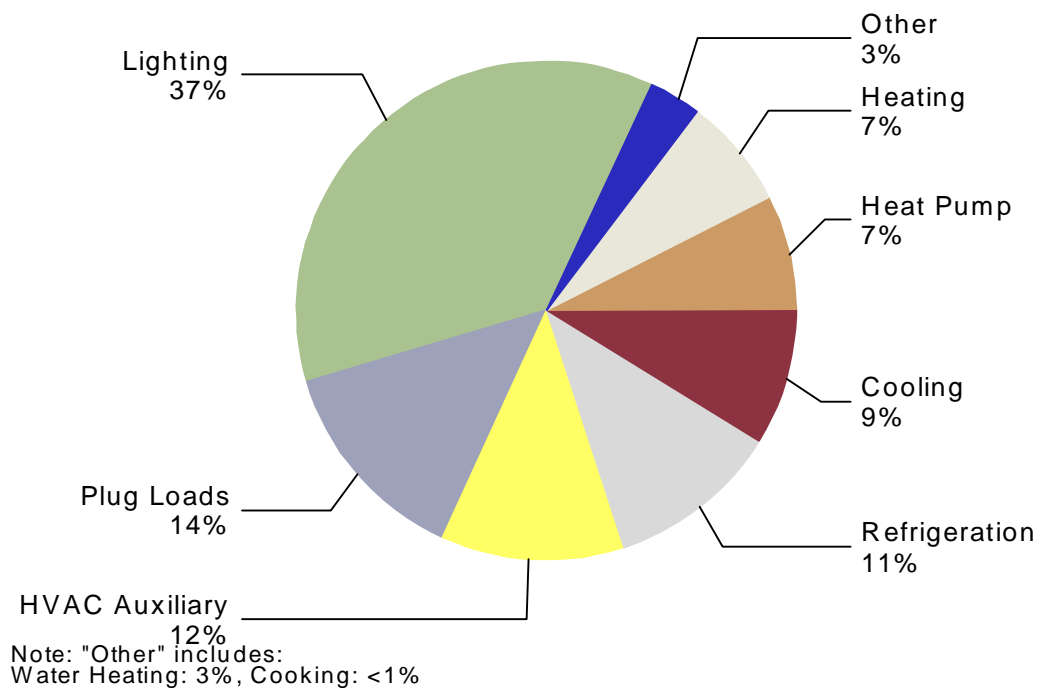


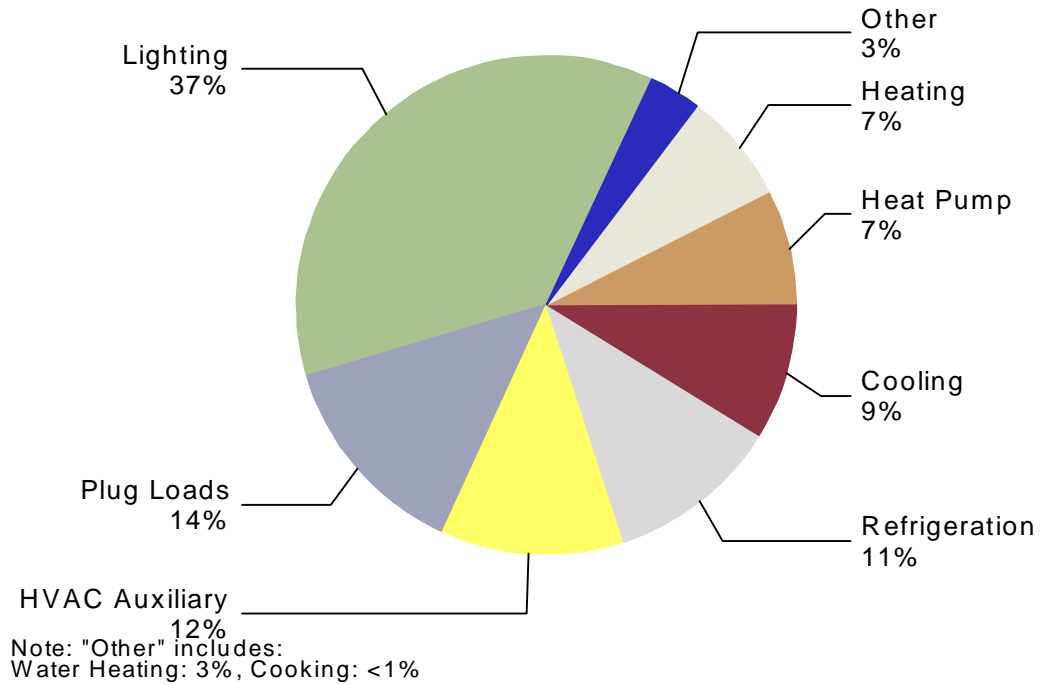
Figure 2: Commercial Technical Potential in 2029 by End Use

Total: 378 aMW



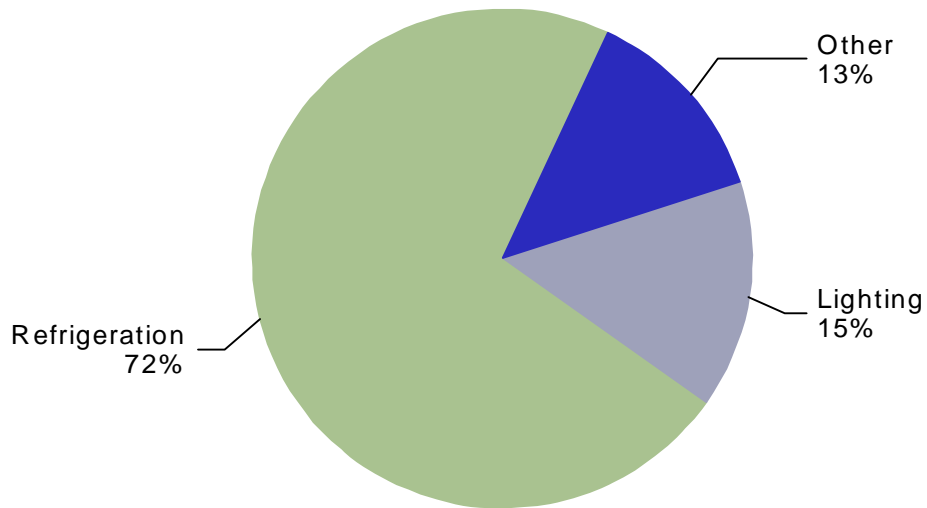
**Figure 3: Commercial Technical Potential in 2029 by End Use, Education**

Total: 378 aMW



**Figure 4: Commercial Technical Potential in 2029 by End Use, Grocery**

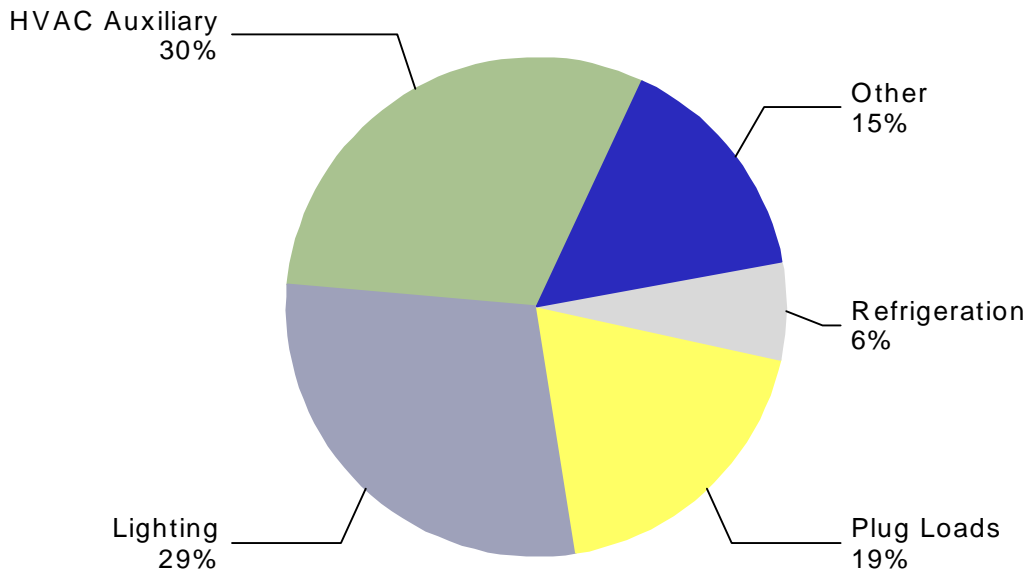
Total: 34 aMW



Note: "Other" includes:  
Plug Loads: 4%, HVAC Auxiliary: 3%, Cooling: 3%, Heat Pump: 2%, Cooking: 1%, Heating: <1%, W:

**Figure 5: Commercial Technical Potential in 2029 by End Use, Health**

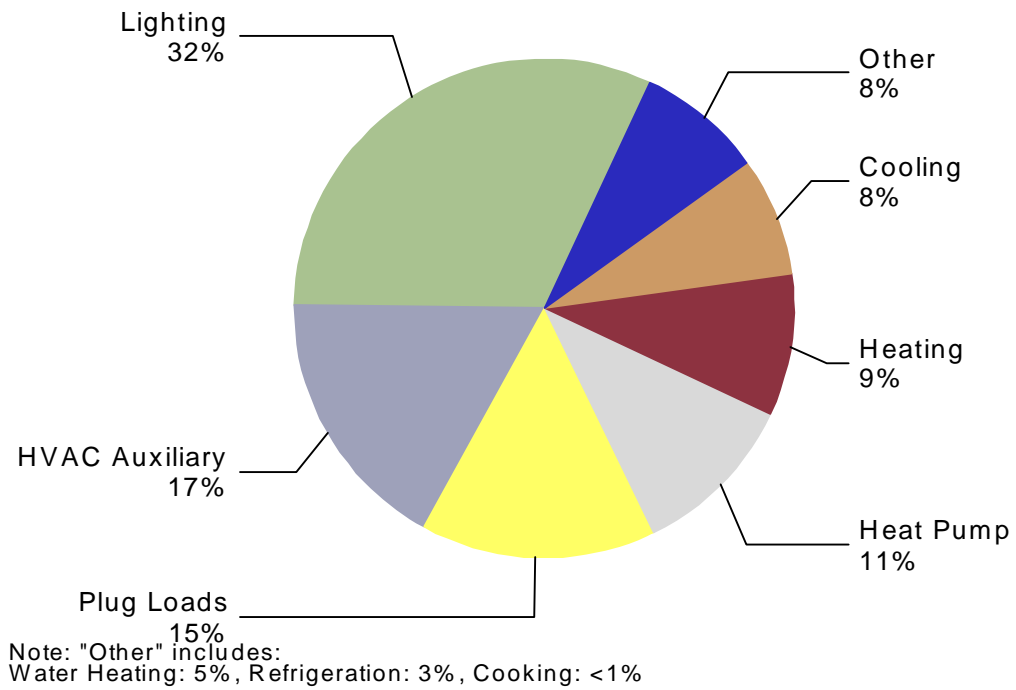
Total: 22 aMW



Note: "Other" includes: Heating: 4%, Water Heating: 4%, Cooling: 4%, Heat Pump: 2%, Cooking: <1%

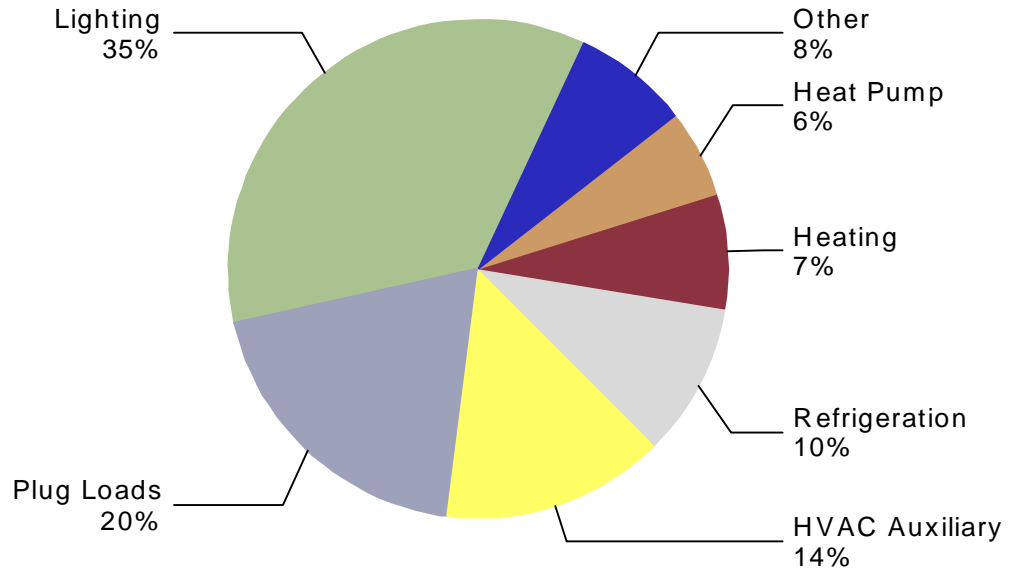
**Figure 6: Commercial Technical Potential in 2029 by End Use, Lodging**

Total: 12 aMW



**Figure 7: Commercial Technical Potential in 2029 by End Use, Miscellaneous**

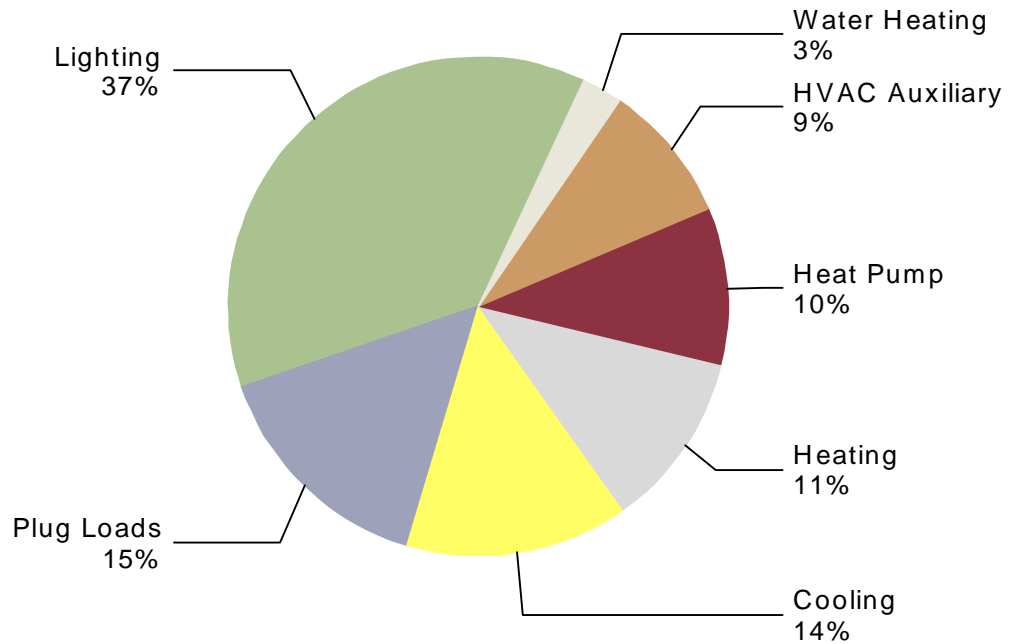
Total: 51 aMW



Note: "Other" includes:  
Cooling: 4%, Water Heating: 2%, Cooking: <1%

**Figure 8: Commercial Technical Potential in 2029 by End Use, Office**

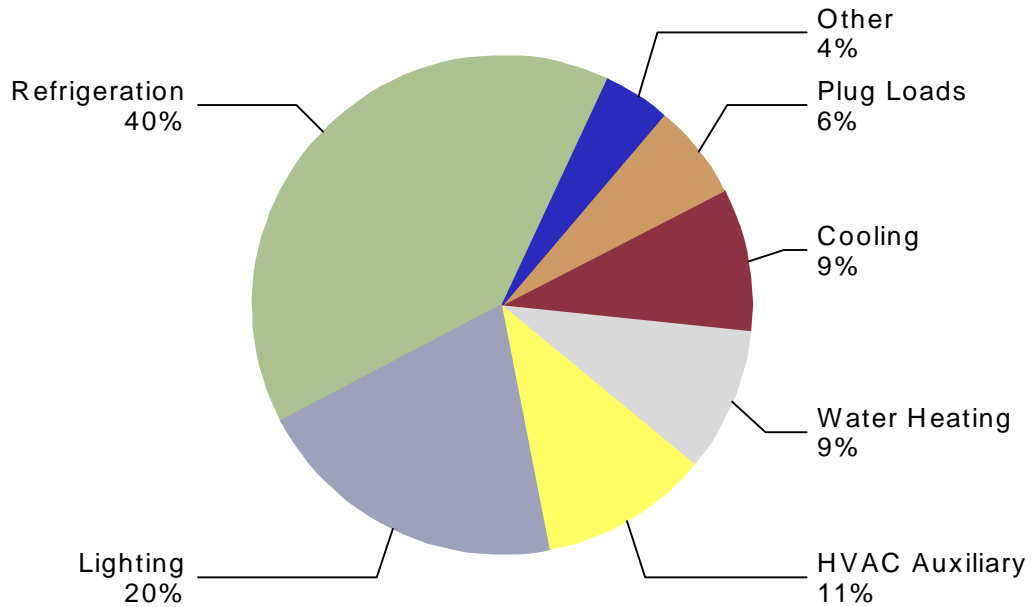
Total: 140 aMW





**Figure 9: Commercial Technical Potential in 2029 by End Use, Restaurant**

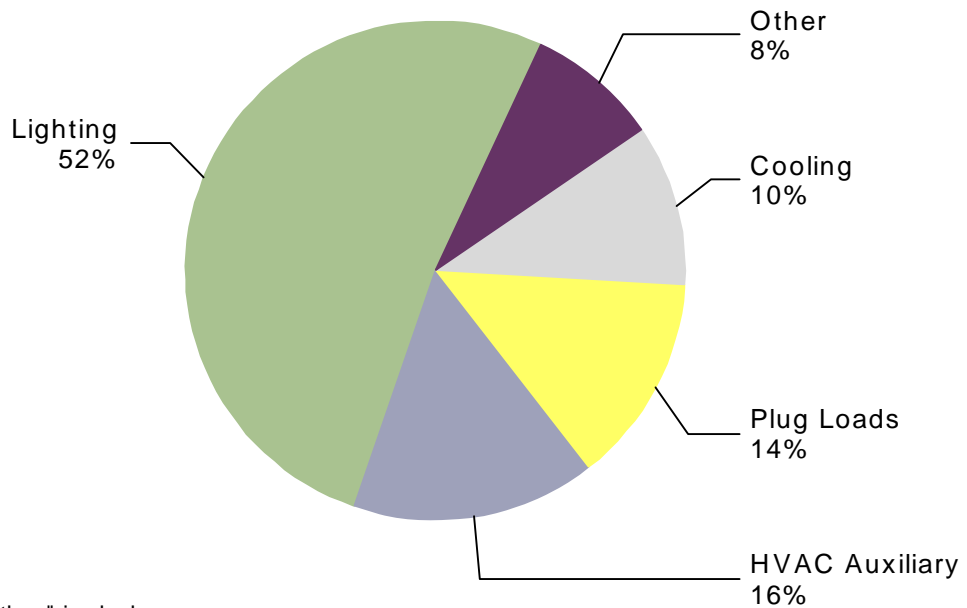
Total: 23 aMW



Note: "Other" includes:  
Cooking: 2%, Heat Pump: 2%, Heating: <1%

**Figure 10: Commercial Technical Potential in 2029 by End Use, Retail**

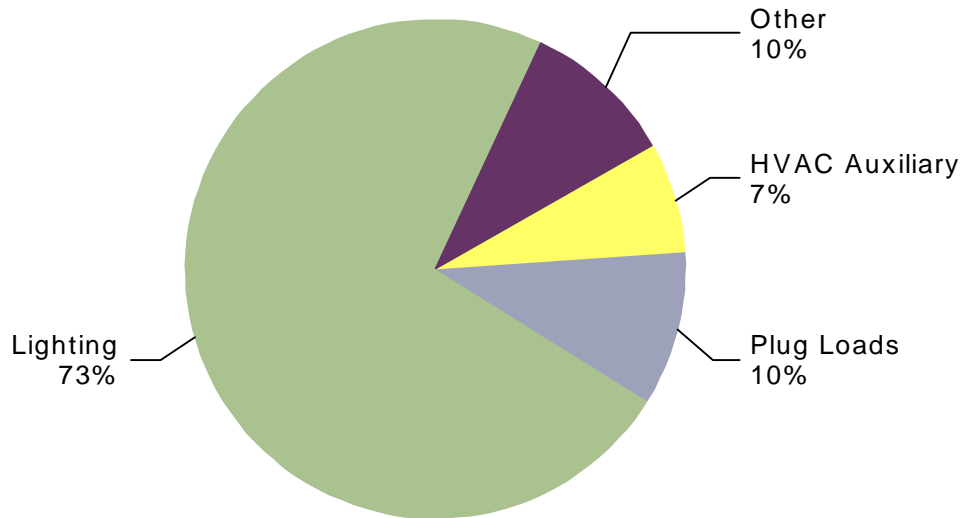
Total: 43 aMW



Note: "Other" includes:  
Heat Pump: 4%, Heating: 3%, Water Heating: 2%

**Figure 11: Commercial Technical Potential in 2029 by End Use, Warehouse**

Total: 21 aMW

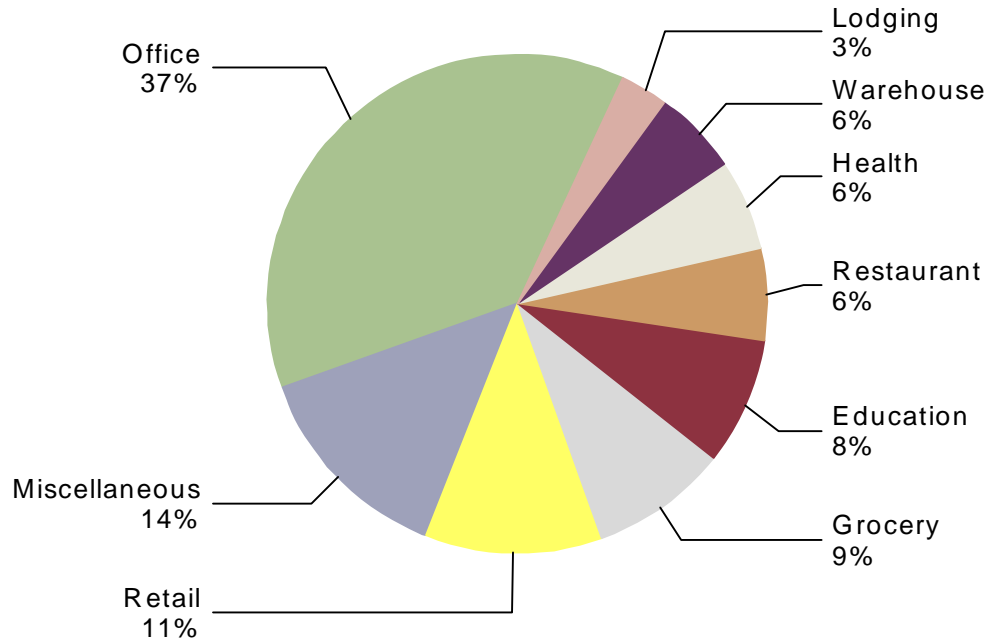


Note: "Other" includes:  
Heating: 4%, Water Heating: 4%, Cooling: 1%, Heat Pump: 1%

**Achievable Technical Potential**

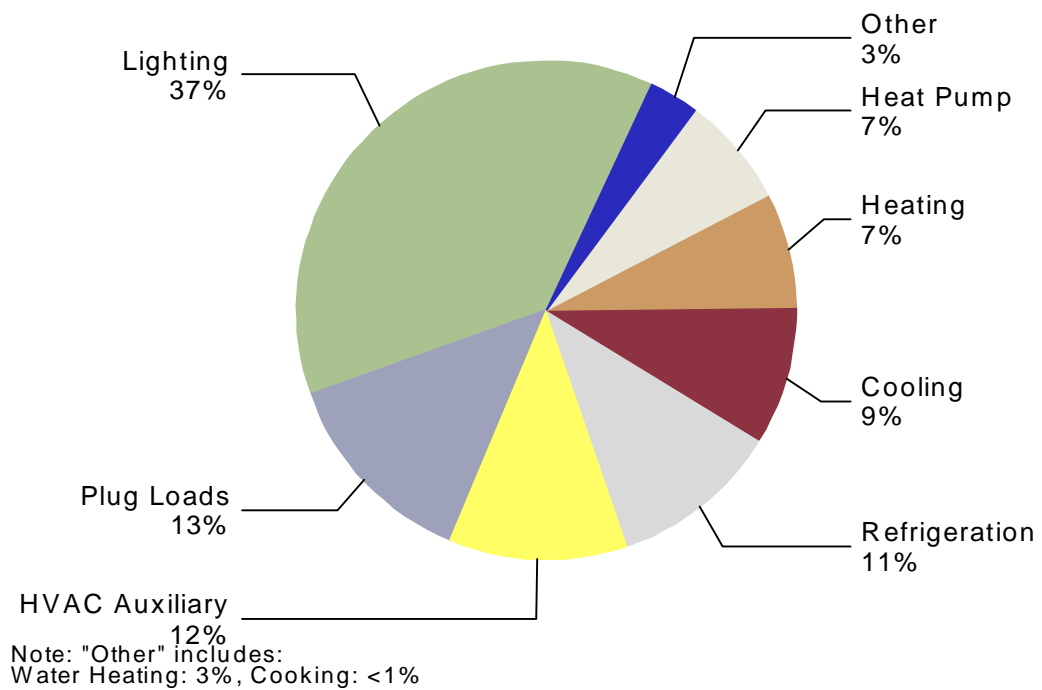
**Figure 12: Commercial Achievable Technical Potential in 2029 by Segment**

Total: 301 aMW



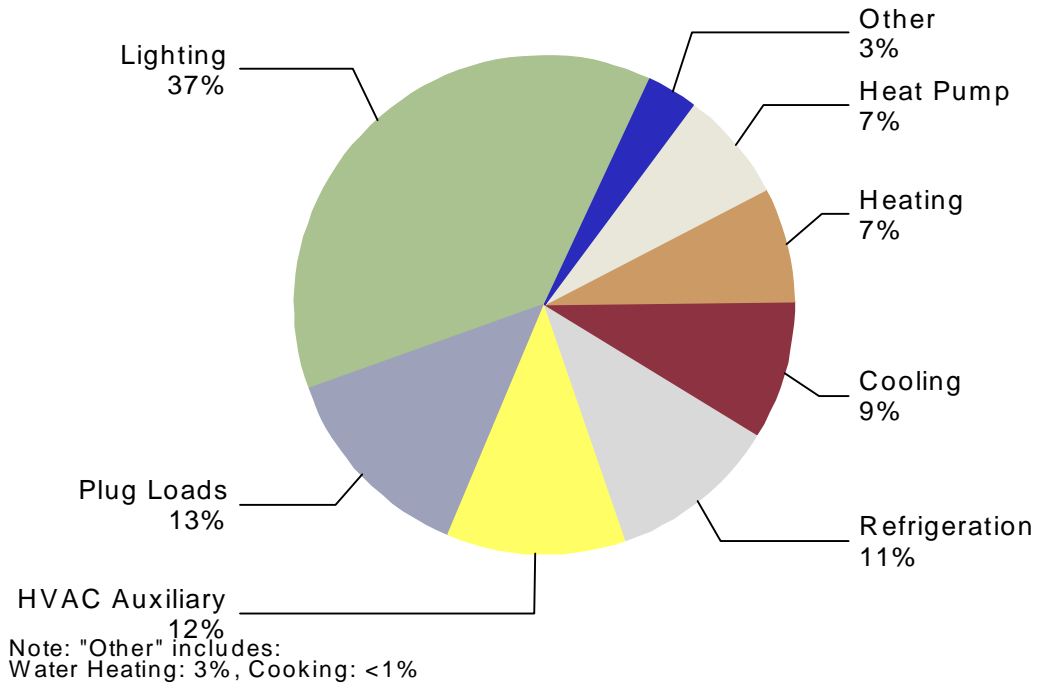
**Figure 13: Commercial Achievable Technical Potential in 2029 by End Use**

Total: 301 aMW



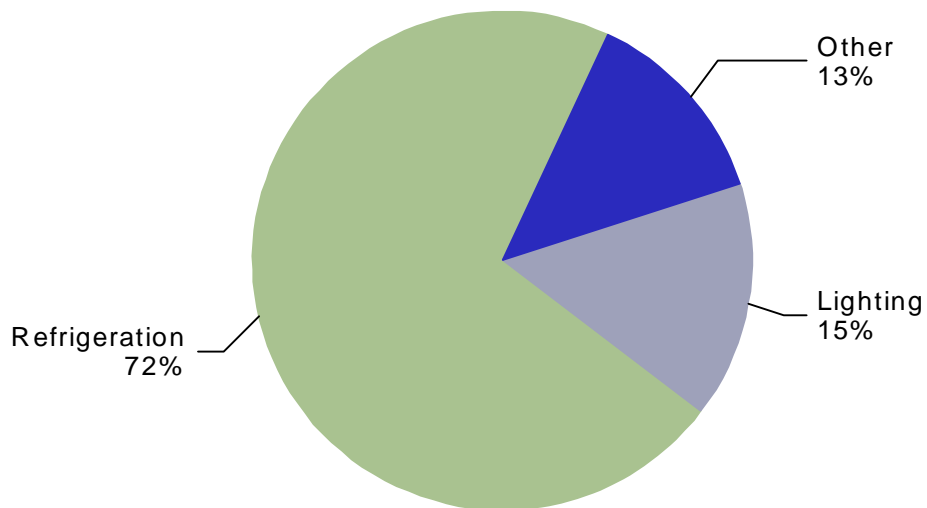
**Figure 14: Commercial Achievable Technical Potential in 2029 by End Use, Education**

Total: 301 aMW



**Figure 15: Commercial Achievable Technical Potential in 2029 by End Use, Grocery**

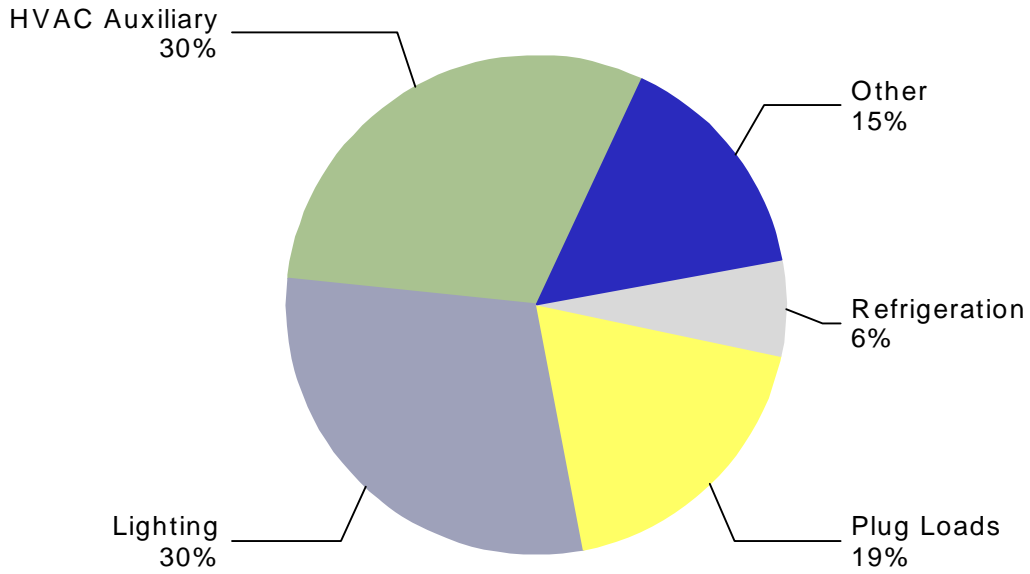
Total: 27 aMW



Note: "Other" includes:  
Plug Loads: 4%, HVAC Auxiliary: 3%, Cooling: 3%, Heat Pump: 2%, Cooking: 1%, Heating: <1%, W:

**Figure 16: Commercial Achievable Technical Potential in 2029 by End Use, Health**

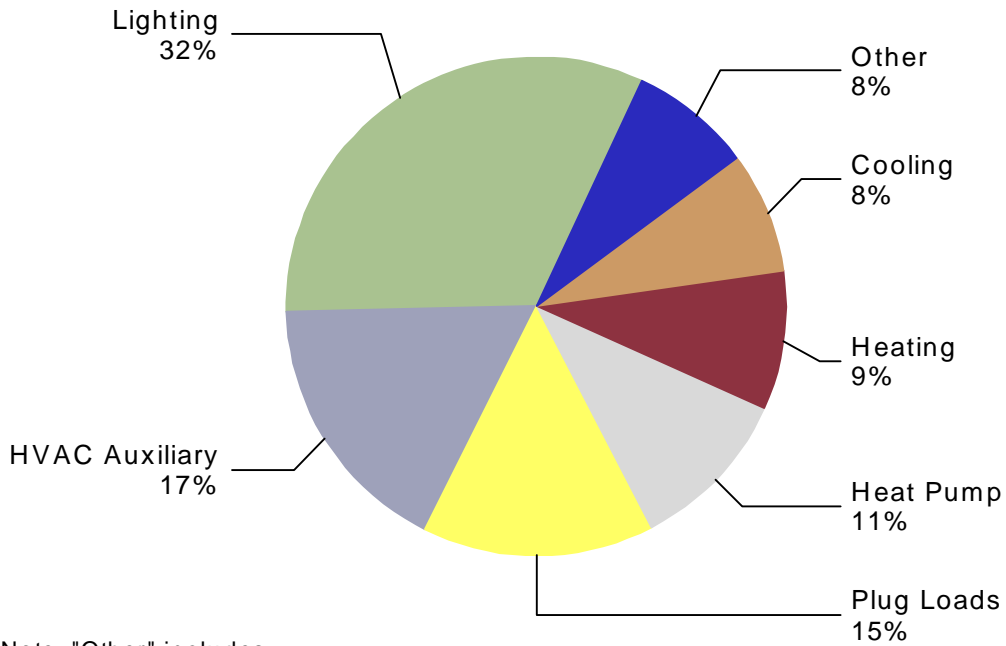
Total: 18 aMW



Note: "Other" includes: Heating: 4%, Cooling: 4%, Water Heating: 4%, Heat Pump: 2%, Cooking: <1%

**Figure 17: Commercial Achievable Technical Potential in 2029 by End Use, Lodging**

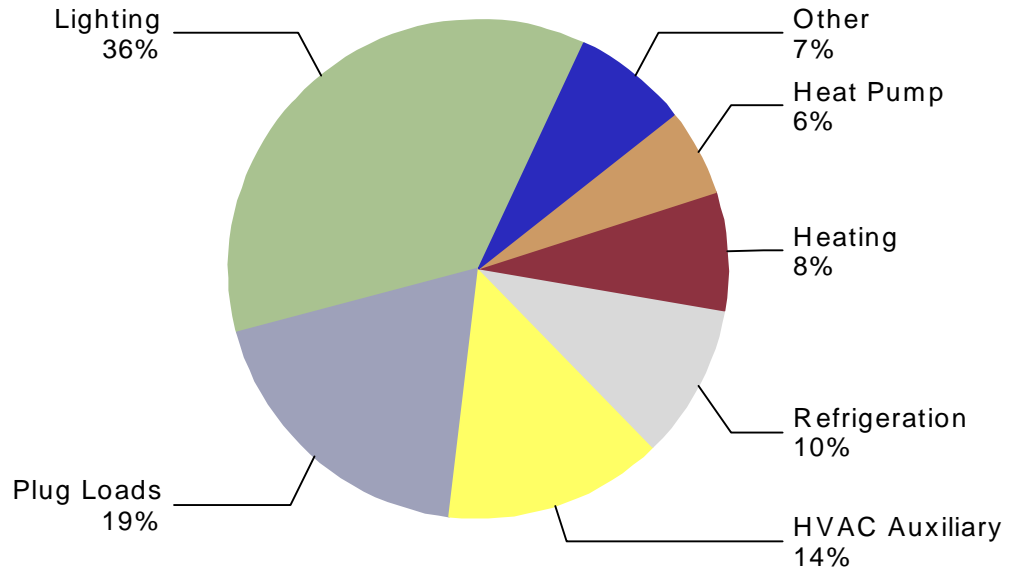
Total: 9 aMW



Note: "Other" includes: Water Heating: 4%, Refrigeration: 3%, Cooking: <1%

**Figure 18: Commercial Achievable Technical Potential in 2029 by End Use, Miscellaneous**

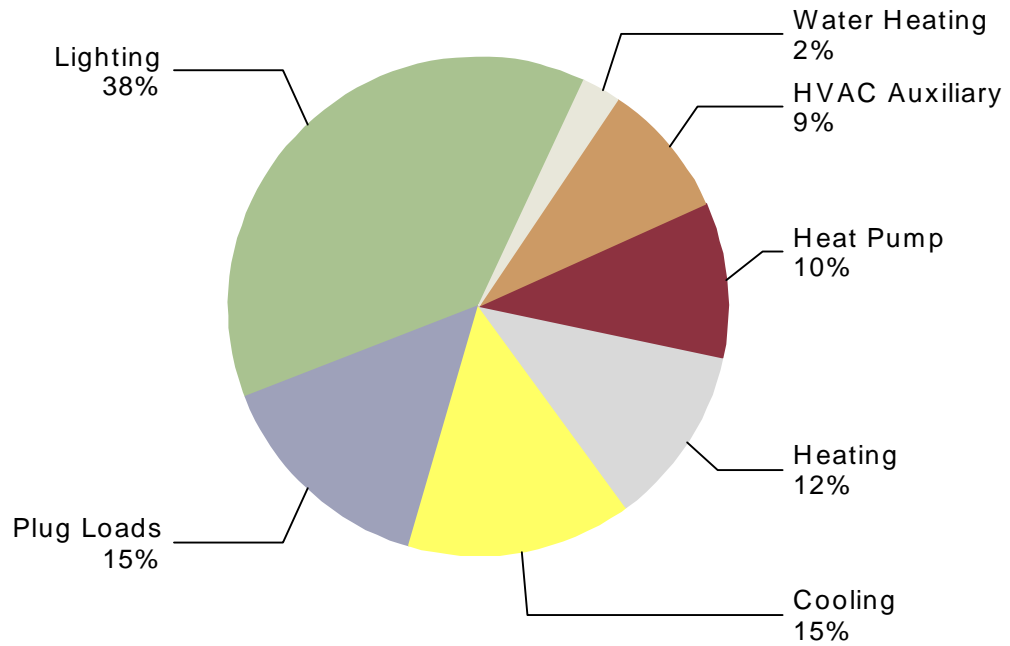
Total: 41 aMW



Note: "Other" includes:  
Cooling: 4%, Water Heating: 2%, Cooking: <1%

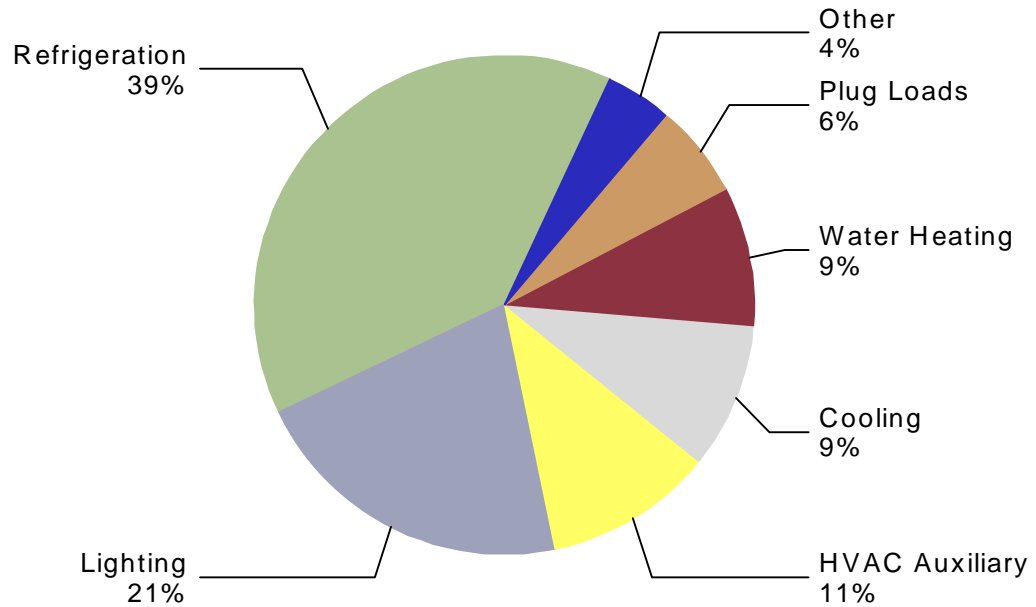
**Figure 19: Commercial Achievable Technical Potential in 2029 by End Use, Office**

Total: 113 aMW



**Figure 20: Commercial Achievable Technical Potential in 2029 by End Use, Restaurant**

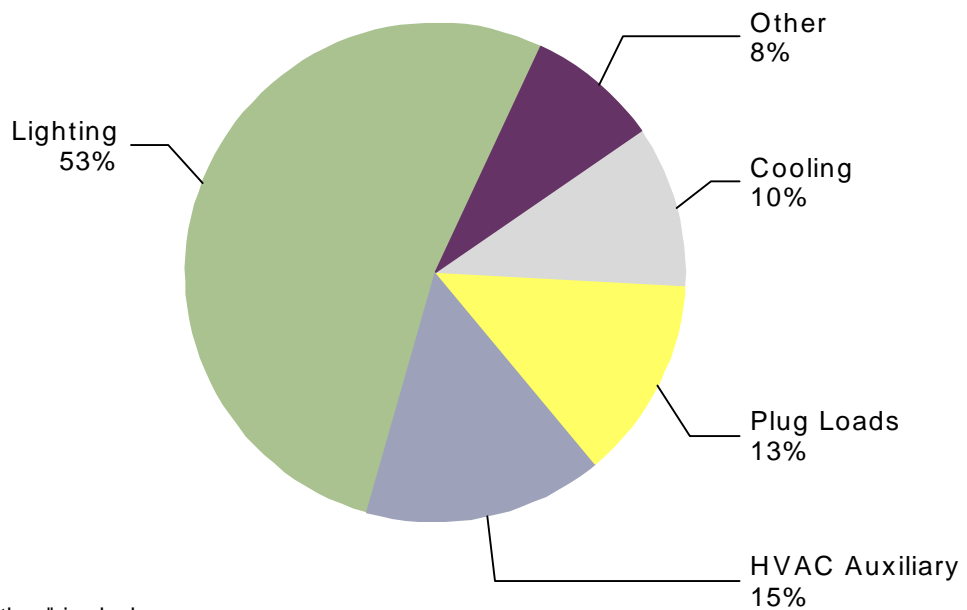
Total: 18 aMW



Note: "Other" includes:  
Cooking: 2%, Heat Pump: 2%, Heating: <1%

**Figure 21: Commercial Achievable Technical Potential in 2029 by End Use, Retail**

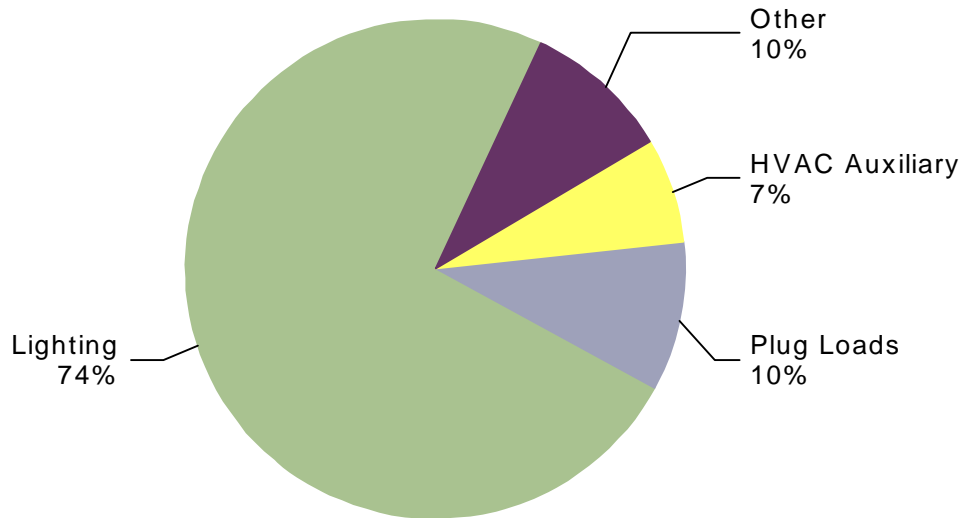
Total: 35 aMW



Note: "Other" includes:  
Heat Pump: 4%, Heating: 3%, Water Heating: 2%

**Figure 22: Commercial Achievable Technical Potential in 2029 by End Use, Warehouse**

Total: 17 aMW



Note: "Other" includes:  
Heating: 4%, Water Heating: 4%, Cooling: 1%, Heat Pump: <1%

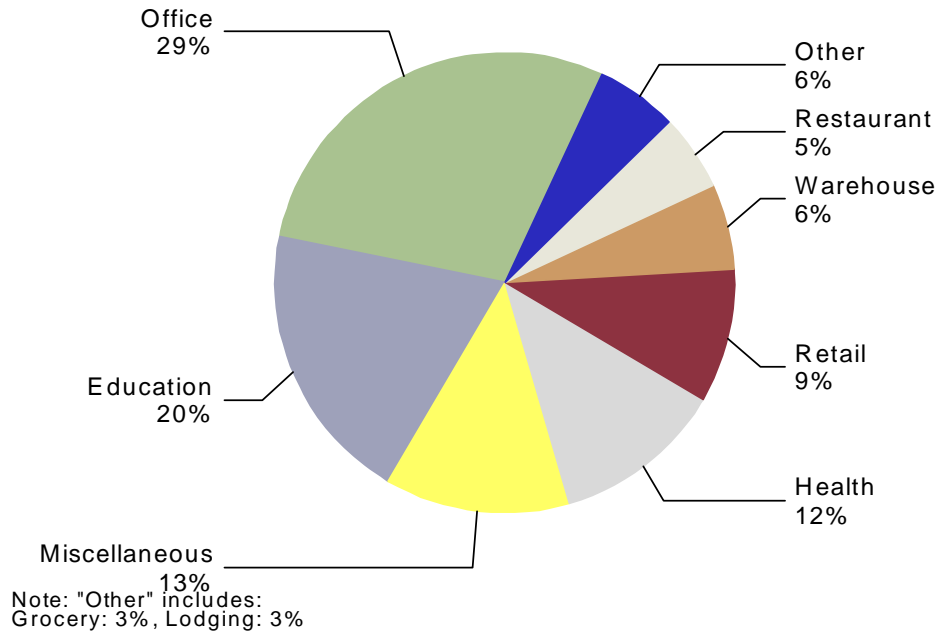


**Commercial Gas  
Technical Potential**

**Com Gas Detailed Results**

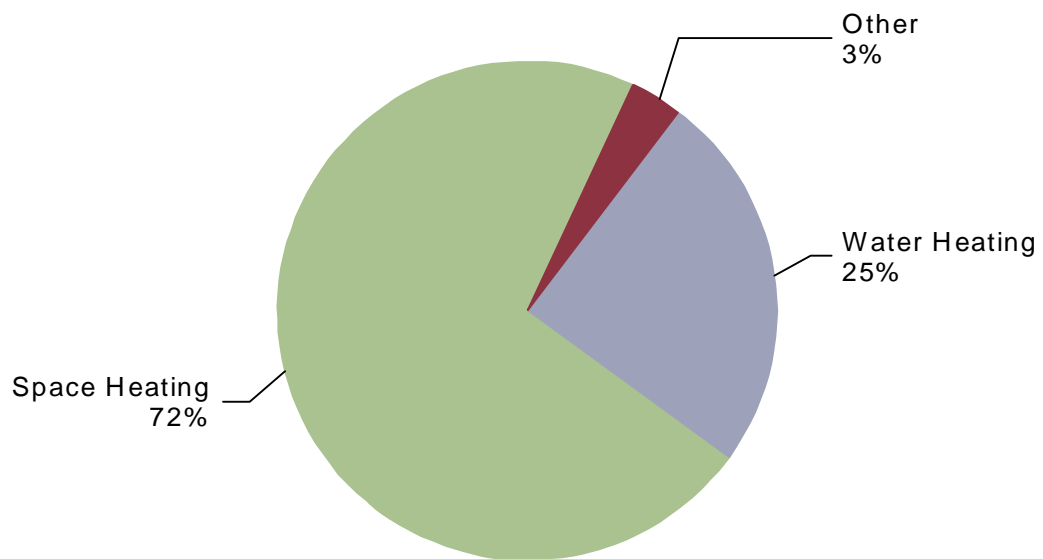
**Figure 1: Commercial Technical Potential in 2029 by Segment**

Total: 131,640,192 therms



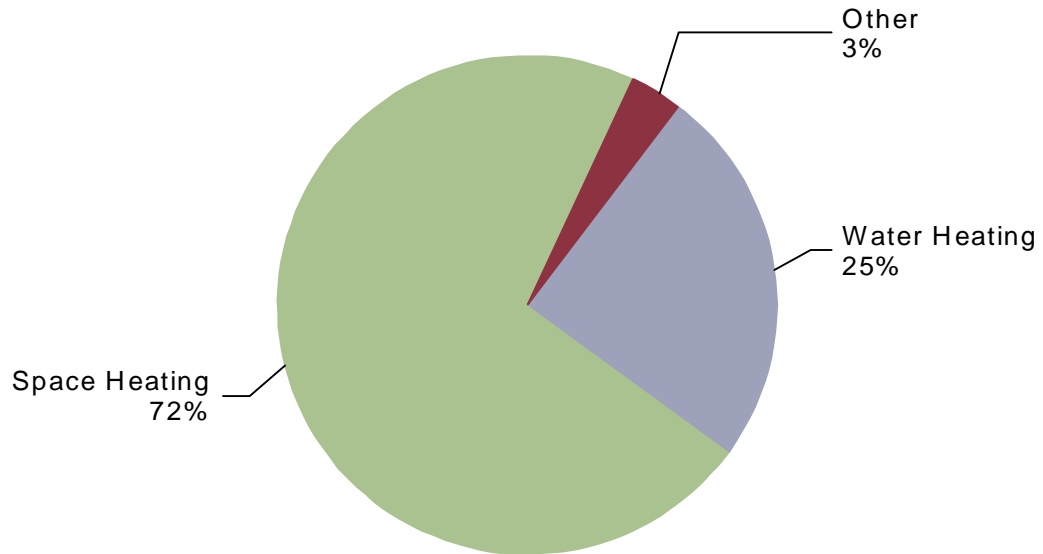
**Figure 2: Commercial Technical Potential in 2029 by End Use**

Total: 131,640,192 therms



**Figure 3: Commercial Technical Potential in 2029 by End Use, Education**

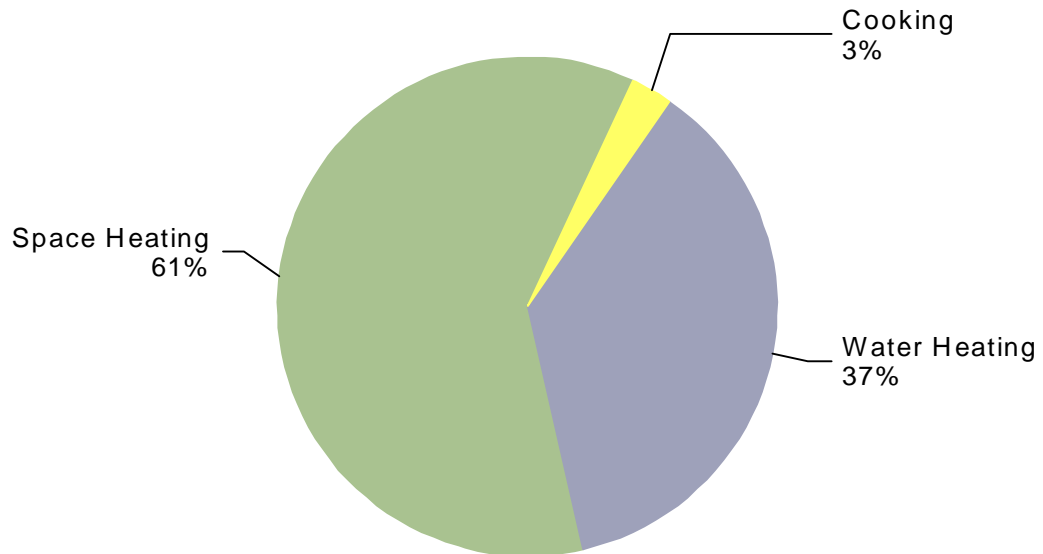
Total: 131,640,192 therms



Note: "Other" includes:  
Cooking: 3%, Pool Heating: <1%

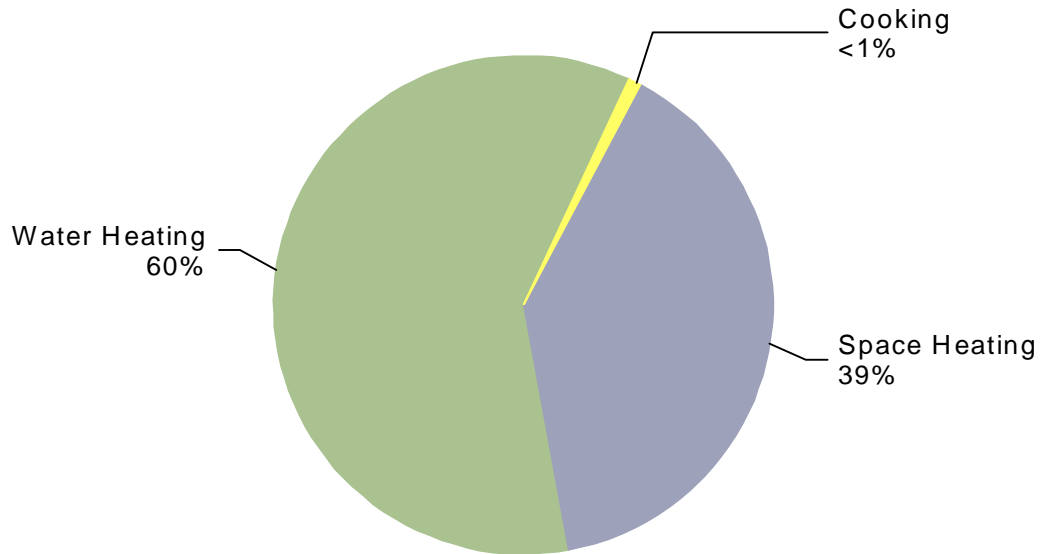
**Figure 4: Commercial Technical Potential in 2029 by End Use, Grocery**

Total: 4,111,332 therms



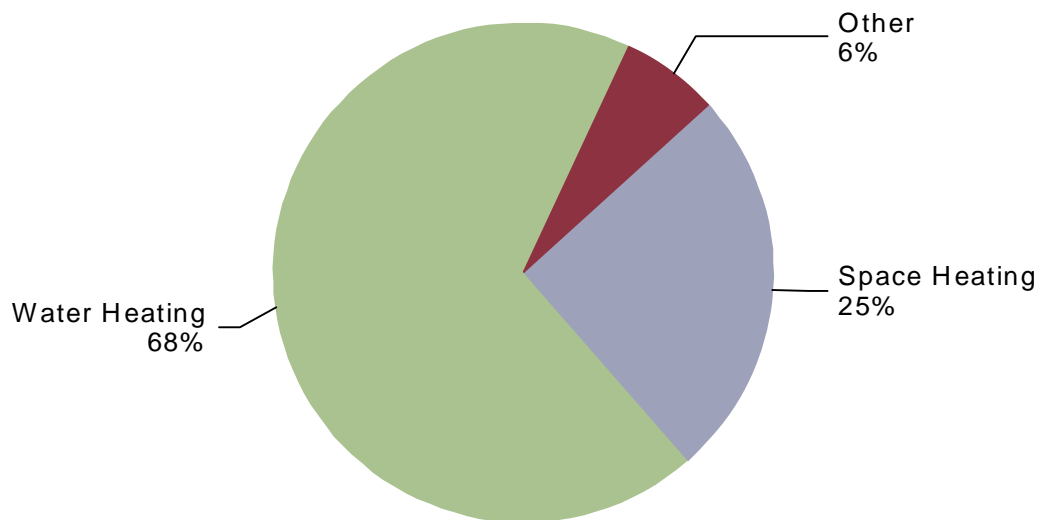
**Figure 5: Commercial Technical Potential in 2029 by End Use, Health**

Total: 15,753,963 therms



**Figure 6: Commercial Technical Potential in 2029 by End Use, Lodging**

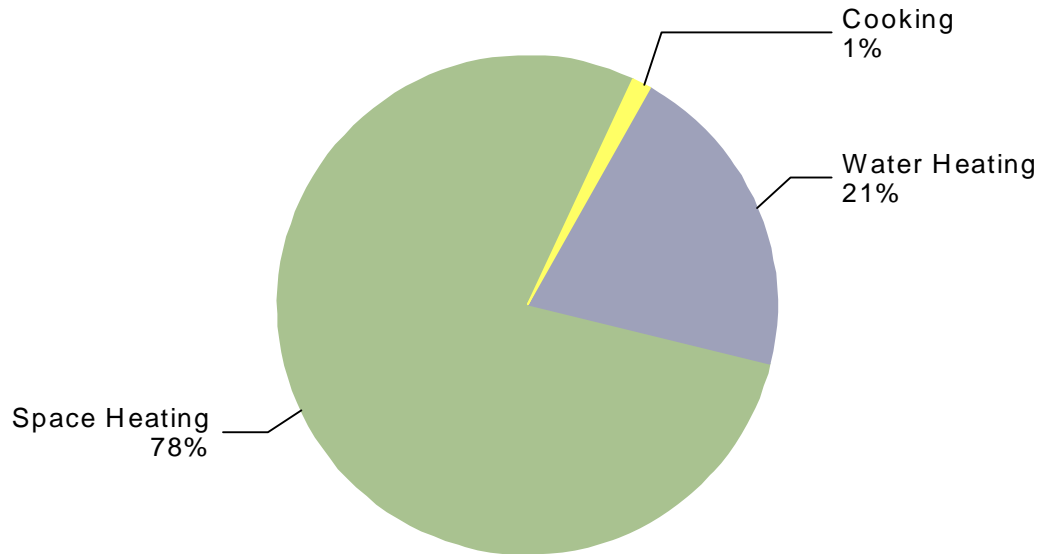
Total: 3,458,562 therms



Note: "Other" includes:  
Pool Heating: 4%, Cooking: 2%

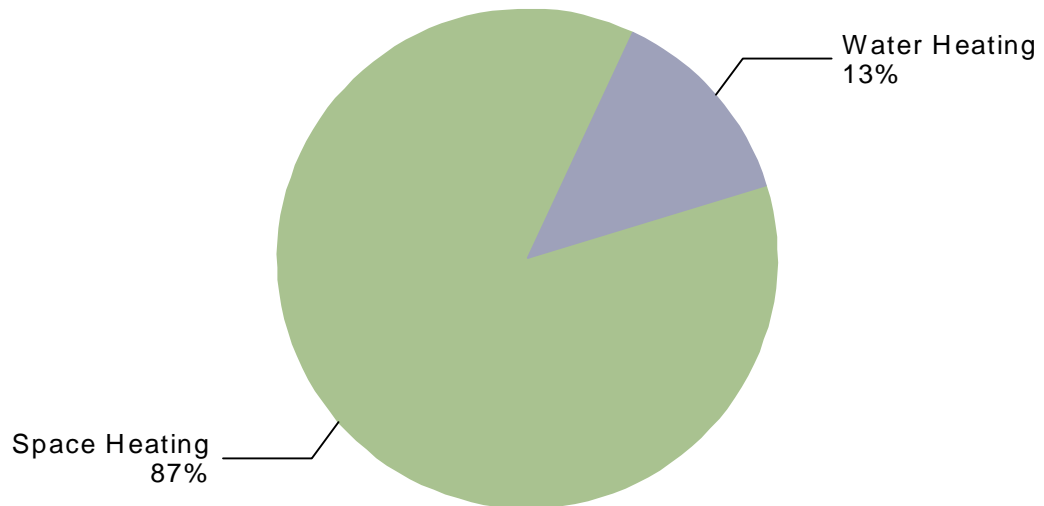
**Figure 7: Commercial Technical Potential in 2029 by End Use, Miscellaneous**

Total: 17,112,691 therms



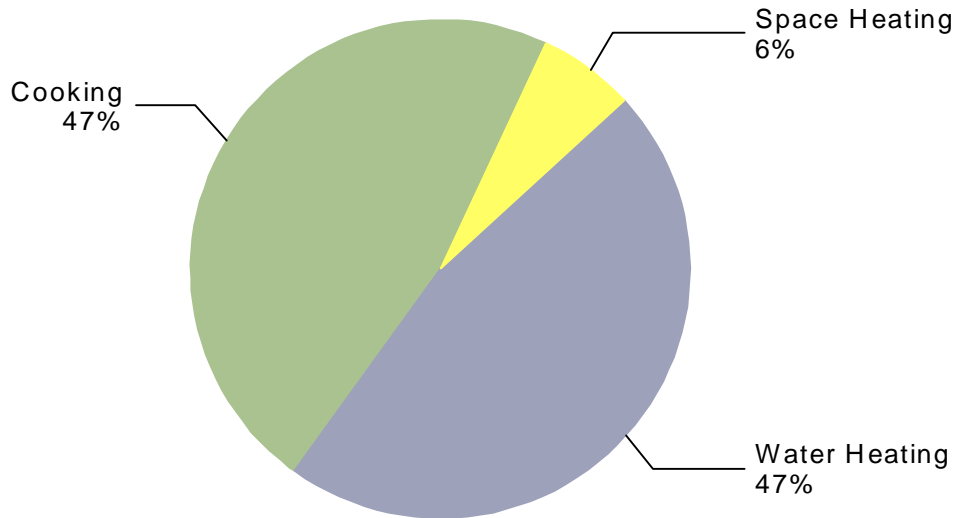
**Figure 8: Commercial Technical Potential in 2029 by End Use, Office**

Total: 37,780,290 therms



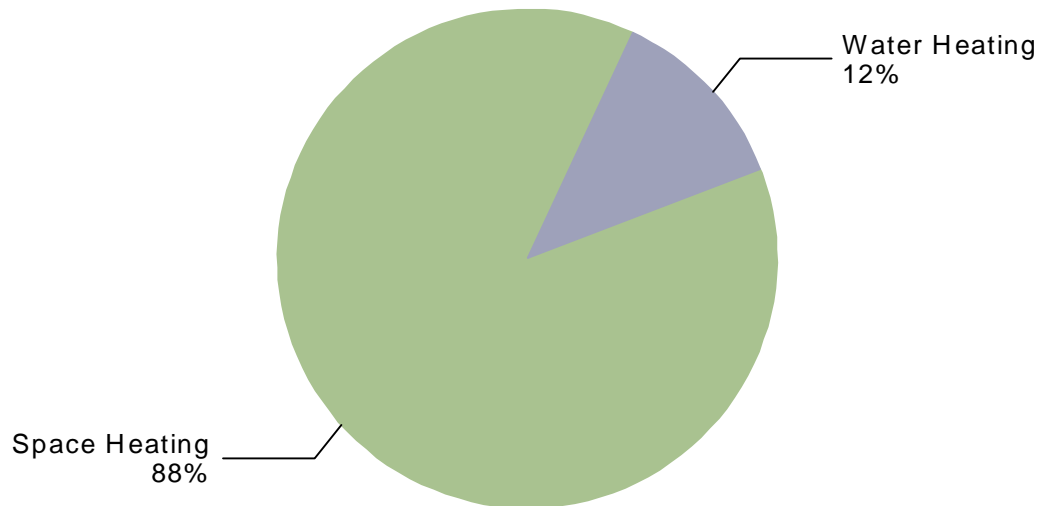
**Figure 9: Commercial Technical Potential in 2029 by End Use, Restaurant**

Total: 7,072,970 therms



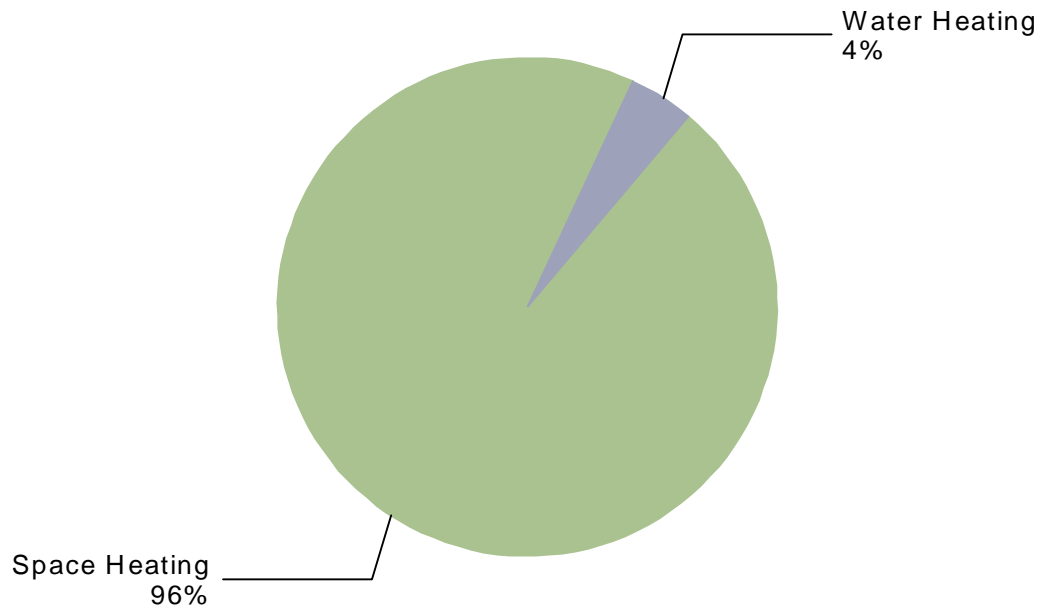
**Figure 10: Commercial Technical Potential in 2029 by End Use, Retail**

Total: 12,419,381 therms



**Figure 11: Commercial Technical Potential in 2029 by End Use, Warehouse**

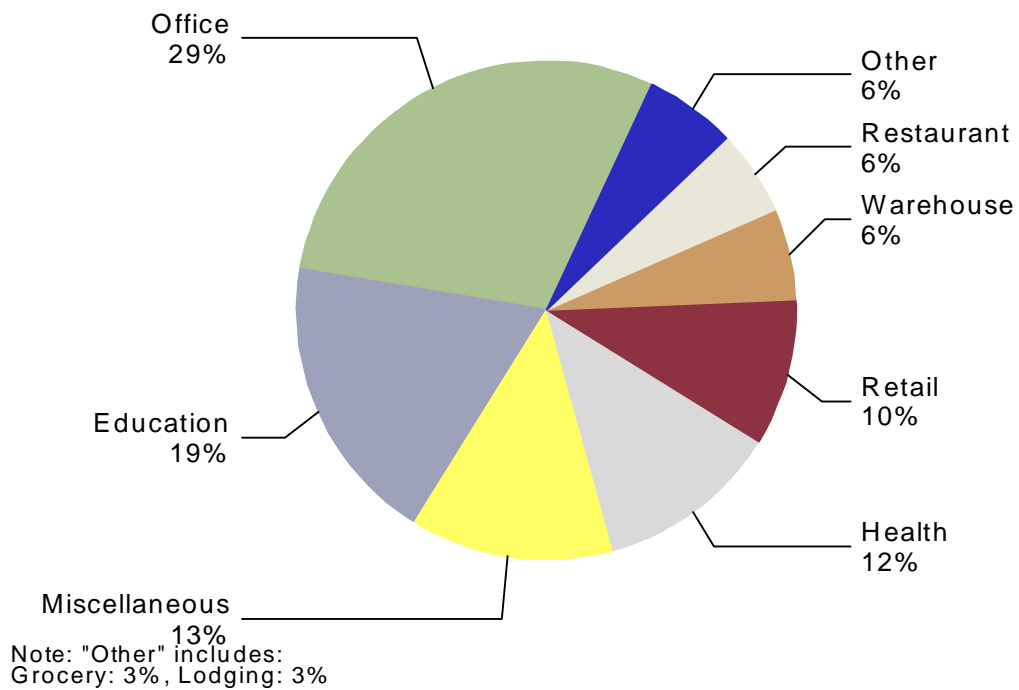
Total: 7,853,705 therms



**Achievable Technical Potential**

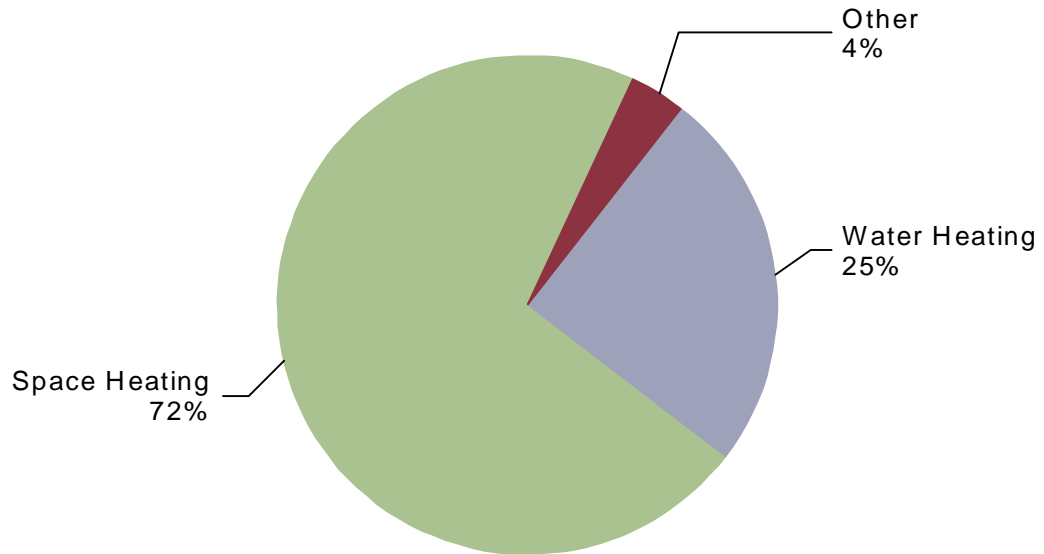
**Figure 12: Commercial Achievable Technical Potential in 2029 by Segment**

Total: 83,744,858 therms



**Figure 13: Commercial Achievable Technical Potential in 2029 by End Use**

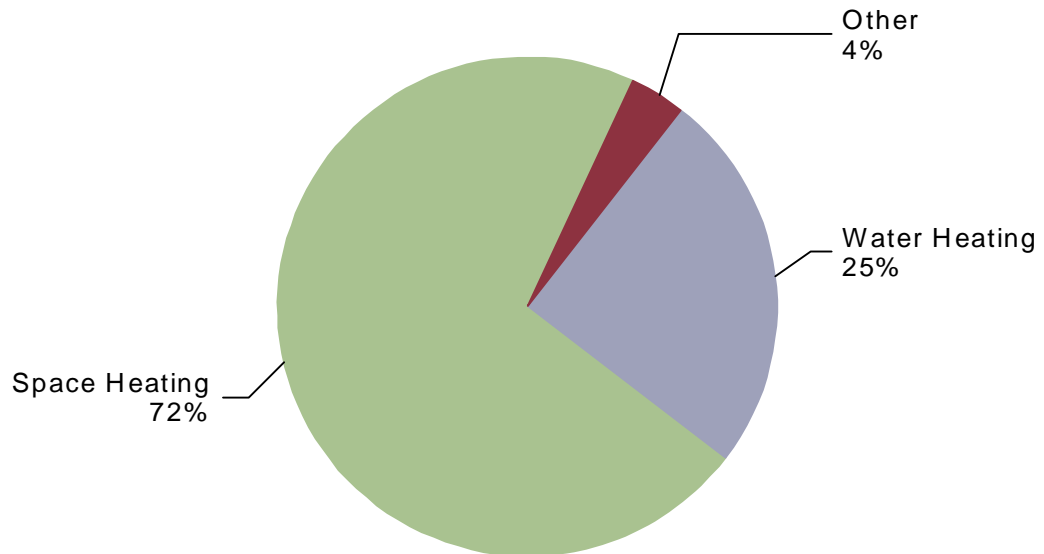
Total: 83,744,858 therms



Note: "Other" includes:  
Cooking: 3%, Pool Heating: <1%

**Figure 14: Commercial Achievable Technical Potential in 2029 by End Use, Education**

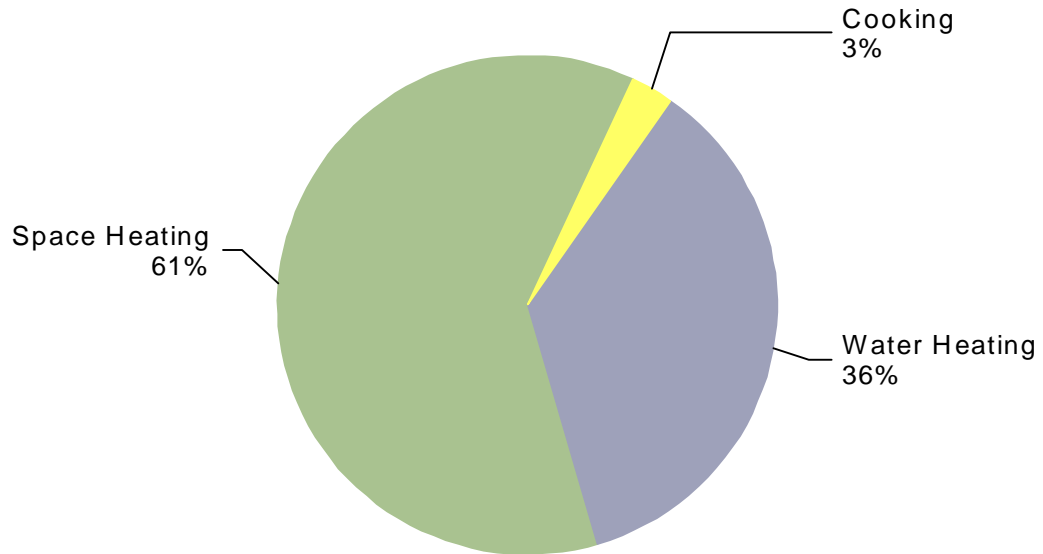
Total: 83,744,858 therms



Note: "Other" includes:  
Cooking: 3%, Pool Heating: <1%

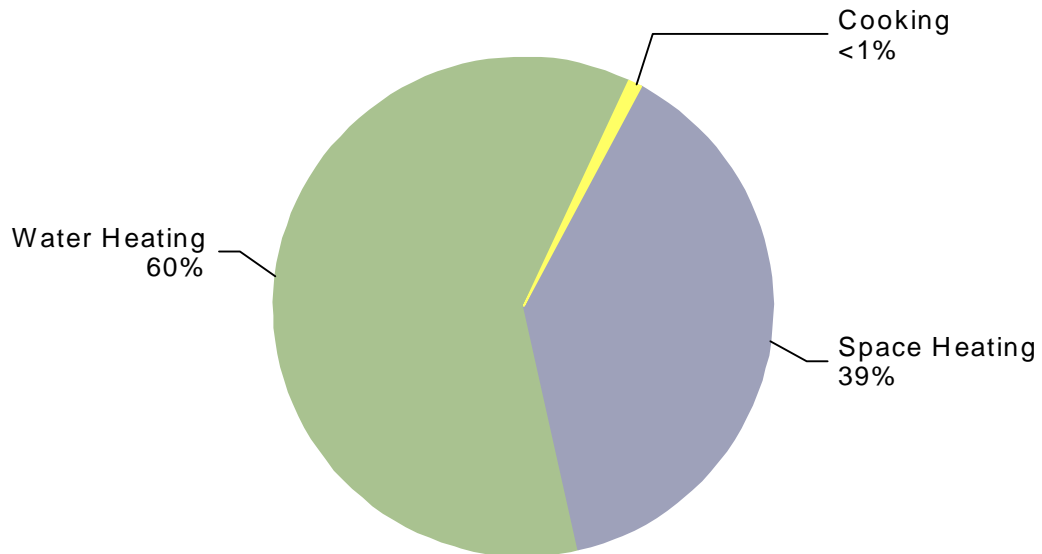
**Figure 15: Commercial Achievable Technical Potential in 2029 by End Use, Grocery**

Total: 2,706,146 therms



**Figure 16: Commercial Achievable Technical Potential in 2029 by End Use, Health**

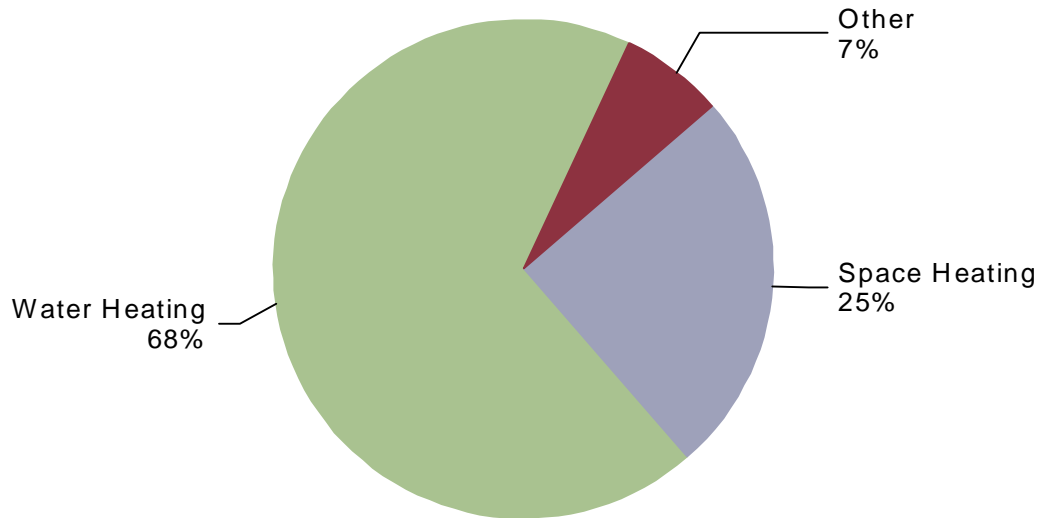
Total: 9,932,937 therms





**Figure 17: Commercial Achievable Technical Potential in 2029 by End Use, Lodging**

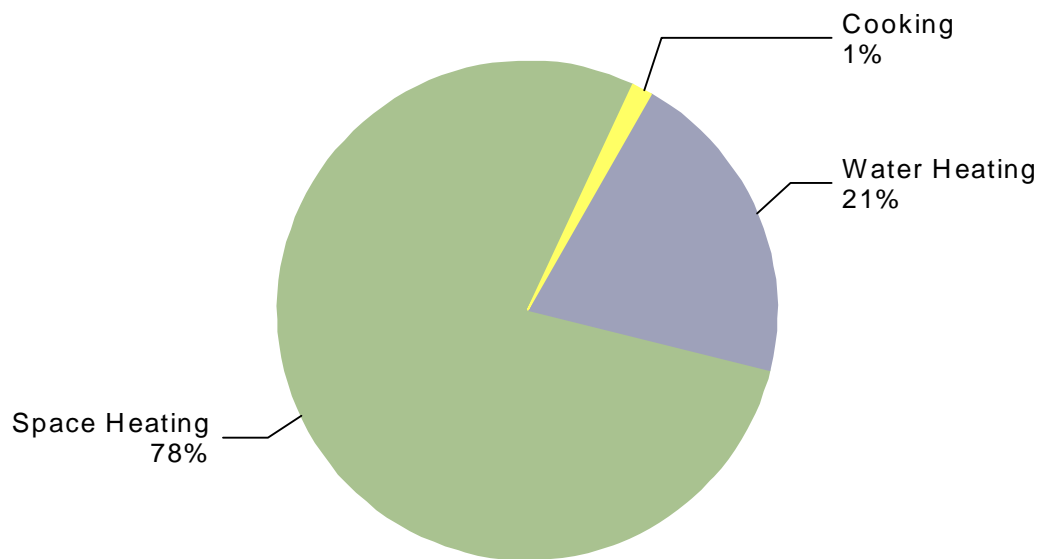
Total: 2,226,227 therms



Note: "Other" includes:  
Pool Heating: 4%, Cooking: 3%

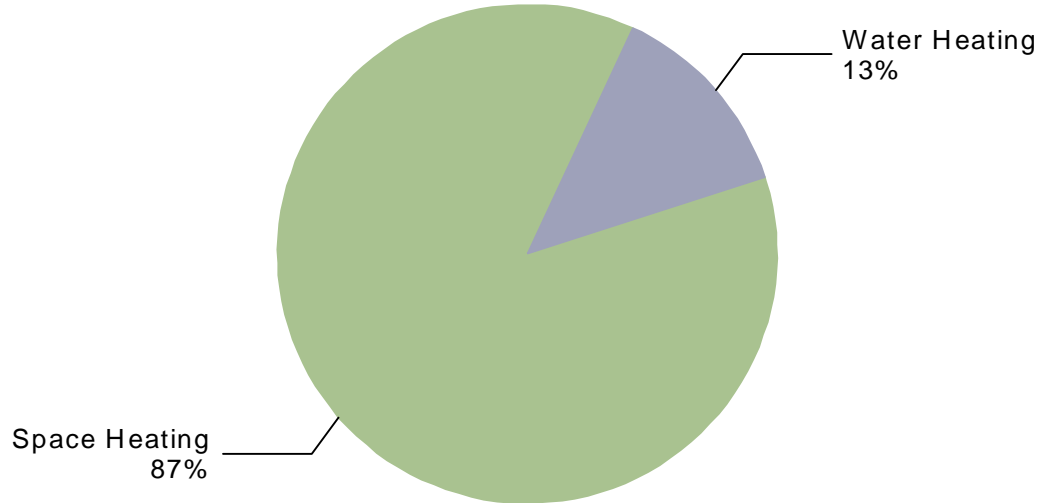
**Figure 18: Commercial Achievable Technical Potential in 2029 by End Use, Miscellaneous**

Total: 11,038,940 therms



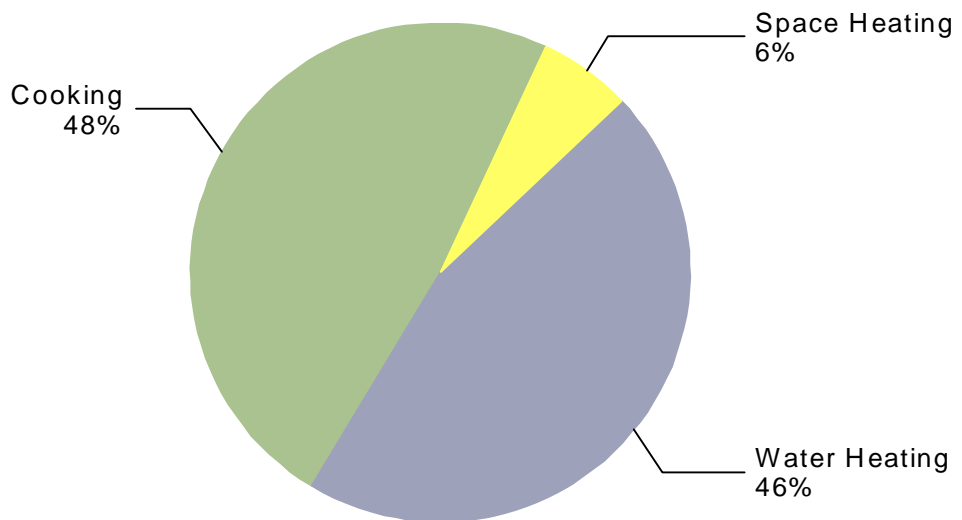
**Figure 19: Commercial Achievable Technical Potential in 2029 by End Use, Office**

Total: 24,512,590 therms



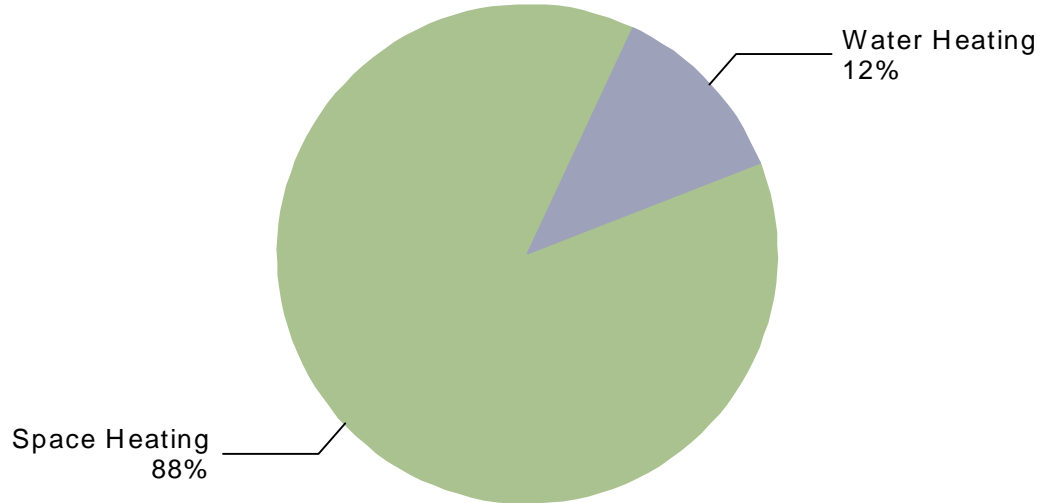
**Figure 20: Commercial Achievable Technical Potential in 2029 by End Use, Restaurant**

Total: 4,666,394 therms



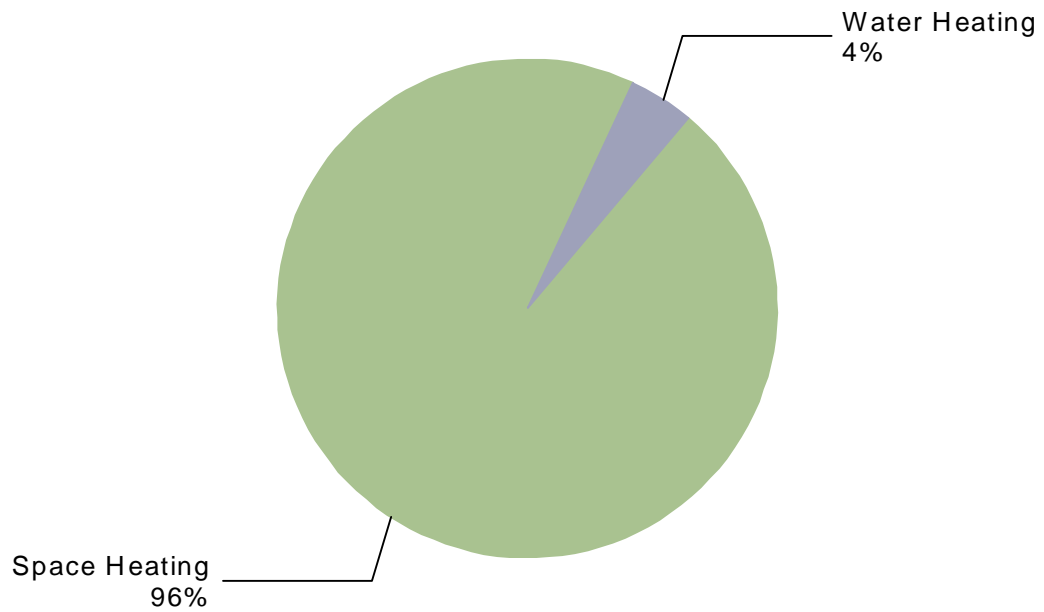
**Figure 21: Commercial Achievable Technical Potential in 2029 by End Use, Retail**

Total: 7,969,595 therms



**Figure 22: Commercial Achievable Technical Potential in 2029 by End Use, Warehouse**

Total: 4,929,424 therms

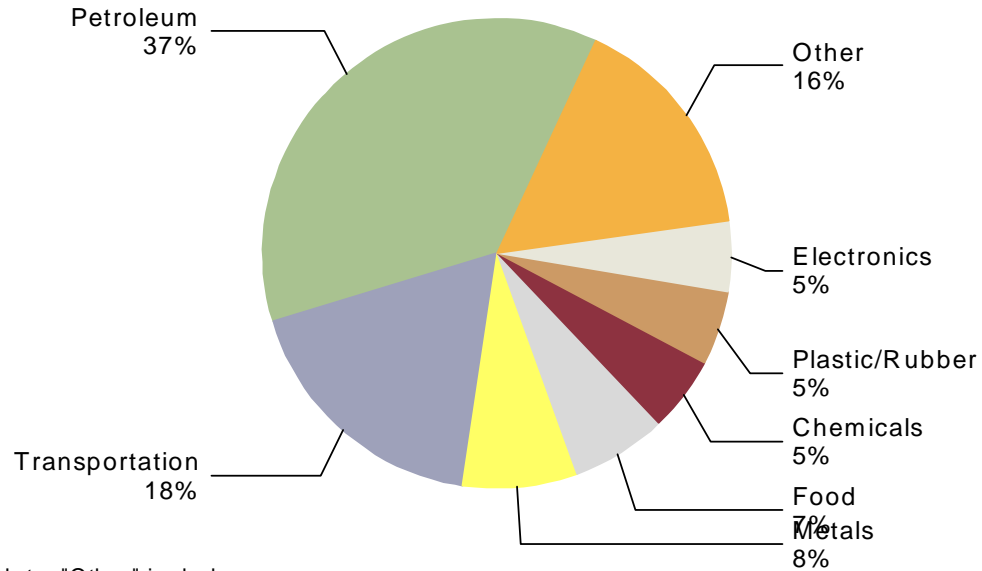


**Industrial Electric**

**Technical Potential**

**Figure 1: Industrial Technical Potential in 2029 by Segment**

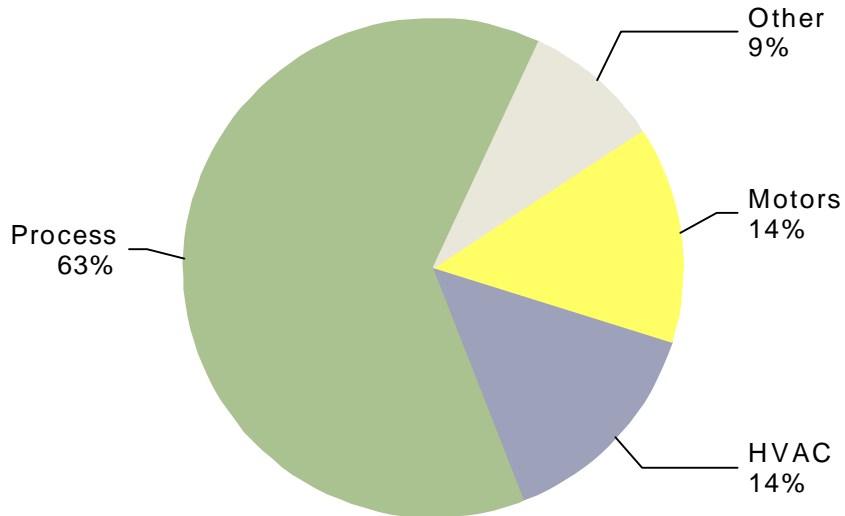
Total: 17 aMW



Note: "Other" includes: Wood: 5%, Machinery: 3%, Miscellaneous: 3%, Minerals: 2%, Paper: 2%, Printing: 1%

**Figure 2: Industrial Technical Potential in 2029 by End Use**

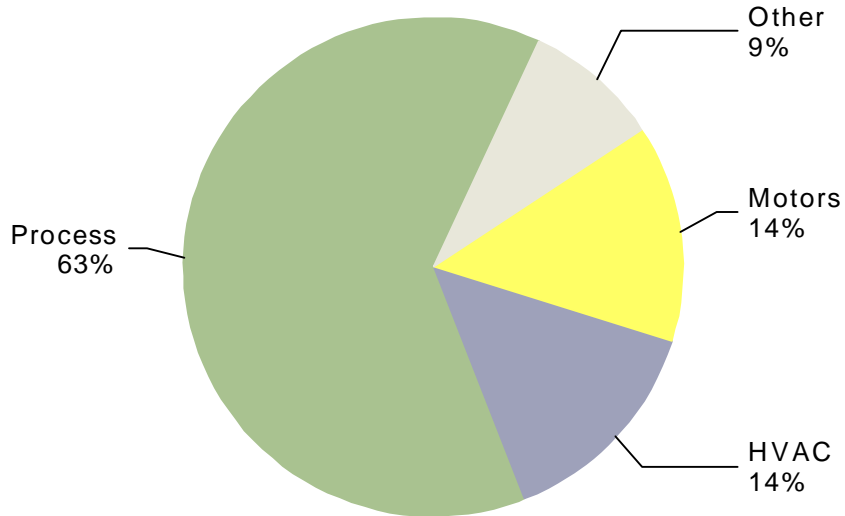
Total: 17 aMW



Note: "Other" includes: Miscellaneous: 4%, Lighting: 4%, Boiler: <1%

**Figure 3: Industrial Technical Potential in 2029 by End Use, Chemicals**

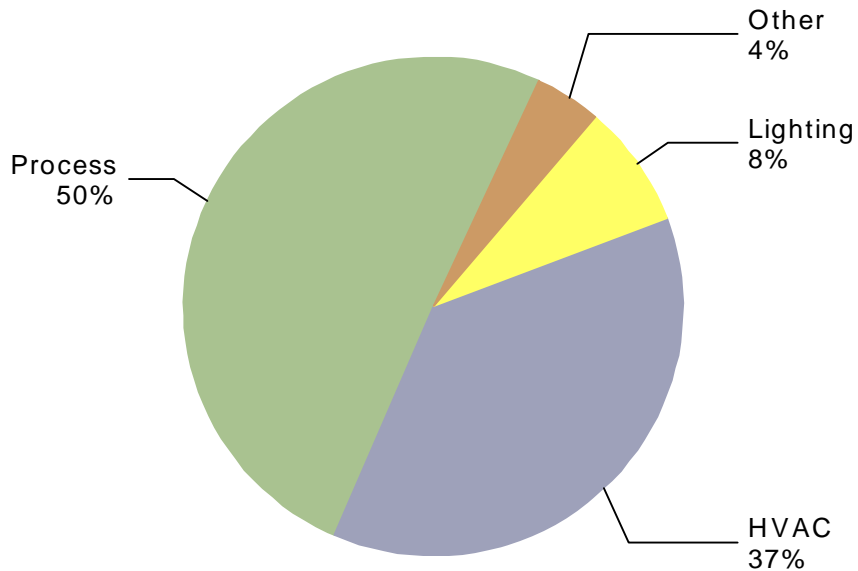
Total: 17 aMW



Note: "Other" includes:  
Miscellaneous: 4%, Lighting: 4%, Boiler: <1%

**Figure 4: Industrial Technical Potential in 2029 by End Use, Electronics**

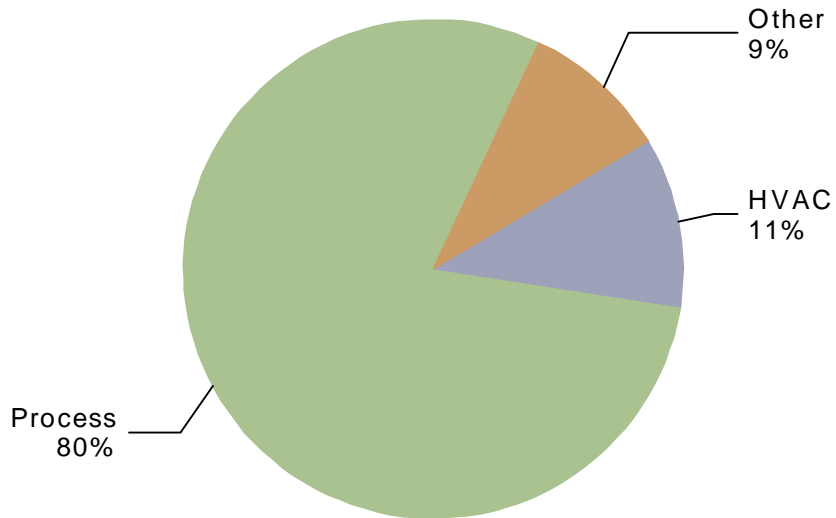
Total: 1 aMW



Note: "Other" includes:  
Motors: 4%, Miscellaneous: <1%

**Figure 5: Industrial Technical Potential in 2029 by End Use, Food**

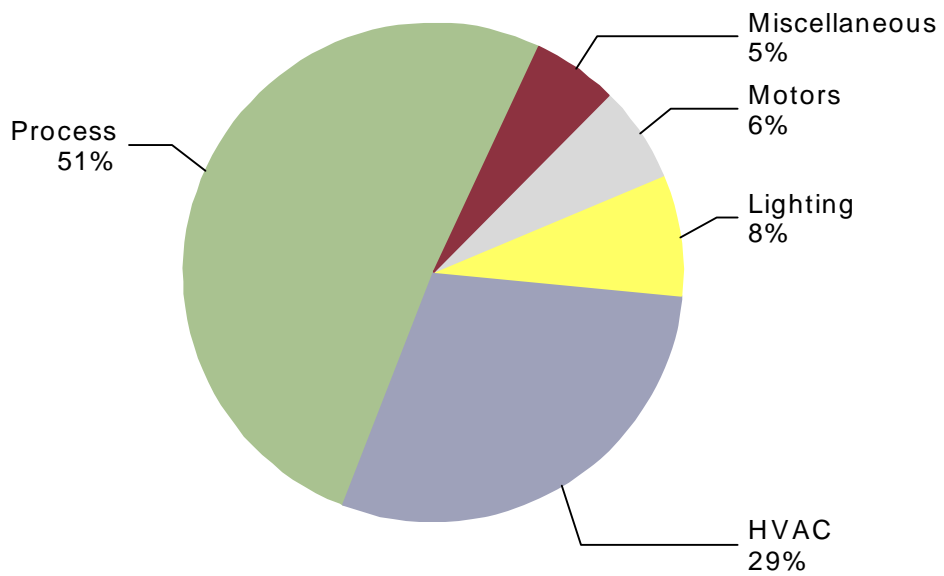
Total: 1 aMW



Note: "Other" includes:  
Motors: 5%, Lighting: 4%, Miscellaneous: <1%

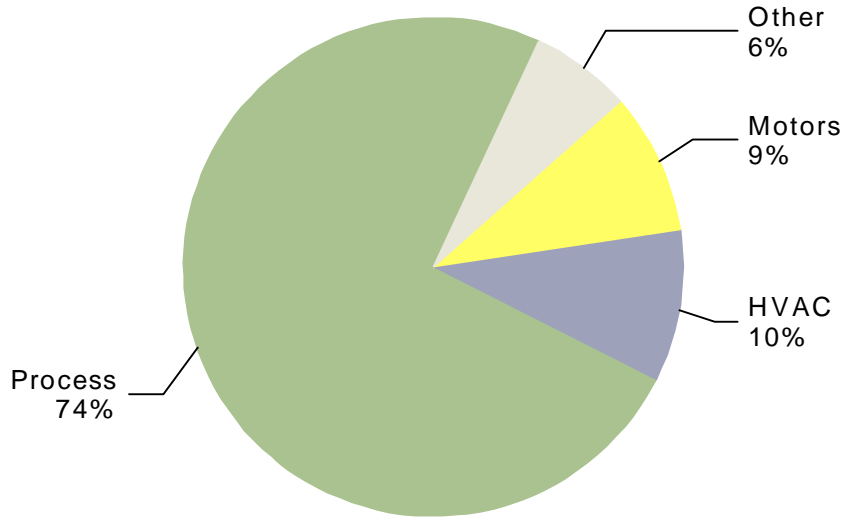
**Figure 6: Industrial Technical Potential in 2029 by End Use, Machinery**

Total: 0 aMW



**Figure 7: Industrial Technical Potential in 2029 by End Use, Metals**

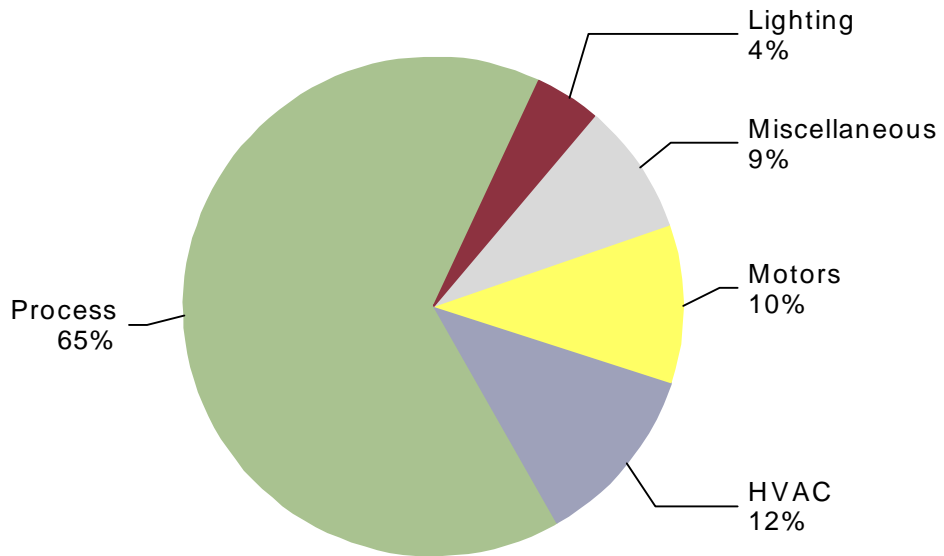
Total: 1 aMW



Note: "Other" includes:  
Lighting: 4%, Miscellaneous: 2%, Boiler: <1%

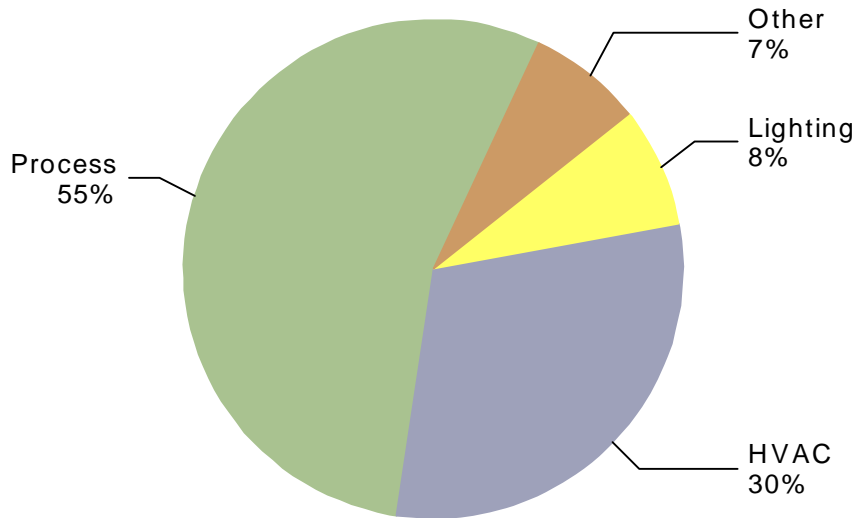
**Figure 8: Industrial Technical Potential in 2029 by End Use, Minerals**

Total: 0 aMW



**Figure 9: Industrial Technical Potential in 2029 by End Use, Miscellaneous**

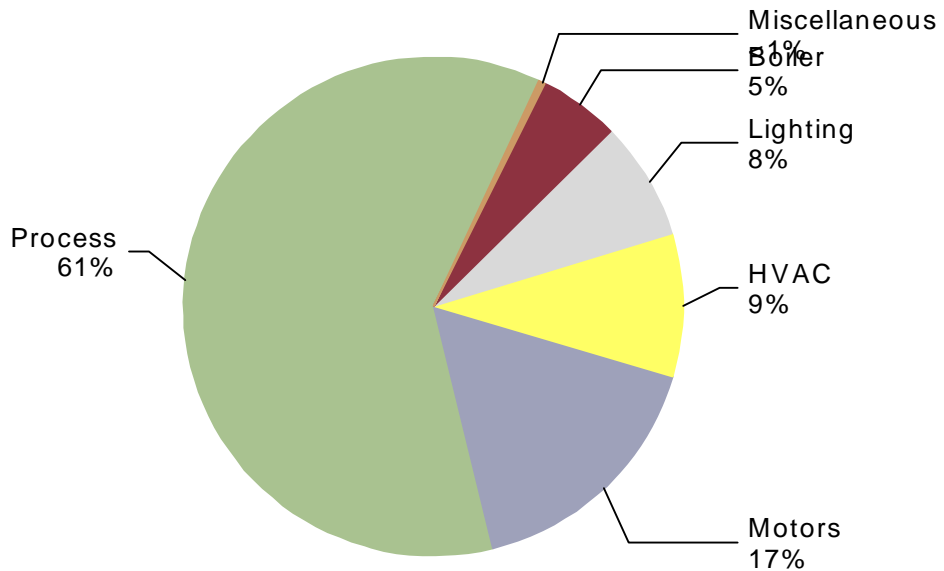
Total: 0 aMW



Note: "Other" includes:  
Motors: 5%, Miscellaneous: 2%

**Figure 10: Industrial Technical Potential in 2029 by End Use, Paper**

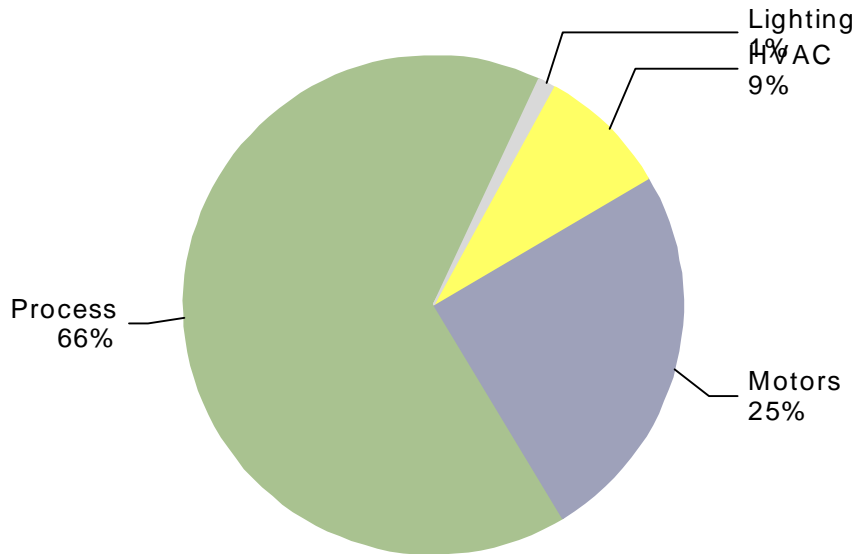
Total: 0 aMW





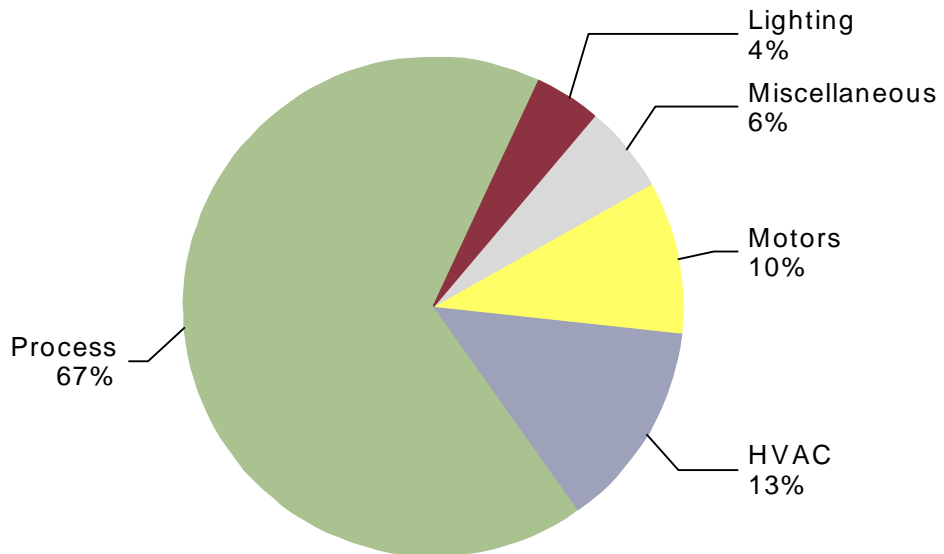
**Figure 11: Industrial Technical Potential in 2029 by End Use, Petroleum**

Total: 6 aMW



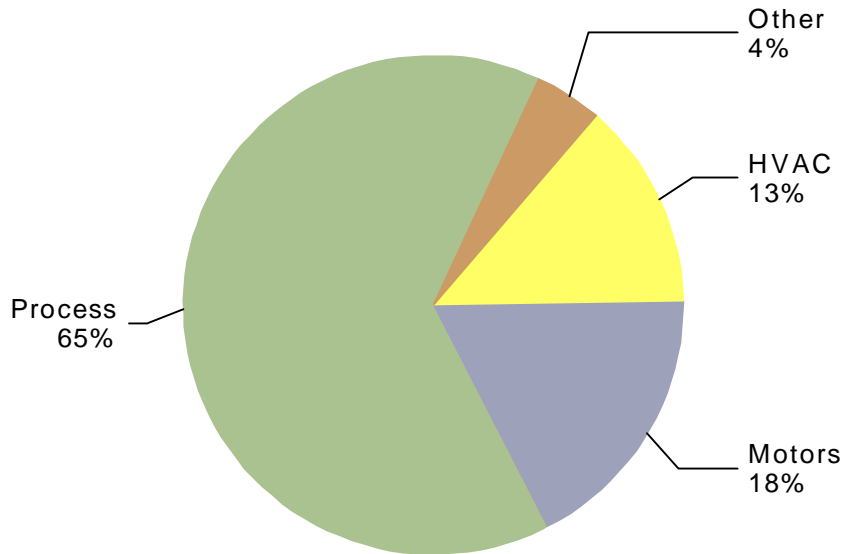
**Figure 12: Industrial Technical Potential in 2029 by End Use, PlasticRubber**

Total: 1 aMW



**Figure 13: Industrial Technical Potential in 2029 by End Use, Printing**

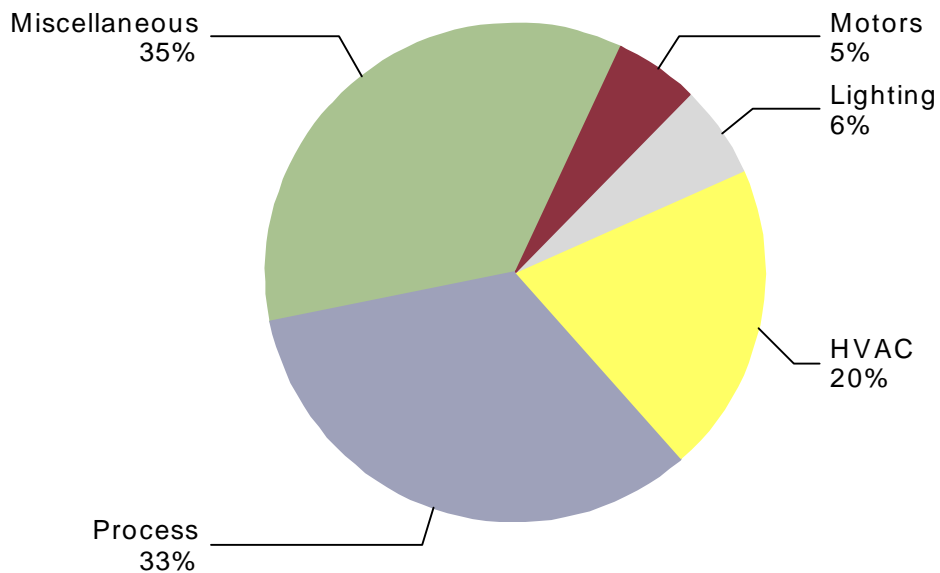
Total: 1 aMW



Note: "Other" includes:  
Lighting: 2%, Miscellaneous: 2%

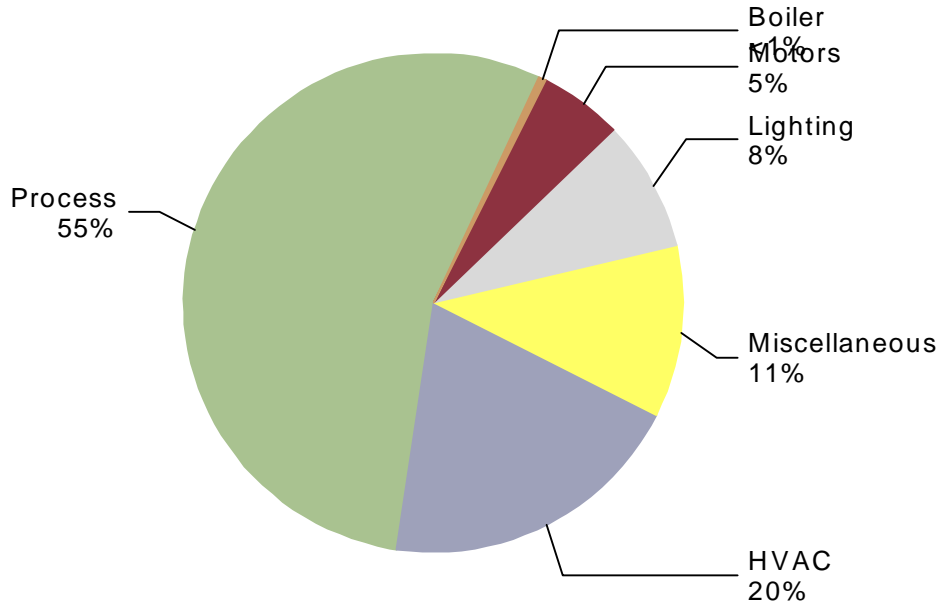
**Figure 14: Industrial Technical Potential in 2029 by End Use, Transportation**

Total: 0 aMW



**Figure 15: Industrial Technical Potential in 2029 by End Use, Wood**

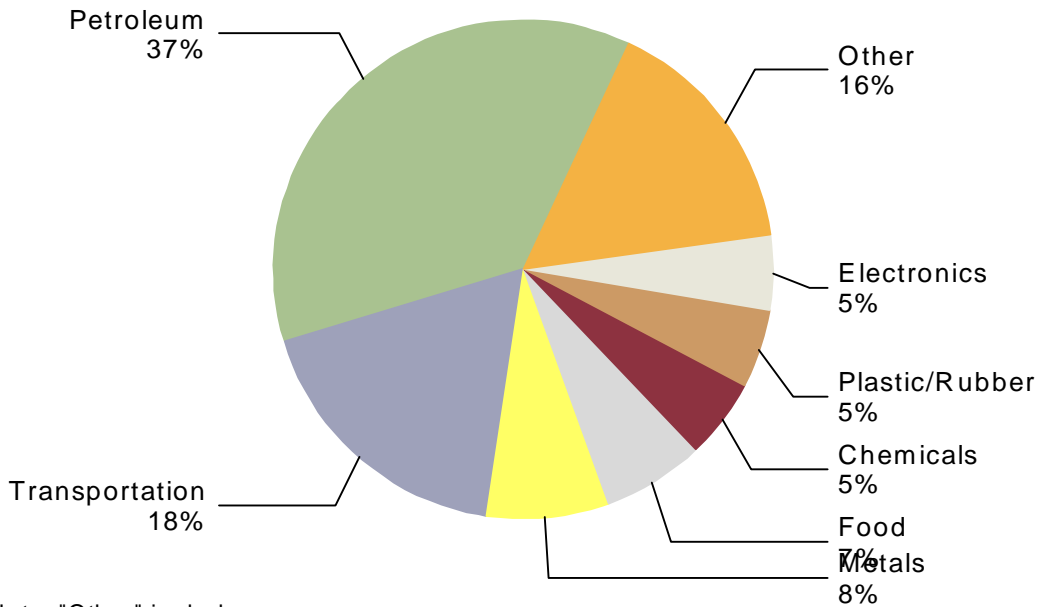
Total: 3 aMW



**Achievable Technical Potential**

**Figure 16: Industrial Achievable Technical Potential in 2029 by Segment**

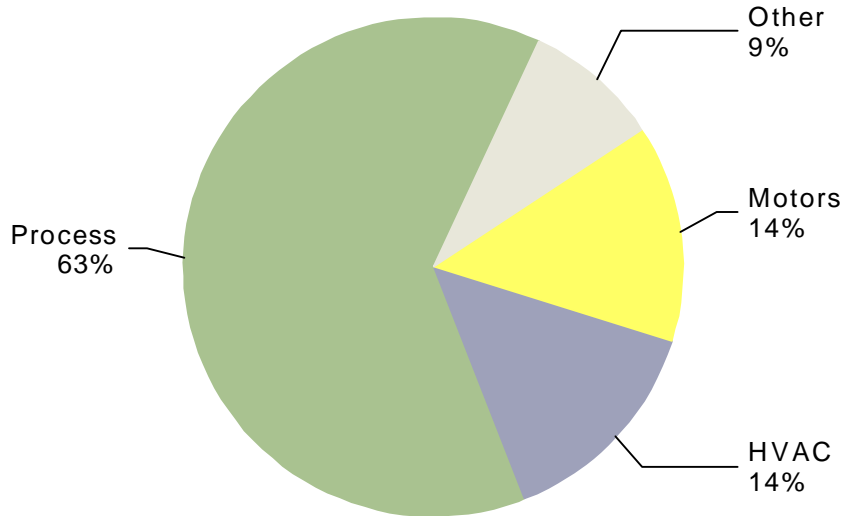
Total: 14 aMW



Note: "Other" includes: Wood: 5%, Machinery: 3%, Miscellaneous: 3%, Minerals: 2%, Paper: 2%, Printing: 1%

**Figure 17: Industrial Achievable Technical Potential in 2029 by End Use**

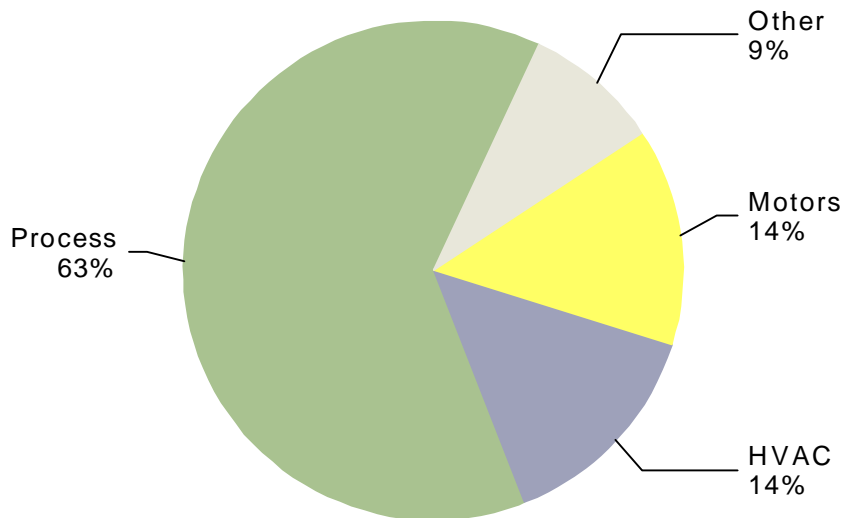
Total: 14 aMW



Note: "Other" includes:  
Miscellaneous: 4%, Lighting: 4%, Boiler: <1%

**Figure 18: Industrial Achievable Technical Potential in 2029 by End Use, Chemicals**

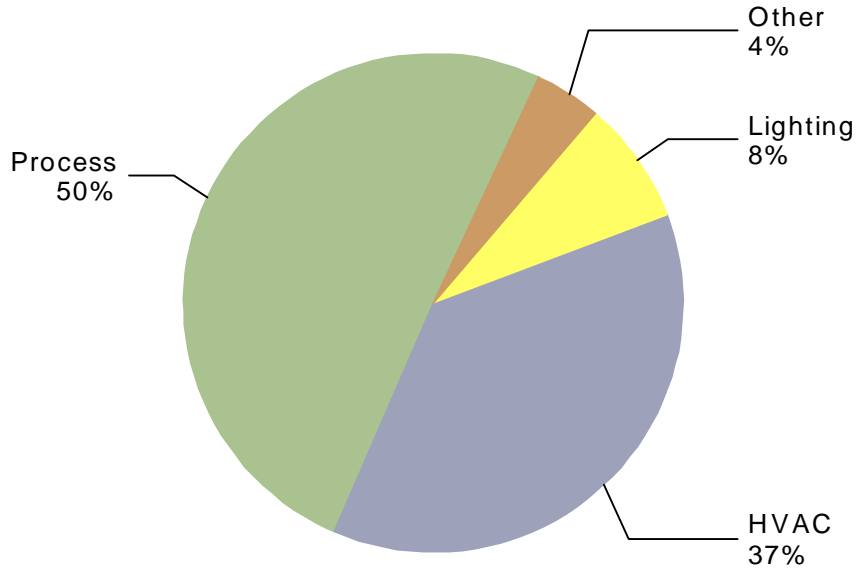
Total: 14 aMW



Note: "Other" includes:  
Miscellaneous: 4%, Lighting: 4%, Boiler: <1%

**Figure 19: Industrial Achievable Technical Potential in 2029 by End Use, Electronics**

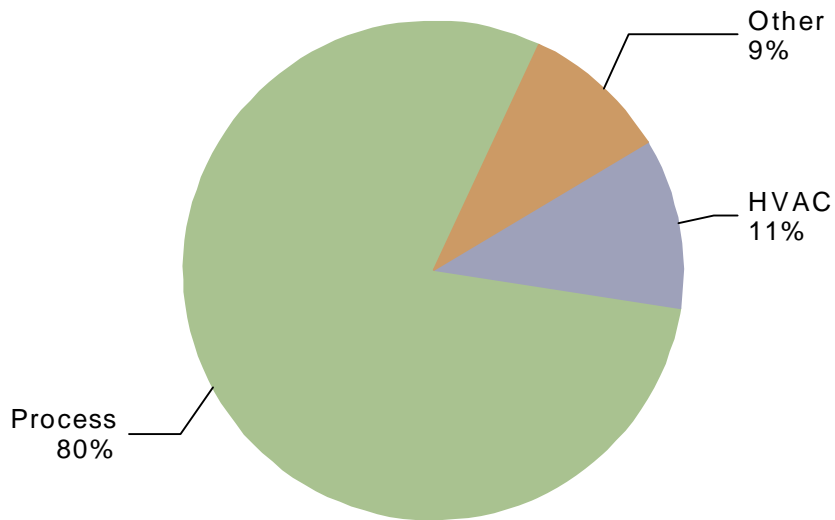
Total: 1 aMW



Note: "Other" includes:  
Motors: 4%, Miscellaneous: <1%

**Figure 20: Industrial Achievable Technical Potential in 2029 by End Use, Food**

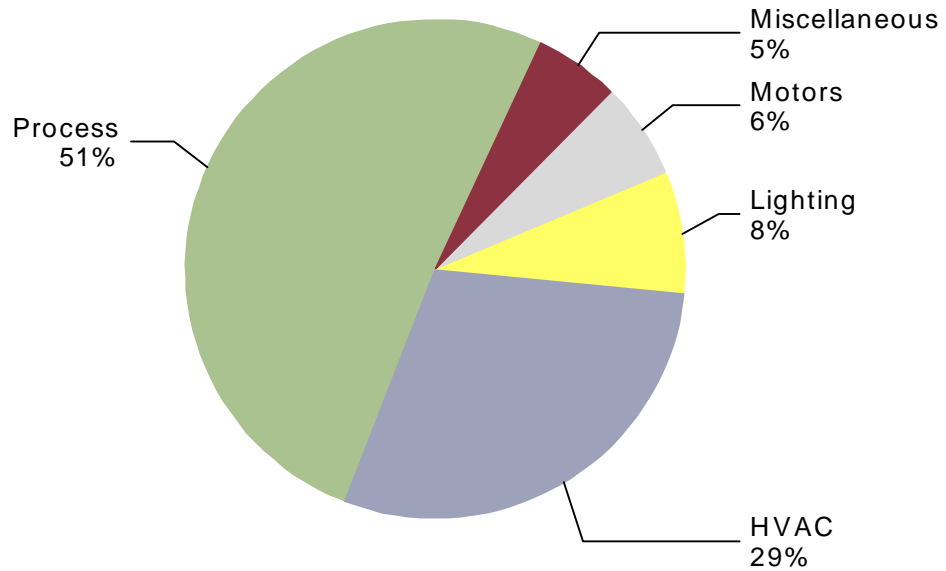
Total: 1 aMW



Note: "Other" includes:  
Motors: 5%, Lighting: 4%, Miscellaneous: <1%

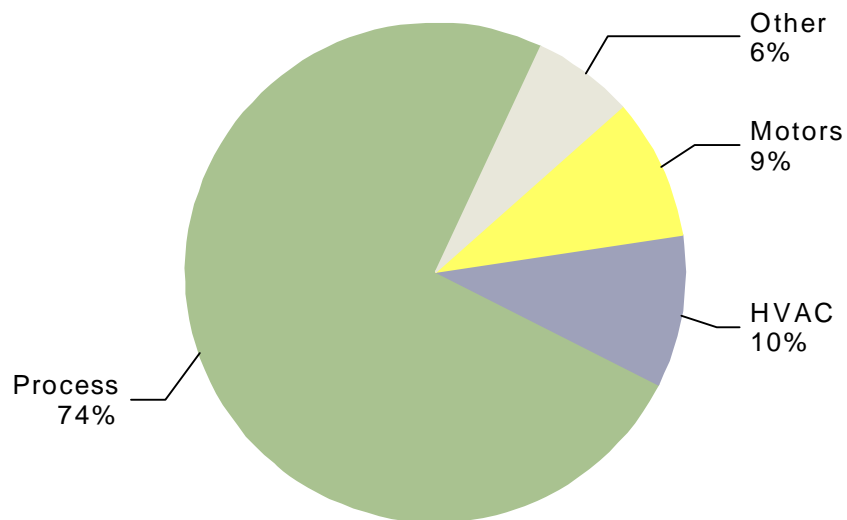
**Figure 21: Industrial Achievable Technical Potential in 2029 by End Use, Machinery**

Total: 0 aMW



**Figure 22: Industrial Achievable Technical Potential in 2029 by End Use, Metals**

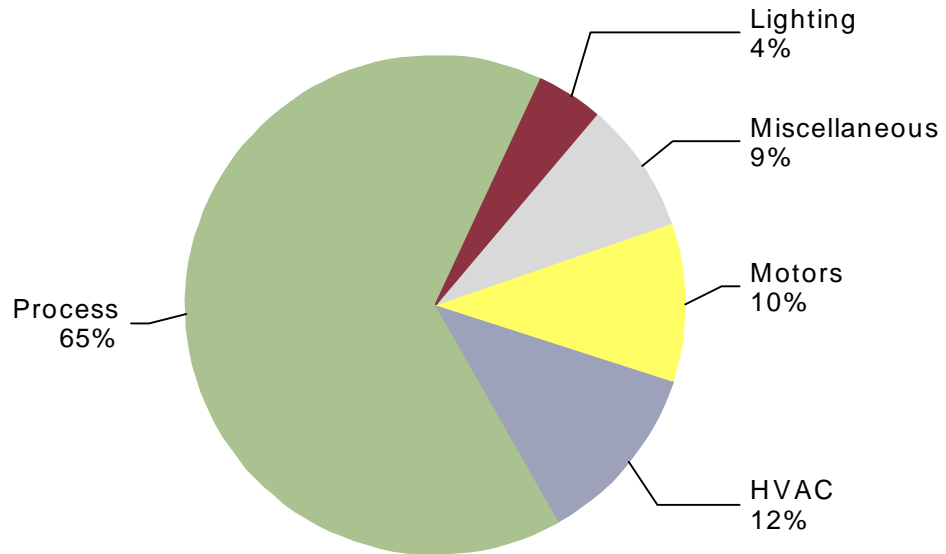
Total: 1 aMW



Note: "Other" includes:  
Lighting: 4%, Miscellaneous: 2%, Boiler: <1%

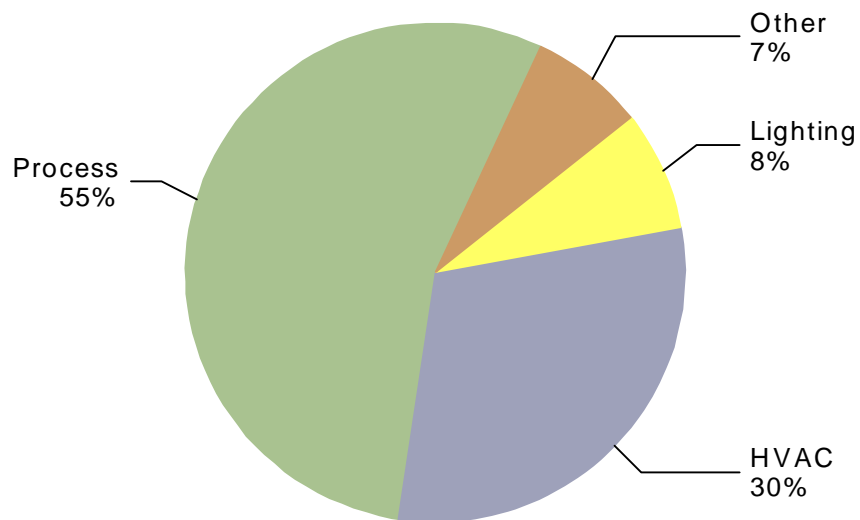
**Figure 23: Industrial Achievable Technical Potential in 2029 by End Use, Minerals**

Total: 0 aMW



**Figure 24: Industrial Achievable Technical Potential in 2029 by End Use, Miscellaneous**

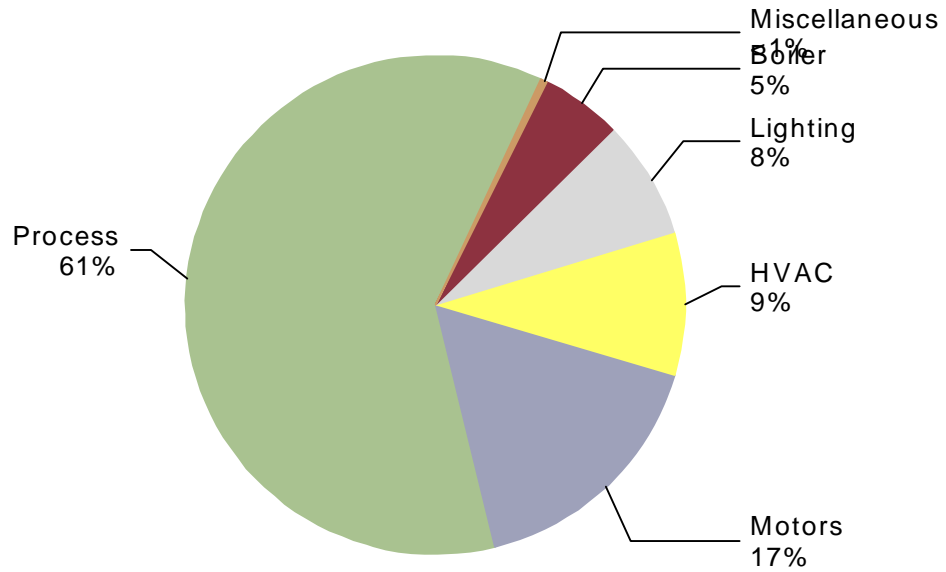
Total: 0 aMW



Note: "Other" includes:  
Motors: 5%, Miscellaneous: 2%

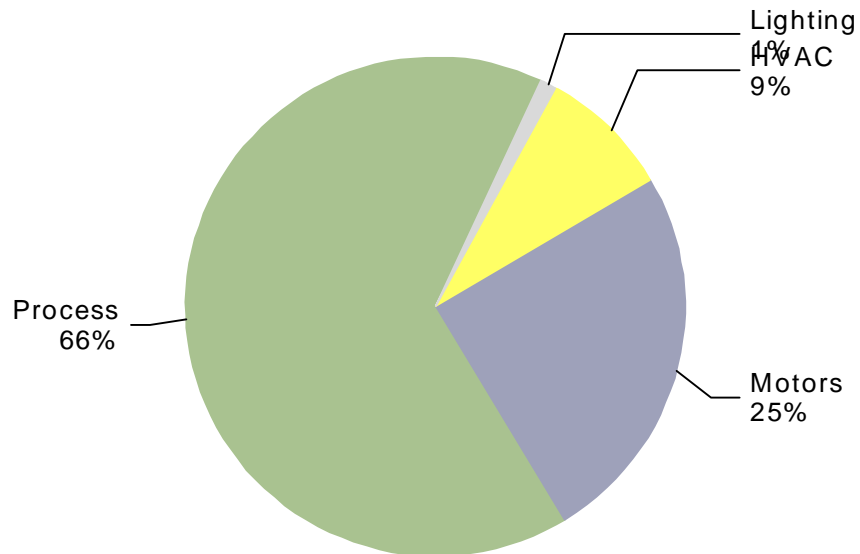
**Figure 25: Industrial Achievable Technical Potential in 2029 by End Use, Paper**

Total: 0 aMW



**Figure 26: Industrial Achievable Technical Potential in 2029 by End Use, Petroleum**

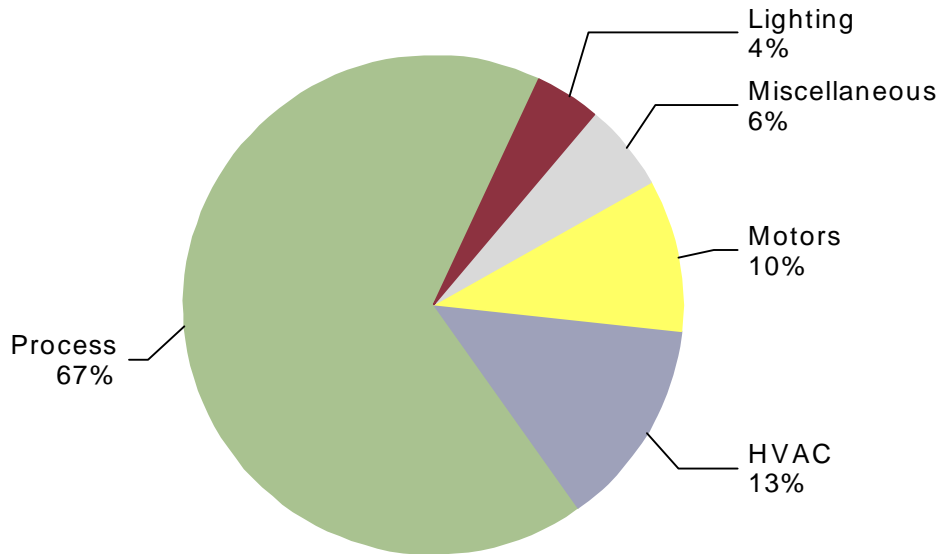
Total: 5 aMW





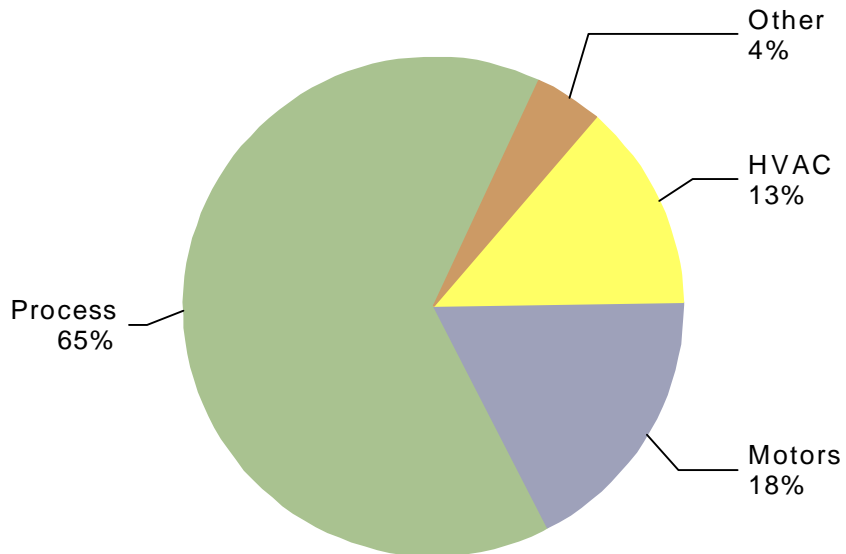
**Figure 27: Industrial Achievable Technical Potential in 2029 by End Use, PlasticRubber**

Total: 1 aMW



**Figure 28: Industrial Achievable Technical Potential in 2029 by End Use, Printing**

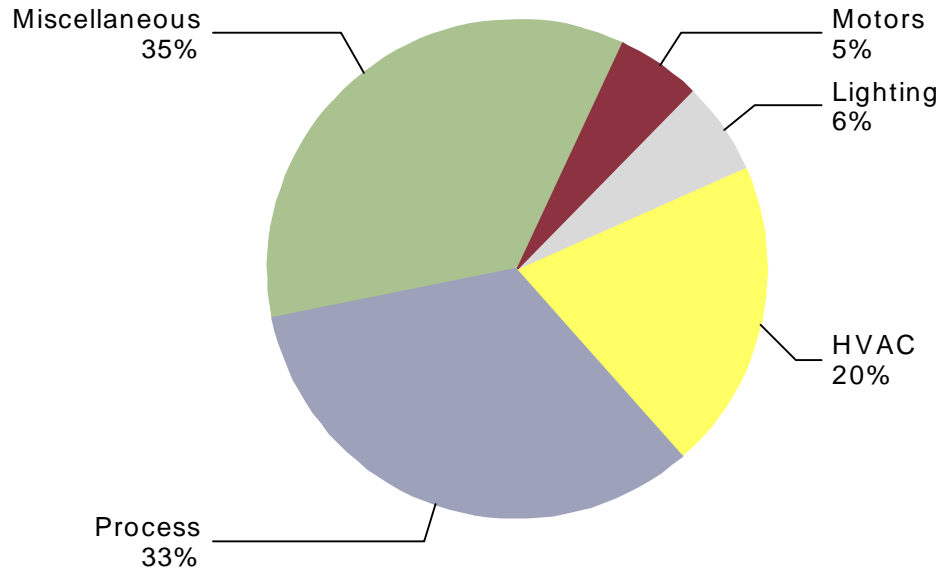
Total: 1 aMW



Note: "Other" includes:  
Lighting: 2%, Miscellaneous: 2%

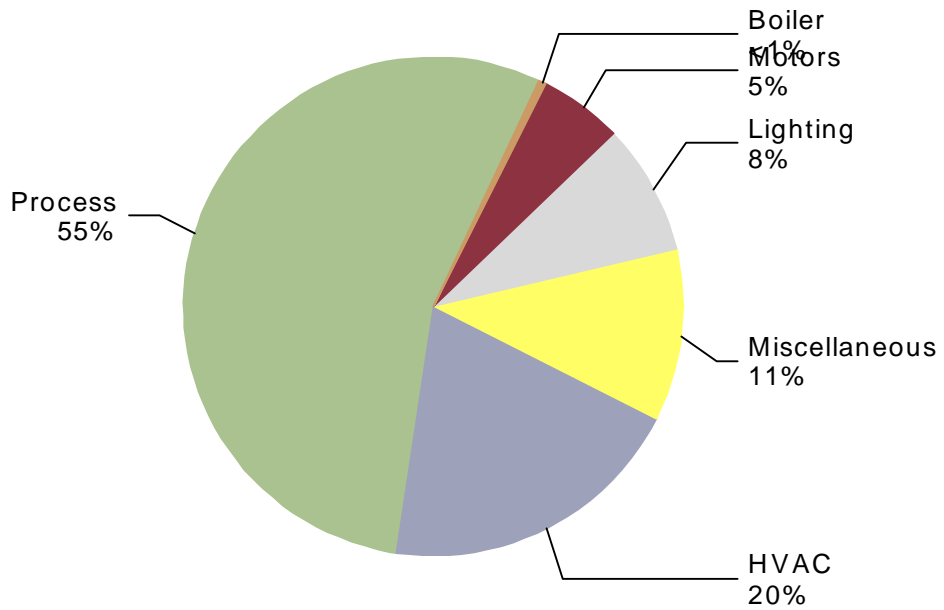
**Figure 29: Industrial Achievable Technical Potential in 2029 by End Use, Transportation**

Total: 0 aMW



**Figure 30: Industrial Achievable Technical Potential in 2029 by End Use, Wood**

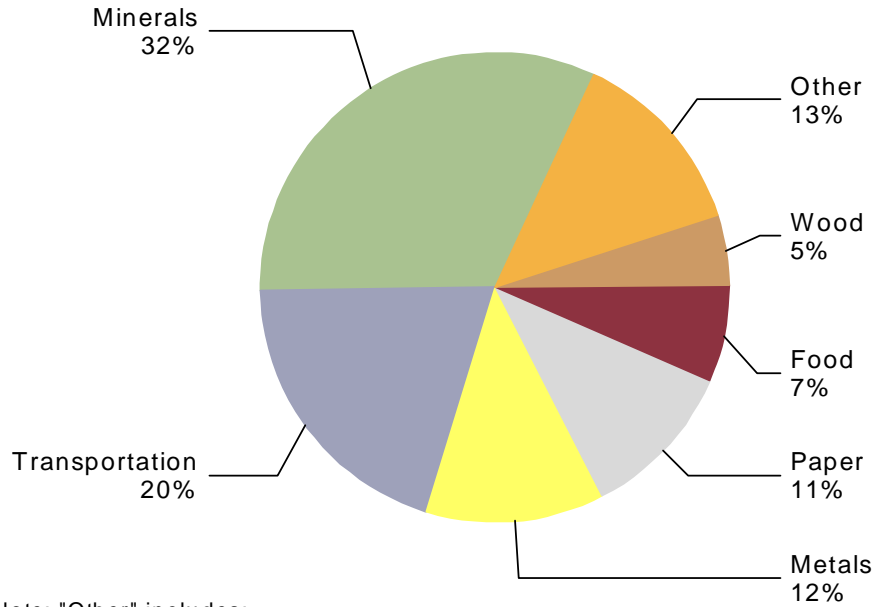
Total: 3 aMW



**Industrial Gas  
Technical Potential**

**Figure 1: Industrial Technical Potential in 2029 by Segment**

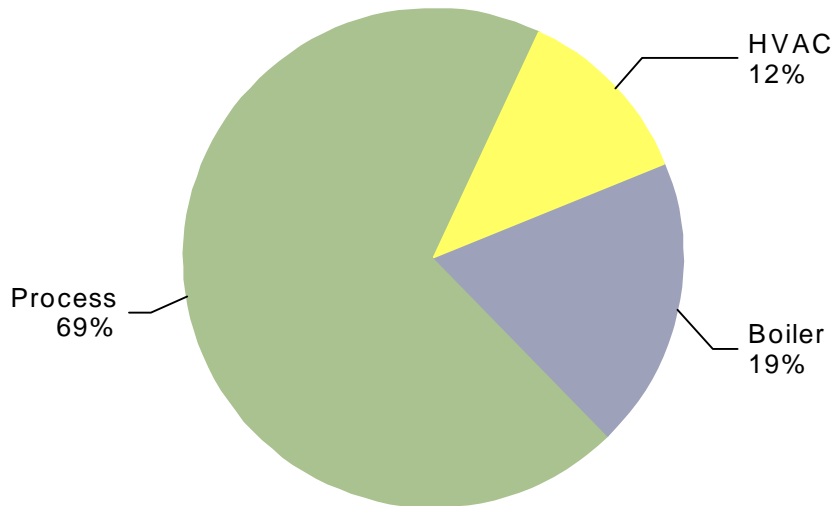
Total: 11,894,716 therms



Note: "Other" includes: Petroleum: 3%, Machinery: 3%, Chemicals: 2%, Miscellaneous: 2%, Plastic/Rubber: 1%, Electronics

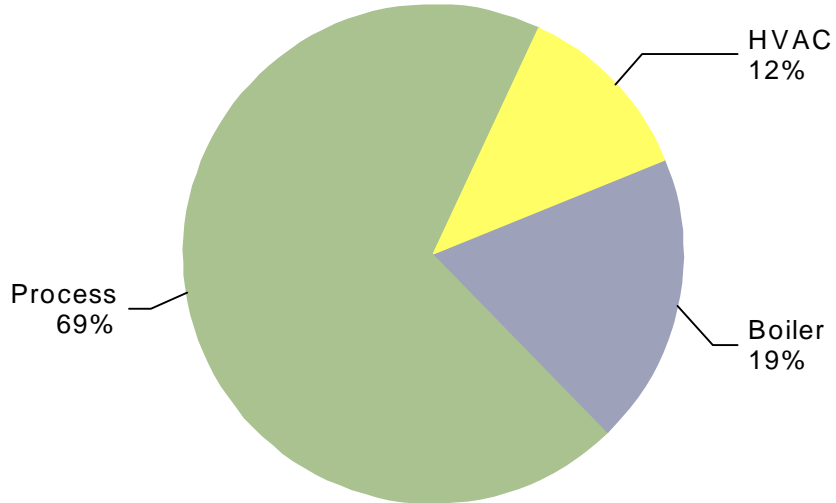
**Figure 2: Industrial Technical Potential in 2029 by End Use**

Total: 11,894,716 therms



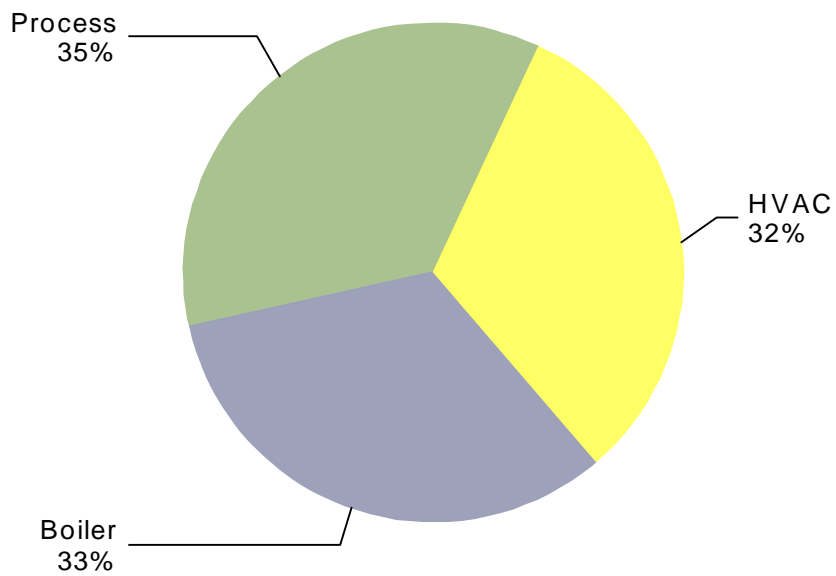
**Figure 3: Industrial Technical Potential in 2029 by End Use, Chemicals**

Total: 11,894,716 therms



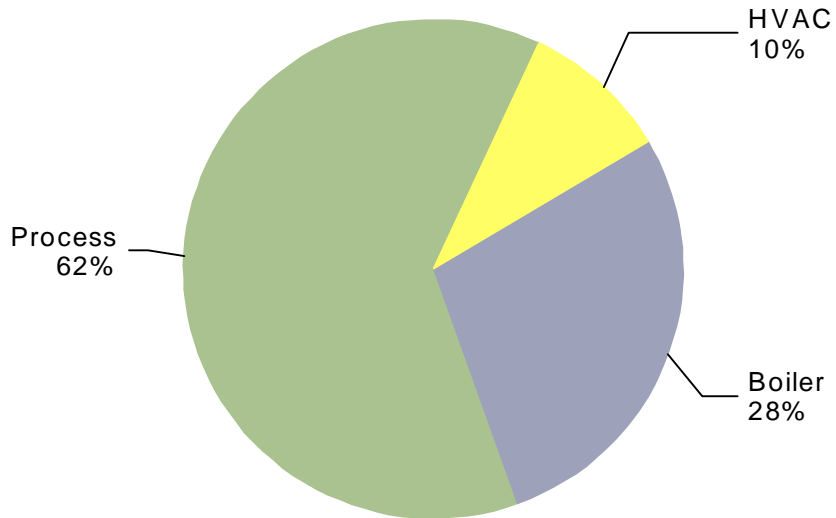
**Figure 4: Industrial Technical Potential in 2029 by End Use, Electronics**

Total: 119,114 therms



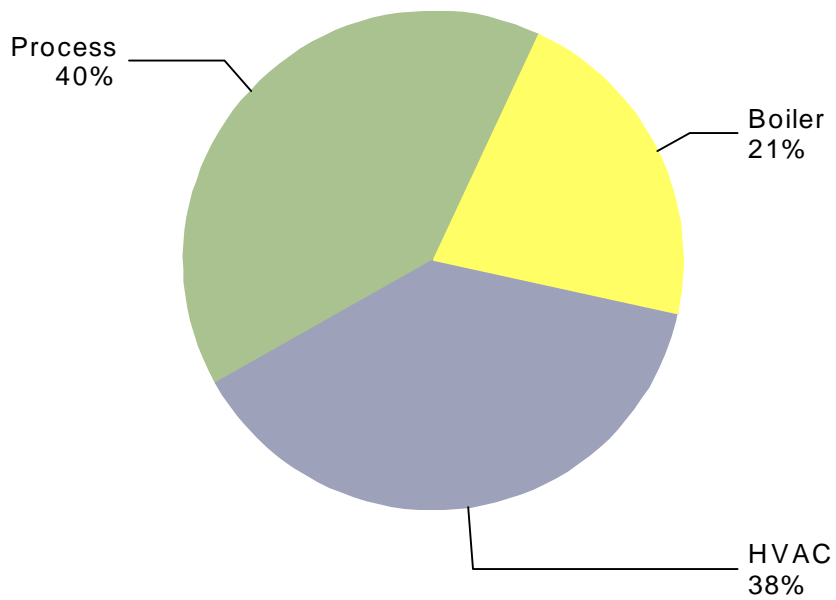
**Figure 5: Industrial Technical Potential in 2029 by End Use, Food**

Total: 789,692 therms



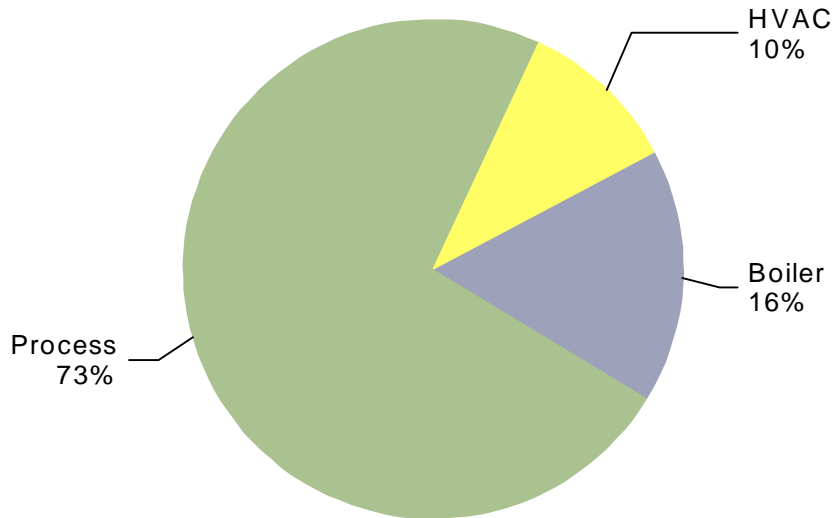
**Figure 6: Industrial Technical Potential in 2029 by End Use, Machinery**

Total: 302,922 therms



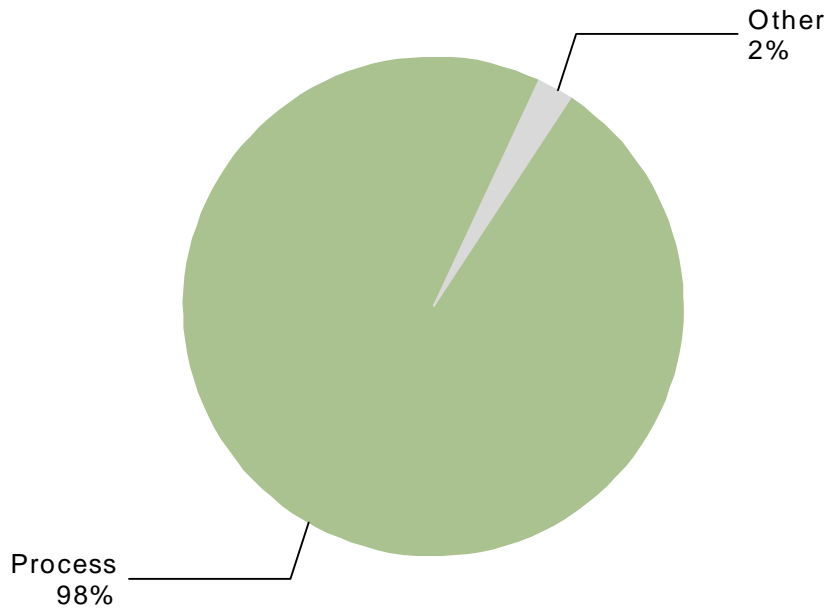
**Figure 7: Industrial Technical Potential in 2029 by End Use, Metals**

Total: 1,465,136 therms



**Figure 8: Industrial Technical Potential in 2029 by End Use, Minerals**

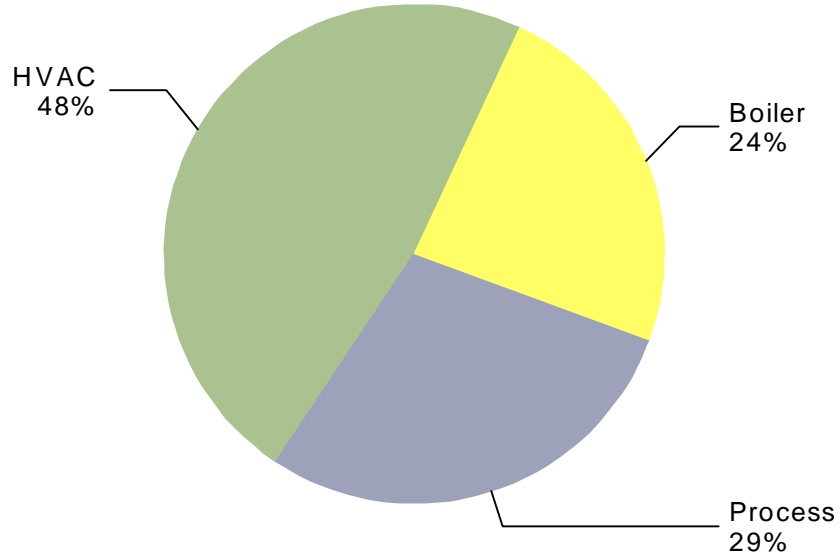
Total: 3,823,347 therms



Note: "Other" includes:  
HVAC: 2%, Boiler: <1%

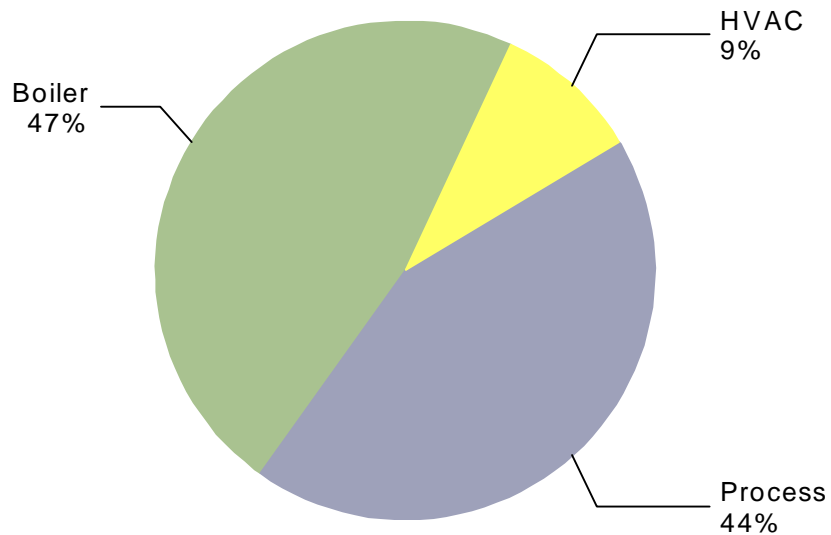
**Figure 9: Industrial Technical Potential in 2029 by End Use, Miscellaneous**

Total: 202,980 therms



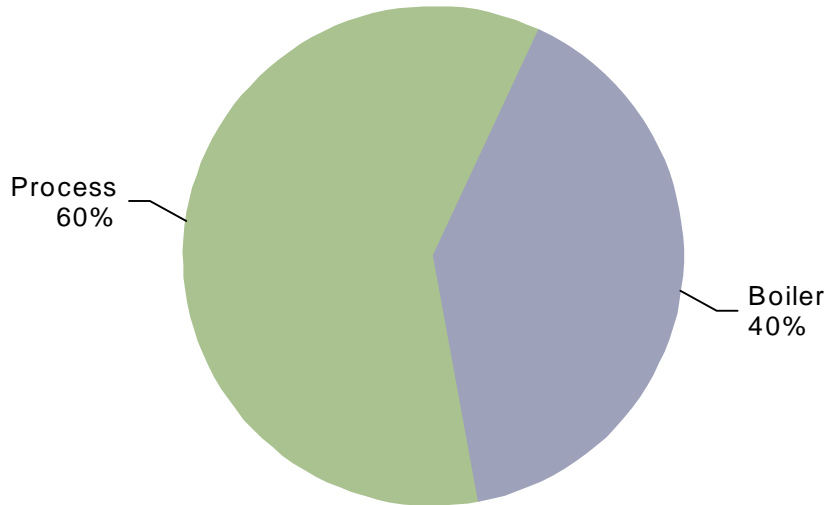
**Figure 10: Industrial Technical Potential in 2029 by End Use, Paper**

Total: 1,300,019 therms



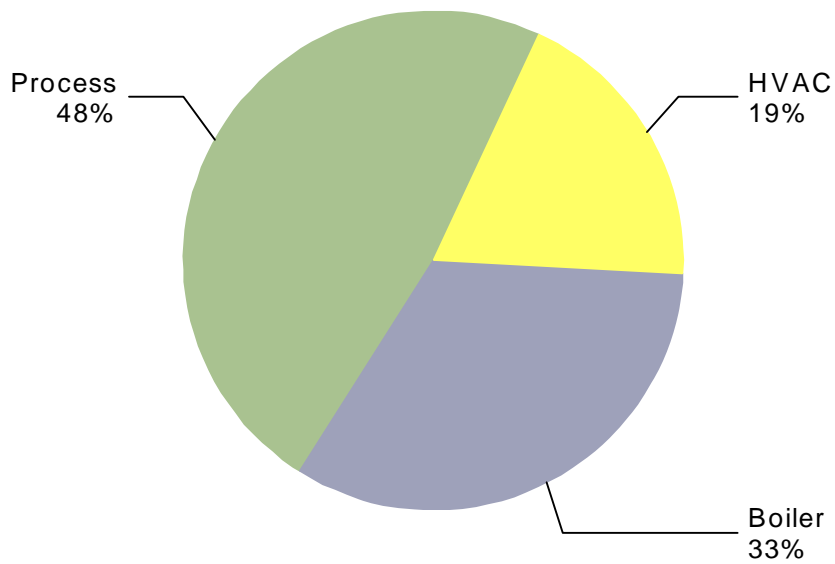
**Figure 11: Industrial Technical Potential in 2029 by End Use, Petroleum**

Total: 385,404 therms



**Figure 12: Industrial Technical Potential in 2029 by End Use, PlasticRubber**

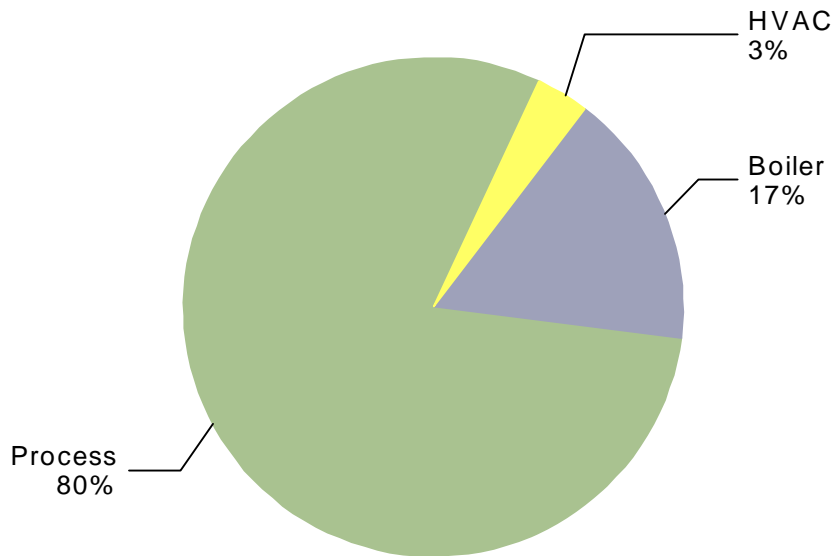
Total: 172,938 therms





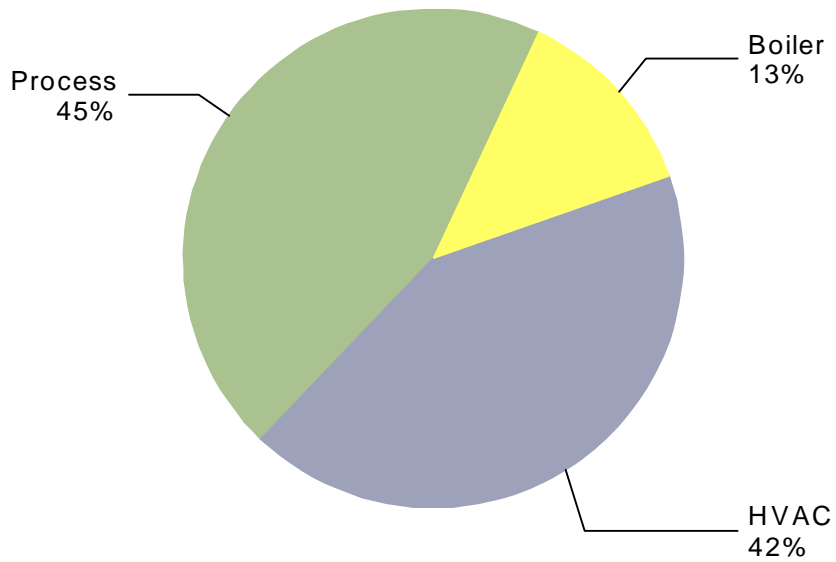
**Figure 13: Industrial Technical Potential in 2029 by End Use, Printing**

Total: 284,445 therms



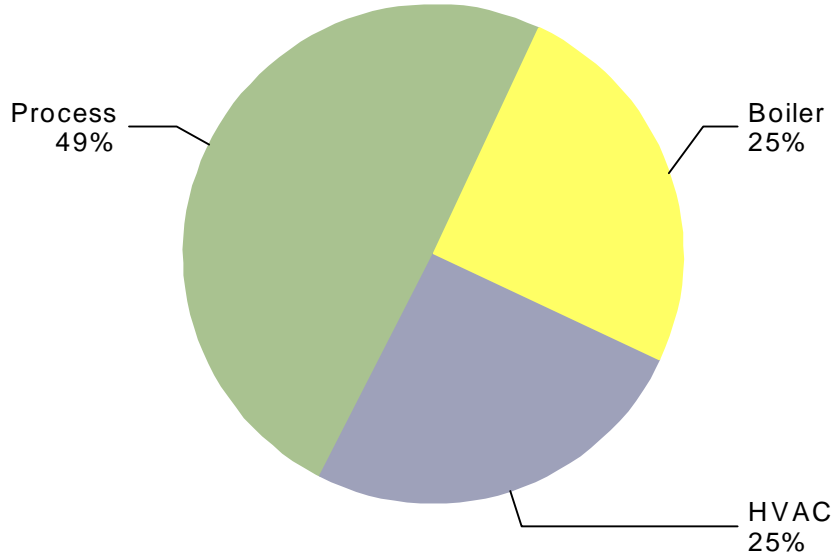
**Figure 14: Industrial Technical Potential in 2029 by End Use, Transportation**

Total: 89,840 therms



**Figure 15: Industrial Technical Potential in 2029 by End Use, Wood**

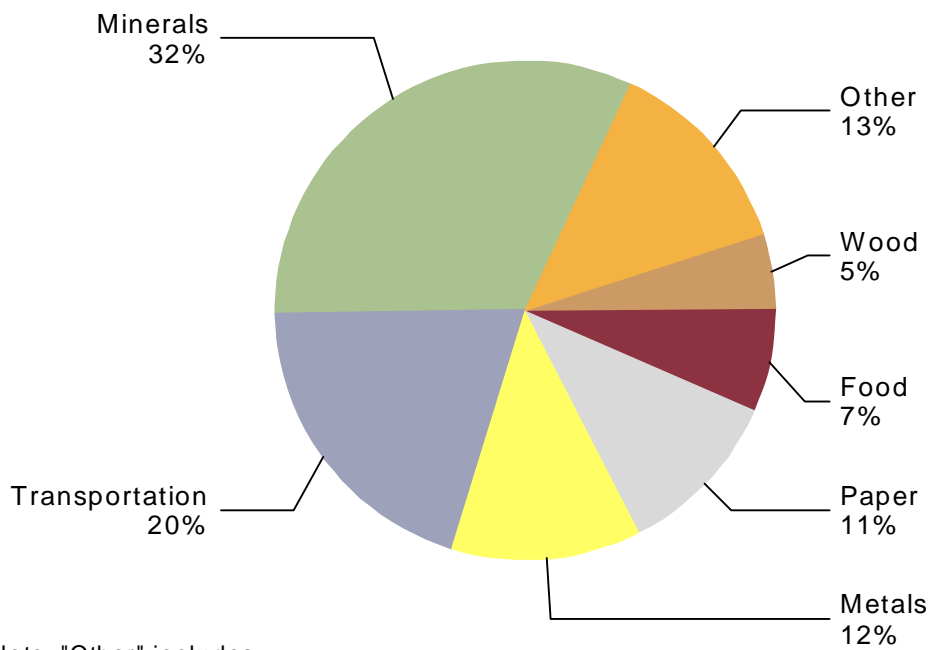
Total: 2,387,799 therms



**Achievable Technical Potential**

**Figure 16: Industrial Achievable Technical Potential in 2029 by Segment**

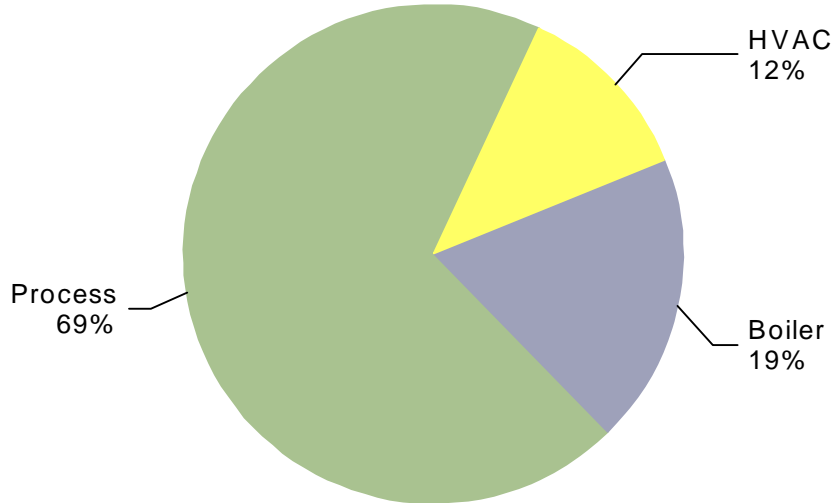
Total: 8,921,037 therms



Note: "Other" includes: Petroleum: 3%, Machinery: 3%, Chemicals: 2%, Miscellaneous: 2%, Plastic/Rubber: 1%, Electronics

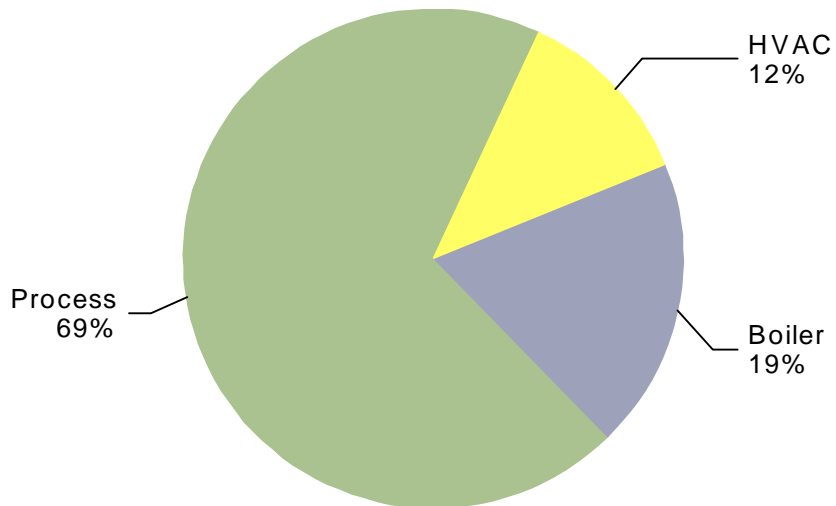
**Figure 17: Industrial Achievable Technical Potential in 2029 by End Use**

Total: 8,921,037 therms



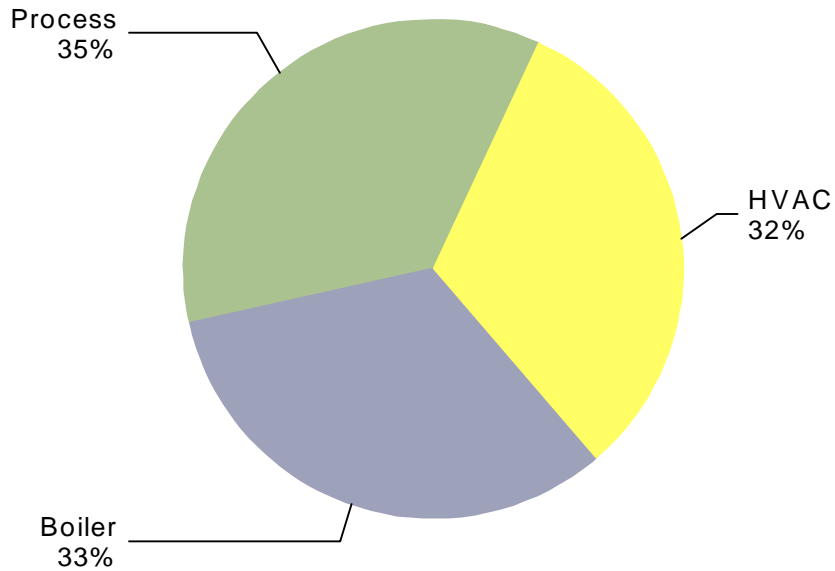
**Figure 18: Industrial Achievable Technical Potential in 2029 by End Use, Chemicals**

Total: 8,921,037 therms



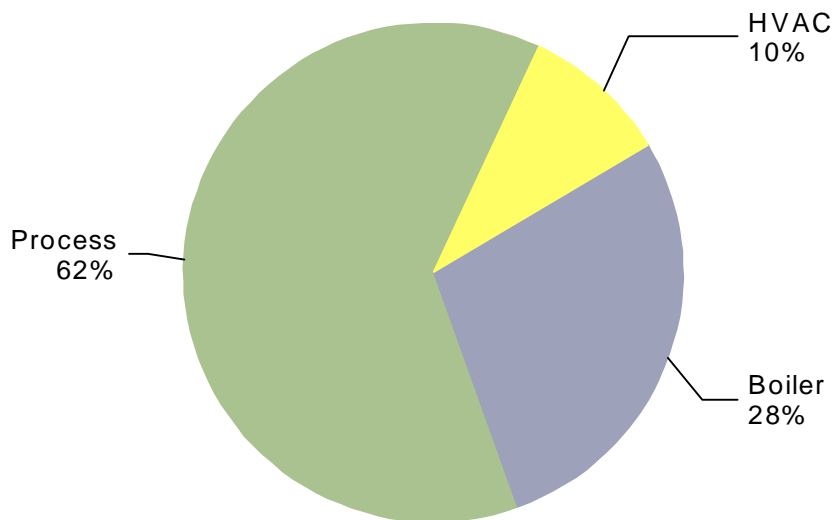
**Figure 19: Industrial Achievable Technical Potential in 2029 by End Use, Electronics**

Total: 89,335 therms



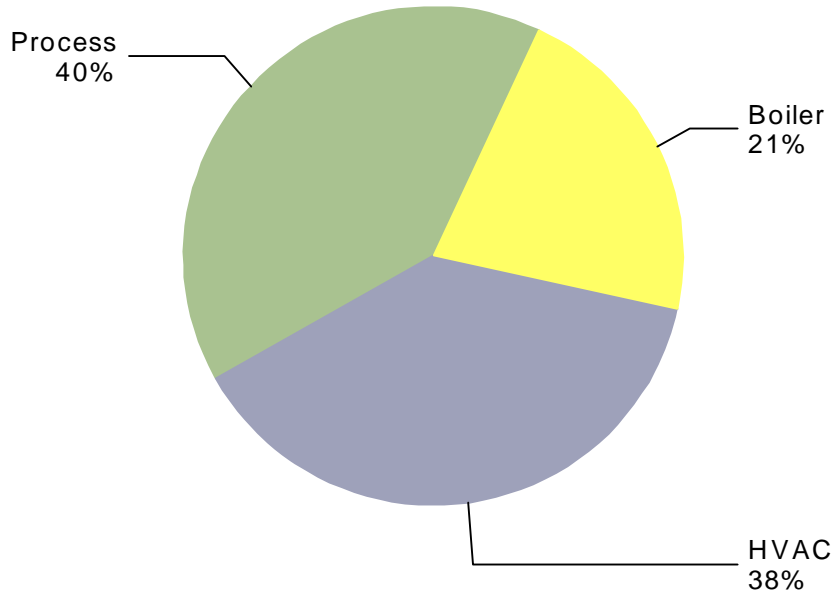
**Figure 20: Industrial Achievable Technical Potential in 2029 by End Use, Food**

Total: 592,269 therms



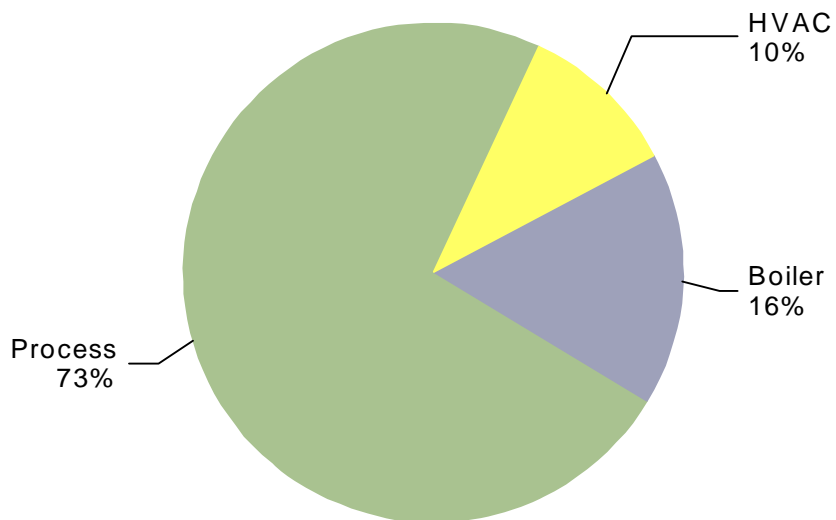
**Figure 21: Industrial Achievable Technical Potential in 2029 by End Use, Machinery**

Total: 227,191 therms



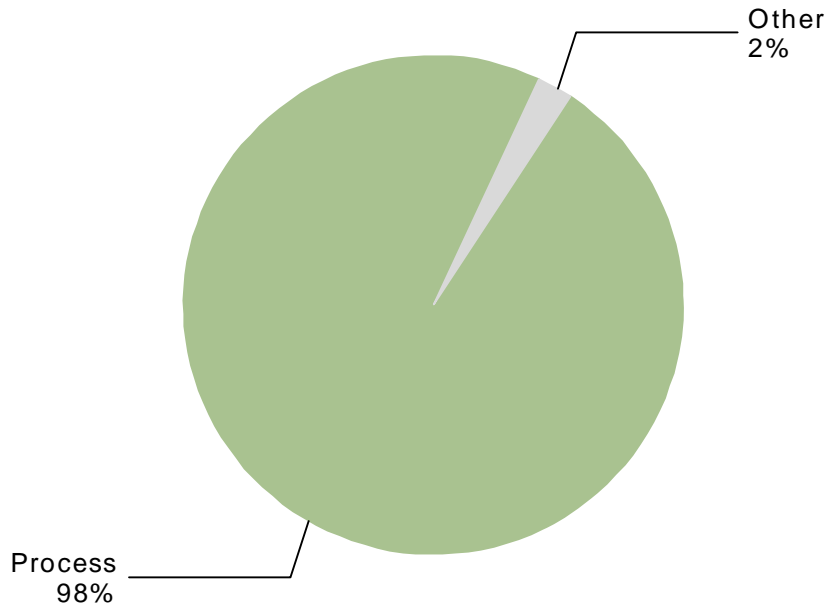
**Figure 22: Industrial Achievable Technical Potential in 2029 by End Use, Metals**

Total: 1,098,852 therms



**Figure 23: Industrial Achievable Technical Potential in 2029 by End Use, Minerals**

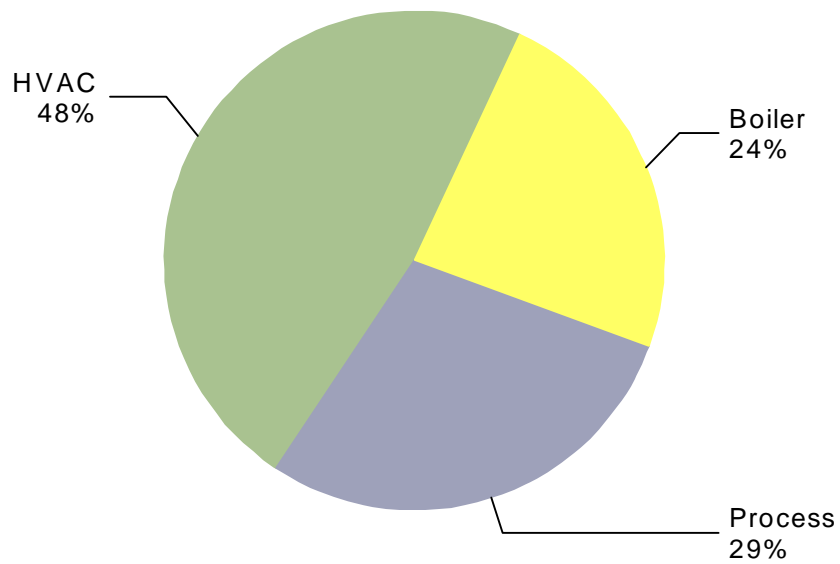
Total: 2,867,510 therms



Note: "Other" includes:  
HVAC: 2%, Boiler: <1%

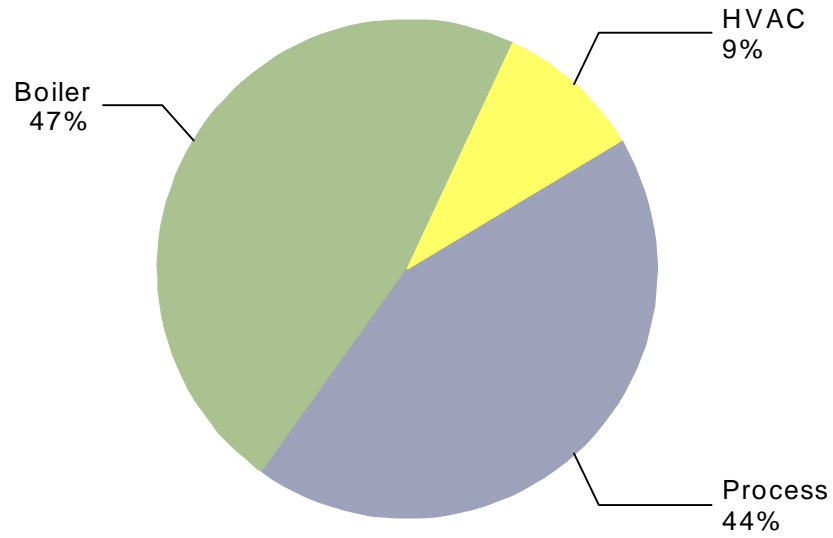
**Figure 24: Industrial Achievable Technical Potential in 2029 by End Use, Miscellaneous**

Total: 152,235 therms



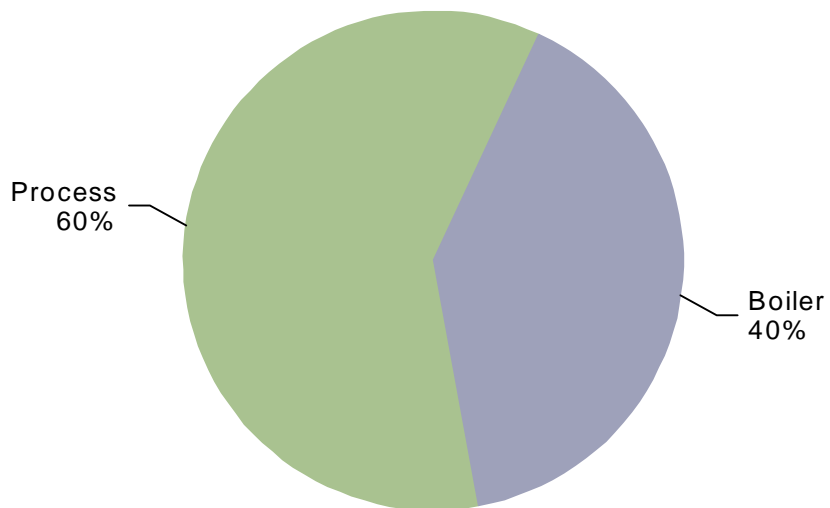
**Figure 25: Industrial Achievable Technical Potential in 2029 by End Use, Paper**

Total: 975,014 therms



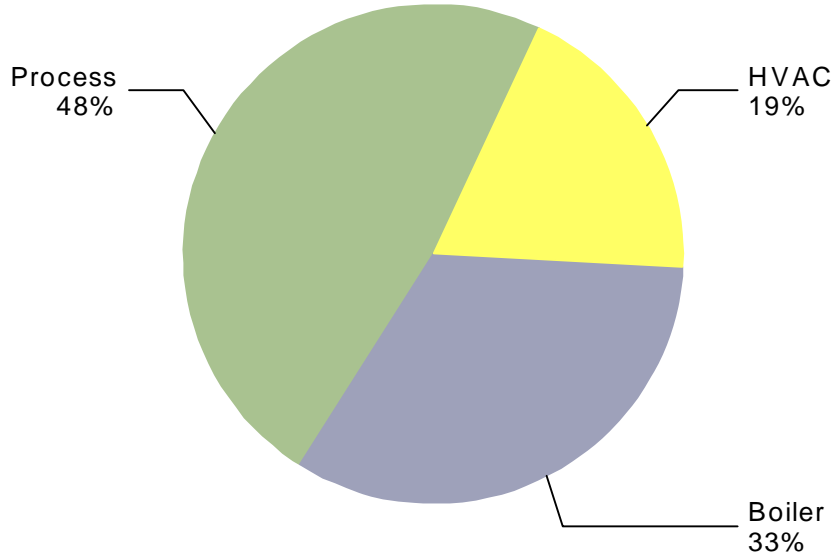
**Figure 26: Industrial Achievable Technical Potential in 2029 by End Use, Petroleum**

Total: 289,053 therms



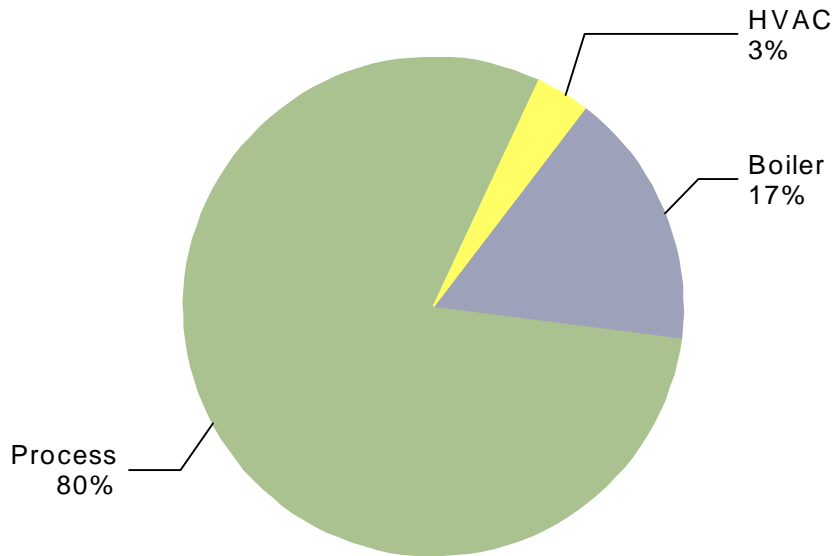
**Figure 27: Industrial Achievable Technical Potential in 2029 by End Use, PlasticRubber**

Total: 129,704 therms



**Figure 28: Industrial Achievable Technical Potential in 2029 by End Use, Printing**

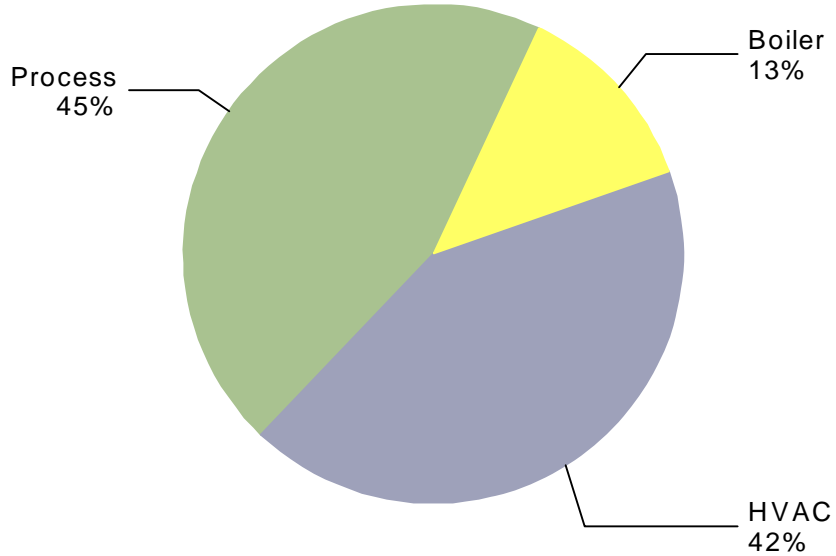
Total: 213,333 therms





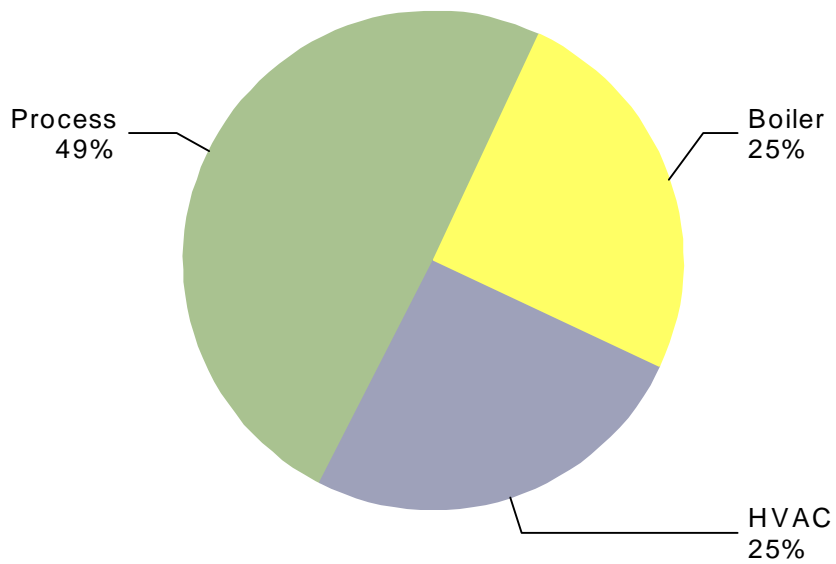
**Figure 29: Industrial Achievable Technical Potential in 2029 by End Use, Transportation**

Total: 67,380 therms



**Figure 30: Industrial Achievable Technical Potential in 2029 by End Use, Wood**

Total: 1,790,849 therms



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## Appendix D: Supplemental Material—Fuel Conversion

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# Appendix D: Supplemental Material—Fuel Conversion

## Economic Assumptions

|                                    |          |
|------------------------------------|----------|
| Discount Rate                      | 8.25%    |
| Inflation Rate                     | 2.50%    |
| Electric T&D Savings               | 6.70%    |
| Gas T&D Savings                    | 0.80%    |
| Admin Adder                        | 5.00%    |
| Conservation Credit                | 10.00%   |
| Electric: Carbon Adder             | 20.00%   |
| Gas: Carbon Adder                  | 10.00%   |
| Main Ext - Short (ft)              | 50       |
| Main Ext - Medium (ft)             | 300      |
| Main Ext - Long (ft)               | 500      |
| Line Cost per foot                 | \$40     |
| In-House Extension                 | \$200    |
| NPV Avoided Generation (\$/kW)     | \$108.25 |
| therms/kWh Conversion Factor       | 0.0341   |
| Electric Dryer Energy Factor       | 2.67     |
| Gas Dryer Energy Factor            | 3.01     |
| Electric Range Energy Factor       | 0.068    |
| Gas Range Energy Factor            | 0.112    |
| Electric Retail Rate - Residential | \$0.107  |
| Electric Retail Rate - Commercial  | \$0.090  |
| Gas Retail Rate - Residential      | \$1.53   |
| Gas Retail Rate - Commercial       | \$1.39   |
| Utility/Participant Cost Basis     | Total    |
| Rate Escalators                    | Yearly   |

Source for Electricity Use Data is 2001 Electric End Use Model;  
 Labor is included for Space/Zone Heating Equipment Cost.  
 One year potential assumes linear acquisition  
 UECs for electric dryer/cooking: PSE gas tariff information  
 UECs for space/water heating: EndUse Forecaster Model  
 All calculations done for kWh/therms at GENERATION

| End Use                  | Piping&Labor | Bundling % |
|--------------------------|--------------|------------|
| Space Heating: Ducted    | \$700        | 100%       |
| Space Heating: Baseboard | \$500        | 100%       |
| Clothes Drying           | \$200        | 5%         |
| Cooking                  | \$200        | 5%         |
| Water Heating            | \$200        | 70%        |
| Space Heating            | \$700        | 100%       |

### Total Customers: Electric and/or Gas Customers/Territory

|               | New     | Existing |
|---------------|---------|----------|
| Single Family | NA      | 883,839  |
| Commercial    | 107,443 | 172,072  |
| MultiFamily   | 200,715 | NA       |

### Distribution by Single Family Home Size

|                   |     |
|-------------------|-----|
| SFam - 1800 sq ft | 50% |
| SFam - 2100 sq ft | 10% |
| SFam - 2400 sq ft | 40% |

## Fuel Conversion Measure Assumptions

| Sector                | End Use                  | Measure                 | Vintage  | Baseline                                 | kWh/yr at meter | Elec Equip Cost | Therms/yr at meter | Gas Equip Cost |
|-----------------------|--------------------------|-------------------------|----------|--|-----------------|-----------------|--------------------|----------------|
| SFam - 1800 sq ft     | Space Heating: Ducted    | 90% Furnace             | Existing | Electric Furnace                         | 7,961           | \$1,500         | 507                | \$2,950        |
| SFam - 1800 sq ft     | Space Heating: Baseboard | Wall Heater 84% eff     | Existing | Baseboard Heating                        | 6,130           | \$249           | 418                | \$1,549        |
| SFam - 2100 sq ft     | Space Heating: Ducted    | 90% Furnace             | Existing | Electric Furnace                         | 9,287           | \$1,500         | 591                | \$2,950        |
| SFam - 2100 sq ft     | Space Heating: Baseboard | Wall Heater 84% eff     | Existing | Baseboard Heating                        | 7,151           | \$299           | 488                | \$1,549        |
| SFam - 2400 sq ft     | Space Heating: Ducted    | 90% Furnace             | Existing | Electric Furnace                         | 10,614          | \$1,500         | 676                | \$2,950        |
| SFam - 2400 sq ft     | Space Heating: Baseboard | Wall Heater 84% eff     | Existing | Baseboard Heating                        | 8,173           | \$349           | 558                | \$1,549        |
| SFam - 1800 sq ft     | Clothes Drying           | Moisture Sensor Dryer   | Existing | Electric dryer w/ moisture sens, 7.0cuft | 755             | \$410           | 32                 | \$479          |
| SFam - 1800 sq ft     | Cooking                  | Convection Cooking      | Existing | Convection Electric range, 30"           | 339             | \$719           | 15                 | \$649          |
| SFam - 1800 sq ft     | Water Heating            | Tankless WH             | Existing | Electric Water Heater, 50 gal.           | 3,348           | \$239           | 172                | \$734          |
| SFam - 1800 sq ft     | Water Heating            | Condensing WH (>80% EF) | Existing | Electric Water Heater, 50 gal.           | 3,348           | \$239           | 190                | \$812          |
| SFam - 2100 sq ft     | Clothes Drying           | Moisture Sensor Dryer   | Existing | Electric dryer w/ moisture sens, 7.0cuft | 755             | \$410           | 32                 | \$479          |
| SFam - 2100 sq ft     | Cooking                  | Convection Cooking      | Existing | Convection Electric range, 30"           | 339             | \$719           | 15                 | \$649          |
| SFam - 2100 sq ft     | Water Heating            | Tankless WH             | Existing | Electric Water Heater, 50 gal.           | 3,348           | \$239           | 172                | \$734          |
| SFam - 2100 sq ft     | Water Heating            | Condensing WH (>80% EF) | Existing | Electric Water Heater, 50 gal.           | 3,348           | \$239           | 190                | \$812          |
| SFam - 2400 sq ft     | Clothes Drying           | Moisture Sensor Dryer   | Existing | Electric dryer w/ moisture sens, 7.0cuft | 755             | \$410           | 32                 | \$479          |
| SFam - 2400 sq ft     | Cooking                  | Convection Cooking      | Existing | Convection Electric range, 30"           | 339             | \$719           | 15                 | \$649          |
| SFam - 2400 sq ft     | Water Heating            | Tankless WH             | Existing | Electric Water Heater, 50 gal.           | 3,348           | \$239           | 172                | \$734          |
| SFam - 2400 sq ft     | Water Heating            | Condensing WH (>80% EF) | Existing | Electric Water Heater, 50 gal.           | 3,348           | \$239           | 190                | \$812          |
| Commercial            | Space Heating: Ducted    | 90% Furnace             | Existing | Electric Furnace                         | 27,124          | \$6,300         | 2,175              | \$6,034        |
| Commercial            | Water Heating            | Tankless WH             | Existing | Electric Water Heater, 50 gal.           | 8,279           | \$650           | 748                | \$1,874        |
| Commercial            | Water Heating            | Condensing WH (>80% EF) | Existing | Electric Water Heater, 50 gal.           | 8,279           | \$650           | 748                | \$2,678        |
| Commercial            | Water Heating            | Tankless WH             | New      | Electric Water Heater, 50 gal.           | 8,605           | \$650           | 815                | \$1,874        |
| Commercial            | Water Heating            | Condensing WH (>80% EF) | New      | Electric Water Heater, 50 gal.           | 8,605           | \$650           | 815                | \$2,678        |
| Commercial            | Space Heating: Ducted    | 90% Furnace             | New      | Electric Furnace                         | 18,297          | \$4,222         | 1,467              | \$4,212        |
| MFam Mid Rise: Renter | Space Heating: Ducted    | 90% Furnace             | New      | Electric Furnace                         | 3,361           | \$1,500         | 299                | \$2,950        |
| MFam Mid Rise: Renter | Space Heating: Baseboard | 90% Furnace             | New      | Baseboard Heating                        | 2,588           | \$249           | 299                | \$2,950        |
| MFam Mid Rise: Renter | Clothes Drying           | Moisture Sensor Dryer   | New      | Electric dryer w/ moisture sens, 7.0cuft | 654             | \$410           | 32                 | \$479          |
| MFam Mid Rise: Renter | Cooking                  | Convection Cooking      | New      | Convection Electric range, 30"           | 440             | \$719           | 19                 | \$649          |
| MFam Mid Rise: Renter | Water Heating            | Tankless WH             | New      | Electric Water Heater, 50 gal.           | 1,696           | \$239           | 125                | \$734          |
| MFam Mid Rise: Renter | Water Heating            | Condensing WH (>80% EF) | New      | Electric Water Heater, 50 gal.           | 1,696           | \$239           | 128                | \$812          |
| MFam Low Rise: Renter | Space Heating: Ducted    | 90% Furnace             | New      | Electric Furnace                         | 3,361           | \$1,500         | 299                | \$2,950        |
| MFam Low Rise: Renter | Space Heating: Baseboard | 90% Furnace             | New      | Baseboard Heating                        | 2,588           | \$249           | 299                | \$2,950        |
| MFam Low Rise: Renter | Clothes Drying           | Moisture Sensor Dryer   | New      | Electric dryer w/ moisture sens, 7.0cuft | 654             | \$410           | 32                 | \$479          |
| MFam Low Rise: Renter | Cooking                  | Convection Cooking      | New      | Convection Electric range, 30"           | 440             | \$719           | 19                 | \$649          |
| MFam Low Rise: Renter | Water Heating            | Tankless WH             | New      | Electric Water Heater, 50 gal.           | 1,696           | \$239           | 125                | \$734          |
| MFam Low Rise: Renter | Water Heating            | Condensing WH (>80% EF) | New      | Electric Water Heater, 50 gal.           | 1,696           | \$239           | 128                | \$812          |
| MFam Mid Rise: Owner  | Space Heating: Ducted    | 90% Furnace             | New      | Electric Furnace                         | 3,361           | \$1,500         | 299                | \$2,950        |
| MFam Mid Rise: Owner  | Space Heating: Baseboard | 90% Furnace             | New      | Baseboard Heating                        | 2,588           | \$249           | 299                | \$2,950        |
| MFam Mid Rise: Owner  | Clothes Drying           | Moisture Sensor Dryer   | New      | Electric dryer w/ moisture sens, 7.0cuft | 654             | \$410           | 32                 | \$479          |
| MFam Mid Rise: Owner  | Cooking                  | Convection Cooking      | New      | Convection Electric range, 30"           | 440             | \$719           | 19                 | \$649          |
| MFam Mid Rise: Owner  | Water Heating            | Tankless WH             | New      | Electric Water Heater, 50 gal.           | 1,696           | \$239           | 125                | \$734          |
| MFam Mid Rise: Owner  | Water Heating            | Condensing WH (>80% EF) | New      | Electric Water Heater, 50 gal.           | 1,696           | \$239           | 128                | \$812          |
| MFam Low Rise: Owner  | Space Heating: Ducted    | 90% Furnace             | New      | Electric Furnace                         | 3,361           | \$1,500         | 299                | \$2,950        |
| MFam Low Rise: Owner  | Space Heating: Baseboard | 90% Furnace             | New      | Baseboard Heating                        | 2,588           | \$249           | 299                | \$2,950        |
| MFam Low Rise: Owner  | Clothes Drying           | Moisture Sensor Dryer   | New      | Electric dryer w/ moisture sens, 7.0cuft | 654             | \$410           | 32                 | \$479          |
| MFam Low Rise: Owner  | Cooking                  | Convection Cooking      | New      | Convection Electric range, 30"           | 440             | \$719           | 19                 | \$649          |
| MFam Low Rise: Owner  | Water Heating            | Tankless WH             | New      | Electric Water Heater, 50 gal.           | 1,696           | \$239           | 125                | \$734          |
| MFam Low Rise: Owner  | Water Heating            | Condensing WH (>80% EF) | New      | Electric Water Heater, 50 gal.           | 1,696           | \$239           | 128                | \$812          |

# Appendix E: Supplemental Material—Demand Response

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# Appendix E: Demand Response Resource Materials: Detailed Program Results – Year, Peak Season, and Market Segment

## All Demand Response Programs by Year and Peak Season

**Table E.1. Achievable Technical Potential, Cost, and Customers by Year and Peak Season**

| Year | Winter  |                |           | Summer |                |           |
|------|---------|----------------|-----------|--------|----------------|-----------|
|      | kW      | Cost (2008 \$) | Customers | kW     | Cost (2008 \$) | Customers |
| 2010 | 4,047   | 2,619,864      | 3,690     | 1,458  | 524,435        | 2,275     |
| 2011 | 9,643   | 1,809,046      | 8,796     | 3,472  | 860,198        | 5,424     |
| 2012 | 16,875  | 2,504,836      | 15,399    | 6,072  | 1,258,814      | 9,497     |
| 2013 | 31,566  | 4,660,706      | 28,819    | 11,351 | 2,467,974      | 17,775    |
| 2014 | 54,146  | 7,333,631      | 49,455    | 19,458 | 3,981,857      | 30,505    |
| 2015 | 99,963  | 14,056,267     | 91,340    | 35,901 | 7,752,845      | 56,347    |
| 2016 | 124,687 | 11,646,491     | 113,976   | 44,754 | 6,538,222      | 70,317    |
| 2017 | 142,523 | 11,403,136     | 130,330   | 51,127 | 6,466,370      | 80,413    |
| 2018 | 153,042 | 10,674,691     | 140,000   | 54,870 | 6,108,830      | 86,386    |
| 2019 | 160,634 | 10,571,978     | 146,997   | 57,562 | 6,078,360      | 90,711    |
| 2020 | 163,493 | 9,880,523      | 149,665   | 58,557 | 5,715,093      | 92,364    |
| 2021 | 166,351 | 10,040,346     | 152,332   | 59,551 | 5,810,262      | 94,017    |
| 2022 | 169,210 | 10,200,168     | 154,999   | 60,546 | 5,905,432      | 95,670    |
| 2023 | 172,069 | 10,359,990     | 157,667   | 61,540 | 6,000,601      | 97,322    |
| 2024 | 174,928 | 10,519,813     | 160,334   | 62,535 | 6,095,770      | 98,975    |
| 2025 | 177,786 | 10,679,635     | 163,001   | 63,529 | 6,190,940      | 100,628   |
| 2026 | 180,645 | 10,839,457     | 165,669   | 64,524 | 6,286,109      | 102,281   |
| 2027 | 183,504 | 10,999,279     | 168,336   | 65,518 | 6,381,278      | 103,934   |
| 2028 | 186,362 | 11,159,102     | 171,003   | 66,513 | 6,476,447      | 105,587   |
| 2029 | 189,221 | 11,318,924     | 173,670   | 67,507 | 6,571,617      | 107,240   |

Note: Costs assume no AMR installations for direct load control programs.

**Table E.2. Achievable Technical Potential (MW) by Market Segment (2029)  
and Peak Season**

| Market Segment               | Achievable Potential<br>- Winter | Achievable Potential -<br>Summer |
|------------------------------|----------------------------------|----------------------------------|
| Single Family                | 117.99                           | 38.10                            |
| Multifamily                  | 35.69                            | 6.29                             |
| Manufactured                 | 16.26                            | 3.76                             |
| Grocery                      | 0.97                             | 1.07                             |
| Health                       | 1.44                             | 1.69                             |
| Office                       | 6.07                             | 6.27                             |
| Retail                       | 1.43                             | 1.52                             |
| Lodging                      | 0.25                             | 0.21                             |
| Other Comm                   | 1.11                             | 1.16                             |
| Restaurant                   | 0.50                             | 0.54                             |
| Education                    | 1.93                             | 1.29                             |
| Warehouse                    | 0.47                             | 0.52                             |
| Food Mfg                     | 0.26                             | 0.36                             |
| Primary Metal Mfg            | 0.03                             | 0.03                             |
| Paper Mfg                    | 0.25                             | 0.24                             |
| Plastics Rubber Products     | 0.25                             | 0.38                             |
| Chemical Mfg                 | 0.46                             | 0.38                             |
| Nonmetallic Mineral Products | 0.10                             | 0.11                             |
| Industrial Machinery         | 0.05                             | 0.05                             |
| Fabricated Metal Products    | 0.19                             | 0.17                             |
| Printing Related Support     | 0.00                             | 0.00                             |
| Transportation Equipment Mfg | 0.79                             | 0.73                             |
| Electrical Equipment Mfg     | 0.00                             | 0.00                             |
| Wood Product Mfg             | 0.17                             | 0.16                             |
| Miscellaneous Mfg            | 0.08                             | 0.12                             |
| Petroleum Coal Products      | 2.36                             | 2.21                             |
| Computer Electronic Mfg      | 0.12                             | 0.13                             |
| Waste Water                  | 0.01                             | 0.01                             |
| Water                        | 0.00                             | 0.01                             |

## Summer DLC - Residential AC and Water Heat

**Table E.3. Achievable Technical Potential (kW) by Year: Summer Direct Load Control – Residential Air Conditioning and Water Heat**

| Year | kW    | Customers | Cost (2008 \$) |            |           |
|------|-------|-----------|----------------|------------|-----------|
|      |       |           | No AMR         | AMR to AMI | AMI       |
| 2010 | 174   | 429       | 90,517         | 125,659    | 93,731    |
| 2011 | 414   | 1,023     | 149,975        | 204,067    | 157,638   |
| 2012 | 725   | 1,791     | 220,890        | 296,792    | 234,307   |
| 2013 | 1,357 | 3,352     | 432,377        | 582,988    | 457,489   |
| 2014 | 2,328 | 5,753     | 699,352        | 938,573    | 742,450   |
| 2015 | 4,301 | 10,626    | 1,359,101      | 1,831,333  | 1,438,709 |
| 2016 | 5,367 | 13,261    | 1,167,170      | 1,517,926  | 1,266,514 |
| 2017 | 6,138 | 15,165    | 1,164,597      | 1,488,967  | 1,278,205 |
| 2018 | 6,594 | 16,292    | 1,110,123      | 1,394,999  | 1,232,171 |
| 2019 | 6,924 | 17,107    | 1,109,330      | 1,383,042  | 1,237,488 |
| 2020 | 7,050 | 17,419    | 1,049,953      | 1,292,753  | 1,180,446 |
| 2021 | 7,176 | 17,731    | 1,067,886      | 1,314,645  | 1,200,714 |
| 2022 | 7,302 | 18,042    | 1,085,818      | 1,336,536  | 1,220,981 |
| 2023 | 7,429 | 18,354    | 1,103,751      | 1,358,428  | 1,241,249 |
| 2024 | 7,555 | 18,666    | 1,121,684      | 1,380,319  | 1,261,517 |
| 2025 | 7,681 | 18,977    | 1,139,617      | 1,402,211  | 1,281,785 |
| 2026 | 7,807 | 19,289    | 1,157,549      | 1,424,103  | 1,302,053 |
| 2027 | 7,933 | 19,601    | 1,175,482      | 1,445,994  | 1,322,320 |
| 2028 | 8,059 | 19,912    | 1,193,415      | 1,467,886  | 1,342,588 |
| 2029 | 8,186 | 20,224    | 1,211,347      | 1,489,777  | 1,362,856 |

**Table E.4. Achievable Technical Potential (MW) by Market Segment (2029): Summer Direct Load Control- Residential Air Conditioning and Water Heat**

| Market Segment | Achievable Potential |
|----------------|----------------------|
| Single Family  | 7.16                 |
| Multifamily    | 0.18                 |
| Manufactured   | 0.84                 |

## Summer Critical Peak Pricing - Residential

**Table E.5. Achievable Technical Potential (kW) by Year: Summer Critical Peak Pricing - Residential**

| Year | kW     | Customers | Cost (2008 \$) |
|------|--------|-----------|----------------|
| 2010 | 848    | 1,843     | 404,212        |
| 2011 | 2,021  | 4,394     | 646,643        |
| 2012 | 3,539  | 7,693     | 931,362        |
| 2013 | 6,623  | 14,398    | 1,834,455      |
| 2014 | 11,367 | 24,711    | 2,942,654      |
| 2015 | 20,996 | 45,643    | 5,759,654      |
| 2016 | 26,202 | 56,960    | 4,640,271      |
| 2017 | 29,964 | 65,138    | 4,486,987      |
| 2018 | 32,190 | 69,977    | 4,141,258      |
| 2019 | 33,801 | 73,480    | 4,077,086      |
| 2020 | 34,417 | 74,819    | 3,768,035      |
| 2021 | 35,033 | 76,158    | 3,831,341      |
| 2022 | 35,649 | 77,497    | 3,894,646      |
| 2023 | 36,265 | 78,835    | 3,957,952      |
| 2024 | 36,881 | 80,174    | 4,021,258      |
| 2025 | 37,497 | 81,513    | 4,084,563      |
| 2026 | 38,113 | 82,852    | 4,147,869      |
| 2027 | 38,729 | 84,191    | 4,211,174      |
| 2028 | 39,344 | 85,530    | 4,274,480      |
| 2029 | 39,960 | 86,869    | 4,337,786      |

**Table E.6. Achievable Technical Potential (MW) by Market Segment (2029): Summer Critical Peak Pricing - Residential**

| Market Segment | Achievable Potential |
|----------------|----------------------|
| Single Family  | 30.94                |
| Multifamily    | 6.10                 |
| Manufactured   | 2.92                 |

## Summer Direct Load Control - Commercial

**Table E.7. Achievable Technical Potential (kW) by Year: Summer Direct Load Control - Commercial**

| Year | kW    | Customers | Cost (2008 \$) |
|------|-------|-----------|----------------|
| 2010 | 60    | 1         | 11,441         |
| 2011 | 145   | 3         | 21,346         |
| 2012 | 255   | 6         | 33,728         |
| 2013 | 481   | 12        | 65,364         |
| 2014 | 832   | 20        | 108,854        |
| 2015 | 1,546 | 37        | 208,817        |
| 2016 | 1,942 | 46        | 211,009        |
| 2017 | 2,234 | 53        | 226,127        |
| 2018 | 2,413 | 58        | 230,447        |
| 2019 | 2,548 | 61        | 237,695        |
| 2020 | 2,608 | 62        | 235,354        |
| 2021 | 2,668 | 64        | 240,628        |
| 2022 | 2,728 | 65        | 245,902        |
| 2023 | 2,788 | 67        | 251,175        |
| 2024 | 2,848 | 68        | 256,449        |
| 2025 | 2,908 | 70        | 261,722        |
| 2026 | 2,968 | 71        | 266,996        |
| 2027 | 3,028 | 72        | 272,270        |
| 2028 | 3,088 | 74        | 277,543        |
| 2029 | 3,148 | 75        | 282,817        |

**Table E.8. Achievable Technical Potential (MW) by Market Segment (2029): Summer Direct Load Control – Commercial**

| Market Segment | Achievable Potential |
|----------------|----------------------|
| Grocery        | 0.21                 |
| Health         | 0.30                 |
| Office         | 1.70                 |
| Retail         | 0.20                 |
| Lodging        | 0.02                 |
| Other Comm     | 0.14                 |
| Restaurant     | 0.09                 |
| Education      | 0.32                 |
| Warehouse      | 0.16                 |

## Summer Interruptible Loads - Commercial and Industrial

**Table E.9. Achievable Technical Potential (kW) by Year: Summer Interruptible Loads - Commercial and Industrial**

| Year | kW     | Customers | Cost (2008 \$) |
|------|--------|-----------|----------------|
| 2010 | 341    | 1         | 17,600         |
| 2011 | 807    | 3         | 40,949         |
| 2012 | 1,404  | 5         | 70,774         |
| 2013 | 2,612  | 9         | 131,850        |
| 2014 | 4,455  | 15        | 224,464        |
| 2015 | 8,182  | 28        | 412,941        |
| 2016 | 10,153 | 35        | 506,741        |
| 2017 | 11,548 | 40        | 574,538        |
| 2018 | 12,341 | 43        | 612,482        |
| 2019 | 12,893 | 45        | 639,283        |
| 2020 | 13,063 | 45        | 646,891        |
| 2021 | 13,234 | 46        | 655,318        |
| 2022 | 13,404 | 46        | 663,746        |
| 2023 | 13,574 | 47        | 672,174        |
| 2024 | 13,744 | 47        | 680,602        |
| 2025 | 13,915 | 48        | 689,030        |
| 2026 | 14,085 | 49        | 697,457        |
| 2027 | 14,255 | 49        | 705,885        |
| 2028 | 14,426 | 50        | 714,313        |
| 2029 | 14,596 | 50        | 722,741        |



**Table E.10. Achievable Technical Potential (MW) by Market Segment (2029): Summer Interruptible Loads - Commercial and Industrial**

| Market Segment               | Achievable Potential |
|------------------------------|----------------------|
| Grocery                      | 0.68                 |
| Health                       | 1.27                 |
| Office                       | 4.16                 |
| Retail                       | 1.14                 |
| Lodging                      | 0.15                 |
| Other Comm                   | 0.92                 |
| Restaurant                   | 0.41                 |
| Education                    | 0.85                 |
| Warehouse                    | 0.29                 |
| Food Mfg                     | 0.33                 |
| Primary Metal Mfg            | 0.03                 |
| Paper Mfg                    | 0.22                 |
| Plastics Rubber Products     | 0.35                 |
| Chemical Mfg                 | 0.35                 |
| Nonmetallic Mineral Products | 0.10                 |
| Industrial Machinery         | 0.04                 |
| Fabricated Metal Products    | 0.16                 |
| Printing Related Support     | 0.00                 |
| Transportation Equipment Mfg | 0.68                 |
| Electrical Equipment Mfg     | 0.00                 |
| Wood Product Mfg             | 0.15                 |
| Miscellaneous Mfg            | 0.11                 |
| Petroleum Coal Products      | 2.06                 |
| Computer Electronic Mfg      | 0.12                 |
| Waste Water                  | 0.01                 |
| Water                        | 0.00                 |

## Summer Demand Bidding – Commercial and Industrial

**Table E.11. Achievable Technical Potential (kW) by Year: Summer Demand Bidding - Commercial and Industrial**

| Year | kW    | Customers | Cost (2008 \$) |
|------|-------|-----------|----------------|
| 2010 | 36    | 0         | 665            |
| 2011 | 85    | 1         | 1,286          |
| 2012 | 149   | 2         | 2,060          |
| 2013 | 278   | 4         | 3,928          |
| 2014 | 475   | 6         | 6,534          |
| 2015 | 876   | 11        | 12,332         |
| 2016 | 1,090 | 14        | 13,031         |
| 2017 | 1,243 | 16        | 14,122         |
| 2018 | 1,332 | 17        | 14,520         |
| 2019 | 1,396 | 18        | 14,966         |
| 2020 | 1,418 | 19        | 14,860         |
| 2021 | 1,440 | 19        | 15,089         |
| 2022 | 1,462 | 19        | 15,319         |
| 2023 | 1,484 | 19        | 15,549         |
| 2024 | 1,507 | 20        | 15,778         |
| 2025 | 1,529 | 20        | 16,008         |
| 2026 | 1,551 | 20        | 16,237         |
| 2027 | 1,573 | 21        | 16,467         |
| 2028 | 1,595 | 21        | 16,697         |
| 2029 | 1,618 | 21        | 16,926         |

**Table E.12. Achievable Technical Potential (MW) by Market Segment (2029): Summer Demand Bidding - Commercial and Industrial**

| Market Segment               | Achievable Potential |
|------------------------------|----------------------|
| Grocery                      | 0.18                 |
| Health                       | 0.12                 |
| Office                       | 0.40                 |
| Retail                       | 0.18                 |
| Lodging                      | 0.03                 |
| Other Comm                   | 0.10                 |
| Restaurant                   | 0.03                 |
| Education                    | 0.12                 |
| Warehouse                    | 0.06                 |
| Food Mfg                     | 0.03                 |
| Primary Metal Mfg            | 0.00                 |
| Paper Mfg                    | 0.02                 |
| Plastics Rubber Products     | 0.03                 |
| Chemical Mfg                 | 0.03                 |
| Nonmetallic Mineral Products | 0.01                 |
| Industrial Machinery         | 0.00                 |
| Fabricated Metal Products    | 0.01                 |
| Printing Related Support     | 0.00                 |
| Transportation Equipment Mfg | 0.06                 |
| Electrical Equipment Mfg     | 0.00                 |
| Wood Product Mfg             | 0.01                 |
| Miscellaneous Mfg            | 0.01                 |
| Petroleum Coal Products      | 0.15                 |
| Computer Electronic Mfg      | 0.01                 |
| Waste Water                  | 0.00                 |
| Water                        | 0.00                 |

## Winter DLC – Residential Space Heat-Water Heat and Room Heat-Water Heat Programs

**Table E.13. Achievable Technical Potential (kW) by Year: Winter Direct Load Control – Residential**

| Year | Space Heat-Water Heat Program |           |                |            |           | Room Heat-Water Heat Program |           |                |            |         |
|------|-------------------------------|-----------|----------------|------------|-----------|------------------------------|-----------|----------------|------------|---------|
|      | kW                            | Customers | Cost (2008 \$) |            |           | kW                           | Customers | Cost (2008 \$) |            |         |
|      |                               |           | No AMR         | AMR to AMI | AMI       |                              |           | No AMR         | AMR to AMI | AMI     |
| 2010 | 1,006                         | 992       | 669,340        | 750,909    | 676,801   | 1,150                        | 852       | 313,974        | 404,212    | 267,483 |
| 2011 | 2,398                         | 2,364     | 406,783        | 532,297    | 424,567   | 2,742                        | 2,030     | 498,808        | 646,643    | 90,647  |
| 2012 | 4,197                         | 4,138     | 570,660        | 746,732    | 601,790   | 4,800                        | 3,554     | 715,116        | 931,362    | 120,225 |
| 2013 | 7,853                         | 7,743     | 1,059,394      | 1,408,709  | 1,117,646 | 8,982                        | 6,651     | 1,410,016      | 1,834,455  | 180,808 |
| 2014 | 13,476                        | 13,287    | 1,676,190      | 2,230,903  | 1,776,146 | 15,412                       | 11,412    | 2,257,649      | 2,942,654  | 272,635 |
| 2015 | 24,887                        | 24,537    | 3,200,301      | 4,295,166  | 3,384,898 | 28,463                       | 21,076    | 4,424,456      | 5,759,654  | 459,528 |
| 2016 | 31,051                        | 30,616    | 2,756,486      | 3,569,399  | 2,986,811 | 35,513                       | 26,297    | 3,517,113      | 4,640,271  | 552,282 |
| 2017 | 35,504                        | 35,006    | 2,750,177      | 3,501,732  | 3,013,527 | 40,606                       | 30,068    | 3,377,070      | 4,486,987  | 619,327 |
| 2018 | 38,135                        | 37,600    | 2,624,023      | 3,283,885  | 2,906,891 | 43,615                       | 32,296    | 3,093,554      | 4,141,258  | 656,780 |
| 2019 | 40,038                        | 39,476    | 2,621,857      | 3,255,735  | 2,918,840 | 45,791                       | 33,908    | 3,034,570      | 4,077,086  | 683,211 |
| 2020 | 40,762                        | 40,190    | 2,484,449      | 3,046,607  | 2,786,799 | 46,619                       | 34,520    | 2,788,178      | 3,768,035  | 690,621 |
| 2021 | 41,485                        | 40,903    | 2,525,537      | 3,096,793  | 2,833,253 | 47,446                       | 35,133    | 2,834,478      | 3,831,341  | 698,869 |
| 2022 | 42,208                        | 41,616    | 2,566,625      | 3,146,979  | 2,879,708 | 48,274                       | 35,746    | 2,880,779      | 3,894,646  | 707,117 |
| 2023 | 42,932                        | 42,330    | 2,607,713      | 3,197,164  | 2,926,162 | 49,101                       | 36,358    | 2,927,079      | 3,957,952  | 715,366 |
| 2024 | 43,655                        | 43,043    | 2,648,801      | 3,247,350  | 2,972,616 | 49,928                       | 36,971    | 2,973,380      | 4,021,258  | 723,614 |
| 2025 | 44,379                        | 43,756    | 2,689,889      | 3,297,536  | 3,019,071 | 50,756                       | 37,584    | 3,019,680      | 4,084,563  | 731,862 |
| 2026 | 45,102                        | 44,470    | 2,730,977      | 3,347,722  | 3,065,525 | 51,583                       | 38,197    | 3,065,981      | 4,147,869  | 740,110 |
| 2027 | 45,826                        | 45,183    | 2,772,065      | 3,397,908  | 3,111,980 | 52,411                       | 38,809    | 3,112,281      | 4,211,174  | 748,359 |
| 2028 | 46,549                        | 45,896    | 2,813,153      | 3,448,093  | 3,158,434 | 53,238                       | 39,422    | 3,158,582      | 4,274,480  | 756,607 |
| 2029 | 47,273                        | 46,610    | 2,854,241      | 3,498,279  | 3,204,888 | 54,066                       | 40,035    | 3,204,882      | 4,337,786  | 764,855 |

**Table E.14. Achievable Technical Potential (MW) by Market Segment (2029): Winter Direct Load Control - Residential Space Heat-Water Heat and Room Heat-Water Heat Programs**

| Market Segment | Space Heat and Water Heat | Room Heat and Water Heat |
|----------------|---------------------------|--------------------------|
| Single Family  | 35.24                     | 32.63                    |
| Multifamily    | 2.74                      | 19.59                    |
| Manufactured   | 9.29                      | 1.85                     |

## Winter Critical Peak Pricing - Residential

**Table E.15. Achievable Technical Potential (kW) by Year: Winter Critical Peak Pricing - Residential**

| Year | kW     | Customers | Cost (2008 \$) |
|------|--------|-----------|----------------|
| 2010 | 1,455  | 1,843     | 864,211        |
| 2011 | 3,470  | 4,394     | 706,643        |
| 2012 | 6,076  | 7,693     | 991,362        |
| 2013 | 11,371 | 14,398    | 1,894,455      |
| 2014 | 19,516 | 24,711    | 3,002,654      |
| 2015 | 36,048 | 45,643    | 5,819,654      |
| 2016 | 44,986 | 56,960    | 4,700,271      |
| 2017 | 51,445 | 65,138    | 4,546,987      |
| 2018 | 55,266 | 69,977    | 4,201,258      |
| 2019 | 58,033 | 73,480    | 4,137,086      |
| 2020 | 59,090 | 74,819    | 3,828,035      |
| 2021 | 60,148 | 76,158    | 3,891,341      |
| 2022 | 61,205 | 77,497    | 3,954,646      |
| 2023 | 62,263 | 78,835    | 4,017,952      |
| 2024 | 63,320 | 80,174    | 4,081,258      |
| 2025 | 64,377 | 81,513    | 4,144,563      |
| 2026 | 65,435 | 82,852    | 4,207,869      |
| 2027 | 66,492 | 84,191    | 4,271,174      |
| 2028 | 67,550 | 85,530    | 4,334,480      |
| 2029 | 68,607 | 86,869    | 4,397,786      |

**Table E.16. Achievable Technical Potential by Market Segment (2029): Winter Critical Peak Pricing - Residential**

| Market Segment | Achievable Potential |
|----------------|----------------------|
| Single Family  | 50.12                |
| Multifamily    | 13.36                |
| Manufactured   | 5.12                 |

## Winter Direct Load Control - Commercial

**Table E.17. Achievable Technical Potential (kW) by Year: Winter Direct Load Control - Commercial**

| Year | kW    | Customers | Cost (2008 \$) |
|------|-------|-----------|----------------|
| 2010 | 62    | 1         | 260,310        |
| 2011 | 150   | 3         | 69,730         |
| 2012 | 264   | 5         | 81,581         |
| 2013 | 498   | 10        | 110,998        |
| 2014 | 861   | 18        | 152,042        |
| 2015 | 1,600 | 33        | 244,998        |
| 2016 | 2,009 | 42        | 252,829        |
| 2017 | 2,311 | 48        | 269,693        |
| 2018 | 2,497 | 52        | 275,979        |
| 2019 | 2,636 | 55        | 283,982        |
| 2020 | 2,698 | 56        | 282,976        |
| 2021 | 2,760 | 57        | 288,220        |
| 2022 | 2,822 | 59        | 293,464        |
| 2023 | 2,885 | 60        | 298,708        |
| 2024 | 2,947 | 61        | 303,952        |
| 2025 | 3,009 | 63        | 309,196        |
| 2026 | 3,071 | 64        | 314,440        |
| 2027 | 3,133 | 65        | 319,684        |
| 2028 | 3,195 | 66        | 324,929        |
| 2029 | 3,257 | 68        | 330,173        |

**Table E.18. Achievable Technical Potential by Market Segment (2029): Winter Direct Load Control – Commercial**

| Market Segment | Achievable Potential |
|----------------|----------------------|
| Grocery        | 0.18                 |
| Health         | 0.25                 |
| Office         | 1.70                 |
| Retail         | 0.19                 |
| Lodging        | 0.03                 |
| Other Comm     | 0.15                 |
| Restaurant     | 0.08                 |
| Education      | 0.54                 |
| Warehouse      | 0.14                 |

## Winter Interruptible Loads – Commercial and Industrial

**Table E.19. Achievable Technical Potential (kW) by Year: Winter Interruptible Loads - Commercial and Industrial**

| Year | kW     | Customers | Cost (2008 \$) |
|------|--------|-----------|----------------|
| 2010 | 338    | 1         | 267,483        |
| 2011 | 800    | 3         | 90,647         |
| 2012 | 1,391  | 5         | 120,225        |
| 2013 | 2,587  | 9         | 180,808        |
| 2014 | 4,412  | 15        | 272,635        |
| 2015 | 8,101  | 28        | 459,528        |
| 2016 | 10,051 | 35        | 552,282        |
| 2017 | 11,430 | 40        | 619,327        |
| 2018 | 12,213 | 43        | 656,780        |
| 2019 | 12,757 | 44        | 683,211        |
| 2020 | 12,923 | 45        | 690,621        |
| 2021 | 13,090 | 46        | 698,869        |
| 2022 | 13,256 | 46        | 707,117        |
| 2023 | 13,423 | 47        | 715,366        |
| 2024 | 13,589 | 47        | 723,614        |
| 2025 | 13,756 | 48        | 731,862        |
| 2026 | 13,922 | 49        | 740,110        |
| 2027 | 14,089 | 49        | 748,359        |
| 2028 | 14,255 | 50        | 756,607        |
| 2029 | 14,422 | 50        | 764,855        |

**Table E.20. Achievable Technical Potential by Market Segment (2029): Winter Interruptible Loads - Commercial and Industrial**

| Market Segment               | Achievable Potential |
|------------------------------|----------------------|
| Grocery                      | 0.62                 |
| Health                       | 1.09                 |
| Office                       | 3.98                 |
| Retail                       | 1.07                 |
| Lodging                      | 0.18                 |
| Other Comm                   | 0.87                 |
| Restaurant                   | 0.39                 |
| Education                    | 1.22                 |
| Warehouse                    | 0.27                 |
| Food Mfg                     | 0.24                 |
| Primary Metal Mfg            | 0.03                 |
| Paper Mfg                    | 0.23                 |
| Plastics Rubber Products     | 0.23                 |
| Chemical Mfg                 | 0.43                 |
| Nonmetallic Mineral Products | 0.10                 |
| Industrial Machinery         | 0.05                 |
| Fabricated Metal Products    | 0.17                 |
| Printing Related Support     | 0.00                 |
| Transportation Equipment Mfg | 0.73                 |
| Electrical Equipment Mfg     | 0.00                 |
| Wood Product Mfg             | 0.16                 |
| Miscellaneous Mfg            | 0.07                 |
| Petroleum Coal Products      | 2.20                 |
| Computer Electronic Mfg      | 0.11                 |
| Waste Water                  | 0.00                 |
| Water                        | 0.00                 |



## Winter Demand Bidding – Commercial and Industrial

**Table E.21. Achievable Technical Potential (kW) by Year: Winter Commercial and Industrial Demand Bidding**

| Year | kW    | Customers | Cost (2008 \$) |
|------|-------|-----------|----------------|
| 2010 | 35    | 1         | 250,939        |
| 2011 | 84    | 2         | 51,671         |
| 2012 | 147   | 4         | 52,563         |
| 2013 | 274   | 7         | 54,943         |
| 2014 | 470   | 12        | 58,099         |
| 2015 | 865   | 21        | 65,484         |
| 2016 | 1,077 | 27        | 64,841         |
| 2017 | 1,228 | 30        | 65,508         |
| 2018 | 1,316 | 33        | 65,445         |
| 2019 | 1,379 | 34        | 65,713         |
| 2020 | 1,400 | 35        | 65,303         |
| 2021 | 1,422 | 35        | 65,537         |
| 2022 | 1,444 | 36        | 65,770         |
| 2023 | 1,466 | 36        | 66,003         |
| 2024 | 1,488 | 37        | 66,237         |
| 2025 | 1,510 | 37        | 66,470         |
| 2026 | 1,531 | 38        | 66,703         |
| 2027 | 1,553 | 39        | 66,937         |
| 2028 | 1,575 | 39        | 67,170         |
| 2029 | 1,597 | 40        | 67,404         |

**Table E.22. Achievable Technical Potential by Market Segment (2029): Winter Demand Bidding - Commercial and Industrial**

| Market Segment               | Achievable Potential |
|------------------------------|----------------------|
| Grocery                      | 0.17                 |
| Health                       | 0.10                 |
| Office                       | 0.39                 |
| Retail                       | 0.17                 |
| Lodging                      | 0.04                 |
| Other Comm                   | 0.10                 |
| Restaurant                   | 0.03                 |
| Education                    | 0.17                 |
| Warehouse                    | 0.06                 |
| Food Mfg                     | 0.02                 |
| Primary Metal Mfg            | 0.00                 |
| Paper Mfg                    | 0.02                 |
| Plastics Rubber Products     | 0.02                 |
| Chemical Mfg                 | 0.03                 |
| Nonmetallic Mineral Products | 0.01                 |
| Industrial Machinery         | 0.00                 |
| Fabricated Metal Products    | 0.01                 |
| Printing Related Support     | 0.00                 |
| Transportation Equipment Mfg | 0.06                 |
| Electrical Equipment Mfg     | 0.00                 |
| Wood Product Mfg             | 0.01                 |
| Miscellaneous Mfg            | 0.01                 |
| Petroleum Coal Products      | 0.16                 |
| Computer Electronic Mfg      | 0.01                 |
| Waste Water                  | 0.00                 |
| Water                        | 0.00                 |

# Appendix F: Supplemental Material—Distributed Generation

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## CHP Background Data

The primary data source for installed cost of CHP technologies is the California’s Self-Generation Incentive Program (SGIP).<sup>1</sup> This program, funded by the major investor-owned utilities of California, provides varying levels of incentives for individual customers to install various distributed generation technologies, including CHP, with a maximum capacity of 5 MW. This program has been in effect since 2001, although as of Jan 1, 2008, the program only offers incentives for wind and fuel cells. As such, only data through 2007 is considered in this analysis. The program has a publicly-available database of all installations, including generation technology, capacity, fuel, and total cost.

For the CHP assessment, nameplate capacity is based on the weighted average of the units installed through California’s SGIP for both non-renewable generation and anaerobic digesters. Typical nameplate capacities for industrial biomass vary widely; a 4,800 kW unit is used as a proxy based on a study for the Energy Trust of Oregon.<sup>2</sup> It should be realized that these are just proxy values, and larger or smaller units can be installed. These values are summarized in Table 1. Also shown in the table is the net fuel heat rate, measure life and capacity factors for the different generators. Heat rates are from literature values,<sup>3</sup> based on a weighted average of CHP units from the SGIP data. The measure life and capacity factors were also obtained from the literature.<sup>3</sup> Note that these values are assumed equivalent across PSE territory.

**Table 1. CHP Prototypical Generating Units**

| Technology                | Nameplate Capacity (kW) | Fuel Heat Rate (MMBTU/MWh) | Measure Life (years) | Capacity Factor |
|---------------------------|-------------------------|----------------------------|----------------------|-----------------|
| <b>CHP: Non-Renewable</b> |                         |                            |                      |                 |
| Reciprocating Engine      | 644                     | 5.0                        | 20                   | 0.9             |
| Microturbine              | 140                     | 7.4                        | 15                   | 0.9             |
| Fuel Cell                 | 531                     | 5.8                        | 10                   | 0.95            |
| Gas Turbine               | 3,174                   | 6.6                        | 20                   | 0.9             |
| <b>CHP: Renewable</b>     |                         |                            |                      |                 |
| Small Anaerobic Digesters | 525                     | N/A                        | 15                   | 0.8             |
| Large Anaerobic Digesters | 1,929                   | N/A                        | 15                   | 0.8             |
| Industrial Biomass        | 4,800                   | N/A                        | 20                   | 0.9             |

Note: no heat rate is given for the renewable generation technologies; since the fuel is produced on-site the heat rate is not relevant.

With these prototypical generating units, the associated costs are determined from the SGIP database or, for industrial biomass, literature values.<sup>3</sup> The installed costs include: planning and feasibility, engineering and design, permitting, generator equipment costs, waste heat recovery costs, construction and installation, interconnection, service contracts. The SGIP database costs

<sup>1</sup> [http://www.cpuc.ca.gov/static/energy/electric/051005\\_sgip.htm](http://www.cpuc.ca.gov/static/energy/electric/051005_sgip.htm)

<sup>2</sup> “Sizing and Characterizing the Market for Oregon Biopower Projects,” prepared for Energy Trust of Oregon, by CH2MHill, 2005.

<sup>3</sup> “Gas-Fired Distributed Energy Resource Technology Characterization,” National Renewable Energy Laboratory, NREL-TP-620-34783, 2003.

were reduced by 17% to remove the included sales tax (7%) as well a 10% reduction based on higher costs typical of the California market.<sup>4</sup>

It should be noted that, for generators used with anaerobic digesters, any of the three CHP technologies could be used; thus, the costs can vary widely. In this analysis, two size ranges are used and a weighted average cost of the technologies, based on adoption proportions in California, is assumed. The small digesters are coupled with a microturbine, fuel cell, or reciprocating engine, while the large digesters could be coupled with a reciprocating engine or gas turbine. These costs are reported in Table 2. It is assumed the installed cost will negate the effects of inflation (annual increase of 2.5%). Administration costs of 10% of the capital expense are included in total cost and increase with inflation. Fuel costs are calculated from the heat rates using 2010 expected natural gas prices, based on the 2007 projected gas retail rates. Together, these data allow a full life-cycle cost analysis of the resource.

**Table 2. Costs for Assessed Technologies (2007\$)**

| Technology                | Installed Cost (\$/kW) | Annual O&M Costs (\$/kW) | Annual Fuel Cost (\$/kW) |
|---------------------------|------------------------|--------------------------|--------------------------|
| Reciprocating Engine (RE) | 2,314                  | 80                       | 316                      |
| Microturbine (MT)         | 2,623                  | 73                       | 468                      |
| Fuel Cell (FC)            | 5,866                  | 15                       | 385                      |
| Gas Turbine (GT)          | 1,644                  | 49                       | 438                      |
| Small Anaerobic Digesters | 4,239                  | 58                       | 0                        |
| Large Anaerobic Digesters | 2,281                  | 64                       | 0                        |
| Industrial Biomass        | 1,800                  | 39                       | 0                        |

For cooling applications, the cost of an absorption chiller is added to the cost of the generator. In addition, the net heat rate is adjusted to account for savings offsetting cooling rather than heating requirements. Cost and technical specifications for the prototypical cooling units are given in Table 3.

**Table 3. Cooling CHP Specifications**

| Size (tons) | Generator            | Cost (\$/ton) | Net Heat Rate |
|-------------|----------------------|---------------|---------------|
| 10          | Microturbine         | \$2,632       | 11.4          |
| 100         | Fuel Cell            | \$1,650       | 2.9           |
| 500         | Reciprocating Engine | \$580         | 4.1           |
| 800         | Gas Turbine          | \$900         | 7.0           |

<sup>4</sup> RS Means, 2007

**Table 4. Total Number of Dairy and Swine Farms by Zip Code**

|                               |       | Milk cow inventory, total farms | Hogs and pigs inventory, total farms | Cows    |       | Swine     |       |       | cows | 500-999 head | 15.5% |
|-------------------------------|-------|---------------------------------|--------------------------------------|---------|-------|-----------|-------|-------|------|--------------|-------|
|                               |       |                                 |                                      | 500-999 | 1000+ | 2000-4999 | 5000+ |       |      |              |       |
| <b>TOTAL IN PSE TERRITORY</b> |       | 634                             | 282                                  | 98      | 279   | 120       | 415   |       |      | 1000+        | 44%   |
| County                        | Zip   |                                 |                                      |         |       |           |       |       |      |              |       |
| KING                          | 98001 |                                 |                                      | 0       | 0     | 0         | 0     |       |      |              |       |
| KING                          | 98002 |                                 |                                      | 0       | 0     | 0         | 0     |       |      |              |       |
| KING                          | 98003 |                                 |                                      | 0       | 0     | 0         | 0     | swine |      | 2000-4999    | 19%   |
| KING                          | 98004 |                                 |                                      | 0       | 0     | 0         | 0     |       |      | 5000+        | 65.5% |
| KING                          | 98005 |                                 |                                      | 0       | 0     | 0         | 0     |       |      |              |       |
| KING                          | 98006 |                                 |                                      | 0       | 0     | 0         | 0     |       |      |              |       |
| KING                          | 98007 |                                 |                                      | 0       | 0     | 0         | 0     |       |      |              |       |
| KING                          | 98008 |                                 |                                      | 0       | 0     | 0         | 0     |       |      |              |       |
| KING                          | 98010 |                                 | *                                    | 0       | 0     | 0         | 0     |       |      |              |       |
| KING                          | 98011 | *                               |                                      | 0       | 0     | 0         | 0     |       |      |              |       |
| KING                          | 98013 |                                 |                                      | 0       | 0     | 0         | 0     |       |      |              |       |
| KING                          | 98014 | *                               | *                                    | 0       | 0     | 0         | 0     |       |      |              |       |
| KING                          | 98019 | 10                              | 7                                    | 2       | 4     | 2         | 7     |       |      |              |       |
| KING                          | 98022 | 43                              | 20                                   | 7       | 19    | 8         | 28    |       |      |              |       |
| PIERCE                        | 98022 | 43                              | 20                                   | 7       | 19    | 8         | 28    |       |      |              |       |
| KING                          | 98023 |                                 |                                      | 0       | 0     | 0         | 0     |       |      |              |       |
| KING                          | 98024 | *                               | *                                    | 0       | 0     | 0         | 0     |       |      |              |       |
| KING                          | 98025 |                                 |                                      | 0       | 0     | 0         | 0     |       |      |              |       |
| KING                          | 98027 |                                 |                                      | 0       | 0     | 0         | 0     |       |      |              |       |
| KING                          | 98028 |                                 |                                      | 0       | 0     | 0         | 0     |       |      |              |       |
| KING                          | 98029 |                                 |                                      | 0       | 0     | 0         | 0     |       |      |              |       |
| KING                          | 98030 |                                 |                                      | 0       | 0     | 0         | 0     |       |      |              |       |
| KING                          | 98031 |                                 |                                      | 0       | 0     | 0         | 0     |       |      |              |       |
| KING                          | 98032 |                                 | *                                    | 0       | 0     | 0         | 0     |       |      |              |       |
| KING                          | 98033 |                                 |                                      | 0       | 0     | 0         | 0     |       |      |              |       |
| KING                          | 98034 |                                 |                                      | 0       | 0     | 0         | 0     |       |      |              |       |
| KING                          | 98038 |                                 |                                      | 0       | 0     | 0         | 0     |       |      |              |       |
| KING                          | 98039 |                                 |                                      | 0       | 0     | 0         | 0     |       |      |              |       |
| KING                          | 98040 |                                 |                                      | 0       | 0     | 0         | 0     |       |      |              |       |
| KING                          | 98042 |                                 | *                                    | 0       | 0     | 0         | 0     |       |      |              |       |
| KING                          | 98045 | *                               |                                      | 0       | 0     | 0         | 0     |       |      |              |       |
| KING                          | 98047 |                                 | *                                    | 0       | 0     | 0         | 0     |       |      |              |       |

|           |       |    |    |   |    |   |    |  |  |  |  |
|-----------|-------|----|----|---|----|---|----|--|--|--|--|
| PIERCE    | 98047 |    | *  | 0 | 0  | 0 | 0  |  |  |  |  |
| KING      | 98050 |    |    | 0 | 0  | 0 | 0  |  |  |  |  |
| KING      | 98051 |    | *  | 0 | 0  | 0 | 0  |  |  |  |  |
| KING      | 98052 |    |    | 0 | 0  | 0 | 0  |  |  |  |  |
| KING      | 98053 |    | *  | 0 | 0  | 0 | 0  |  |  |  |  |
| KING      | 98055 |    |    | 0 | 0  | 0 | 0  |  |  |  |  |
| KING      | 98056 |    |    | 0 | 0  | 0 | 0  |  |  |  |  |
| KING      | 98057 |    |    | 0 | 0  | 0 | 0  |  |  |  |  |
| KING      | 98058 |    |    | 0 | 0  | 0 | 0  |  |  |  |  |
| KING      | 98059 |    |    | 0 | 0  | 0 | 0  |  |  |  |  |
| KING      | 98065 |    |    | 0 | 0  | 0 | 0  |  |  |  |  |
| KING      | 98068 |    |    | 0 | 0  | 0 | 0  |  |  |  |  |
| KITTITAS  | 98068 |    |    | 0 | 0  | 0 | 0  |  |  |  |  |
| KING      | 98070 |    | *  | 0 | 0  | 0 | 0  |  |  |  |  |
| KING      | 98072 |    |    | 0 | 0  | 0 | 0  |  |  |  |  |
| SNOHOMISH | 98072 |    |    | 0 | 0  | 0 | 0  |  |  |  |  |
| KING      | 98077 |    |    | 0 | 0  | 0 | 0  |  |  |  |  |
| SNOHOMISH | 98077 |    |    | 0 | 0  | 0 | 0  |  |  |  |  |
| KING      | 98092 | 5  | 7  | 1 | 2  | 1 | 3  |  |  |  |  |
| KITSAP    | 98110 |    |    | 0 | 0  | 0 | 0  |  |  |  |  |
| KING      | 98133 |    |    | 0 | 0  | 0 | 0  |  |  |  |  |
| KING      | 98148 |    |    | 0 | 0  | 0 | 0  |  |  |  |  |
| KING      | 98155 |    |    | 0 | 0  | 0 | 0  |  |  |  |  |
| KING      | 98166 |    |    | 0 | 0  | 0 | 0  |  |  |  |  |
| KING      | 98168 |    |    | 0 | 0  | 0 | 0  |  |  |  |  |
| KING      | 98188 |    |    | 0 | 0  | 0 | 0  |  |  |  |  |
| KING      | 98198 |    |    | 0 | 0  | 0 | 0  |  |  |  |  |
| WHATCOM   | 98220 | *  | *  | 0 | 0  | 0 | 0  |  |  |  |  |
| SKAGIT    | 98221 |    | *  | 0 | 0  | 0 | 0  |  |  |  |  |
| KING      | 98224 | 26 | 15 | 4 | 11 | 5 | 17 |  |  |  |  |
| WHATCOM   | 98225 |    |    | 0 | 0  | 0 | 0  |  |  |  |  |
| SKAGIT    | 98226 | 15 | 7  | 2 | 7  | 3 | 10 |  |  |  |  |
| WHATCOM   | 98226 | 15 | 7  | 2 | 7  | 3 | 10 |  |  |  |  |
| WHATCOM   | 98229 | *  |    | 0 | 0  | 0 | 0  |  |  |  |  |
| WHATCOM   | 98230 | *  | *  | 0 | 0  | 0 | 0  |  |  |  |  |
| SKAGIT    | 98232 | 9  | *  | 1 | 4  | 2 | 6  |  |  |  |  |
| SKAGIT    | 98233 | 6  | *  | 1 | 3  | 1 | 4  |  |  |  |  |
| SKAGIT    | 98235 |    |    | 0 | 0  | 0 | 0  |  |  |  |  |
| ISLAND    | 98236 | *  |    | 0 | 0  | 0 | 0  |  |  |  |  |
| SKAGIT    | 98237 |    | *  | 0 | 0  | 0 | 0  |  |  |  |  |



|           |       |    |    |    |    |    |    |  |  |  |  |
|-----------|-------|----|----|----|----|----|----|--|--|--|--|
| SKAGIT    | 98238 |    |    | 0  | 0  | 0  | 0  |  |  |  |  |
| ISLAND    | 98239 | *  | *  | 0  | 0  | 0  | 0  |  |  |  |  |
| WHATCOM   | 98240 | 14 |    | 2  | 6  | 3  | 9  |  |  |  |  |
| WHATCOM   | 98244 | 11 |    | 2  | 5  | 2  | 7  |  |  |  |  |
| WHATCOM   | 98247 | 58 | 5  | 9  | 26 | 11 | 38 |  |  |  |  |
| WHATCOM   | 98248 | 21 | 10 | 3  | 9  | 4  | 14 |  |  |  |  |
| ISLAND    | 98249 |    | *  | 0  | 0  | 0  | 0  |  |  |  |  |
| ISLAND    | 98253 |    | *  | 0  | 0  | 0  | 0  |  |  |  |  |
| SKAGIT    | 98255 |    |    | 0  | 0  | 0  | 0  |  |  |  |  |
| SKAGIT    | 98257 |    |    | 0  | 0  | 0  | 0  |  |  |  |  |
| ISLAND    | 98260 |    |    | 0  | 0  | 0  | 0  |  |  |  |  |
| WHATCOM   | 98262 |    |    | 0  | 0  | 0  | 0  |  |  |  |  |
| SKAGIT    | 98263 |    |    | 0  | 0  | 0  | 0  |  |  |  |  |
| WHATCOM   | 98264 | 99 | *  | 15 | 44 | 19 | 65 |  |  |  |  |
| WHATCOM   | 98266 |    |    | 0  | 0  | 0  | 0  |  |  |  |  |
| SKAGIT    | 98267 |    |    | 0  | 0  | 0  | 0  |  |  |  |  |
| SNOHOMISH | 98272 | 8  | *  | 1  | 4  | 2  | 5  |  |  |  |  |
| SKAGIT    | 98273 | 27 | *  | 4  | 12 | 5  | 18 |  |  |  |  |
| SKAGIT    | 98274 | 6  |    | 1  | 3  | 1  | 4  |  |  |  |  |
| WHATCOM   | 98276 |    |    | 0  | 0  | 0  | 0  |  |  |  |  |
| ISLAND    | 98277 | 11 | *  | 2  | 5  | 2  | 7  |  |  |  |  |
| WHATCOM   | 98281 |    |    | 0  | 0  | 0  | 0  |  |  |  |  |
| SKAGIT    | 98283 | *  | *  | 0  | 0  | 0  | 0  |  |  |  |  |
| SKAGIT    | 98284 | 26 | 5  | 4  | 11 | 5  | 17 |  |  |  |  |
| WHATCOM   | 98284 | 26 | 5  | 4  | 11 | 5  | 17 |  |  |  |  |
| KING      | 98288 |    |    | 0  | 0  | 0  | 0  |  |  |  |  |
| SKAGIT    | 98292 | 28 | 25 | 4  | 12 | 5  | 18 |  |  |  |  |
| WHATCOM   | 98295 | 25 | *  | 4  | 11 | 5  | 16 |  |  |  |  |
| KITSAP    | 98310 |    |    | 0  | 0  | 0  | 0  |  |  |  |  |
| KITSAP    | 98311 |    |    | 0  | 0  | 0  | 0  |  |  |  |  |
| KITSAP    | 98312 |    | *  | 0  | 0  | 0  | 0  |  |  |  |  |
| PIERCE    | 98321 | 7  | 8  | 1  | 3  | 1  | 5  |  |  |  |  |
| PIERCE    | 98323 |    |    | 0  | 0  | 0  | 0  |  |  |  |  |
| JEFFERSON | 98325 | 12 |    | 2  | 5  | 2  | 8  |  |  |  |  |
| PIERCE    | 98327 |    |    | 0  | 0  | 0  | 0  |  |  |  |  |
| PIERCE    | 98328 | *  | 9  | 0  | 0  | 0  | 0  |  |  |  |  |
| PIERCE    | 98329 |    | *  | 0  | 0  | 0  | 0  |  |  |  |  |
| PIERCE    | 98332 |    |    | 0  | 0  | 0  | 0  |  |  |  |  |
| JEFFERSON | 98334 |    |    | 0  | 0  | 0  | 0  |  |  |  |  |
| KITSAP    | 98337 | *  | *  | 0  | 0  | 0  | 0  |  |  |  |  |

|           |       |   |    |   |   |   |   |   |  |  |  |  |
|-----------|-------|---|----|---|---|---|---|---|--|--|--|--|
| PIERCE    | 98338 | * |    | 6 | 0 | 0 | 0 | 0 |  |  |  |  |
| JEFFERSON | 98339 | * |    | 6 | 0 | 0 | 0 | 0 |  |  |  |  |
| KITSAP    | 98340 | * |    |   | 0 | 0 | 0 | 0 |  |  |  |  |
| KITSAP    | 98342 |   |    |   | 0 | 0 | 0 | 0 |  |  |  |  |
| PIERCE    | 98344 |   |    |   | 0 | 0 | 0 | 0 |  |  |  |  |
| KITSAP    | 98345 |   |    |   | 0 | 0 | 0 | 0 |  |  |  |  |
| KITSAP    | 98346 | * | *  |   | 0 | 0 | 0 | 0 |  |  |  |  |
| KITSAP    | 98353 |   |    |   | 0 | 0 | 0 | 0 |  |  |  |  |
| PIERCE    | 98354 |   |    |   | 0 | 0 | 0 | 0 |  |  |  |  |
| JEFFERSON | 98358 |   |    |   | 0 | 0 | 0 | 0 |  |  |  |  |
| KITSAP    | 98359 | * |    |   | 0 | 0 | 0 | 0 |  |  |  |  |
| PIERCE    | 98360 | * | *  |   | 0 | 0 | 0 | 0 |  |  |  |  |
| KITSAP    | 98364 |   |    |   | 0 | 0 | 0 | 0 |  |  |  |  |
| JEFFERSON | 98365 |   |    |   | 0 | 0 | 0 | 0 |  |  |  |  |
| KITSAP    | 98366 | * |    | 8 | 0 | 0 | 0 | 0 |  |  |  |  |
| KITSAP    | 98367 |   | 8  | 9 | 1 | 4 | 2 | 5 |  |  |  |  |
| JEFFERSON | 98368 |   |    |   | 0 | 0 | 0 | 0 |  |  |  |  |
| KITSAP    | 98370 |   | 10 | 8 | 2 | 4 | 2 | 7 |  |  |  |  |
| PIERCE    | 98371 | * | *  |   | 0 | 0 | 0 | 0 |  |  |  |  |
| PIERCE    | 98372 |   |    |   | 0 | 0 | 0 | 0 |  |  |  |  |
| PIERCE    | 98373 |   |    |   | 0 | 0 | 0 | 0 |  |  |  |  |
| PIERCE    | 98374 |   |    |   | 0 | 0 | 0 | 0 |  |  |  |  |
| PIERCE    | 98375 | * |    |   | 0 | 0 | 0 | 0 |  |  |  |  |
| JEFFERSON | 98376 |   |    |   | 0 | 0 | 0 | 0 |  |  |  |  |
| KITSAP    | 98380 |   | *  |   | 0 | 0 | 0 | 0 |  |  |  |  |
| JEFFERSON | 98382 |   | 14 | * | 2 | 6 | 3 | 9 |  |  |  |  |
| KITSAP    | 98383 |   | *  |   | 0 | 0 | 0 | 0 |  |  |  |  |
| PIERCE    | 98385 | * |    |   | 0 | 0 | 0 | 0 |  |  |  |  |
| KITSAP    | 98386 | * |    |   | 0 | 0 | 0 | 0 |  |  |  |  |
| PIERCE    | 98387 |   |    | 9 | 0 | 0 | 0 | 0 |  |  |  |  |
| PIERCE    | 98388 |   |    |   | 0 | 0 | 0 | 0 |  |  |  |  |
| PIERCE    | 98390 | * | *  |   | 0 | 0 | 0 | 0 |  |  |  |  |
| PIERCE    | 98391 | * | *  |   | 0 | 0 | 0 | 0 |  |  |  |  |
| KITSAP    | 98392 |   |    |   | 0 | 0 | 0 | 0 |  |  |  |  |
| KITSAP    | 98393 |   |    |   | 0 | 0 | 0 | 0 |  |  |  |  |
| PIERCE    | 98396 |   |    |   | 0 | 0 | 0 | 0 |  |  |  |  |
| PIERCE    | 98422 |   |    |   | 0 | 0 | 0 | 0 |  |  |  |  |
| PIERCE    | 98424 |   |    |   | 0 | 0 | 0 | 0 |  |  |  |  |
| PIERCE    | 98439 |   |    |   | 0 | 0 | 0 | 0 |  |  |  |  |
| PIERCE    | 98445 |   | *  |   | 0 | 0 | 0 | 0 |  |  |  |  |

|  |   |   |    |    |   |   |   |   |  |  |  |  |
|--|---|---|----|----|---|---|---|---|--|--|--|--|
| PIERCE   | 98446   | * |    | 5  | 0 | 0 | 0 | 0 |  |  |  |  |
| PIERCE   | 98498   |   |    |    | 0 | 0 | 0 | 0 |  |  |  |  |
| PIERCE   | 98499   |   |    |    | 0 | 0 | 0 | 0 |  |  |  |  |
| THURSTON   | 98501   | * | *  |    | 0 | 0 | 0 | 0 |  |  |  |  |
| THURSTON   | 98502   |   |    |    | 0 | 0 | 0 | 0 |  |  |  |  |
| THURSTON   | 98503   |   |    |    | 0 | 0 | 0 | 0 |  |  |  |  |
| THURSTON   | 98506   | * |    | 8  | 0 | 0 | 0 | 0 |  |  |  |  |
| THURSTON   | 98512   | * | *  |    | 0 | 0 | 0 | 0 |  |  |  |  |
| PIERCE   | 98513   | * | *  |    | 0 | 0 | 0 | 0 |  |  |  |  |
| THURSTON   | 98513   | * | *  |    | 0 | 0 | 0 | 0 |  |  |  |  |
| THURSTON   | 98516   |   |    |    | 0 | 0 | 0 | 0 |  |  |  |  |
| THURSTON   | 98530   |   |    |    | 0 | 0 | 0 | 0 |  |  |  |  |
| THURSTON   | 98531   |   | 5  | 12 | 1 | 2 | 1 | 3 |  |  |  |  |
| PIERCE   | 98558   |   |    |    | 0 | 0 | 0 | 0 |  |  |  |  |
| THURSTON   | 98568   |   | 8  | *  | 1 | 4 | 2 | 5 |  |  |  |  |
| THURSTON   | 98576   | * |    | 7  | 0 | 0 | 0 | 0 |  |  |  |  |
| THURSTON   | 98579   |   | 13 | 12 | 2 | 6 | 2 | 9 |  |  |  |  |
| PIERCE   | 98580   |   | 5  | 12 | 1 | 2 | 1 | 3 |  |  |  |  |
| THURSTON   | 98589   | * | *  |    | 0 | 0 | 0 | 0 |  |  |  |  |
| THURSTON   | 98597   |   | 9  | 9  | 1 | 4 | 2 | 6 |  |  |  |  |
| KITTITAS   | 98922   | * | *  |    | 0 | 0 | 0 | 0 |  |  |  |  |
| KITTITAS   | 98925   |   |    |    | 0 | 0 | 0 | 0 |  |  |  |  |
| KITTITAS   | 98926   |   | 11 | 21 | 2 | 5 | 2 | 7 |  |  |  |  |
| KITTITAS   | 98934   |   |    |    | 0 | 0 | 0 | 0 |  |  |  |  |
| KITTITAS   | 98940   |   |    |    | 0 | 0 | 0 | 0 |  |  |  |  |
| KITTITAS   | 98941   |   |    |    | 0 | 0 | 0 | 0 |  |  |  |  |
| KITTITAS   | 98943   |   |    |    | 0 | 0 | 0 | 0 |  |  |  |  |
| KITTITAS   | 98946   |   |    |    | 0 | 0 | 0 | 0 |  |  |  |  |
| * - Data withheld for categories with one to four farms. Farm counts for these zip codes are included in the 'State Total' category. |   |   |    |    |   |   |   |   |  |  |  |  |
| Source:  | USDA Farms, Land in Farms & Livestock, 2/07   |   |    |    |   |   |   |   |  |  |  |  |
|  | <a href="http://www.nass.usda.gov/Census_of_Agriculture/index.asp">http://www.nass.usda.gov/Census_of_Agriculture/index.asp</a> |   |    |    |   |   |   |   |  |  |  |  |

**Table 5. Existing Landfills in PSE Territory**

| Project ID # | Landfill ID # | Expansion ID # | LMOP Territory | Landfill Name                             | Landfill City | Landfill County | State | Waste In Place (tons) | Year Landfill Opened | Landfill Closure Year | Landfill Owner Organization | Project Status | Project Start Date | Project Shutdown Date | Project Developer Organization | LFGE Utilization Type (Direct-Use vs Electricity) | LFGE Project Type    | MW Capacity | LFG Flow to Project (mmscfd) | Emission Reductions (MMTCO2E/yr) |
|--------------|---------------|----------------|----------------|---|---------------|-----------------|-------|-----------------------|----------------------|-----------------------|-----------------------------|----------------|--------------------|-----------------------|--------------------------------|---|----------------------|-------------|------------------------------|----------------------------------|
| 1695         | 1616          | 0              | 3              | Hidden Valley LF                          | Puyallup      | Pierce          | WA    | 17,425,280            | 1959                 | 1999                  | Land Recovery, Inc.         | Operational    | 1/1/1999           |                       |                                | Electricity                                       | Reciprocating Engine | 1.9         |                              | 0.082                            |
| 1701         | 1622          | 0              | 3              | Olympic View LF                           | Port Orchard  | Kitsap          | WA    | 7,004,248             | 1960                 | 2012                  | Kitsap County               | Operational    | 1/1/1998           |                       | Shaw Environmental, Inc.       | Direct  | Leachate Evaporation |             |                              |                                  |
| 1685         | 1606          | 0              | 3              | Cedar Hills LF                            | Maple Valley  | King            | WA    | 24,135,629            | 1962                 | 2012                  | King County, WA             | Construction   | 6/1/2008           |                       | Energy Developments            | Electricity                                       | Gas Turbine          | 17.0        |                              | 0.729                            |
| 1692         | 1613          | 0              | 3              | Fort Lewis LF #5                          | Fort Lewis    | Pierce          | WA    | 1,198,910             | 1969                 | 2004                  | Fort Lewis-PW / ENRD        | Candidate      |                    |                       |                                |   |                      |             |                              |                                  |
| 1736         | 1656          | 0              | 3              | Kent Highlands LF                         | Kent          | King            | WA    | 8,000,000             | 1968                 | 1986                  | City of Seattle, WA         | Candidate      |                    |                       |                                |   |                      |             |                              |                                  |
| 1694         | 1615          | 0              | 3              | Thurston County Waste and Recovery Center | Olympia       | Thurston        | WA    | 750,000               | 1970                 | 2001                  | Thurston County             | Candidate      |                    |                       |                                |   |                      |             |                              |                                  |
| 1722         | 1643          | 0              | 3              | Carnation LF                              |               | King            | WA    |                       |                      | 1989                  |                             | Potential      |                    |                       |                                |   |                      |             |                              |                                  |
| 1713         | 1634          | 0              | 3              | Cedarville LF                             |               | Whatcom         | WA    | 250,000               | 1981                 | 1990                  |                             | Potential      |                    |                       |                                |   |                      |             |                              |                                  |
| 1715         | 1636          | 0              | 3              | Enumclaw LF                               |               | King            | WA    |                       | 1958                 | 1993                  | Landfill Owner              | Potential      |                    |                       |                                |   |                      |             |                              |                                  |
| 1723         | 1644          | 0              | 3              | Gibraltar LF                              |               | Skagit          | WA    |                       |                      | 1989                  |                             | Potential      |                    |                       |                                |   |                      |             |                              |                                  |
| 1716         | 1637          | 0              | 3              | Hansville LF                              |               | Kitsap          | WA    | 599,880               | 1962                 | 1989                  |                             | Potential      |                    |                       |                                |   |                      |             |                              |                                  |
| 1717         | 1638          | 0              | 3              | Hobart LF                                 |               | King            | WA    | 413,697               | 1958                 | 1994                  | Landfill Owner              | Potential      |                    |                       |                                |   |                      |             |                              |                                  |
| 1718         | 1639          | 0              | 3              | Inman LF                                  |               | Skagit          | WA    |                       |                      |                       | Landfill Owner              | Potential      |                    |                       |                                |   |                      |             |                              |                                  |
| 1727         | 1648          | 0              | 3              | Olalla LF                                 |               | Kitsap          | WA    |                       |                      | 1989                  |                             | Potential      |                    |                       |                                |   |                      |             |                              |                                  |
| 1729         | 1650          | 0              | 3              | Point Roberts LF                          |               | Whatcom         | WA    |                       |                      | 1991                  |                             | Potential      |                    |                       |                                |   |                      |             |                              |                                  |
| 1709         | 1630          | 0              | 3              | Vashon LF                                 | Vashon Island | King            | WA    | 281,554               | 1963                 |                       | Landfill Owner              | Potential      |                    |                       |                                |   |                      |             |                              |                                  |

Source: <http://www.epa.gov/lmop/proj/index.htm#1>

**Table 6. Wastewater Treatment Facilities in PSE Territory**

| County Name + | Authority Name                     | Facility Name             | Watershed Name                 | Congressional District | Existing Municipal Flow (Mgd) | Present Municipal Flow (Mgd) | Future Municipal Flow (Mgd) | Total Existing Flow (Mgd) | Present Design Flow (Mgd) | Future Design Flow (Mgd) |
|---------------|------------------------------------|---------------------------|--------------------------------|------------------------|-------------------------------|------------------------------|-----------------------------|---------------------------|---------------------------|--------------------------|
| ISLAND        | COUPEVILLE, TOWN OF                | COUPEVILLE STP            | Puget Sound.                   | 2                      | 0.18                          | 0.21                         | 0.3                         | 0.18                      | 0.21                      | 0.3                      |
| ISLAND        | LANGLEY WATER AND SEWER DIST.      | LANGLEY S/T FACILITY      | Puget Sound.                   | 2                      | 0.09                          | 0.128                        | 0.128                       | 0.09                      | 0.128                     | 0.128                    |
| ISLAND        | OAK HARBOR, CITY OF                | OAK HARBOR STP            | Puget Sound.                   | 2                      | 0.57                          | 0.595                        | 0.595                       | 0.57                      | 0.595                     | 0.595                    |
| ISLAND        | PENN COVE SEWER DIST               | PENN COVE S.D. STP        | Puget Sound.                   | 2                      | 0.04                          | 0.051                        | 0.051                       | 0.04                      | 0.051                     | 0.051                    |
| JEFFERSON     | PORT TOWNSEND, CITY OF             | PORT TOWNSEND STP         | Puget Sound., Dungeness-Elwha. | 6                      | 0.81                          | 0.81                         | 0.81                        | 0.81                      | 0.81                      | 0.81                     |
| KING          | DES MOINES SEWER DISTRICT          | DES MOINES STP            | Puget Sound.                   | 7                      | 4.5                           | 7.65                         | 7.65                        | 4.5                       | 7.65                      | 7.65                     |
| KING          | DUVALL TOWN OF                     | DUVALL WW TREAT FAC       | Snoqualmie.                    | 8                      | 0.636                         | 0.9                          | 0.9                         | 0.636                     | 0.9                       | 0.9                      |
| KING          | ENUMCLAW, CITY OF                  | ENUMCLAW STP              | Puyallup.                      | 8                      | 1.8                           | 2.4                          | 3.7                         | 1.83                      | 2.43                      | 3.73                     |
| KING          | FEDERAL WAY SEWER DIST.            | LAKOTA STP                | Puget Sound.                   | 9                      | 4                             | 10                           | 10                          | 4                         | 10                        | 10                       |
| KING          | FEDERAL WAY WATER & SEWER KING CO. | REDONDO STP               | Puget Sound.                   | 9                      | 2.4                           | 4.32                         | 4.32                        | 2.4                       | 4.32                      | 4.32                     |
| KING          | SEWER DISTRICT MUN OF              | SPRING BEACH              | Puget Sound.                   | 7                      |                               |                              | 0.005                       |                           |                           | 0.005                    |
| KING          | METRO SEATTLE MUN OF               | RENTON WWTP               | Duamish., Puget Sound.         | 9                      | 70                            | 122                          | 122                         | 70                        | 122                       | 122                      |
| KING          | METRO SEATTLE                      | WEST POINT WWTP           | Puget Sound.                   | 7                      | 100                           | 133                          | 133                         | 100                       | 133                       | 133                      |
| KING          | NORTH BEND, CITY OF                | NORTH BEND TREATMENT PLAN | Snoqualmie., Hood Canal.       | 8                      | 0.636                         | 1.06                         | 2.503                       | 0.636                     | 1.06                      | 2.503                    |
| KING          | SNOQUALMIE TOWN OF                 | SNOQUALMIE LAGOONS        | Snoqualmie.                    | 8                      | 0.34                          | 0.72                         | 0.72                        | 0.34                      | 0.72                      | 0.72                     |
| KING          | SOUTHWEST                          | MILLER                    | Puget Sound.                   | 7                      | 3.3                           | 5.2                          | 7                           | 3.3                       | 5.2                       | 7                        |



|          |  |   |                        |   |       |       |       |       |       |       |
|----------|--|---|------------------------|---|-------|-------|-------|-------|-------|-------|
|          | SUBURBAN SEWER SW  | CREEK STP   |                        |   |       |       |       |       |       |       |
| KING     | SUBURBAN SEWER DISTRICT VASHON   | SALMON CREEK STP #1   | Puget Sound.           | 7 | 2.4   | 6.88  | 6.88  | 2.4   | 6.88  | 6.88  |
| KING     | SEWER DISTRICT BAINBRIDGE ISLAND CITY  | VASHON STP  | Puget Sound.           | 7 | 0.175 | 0.264 | 0.264 | 0.175 | 0.264 | 0.264 |
| KITSAP   | OF BREMERTON ,CITYOF KITSAP CO.  | WINSLOW S/T FACILITY BREMERTON STP                          | Puget Sound.           | 1 | 0.39  | 0.5   | 0.5   | 0.39  | 0.5   | 0.5   |
| KITSAP   | COMMISSIONERS KITSAP CO. PUBLIC WORKS KITSAP CO. S.D. #3 KITSAP COUNTY SD                    | CENT. KITSAP REG. STP                                       | Puget Sound.           | 1 | 3.3   | 5.1   | 8.79  | 3.3   | 5.1   | 8.79  |
| KITSAP   | WORKS KITSAP CO. S.D. #3 KITSAP COUNTY SD  | KINGSTON STP  | Puget Sound.           | 6 | 0.14  | 0.15  | 0.29  | 0.14  | 0.15  | 0.29  |
| KITSAP   | WORKS KITSAP CO. S.D. #3 KITSAP COUNTY SD  | MANCHESTER STP  | Puget Sound.           | 6 | 0.17  | 0.23  | 0.23  | 0.17  | 0.23  | 0.23  |
| KITSAP   | WORKS KITSAP CO. S.D. #3 KITSAP COUNTY SD  | FORT WARD SUQUAMISH STP                                     | Puget Sound.           | 6 | 0.1   | 0.142 | 0.142 | 0.1   | 0.142 | 0.142 |
| KITSAP   | WORKS KITSAP CO. S.D. #3 KITSAP COUNTY SD  | FORT WARD SUQUAMISH STP                                     | Puget Sound.           | 6 | 0.1   | 0.2   | 0.2   | 0.1   | 0.2   | 0.2   |
| KITSAP   | ORCHARD PUBLIC WORKS CLE ELUM, CITY OF ELLENSBURG ,CITYOF                                    | RETSIL TREATMENT PLANT CLE ELUM S/T FACILITY ELLENSBURG STP | Puget Sound.           | 6 | 1.8   | 2.38  | 4.8   | 1.8   | 2.38  | 4.8   |
| KITTITAS | ORCHARD PUBLIC WORKS CLE ELUM, CITY OF ELLENSBURG ,CITYOF                                    | RETSIL TREATMENT PLANT CLE ELUM S/T FACILITY ELLENSBURG STP | Upper Yakima.          | 4 | 0.605 | 0.643 | 1.45  | 0.605 | 0.643 | 1.45  |
| KITTITAS | ORCHARD PUBLIC WORKS CLE ELUM, CITY OF ELLENSBURG ,CITYOF                                    | RETSIL TREATMENT PLANT CLE ELUM S/T FACILITY ELLENSBURG STP | Upper Yakima.          | 4 | 3.11  | 8     | 8     | 3.11  | 8     | 8     |
| KITTITAS | KITTITAS CO. W.D. #6 KITTITAS, CITY OF ROSLYN, CITY OF SNOQUALMIE PASS S.D. BUCKLEY, CITY OF | KITTITAS CO #6 STP  | Upper Columbia-Entiat. | 4 | 0.01  | 0.015 | 0.09  | 0.01  | 0.015 | 0.09  |
| KITTITAS | KITTITAS CO. W.D. #6 KITTITAS, CITY OF ROSLYN, CITY OF SNOQUALMIE PASS S.D. BUCKLEY, CITY OF | KITTITAS STP ROSLYN S/T FACILITY                            | Upper Yakima.          | 4 | 0.16  | 0.28  | 0.29  | 0.16  | 0.28  | 0.29  |
| KITTITAS | KITTITAS CO. W.D. #6 KITTITAS, CITY OF ROSLYN, CITY OF SNOQUALMIE PASS S.D. BUCKLEY, CITY OF | KITTITAS STP ROSLYN S/T FACILITY                            | Upper Yakima.          | 4 | 0.136 | 0.22  | 0.22  | 0.136 | 0.22  | 0.22  |
| KITTITAS | KITTITAS CO. W.D. #6 KITTITAS, CITY OF ROSLYN, CITY OF SNOQUALMIE PASS S.D. BUCKLEY, CITY OF | SNOQUALMIE PASS S/T FAC.                                    | Upper Yakima.          | 4 | 0.1   | 0.368 | 0.368 | 0.1   | 0.368 | 0.368 |
| PIERCE   | KITTITAS CO. W.D. #6 KITTITAS, CITY OF ROSLYN, CITY OF SNOQUALMIE PASS S.D. BUCKLEY, CITY OF | BUCKLEY STP   | Puyallup.              | 8 | 0.29  | 0.44  | 0.44  | 0.29  | 0.44  | 0.44  |

|        |                            |                        |                              |   |       |       |       |       |       |       |
|--------|----------------------------|------------------------|------------------------------|---|-------|-------|-------|-------|-------|-------|
| PIERCE | CARBONADO, CITY OF         | CARBONADO S/T FAC.     | Puyallup.                    | 8 | 0.03  | 0.1   | 0.1   | 0.03  | 0.1   | 0.1   |
| PIERCE | EATONVILLE ,TOWNOF         | EATONVILLE STP         | Nisqually.                   | 8 | 0.08  | 0.13  | 0.13  | 0.08  | 0.13  | 0.13  |
| PIERCE | EATONVILLE STP             | EATONVILLE WWTP        | Nisqually.                   | 8 | 0.453 | 0.453 | 0.534 | 0.453 | 0.453 | 0.534 |
| PIERCE | ELBE, TOWN OF              | ELBE COMM. SEPTIC      | Nisqually.                   | 8 | 0.08  | 0.01  | 0.01  | 0.08  | 0.01  | 0.01  |
| PIERCE | ORTING ,TOWNOF             | ORTING S/T FACILITY    | Puyallup.                    | 8 | 1.2   | 1.2   | 1.2   | 1.2   | 1.2   | 1.2   |
| PIERCE | PIERCE COUNTY              | CHAMBERS CREEK         | Puget Sound.                 | 6 | 14.3  | 18    | 18    | 14.3  | 18    | 18    |
| PIERCE | PIERCE COUNTY PUYALLUP,    | GIG HARBOR STP         | Puget Sound.                 | 6 | 0.886 | 1.36  | 3.5   | 0.886 | 1.36  | 3.5   |
| PIERCE | CITY OF SOUTH PRAIRIE,     | SOUTH PRAIRIE AREA     | Puyallup.                    | 9 | 4.78  | 4.78  | 4.78  | 4.78  | 4.78  | 4.78  |
| PIERCE | TOWN OF SUMNER,            | SUMNER STP             | Puyallup.                    | 8 | 0.038 | 0.038 | 0.048 | 0.038 | 0.038 | 0.048 |
| PIERCE | CITY OF TACOMA,            | TACOMA CENTRAL STP #1  | Puyallup., Puget Sound.      | 8 | 1.5   | 2.62  | 3.42  | 1.5   | 2.62  | 3.42  |
| PIERCE | CITY OF TACOMA,            | TACOMA #3 STP NORTH    | Puget Sound.                 | 6 | 22.8  | 38    | 50    | 22.8  | 38    | 50    |
| PIERCE | WILKESON, TOWN OF          | WILKESON STP           | Puyallup.                    | 6 | 4.4   | 7     | 7     | 4.5   | 7.1   | 7.1   |
| PIERCE | ANACORTES, CITY OF,DEPT PW | ANACORTES STP          | Strait Of Georgia.           | 8 | 0.03  | 0.03  | 0.03  | 0.03  | 0.03  | 0.03  |
| SKAGIT | BURLINGTON ,CITYOF         | BURLINGTON S/T FAC.    | Lower Skagit.                | 2 | 1.59  | 3.2   | 3.2   | 1.59  | 3.2   | 3.2   |
| SKAGIT | CONCRETE ,TOWNOF           | CONCRETE S/T FACILITY  | Upper Skagit., Lower Skagit. | 2 | 0.8   | 1.2   | 1.2   | 0.8   | 1.2   | 1.2   |
| SKAGIT | LA CONNER, TOWN OF         | LA CONNER S/T FACILITY | Lower Skagit.                | 2 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 |
| SKAGIT | MOUNT VERNON ,CITYOF       | MOUNT VERNON S/T FAC.  | Puget Sound.                 | 2 | 0.15  | 0.23  | 0.23  | 0.15  | 0.23  | 0.23  |
| SKAGIT | SEDRO WOOLLEY ,CITYOF      | SEDRO WOOLLEY STP      | Lower Skagit.                | 2 | 3     | 4     | 4     | 3.3   | 4.36  | 4.36  |
| SKAGIT | SKAGIT COUNTY SD # 1       | SNEE OOSH BEACH STP    | Lower Skagit.                | 2 | 0.65  | 1.759 | 1.759 | 0.65  | 1.759 | 1.759 |
| SKAGIT |                            |                        | Puget Sound.                 | 2 | 0.01  | 0.04  | 0.04  | 0.01  | 0.04  | 0.04  |

|          |                             |                           |                     |   |       |       |       |       |       |       |
|----------|-----------------------------|---------------------------|---------------------|---|-------|-------|-------|-------|-------|-------|
| SKAGIT   | SKAGIT COUNTY SD #2         | SKAGIT CO. SD # 2 STP     | Lower Skagit.       | 2 | 0.09  | 0.17  | 0.4   | 0.09  | 0.17  | 0.4   |
| THURSTON | CARLYON BEACH WWTP          | CARLYON BEACH WWTP        | Puget Sound.        | 3 | 0.02  | 0.038 | 0.038 | 0.02  | 0.038 | 0.038 |
| THURSTON | OLYMPIA, CITY OF            | OLYMPIA STP               | Puget Sound.        | 3 | 17    | 17    | 17    | 17.9  | 20.6  | 20.6  |
| THURSTON | THURSTON COUNTY             | BOSTON HARBOR WWTF        | Puget Sound.        | 3 | 0.045 | 0.045 | 0.045 | 0.045 | 0.045 | 0.045 |
| THURSTON | THURSTON COUNTY PWD         | TAMOSHAN DEVELOPMENT      | Puget Sound.        | 3 | 0.01  | 0.05  | 0.05  | 0.01  | 0.05  | 0.05  |
| THURSTON | YELM, CITY OF               | YELM S/T FACILITY         | Nisqually Strait Of | 3 | 1     | 1     | 1     | 1     | 1     | 1     |
| WHATCOM  | BELLINGHAM SEWER DEPT       | BELLINGHAM POST POINT TP  | Georgia., Nooksack. | 2 | 20    | 30    | 30    | 20    | 30    | 30    |
| WHATCOM  | BIRCH BAY WATER DISTRICT #8 | BIRCH BAY STP             | Strait Of Georgia.  | 2 | 0.6   | 0.85  | 0.85  | 0.6   | 0.85  | 0.85  |
| WHATCOM  | BLAINE, CITY OF, WAT & SE   | BLAINE STP                | Strait Of Georgia.  | 2 | 0.483 | 0.68  | 0.68  | 0.483 | 0.68  | 0.68  |
| WHATCOM  | EVERSON, TOWN OF            | EVERSON S/T FACILITY      | Nooksack.           | 2 | 0.12  | 0.18  | 0.18  | 0.12  | 0.18  | 0.18  |
| WHATCOM  | FERNDALE ,TOWNOF            | FERNDALE STP              | Nooksack.           | 2 | 1.1   | 2.7   | 2.7   | 1.1   | 2.7   | 2.7   |
| WHATCOM  | LYNDEN ,CITYOF              | LYNDEN SEWAGE TREATMENT P | Nooksack.           | 2 | 0.31  | 0.41  | 0.41  | 0.31  | 0.41  | 0.41  |

Source: <http://www.epa.gov/lmop/proj/index.htm>



**Table 7. Installed CHP facilities in PSE Territory**

| State | City          | Organization Name                     | Facility Name               | Application            | SIC4 | NAICS  | Op Year | Prime Mover | Capacity (kw) | Fuel Type |
|-------|---------------|---------------------------------------|-----------------------------|------------------------|------|--------|---------|-------------|---------------|-----------|
| WA    | Bremerton     | Bremerton Wastewater                  | Bremerton Wastewater        | Wastewater Treatment   | 4952 | 22132  | .       | ERENG       | 152           | BIOMASS   |
| WA    | Lynden        | Vander Haak Dairy                     | Vander Haak Dairy           | Agriculture            | 241  | 11212  | 2004    | ERENG       | 450           | BIOMASS   |
| WA    | Ferndale      | Whatcom Co. MSW                       | Whatcom Co. MSW             | Solid Waste Facilities | 4953 | 562212 | 1986    | B/ST        | 2000          | WAST      |
| WA    | Darrington    | Hampton Timber Mill                   | Hampton Timber Mill         | Wood Products          | 2421 | 321113 | 2006    | B/ST        | 7200          | WOOD      |
| WA    | Renton        | King County Wastewater Treatment Div. | South Treatment Plant       | Wastewater Treatment   | 4952 | 562111 | 2004    | CT          | 9500          | BIOMASS   |
| WA    | Port Townsend | Port Townsend Paper Company           | Port Townsend Paper Company | Pulp and Paper         | 2621 | 322121 | 1990    | B/ST        | 14500         | WAST      |
| WA    | Burlington    | Sierra Pacific - Skagit County        | Sierra Pacific              | Wood Products          | 2421 | 321113 | 2007    | B/ST        | 26000         | WOOD      |

| Prime Mover Code | Description          | Sites | Capacity (kW) | Fuel Code | Description  |
|------------------|----------------------|-------|---------------|-----------|--|
| Total            |                      | 7     | 59,802        | BIOMASS   | Biomass, landfill gas, digester gas, bagasse                             |
| B/ST             | Boiler/Steam Turbine | 4     | -             | WAST      | Waste, MSW, black liquor, blast furnace gas, petroleum coke, process gas |
| CC               | Combined Cycle       | 0     | 49,700        | WOOD      | Wood, wood waste   |
| CT               | Combustion Turbine   | 1     | 9,500         |           |  |
| FCEL             | Fuel Cell            | 0     | -             |           |  |
| MT               | Microturbine         | 0     | -             |           |  |
| OTR              | Other                | 0     | -             |           |  |
| ERENG            | Reciprocating Engine | 2     | 602           |           |  |

Source: <http://www.eea-inc.com/chpdata/States/WA.html>

**Table 8. Number of Facilities by Segment and Average Annual Usage**

| State | Sector | Segment                      | Average annual usage bins |          |            |            |            |            |       |
|-------|--------|------------------------------|---------------------------|----------|------------|------------|------------|------------|-------|
|       |        |                              | < 30 kW                   | 30-99 kW | 100-199 kW | 200-499 kW | 500-999 kW | 1 - 4.9 MW | 5 MW+ |
| WA    | IND    | Chemical_Mfg                 | 152                       | 10       | 3          | 4          | 1          | 3          | 3     |
| WA    | IND    | Computer_Electronic_Mfg      | 390                       | 37       | 16         | 10         | 5          | 2          | 0     |
| WA    | COM    | Dry Goods Retail             | 10086                     | 686      | 106        | 94         | 29         | 3          | 0     |
| WA    | IND    | Electrical_Equipment_Mfg     | 114                       | 11       | 1          | 2          | 0          | 0          | 0     |
| WA    | IND    | Fabricated_Metal_Products    | 463                       | 31       | 7          | 6          | 2          | 4          | 0     |
| WA    | IND    | Food_Mfg                     | 473                       | 39       | 9          | 15         | 12         | 5          | 0     |
| WA    | COM    | Grocery                      | 1387                      | 134      | 72         | 87         | 4          | 3          | 0     |
| WA    | COM    | Hospital                     | 5779                      | 278      | 79         | 33         | 11         | 10         | 0     |
| WA    | COM    | Hotel Motel                  | 1488                      | 163      | 31         | 24         | 5          | 0          | 0     |
| WA    | IND    | Industrial_Machinery         | 640                       | 55       | 11         | 5          | 3          | 1          | 0     |
| WA    | IND    | Miscellaneous_Mfg            | 1270                      | 75       | 29         | 15         | 1          | 3          | 0     |
| WA    | IND    | Nonmetallic_Mineral_Products | 261                       | 26       | 8          | 4          | 2          | 2          | 0     |
| WA    | COM    | Office                       | 38634                     | 1009     | 282        | 152        | 47         | 31         | 7     |
| WA    | COM    | Other_Comm                   | 35669                     | 666      | 137        | 76         | 19         | 11         | 1     |
| WA    | IND    | Paper_Mfg                    | 50                        | 15       | 4          | 4          | 8          | 1          | 1     |
| WA    | IND    | Petroleum_Coal_Products      | 27                        | 7        | 2          | 0          | 0          | 0          | 2     |
| WA    | IND    | Plastics_Rubber_Products     | 182                       | 18       | 9          | 4          | 5          | 2          | 1     |
| WA    | IND    | Primary_Metal_Mfg            | 75                        | 2        | 2          | 0          | 0          | 1          | 0     |
| WA    | IND    | Printing_Related_Support     | 433                       | 20       | 7          | 1          | 0          | 0          | 0     |
| WA    | COM    | Restaurant                   | 4080                      | 508      | 15         | 4          | 3          | 3          | 0     |
| WA    | COM    | School                       | 1312                      | 516      | 137        | 53         | 1          | 0          | 0     |
| WA    | IND    | Transportation_Equipment_Mfg | 422                       | 55       | 25         | 12         | 4          | 3          | 3     |
| WA    | COM    | University                   | 634                       | 38       | 10         | 7          | 8          | 5          | 0     |
| WA    | COM    | Warehouse                    | 4475                      | 279      | 46         | 46         | 10         | 0          | 0     |
| WA    | IND    | Wood_Product_Mfg             | 356                       | 24       | 9          | 6          | 3          | 5          | 0     |
| WA    | COM    | Swine Farms                  | 0                         | 54       | 185        | 0          | 0          | 0          | 0     |
| WA    | COM    | Dairy Farms                  | 0                         | 0        | 98         | 279        | 0          | 0          | 0     |
| WA    | COM    | Landfills (kW)               | 0                         | 0        | 1205       | 4520       | 2          | 28.7       | 0     |
| WA    | COM    | Wastewater (kW)              | 0                         | 0        | 598        | 618        | 0.6        | 0          | 0     |

## Clean Energy Background Data

The installed costs and operation and maintenance costs (O&M) for the three clean energy technologies are shown in Table 9. Also included are expected measure life and capacity factors. Capacity factors are an indication of the percentage of the year energy will be produced. Further details for each technology are given below.

**Table 9. Costs, Measure Life, and Capacity Factor for Clean Energy Resources**

| Technology               | Average Installed Cost (\$/kW) | O&M Cost (\$/kW/yr) | Measure Life | Capacity Factor |
|--------------------------|--------------------------------|---------------------|--------------|-----------------|
| Building PV <sup>5</sup> | \$8,642                        | \$100               | 25           | 0.12            |
| Small Hydro <sup>6</sup> | \$5,688                        | \$535               | 40           | 0.80            |
| Small Wind <sup>7</sup>  | \$8,197                        | \$20                | 25           | 0.06            |

### Building PV

On-site PVs consist of solar electricity-generation from building-mounted photovoltaic panels. PV systems are weather-dependent and rely on the sun to generate electricity. This study focuses on renewable-electricity generation potential from rooftop residential and commercial buildings. PV systems include an array of solar electric modules, an inverter (DC to AC), and a balance of systems. These systems do not have battery back-up equipment and are completely connected to the utility (grid-tied). PV generation is a whole-building electricity generation resource and typically only offsets a portion of baseline loads. In most cases, PV is considered a secondary source of a building's energy needs. When excess PV electricity is generated (more than the building's loads), it is fed back into the grid. This depends heavily on the PV system size and current weather and, for residential and commercial customers, generally occurs when the building is not occupied.

Three primary PV technologies considered are: (1) mono-crystalline (single crystalline cell); (2) poly-crystalline (multi-crystalline cell); and (3) amorphous thin-film. These three technologies currently dominate the solar market.<sup>8</sup> Efficiencies of these technologies are improving annually and are accounted for in this study. This study does not include large PV generation facilities that operate to sell the majority (or all) of their power to the grid and emerging PV technologies.

The PV Watts performance calculator, developed by the National Renewable Energy Laboratory, is used to determine the capacity factor.<sup>9</sup> The amount of solar insolation (i.e., the measure of solar energy received on a given surface area in a given time), based on weather stations, determines the performance potential for the region. To maximize roof area coverage for calculation of technical potential, commercial and multifamily buildings are fixed with 0.0° array tilt (flat roof), while single-family and manufactured homes are fixed at 18.5° tilt (4/12 pitch).

<sup>5</sup> First year cost.

<sup>6</sup> Average cost.

<sup>7</sup> Average cost and capacity factor.

<sup>8</sup> EIA, based on photovoltaic cell and module shipments by type, 2006.

<sup>9</sup> [http://redc.nrel.gov/solar/codes\\_algs/PVWATTS/](http://redc.nrel.gov/solar/codes_algs/PVWATTS/)

However, for actual installations (used in achievable technical potential), the PV arrays are generally fixed at an angle to maximize solar exposure with coverage. This translates to an optimal array tilt of 33.5° for commercial buildings and 22.5° for residential buildings. With this variance in array tilt, there is a slight difference in the capacity factor; however, for PSE territory, the difference is minimal and the capacity factor for both sectors is 0.12.

**PV Energy Costs.** The primary and secondary resources for PV installed costs are from the California Energy Commission (CEC), the Energy Trust of Oregon (ETO), the U.S. Department of Energy (DOE), and other on-line sources. Cost analysis for PV installation of other programs results in an average installation cost in 2006 of \$9/W<sup>10</sup>; a cost of \$8.64/W in 2010 is assumed for this analysis. Given expected technological improvements, the installed cost of PV is assumed to nearly halve by 2029 to \$4.73/W.<sup>11, 12, 13, 14, 15</sup> Other technical data have been acquired from multiple primary and secondary resources to determine measure life (25 years<sup>16</sup>), and O&M costs. O&M costs of \$100/kW/yr include inverter replacement every ten years and seasonal module washing.<sup>17</sup>

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<sup>10</sup> “Solar Trends: California Energy Commission” by SunPower Consulting LLC provided cost analysis, August 2006, ETO, and DOE.

<sup>11</sup> NREL, “Solar Electric Power: The US Photovoltaic Industry Roadmap”, 2001

<sup>12</sup> EERE, “Solar Energy Technologies Multi-Year Technical Plan 2003-2007”, 2004

<sup>13</sup> DOE/EIA, “Annual Energy Outlook 2008”, 2008

<sup>14</sup> Prometheus Institute, “PV Technology, Performance, and Cost”, 2007

<sup>15</sup> PSE PV cost projections and PV costs include installed labor, contractor profit and overhead

<sup>16</sup> Data was averaged from the following sources: NREL, NW Power, and Conservation Council, and typical warranty periods.

<sup>17</sup> NREL, “A Review of PV Inverter Technology Cost and Performance Projections”, 2006.

**Table 10. Summary Market Potential**

| Market Scenario | Market Potential 2029 (MW) | Market Potential 2029 (aMW) | Market Potential (Percent of Technical) in 2029 | Levelized Cost w/out Subsidy | Levelized Cost w/ Subsidy | Cost per kW in 2010 | Cost per kW in 2029 | Annual O&M Cost per kW |
|-----------------|----------------------------|-----------------------------|---|------------------------------|---------------------------|---------------------|---------------------|------------------------|
| PV Market       | 172                        | 21                          | 0.79%   | \$0.69                       | \$0.61                    | \$8.642             | \$4.733             | \$1.00                 |

| 172 MW                              |           | PV Growth                               |            | 2009       |           | 2010   |        | 2011   |        | 2012 |  | 2013 |  | 2014 |  |
|-------------------------------------|-----------|---|------------|------------|-----------|--------|--------|--------|--------|------|--|------|--|------|--|
| Commercial                          | Tech aMW  | Residential                             | Tech aMW   | 7,429      | 7,766     | 8,118  | 8,487  | 8,872  | 9,275  |      |  |      |  |      |  |
|                                     | Market MW |   | 732        | 765        | 792       | 820    | 881    |        |        |      |  |      |  |      |  |
| Residential                         | Tech aMW  | Combined                                | Tech aMW   | 1,759      | 1,831     | 1,906  | 1,983  | 2,062  | 2,145  |      |  |      |  |      |  |
|                                     | Market MW |   | 188        | 195        | 201       | 208    | 221    |        |        |      |  |      |  |      |  |
| Combined                            | Tech aMW  | Market Potential (Percent of Technical) | Tech aMW   | 9,188      | 9,597     | 10,024 | 10,470 | 10,935 | 11,420 |      |  |      |  |      |  |
|                                     | Market MW |   | 919        | 960        | 993       | 1,028  | 1,101  |        |        |      |  |      |  |      |  |
| Market Curve Cumulative Commercial  |           |   |            | 0.039%     | 0.79%     | 0.79%  | 0.79%  | 0.79%  | 0.79%  |      |  |      |  |      |  |
| Market Curve Cumulative Residential |           |   |            | DSM        | 3%        | 1%     | 3%     | 5%     | 7%     |      |  |      |  |      |  |
| Market Curve Cumulative Combined    |           |   |            | DSM        | 3%        | 6%     | 13%    | 19%    | 28%    |      |  |      |  |      |  |
| Assumptions                         |           |   |            | Commercial | Market MW | (1.75) | 0.76   | 1.99   | 3.13   | 4.90 |  |      |  |      |  |
| Admin Cost %                        | 10%       | Residential                             | Market aMW | (0.21)     | 0.09      | 0.24   | 0.38   | 0.60   | 0.94   |      |  |      |  |      |  |
| O & M Fixed \$/kW                   | \$100     | Combined                                | Market aMW | (0.41)     | 0.79      | 1.87   | 2.92   | 4.56   | 7.11   |      |  |      |  |      |  |
| PV Life yrs                         | 25        | Commercial                              | Market aMW | (0.19)     | 0.10      | 0.23   | 0.35   | 0.55   | 0.86   |      |  |      |  |      |  |
| Inflation %                         | 2.0%      | Residential                             | Market MW  | (2.17)     | 1.55      | 3.87   | 6.05   | 9.46   | 14.80  |      |  |      |  |      |  |
| Discount Rate %                     | 8.4%      | Combined                                | Market aMW | (0.41)     | 0.19      | 0.47   | 0.73   | 1.15   | 1.80   |      |  |      |  |      |  |

Without State and Federal Incentives

| Commercial                             |                   | Cost per kW (\$) |               |
|--|-------------------|------------------|---------------|
| At Customer                            | a MW              | MW               | a MW          |
| At Generation                          | MW_w/adders       | MW_w/adders      | a MW_w/adders |
| Line Loss:                             | 6.7%              | Inst costs (\$)  |               |
| Lev Cost:                              | \$0.68 \$/kWh     | O & M (\$)       |               |
| Lev Cost w/adders:                     | \$0.63 \$/kWh     | Lump sum (\$)    |               |
| NPV:                                   | \$434,848 (\$000) |                  |               |
| Residential                            |                   | Cost per kW (\$) |               |
| At Customer                            | a MW              | MW               | a MW          |
| At Generation                          | MW_w/adders       | MW_w/adders      | a MW_w/adders |
| Line Loss:                             | 6.7%              | Inst costs (\$)  |               |
| Lev Cost:                              | \$0.75 \$/kWh     | O & M (\$)       |               |
| Lev Cost w/adders:                     | \$0.71 \$/kWh     | Lump sum (\$)    |               |
| NPV:                                   | \$123,764 (\$000) |                  |               |
| Combined Commercial and Residential PV |                   |                  |               |
| At Customer                            | MW                | MW               | a MW          |
| At Generation                          | MW_w/adders       | MW_w/adders      | a MW_w/adders |
| Line Loss:                             | 6.7%              | Inst costs (\$)  |               |
| Lev Cost:                              | \$0.69 \$/kWh     | O & M (\$)       |               |
| Lev Cost w/adders:                     | \$0.65 \$/kWh     | Lump sum (\$)    |               |
| NPV:                                   | \$558,612 (\$000) |                  |               |

With State and Federal Incentives

| No Subsidy           |        | Federal Tax Credit (ITC) |        | State Tax Credit (BETC) |        | Production Subsidy   |        | Federal Tax Credit (ITC) and State Tax Credit (BETC) |        | Federal Tax Credit (ITC), State Tax Credit (BETC) and Production Subsidy |        |
|----------------------|--------|--------------------------|--------|-------------------------|--------|----------------------|--------|--|--------|--|--------|
| Lev Cost:            | Com    | Lev Cost:                | Com    | Lev Cost:               | Com    | Lev Cost:            | Com    | Lev Cost:  | Com    | Lev Cost:  | Com    |
|                      | \$/kWh |                          | \$/kWh |                         | \$/kWh |                      | \$/kWh |  | \$/kWh |  | \$/kWh |
| Lev Cost:            | Res    | Lev Cost:                | Res    | Lev Cost:               | Res    | Lev Cost:            | Res    | Lev Cost:  | Res    | Lev Cost:  | Res    |
|                      | \$/kWh |                          | \$/kWh |                         | \$/kWh |                      | \$/kWh |  | \$/kWh |  | \$/kWh |
| Lev Cost w/added Com |        | Lev Cost w/added Com     |        | Lev Cost w/added Com    |        | Lev Cost w/added Com |        | Lev Cost w/added Com                                 |        | Lev Cost w/added Com   |        |
|                      | \$/kWh |                          | \$/kWh |                         | \$/kWh |                      | \$/kWh |  | \$/kWh |  | \$/kWh |
| Lev Cost w/added Res |        | Lev Cost w/added Res     |        | Lev Cost w/added Res    |        | Lev Cost w/added Res |        | Lev Cost w/added Res                                 |        | Lev Cost w/added Res   |        |
|                      | \$/kWh |                          | \$/kWh |                         | \$/kWh |                      | \$/kWh |  | \$/kWh |  | \$/kWh |

Assumptions

|                      |    |      |
|----------------------|----|------|
| Optimal Capacity Com | CF | 0.12 |
| Optimal Capacity Res | CF | 0.12 |
| Output (kW h/kW Com) |    | 1071 |
| Output (kW h/kW Res) |    | 1055 |

Subsidy

|                        |          |        |
|------------------------|----------|--------|
| Federal Tax Credit Com | %        | 30%    |
| Federal Tax Credit Res | %        | 30%    |
| State Tax Credit Com   | %        | 0%     |
| State Tax Credit Res   | %        | 0%     |
| Production Subsidy Com | \$/kWh   | \$0.15 |
| Production Subsidy Res | \$/kWh   | \$0.15 |
| Production Subsidy Com | Term END | 2015   |
| Production Subsidy Res | Term END | 2015   |

**Table 11. PSE DG: PV Technical Potential**

|   |                                   | Capacity | 2010      | 2029      | 2010       | 2029       | 2010 | 2029  |
|---|-----------------------------------|----------|-----------|-----------|------------|------------|------|-------|
| <b>Building Type</b>                      |                                   | Factor   | kW        | kW        | kWh*       | kWh*       | aMW* | aMW*  |
| <b>Commercial Sector</b>                  | Dry_Goods_Retail                  | 0.10     | 527,704   | 1,225,104 | 5,358,119  | 10,876,686 | 52   | 106   |
|   | Grocery                           | 0.10     | 108,686   | 252,322   | 1,103,557  | 2,240,159  | 11   | 22    |
|   | Hospital                          | 0.10     | 341,608   | 793,068   | 3,468,566  | 7,040,998  | 34   | 68    |
|   | Hotel_Motel                       | 0.10     | 40,762    | 94,631    | 413,880    | 840,154    | 4    | 8     |
|   | Office                            | 0.10     | 2,855,720 | 6,629,761 | 28,995,952 | 58,860,181 | 281  | 571   |
|   | Other                             | 0.10     | 2,922,078 | 6,783,817 | 29,669,729 | 60,227,912 | 288  | 584   |
|   | Restaurant                        | 0.10     | 161,742   | 375,496   | 1,642,272  | 3,333,721  | 16   | 32    |
|   | School                            | 0.10     | 167,520   | 388,909   | 1,700,936  | 3,452,806  | 16   | 33    |
|   | University                        | 0.10     | 84,933    | 197,178   | 862,379    | 1,750,582  | 8    | 17    |
|   | Warehouse                         | 0.10     | 556,875   | 1,292,826 | 5,654,309  | 11,477,935 | 55   | 111   |
|   | <b>Total Commercial (MW/MWh)</b>  | 0.10     | 7,768     | 18,033    | 78,870     | 160,101    | 765  | 1,553 |
| <b>Residential Sector</b>                 | Multi_Family                      | 0.10     | 490,913   | 1,028,038 | 4,984,552  | 9,059,404  | 48   | 88    |
|   | Manufactured                      | 0.11     | 196,790   | 412,105   | 1,768,841  | 3,214,862  | 22   | 40    |
|   | Single_Family                     | 0.11     | 1,143,905 | 2,395,492 | 10,281,958 | 18,687,418 | 127  | 231   |
|   | <b>Total Residential (MW/MWh)</b> | 0.11     | 1,832     | 3,836     | 17,035     | 30,962     | 198  | 359   |
| <b>Total Technical Potential (MW/MWh)</b> |                                   | 0.10     | 9,599     | 21,869    | 95,905     | 191,063    | 963  | 1,912 |

**Table 12. Module, Inverter and Total System Costs, System Prices**

**Assumptions**  
 2008 \$  
 Inflation rate 2.00%

| MARKET CASE |             | 2008 \$                          |                                    |                                |                        |                        |                                     |                             |              |  |
|-------------|-------------|----------------------------------|------------------------------------|--------------------------------|------------------------|------------------------|-------------------------------------|-----------------------------|--------------|--|
|             | Sector      | Distributor Module Cost per Watt | Distributor Inverter Cost per Watt | Labor Installed Costs per Watt | Install Costs per Watt | Bulk Quantity Discount | Customers % Receiving Bulk Discount | TOTAL Install Cost per Watt | Source       |  |
| 2008 Costs  | Commercial  | \$ 4.82                          | \$ 0.72                            | \$ 3.61                        | \$ 9.15                | 5%                     | 40%                                 | \$ 8.96                     | SolarBuzz.co |  |
|             | Com %       | 53%                              | 8%                                 | 39%                            | 100%                   |                        |                                     |                             |              |  |
|             | Residential | \$ 4.82                          | \$ 0.72                            | \$ 3.61                        | \$ 9.15                | 0%                     | 0%                                  | \$ 9.15                     | SolarBuzz.co |  |
|             | Res %       | 53%                              | 8%                                 | 39%                            | 100%                   |                        |                                     |                             |              |  |
| 2010 Costs  | Commercial  | \$ 4.40                          | \$ 0.66                            | \$ 3.29                        | \$ 8.35                | 8%                     | 40%                                 | \$ 8.10                     | Prometheus   |  |
|             | Com %       | 53%                              | 8%                                 | 39%                            | 100%                   |                        |                                     |                             |              |  |
|             | Residential | \$ 4.49                          | \$ 0.67                            | \$ 3.36                        | \$ 8.52                | 0%                     | 0%                                  | \$ 8.52                     | Prometheus   |  |
|             | Res %       | 53%                              | 8%                                 | 39%                            | 100%                   |                        |                                     |                             |              |  |
| 2015 Costs  | Commercial  | \$ 3.97                          | \$ 0.59                            | \$ 2.97                        | \$ 7.54                | 10%                    | 40%                                 | \$ 7.24                     | Prometheus   |  |
|             | Com %       | 53%                              | 8%                                 | 39%                            | 100%                   |                        |                                     |                             |              |  |
|             | Residential | \$ 4.05                          | \$ 0.61                            | \$ 3.03                        | \$ 7.69                | 0%                     | 0%                                  | \$ 7.69                     | Prometheus   |  |
|             | Res %       | 53%                              | 8%                                 | 39%                            | 100%                   |                        |                                     |                             |              |  |
| 2015 Costs  | Commercial  | \$ 3.43                          | \$ 0.51                            | \$ 2.57                        | \$ 6.52                | 10%                    | 40%                                 | \$ 6.26                     | DOE/NREL     |  |
|             | Com %       | 53%                              | 8%                                 | 39%                            | 100%                   |                        |                                     |                             |              |  |
|             | Residential | \$ 3.50                          | \$ 0.52                            | \$ 2.62                        | \$ 6.65                | 0%                     | 0%                                  | \$ 6.65                     | DOE/NREL     |  |
|             | Res %       | 53%                              | 8%                                 | 39%                            | 100%                   |                        |                                     |                             |              |  |
| 2025 Costs  | Commercial  | \$ 1.84                          | \$ 0.54                            | \$ 2.31                        | \$ 4.68                | 10%                    | 40%                                 | \$ 4.50                     | DOE/NREL     |  |
|             | Com %       | 39%                              | 11%                                | 49%                            | 100%                   |                        |                                     |                             |              |  |
|             | Residential | \$ 1.88                          | \$ 0.55                            | \$ 2.35                        | \$ 4.78                | 0%                     | 0%                                  | \$ 4.78                     | DOE/NREL     |  |
|             | Res %       | 39%                              | 11%                                | 49%                            | 100%                   |                        |                                     |                             |              |  |

| Sector      | PV Cost     | 2008    | 2009    | 2010    | 2011    | 2012    | 2013    | 2014    | 2015    | 2016    | 2017    | 2018    | 2019    | 2020    |
|-------------|-------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Commercial  | Market Case | \$ 8.96 | \$ 8.76 | \$ 8.55 | \$ 8.35 | \$ 8.15 | \$ 7.94 | \$ 7.74 | \$ 7.54 | \$ 7.33 | \$ 7.13 | \$ 6.93 | \$ 6.72 | \$ 6.52 |
| Residential | Market Case | \$ 9.15 | \$ 8.94 | \$ 8.73 | \$ 8.52 | \$ 8.31 | \$ 8.11 | \$ 7.90 | \$ 7.69 | \$ 7.48 | \$ 7.27 | \$ 7.07 | \$ 6.86 | \$ 6.65 |
| Commercial  | Base Case   | \$ 8.96 | \$ 8.53 | \$ 8.10 | \$ 7.93 | \$ 7.75 | \$ 7.58 | \$ 7.41 | \$ 7.24 | \$ 7.04 | \$ 6.84 | \$ 6.65 | \$ 6.45 | \$ 6.26 |
| Residential | Base Case   | \$ 9.15 | \$ 8.83 | \$ 8.52 | \$ 8.36 | \$ 8.19 | \$ 8.02 | \$ 7.86 | \$ 7.69 | \$ 7.48 | \$ 7.27 | \$ 7.07 | \$ 6.86 | \$ 6.65 |
| Commercial  | High Case   | \$ 5.87 | \$ 5.42 | \$ 5.40 | \$ 5.18 | \$ 4.95 | \$ 4.26 | \$ 4.51 | \$ 3.67 | \$ 4.10 | \$ 3.93 | \$ 3.78 | \$ 3.63 | \$ 3.61 |
| Residential | High Case   | \$ 6.16 | \$ 5.69 | \$ 5.67 | \$ 5.43 | \$ 5.20 | \$ 4.47 | \$ 4.73 | \$ 3.85 | \$ 4.30 | \$ 4.13 | \$ 3.97 | \$ 3.81 | \$ 3.79 |

Market Case = Assume PV costs decrease based on market data by 50% in 2029 based on DOE/NREL while install costs remain high  
 Base Case = Assume PV costs decrease based on market data by 66% in 2029 based on DOE/NREL  
 High Case = Assume PV costs decrease based on aggressive market data - assume cost data from sources (average)

**Sources**

**1 SOLARBUZZ**

**Lowest Prices (\$/Wp)**

The tracking of the lowest price band in the survey is measured against the number of prices below \$4.75 per watt (previously analyzed to below \$4.50 per watt). As of July 2008, there are currently 188 solar module prices below \$4.75 per watt (€2.99 per watt) or 13.0% of the total sample. This compares with 201 prices below \$4.75 per watt in June. The lowest retail price for a multicrystalline solar module is \$4.17 per watt (€2.63 per watt) from a US retailer. The lowest retail price for a monocrystalline module is \$4.35 per watt (€2.74 per watt), also from a US retailer. The module cost represents around 50 - 60% of the total installed cost of a Solar Energy System.

| Year      | Distributor Module | Distributor Invert | Module % of To | Total Installed Cost \$/Watt |
|-----------|--------------------|--------------------|----------------|------------------------------|
| 2005      | \$ 4.57            |                    | 53%            | \$ 8.67                      |
| 2006      | \$ 4.82            | \$ 0.71            | 53%            | \$ 9.14                      |
| 2007      | \$ 4.85            | \$ 0.71            | 53%            | \$ 9.21                      |
| 2008      | \$ 4.82            | \$ 0.72            | 53%            | \$ 9.15                      |
| Averaged: | \$ 4.76            | \$ 0.71            | \$ 0.53        | \$ 9.04                      |

**2 NREL**

According to NREL's U.S. Photovoltaics Industry Roadmap, in 2027 the estimated installed cost for PV will be: estimated: \$ 3.25 /Watt

**3 California Energy Commission (CEC)**

<http://www.renewableenergyaccess.com/rea/news/infoocus/story?id=46191>  
<http://www.renewableenergyaccess.com/assets/images/story/2006/10/11/table1.gif>  
 Average installed costs in CA for less than 30kW over the last 5 years

|           |         |
|-----------|---------|
| 2002      | \$ 9.97 |
| 2003      | \$ 9.00 |
| 2004      | \$ 8.63 |
| 2005      | \$ 8.71 |
| 2006      | \$ 9.14 |
| Averaged: | \$ 9.09 |

**Table 13. Module Power Density Assumptions**

\* Power Density

| Technology                    | % shares in x-Si | Module power density (Wp/sq. ft.) 2010 | System power density (Wp/sq. ft.) |       |       |
|-------------------------------|------------------|--|-----------------------------------|-------|-------|
|                               |                  |  | 2010                              | 2015  | 2029  |
| Mono crystalline              | 25%              | 15.9                                   | 10.18                             | 11.28 | 15.07 |
| Poly-crystalline/Ribbon       | 44%              | 14.7                                   |                                   |       |       |
| Amorphous silicon (thin film) | 30%              | 7.1                                    |                                   |       |       |
| Weighted average              |                  | 12.7                                   |                                   |       |       |

Module power density (w/sq.ft.)

System power density (w/sq.ft)

= 1.25 / Module power density (this accounts for the additional space required for installation such as space between modules, racking, wiring, etc)

U.S. National Photovoltaics Program Goals - 2000-2005

|                             | 1995 | 2000    | 2005  | 2020-2030 |                 |
|-----------------------------|------|---------|-------|-----------|-----------------|
| Module Efficiency (percent) | 7-17 | 8-18    | 10-20 | 15-25     | *assume average |
| average eff percent         | 12   | 13      | 15    | 20        |                 |
| Increase per yr             | -    | 0.20    | 0.40  | 0.25      |                 |
| Change in %                 |      | 1.6%    | 3.0%  | 1.6%      |                 |
|                             |      | average | 2.09% |           |                 |

Source: U.S. Department of Energy, *Photovoltaics - Energy for the New Millennium: The National Photovoltaics Program Plan 2000-2004*, DOE/GO-10099-940 (Washington, DC, January 2000), p. 9.

Note: Table shows range of module efficiencies for commercial flat-plate and concentrator modules

Sources:

Energy Information Administration, Form EIA-63B, "Annual Photovoltaic Module/Cell Manufacturers Survey." Link: <http://www.eia.doe.gov/cneaf/solar.renewables/page/solarreport/solar.html>

IEA 2002: <http://iea-pvps.org/pv/materials.htm>

NREL: 2007 R&D Future - PROJECTIONS OF FUTURE PERFORMANCE Graph

NREL: 2005 <http://www.nrel.gov/docs/fy05osti/37353.pdf>

Comparable Sources:

| Technology       | % share in x-Si Production | Module power density (Wp/sq. ft.) | System power density (Wp/sq. ft.) |       |       |
|------------------|----------------------------|-----------------------------------|-----------------------------------|-------|-------|
|                  |                            |                                   | 2003                              | 2010  | 2025  |
| Mono crystalline | 41%                        | 12.2                              | 8.70                              | 10.20 | 12.30 |
| Poly-crystalline | 59%                        | 9.9                               |                                   |       |       |
| Weighted average |                            | 10.80                             |                                   |       |       |

**Based on 2.4% increase per yr**

Energy Foundation PV: <http://www.ef.org/documents/EF-Final-Final2.pdf>



**Table 14. PSE Building Assumptions**

| RESIDENTIAL             |            |                  |                 |  |     |     |     |                        |                     |               |              |                      |       |
|-------------------------|------------|------------------|-----------------|--|-----|-----|-----|------------------------|---------------------|---------------|--------------|----------------------|-------|
| Residential Assumptions |            |                  |                 |  |     |     |     |                        |                     |               |              |                      |       |
| Building Type           | Roof Pitch |                  |                 | Usable roof orientation by % (max 25%) |     |     |     | Usable Sq. Ft. Factors |                     |               |              | Total Usable Sq. Ft. |       |
|                         | Roof Pitch | Pitch in Degrees | % increase in r | N                                      | E   | S   | W   | % sq. ft. roof usable  | % sq. ft. available | Tree or build | Total Usable |                      |       |
| Multi-Family*           | 0/12 pitch |                  | 0               | 1                                      | 25% | 25% | 25% | 25%                    | 100%                | 100%          | 70%          | 50%                  | 35.0% |
| Manufactured            | 4/12 pitch |                  | 18.43           | 1.05                                   | 0%  | 25% | 25% | 25%                    | 50%                 | 38%           | 85%          | 50%                  | 16.8% |
| Single-Family           | 4/12 pitch |                  | 18.43           | 1.05                                   | 0%  | 25% | 25% | 25%                    | 50%                 | 38%           | 85%          | 50%                  | 16.8% |

Manufactured Homes and Single-Family assumes 15% loss due to obstructions

Multi-Family assume 30% loss due to obstructions

All residential building types assume 50% loss due to shading (by trees and other buildings) and technical feasibility

\* All multi-family units are considered flat roof and use the same commercial times 50% of useable area factor

Assumptions based in part on Cadmus Solar experience and with reasonable limits based on Energy Foundation PV report: <http://www.ef.org/documents/EF-Final-Final2.pdf>

**COMMERCIAL**

Comparison of sources determine of a available roof sq.ft.

| Source                   | % sq. ft. area un-available | Factor (placement an | Total Sq. ft. un- | Total Usable | Source Links   |
|--------------------------|-----------------------------|----------------------|-------------------|--------------|--|
| Energy Foundation**      | 5%                          | 7                    | 35%               | 65%          | Energy Foundation PV: <a href="http://www.ef.org/documents/EF-Final-Final2.pdf">http://www.ef.org/documents/EF-Final-Final2.pdf</a>            |
| San Diego Gas & Electric | 20%                         | 1                    | 20%               | 80%          | TECHNICAL POTENTIAL FOR ROOFTOP PHOTOVOLTAICS IN THE SAN DIEGO REGION: <a href="http://www.sandiego.edu/epic">http://www.sandiego.edu/epic</a> |

\*\*An estimated 5% of commercial building roofing space is occupied by HVAC and other structures. Small obstructions create problems with mechanical array placement while large obstructions share areas up to 7x that of the footprint. Hence, around 35% of roof area is considered to be unavailable due to shading. In some commercial buildings such as shopping center, rooftops tend to be geometrically more complex than in other buildings and the percentage of unavailable space may be slightly higher.

**Commercial Assumptions**

All commercial building types are assumed flat: roof pitch 0

| Building Type    | Obstructions and Equipment | Parapet access (2) | Equipment Shad | Building Shad | Total % loss | Total Usable sq. ft. |
|------------------|----------------------------|--------------------|----------------|---------------|--------------|----------------------|
| Dry Goods Retail | 10%                        | 5%                 | 5%             | 15%           | 35%          | 65%                  |
| Grocery          | 10%                        | 5%                 | 5%             | 15%           | 35%          | 65%                  |
| Hospital         | 10%                        | 5%                 | 5%             | 15%           | 35%          | 65%                  |
| Hotel Motel      | 10%                        | 5%                 | 5%             | 15%           | 35%          | 65%                  |
| Office           | 10%                        | 5%                 | 5%             | 15%           | 35%          | 65%                  |
| Other            | 10%                        | 5%                 | 5%             | 15%           | 35%          | 65%                  |
| Restaurant       | 10%                        | 5%                 | 5%             | 15%           | 35%          | 65%                  |
| School           | 10%                        | 5%                 | 5%             | 15%           | 35%          | 65%                  |
| University       | 10%                        | 5%                 | 5%             | 15%           | 35%          | 65%                  |
| Warehouse        | 10%                        | 5%                 | 5%             | 15%           | 35%          | 65%                  |

1) The obstructions and equipment are assumed to 10% of the building roof and is assumed there is additional shading of 50% by that equipment

2) Parapet access is required by code / OSHA, assume 5% loss in sq.ft.

3) Building shading accounts for the surrounding building and other technical restrictions, it is assumed that more shading occurs in an urban setting due to the surrounding buildings

**General Building Assumptions**

| Bldg ID     | Building Type            | Building Sq. Ft. | Estimated Floors |
|-------------|--------------------------|------------------|------------------|
| RT0         | Dry Goods Retail         | 6,421            | 1                |
| GR0         | Grocery                  | 8,637            | 1                |
| HEH         | Hospital                 | 14,803           | 2                |
| LGO         | Hotel Motel              | 12,772           | 4                |
| OFF0        | Office                   | 9,525            | 1                |
| OCM         | Other                    | 10,699           | 1                |
| RS0         | Restaurant               | 4,699            | 1                |
| EDS         | School                   | 22,241           | 2                |
| EDU         | University               | 32,392           | 2                |
| WA0         | Warehouse                | 15,284           | 1                |
| <b>TCOM</b> | <b>Total Commercial</b>  | <b>137,473</b>   | <b>2</b>         |
| MF0         | Multi-Family             | 1,300            | 2                |
| MN0         | Manufactured             | 1,570            | 1                |
| SF0         | Single-Family            | 1,921            | 2                |
| <b>TRES</b> | <b>Total Residential</b> | <b>4,791</b>     | <b>2</b>         |

**Table 15. PV WATTS Assumptions**

| Overall DC to AC Derate Factor | Component     | Range of          |
|--------------------------------|---------------|-------------------|
| Component Derate Factors       | Derate Values | Acceptable Values |
| PV module nameplate DC rating  | 0.95          | 0.80 - 1.05       |
| Inverter and Transformer       | 0.92          | 0.88 - 0.96       |
| Mismatch                       | 0.98          | 0.97 - 0.995      |
| Diodes and connections         | 0.995         | 0.99 - 0.997      |
| DC wiring                      | 0.98          | 0.97 - 0.99       |
| AC wiring                      | 0.99          | 0.98 - 0.993      |
| Soiling                        | 0.95          | 0.30 - 0.995      |
| System availability            | 0.98          | 0.00 - 0.995      |
| Shading                        | 1             | 0.00 - 1.00       |
| Sun-tracking                   | 1             | 0.95 - 1.00       |
| Age                            | 1             | 0.70 - 1.00       |
| Overall DC to AC derate factor | 77%           | PVWATTS Default   |

**Residential Assumptions**

| PVWATTS: Hourly PV Performance Data |              |
|-------------------------------------|--------------|
| City:                               | SEATTLE      |
| State:                              | WA           |
| Lat (deg N):                        | 47.45        |
| Long (deg W):                       | 122.3        |
| Elev (m):                           | 122          |
| Array Type:                         | "Fixed Tilt" |
| Array Tilt (deg):                   | 18.5         |
| Array Azimuth (deg):                | 180          |
| DC Rating (kW):                     | 1000         |
| DC to AC Derate Factor:             | 0.77         |
| AC Rating (kW):                     | 770          |

**Commercial Assumptions**

| PVWATTS: Hourly PV Performance Data |  |
|-------------------------------------|--|
| City:                               |  |
| State:                              |  |
| Lat (deg N):                        |  |
| Long (deg W):                       |  |
| Elev (m):                           |  |
| Array Type:                         |  |
| Array Tilt (deg):                   |  |
| Array Azimuth (deg):                |  |
| DC Rating (kW):                     |  |
| DC to AC Derate Factor:             |  |
| AC Rating (kW):                     |  |

Source:

PVWATTS: [http://rredc.nrel.gov/solar/codes\\_algs/PVWATTS/](http://rredc.nrel.gov/solar/codes_algs/PVWATTS/)

See link for more information: [http://rredc.nrel.gov/solar/codes\\_algs/PVWATTS/version1/derate.cgi](http://rredc.nrel.gov/solar/codes_algs/PVWATTS/version1/derate.cgi)

## Small Hydro

Hydraulic power can be captured wherever a flow of water falls from a higher level to a lower level, which usually occurs where a stream runs down a hillside, a river passes over a waterfall or man-made weir, or where a reservoir discharges water back into the main river. The vertical fall of the water is known as the “head,” and this, along with the flow rate, determines the power output. The primary resource used in this study to evaluate potential sites for hydro development was the Virtual Hydropower Prospector (VHP), which is available through the Idaho National Laboratory.<sup>18</sup> The VHP is a GIS-based tool that allows users to identify existing and potential small hydro sites ( $\geq 10$  kWa).

The most small or micro hydro systems are run-of-river structures and do not require dams. The water flowing in the stream is channeled into pipes (or a penstock) and then into a turbine, which generates electricity. The water is then returned to the stream downstream from the turbine. The environmental footprints of run-of-river facilities are much smaller than those of larger hydro plants, which require large storage reservoirs. No land is flooded to create a reservoir for the plant, but a small weir may be installed to help regulate flow.

The benefits of small hydro are many and include:

- High efficiency (70% – 90%).
- A high capacity factor.
- A high level of predictability, varying with annual rainfall patterns.
- Slow rate of change for output power, which varies only gradually from day to day (not from minute to minute).
- A long-lasting and robust technology; systems can be engineered to last for 40 years or more.
- Low environmental impact; fish and other wildlife are generally not affected by the installation.

## Hydro Energy Costs

Costs vary considerably according to the size of the system installed, with the cost per kW going down as the system size increases. For this study, costs were taken from a study prepared for BC Hydro<sup>19</sup> and include the following installation related costs: penstock, intake, powerhouse, generating equipment, access road, switchyard, and transmission line. A percentage of the equipment costs are added to the total cost to account for engineering costs (20%) and contingency costs (30%).

Cadmus used cost data from sites with less than one mile of transmission required for installation; these sites ranged from 100 to 3700 kW. Estimated installed costs were \$5,688/kW, with additional O&M costs of \$535/kW per year (calculated as 9.4% of installed cost).

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<sup>18</sup> <http://hydropower.inl.gov/prospector>

<sup>19</sup> *Green Energy Study for British Columbia Phase 2: Mainland*; Small Hydro, October 2002, Prepared for BC Hydro by Sigma Engineering Ltd.

Table 16. Cost Estimation

| Stream | Name         | F3    | Lat_Long    | Region | Flow (m/s) | Head (m) | Penstock Length (m) | Penstock Diameter (m) | Power (kW) | Cost (\$1000) | Transmission Dist (km) | Capacity Factor |
|--------|--------------|-------|-------------|--------|------------|----------|---------------------|-----------------------|------------|---------------|------------------------|-----------------|
| 11     | DAVIS        | CR    | 5008/11657  | 1      | 0.8        | 122      | 500                 | 0.52                  | 800        | 1578          | 0.5                    | 0.47            |
| 16     | FALL         | CR    | 5036/11853  | 1      | 0.45       | 500      | 1000                | 0.41                  | 1800       | 2347          | 1.5                    | 0.45            |
| 18     | FERRY        | CR    | 5015/11839  | 1      | 1.1        | 150      | 3100                | 0.78                  | 1300       | 4060          | 1                      | 0.51            |
| 23     | HOLSTEIN     | CR    | 5018/11835  | 1      | 0.29       | 150      | 1200                | 0.41                  | 300        | 1605          | 1                      | 0.45            |
| 30     | LEGERWOOD    | CR    | 5058/11846  | 1      | 0.53       | 250      | 1300                | 0.47                  | 1000       | 2594          | 1.5                    | 0.45            |
| 33     | LOFTUS       | CR    | 5056/11849  | 1      | 0.75       | 250      | 1000                | 0.51                  | 1500       | 2378          | 0.5                    | 0.45            |
| 34     | LOST         | LEDGE | 5006/11656  | 1      | 0.28       | 430      | 1700                | 0.36                  | 900        | 1639          | 0.5                    | 0.47            |
| 46     | SCHROEDER    | CR    | 5002/11653  | 1      | 0.64       | 300      | 2300                | 0.53                  | 1500       | 3502          | 0.5                    | 0.47            |
| 63     | UNNAMED      | CR    | 5055/11807  | 1      | 0.85       | 250      | 1150                | 0.54                  | 1700       | 2755          | 1                      | 0.45            |
| 69     | BLURTON      | CR    | 5041/111902 | 2      | 0.48       | 400      | 1600                | 0.44                  | 1500       | 2383          | 1                      | 0.45            |
| 72     | CADWALLADER  | CR    | 5046/12248  | 2      | 4.8        | 50       | 600                 | 1.2                   | 1900       | 4284          | 0.5                    | 0.52            |
| 73     | CHASE        | CR    | 5049/11941  | 2      | 0.99       | 100      | 500                 | 0.58                  | 800        | 1591          | 0                      | 0.45            |
| 75     | CORNING      | CR    | 5054/11932  | 2      | 0.52       | 100      | 700                 | 0.49                  | 400        | 1251          | 0                      | 0.45            |
| 76     | CYPRESS      | CR    | 4920/12314  | 2      | 1.3        | 105      | 825                 | 0.7                   | 1100       | 1782          | 0                      | 0.55            |
| 82     | HUMMING      | BIRD  | 5046/11900  | 2      | 0.3        | 250      | 750                 | 0.36                  | 600        | 1103          | 1                      | 0.45            |
| 87     | MARA         | CR    | 5046/11900  | 2      | 0.46       | 250      | 1000                | 0.44                  | 900        | 1389          | 1                      | 0.45            |
| 90     | PAUL         | CR    | 4915/12001  | 2      | 0.67       | 120      | 400                 | 0.47                  | 600        | 2190          | 1                      | 0.4             |
| 91     | PAVILION     | CR    | 5054/12146  | 2      | 0.15       | 350      | 2350                | 0.36                  | 400        | 1686          | 0                      | 0.5             |
| 94     | POTLATCH     | CR    | 4935/12319  | 2      | 0.43       | 150      | 1300                | 0.47                  | 500        | 2061          | 1                      | 0.55            |
| 101    | TRETHEWAY    | CR    | 4942/12205  | 2      | 7.5        | 30       | 150                 | 1.3                   | 1800       | 4228          | 0                      | 0.55            |
| 104    | UNNAMED      | CR    | 4918/12004  | 2      | 0.08       | 600      | 1300                | 0.2                   | 400        | 1380          | 1                      | 0.4             |
| 105    | UNNAMED      | CR    | 4941/12335  | 2      | 0.18       | 793      | 1800                | 0.31                  | 1100       | 2585          | 0                      | 0.57            |
| 106    | UNNAMED      | CR    | 4940/12335  | 2      | 0.15       | 1037     | 2400                | 0.25                  | 1200       | 3276          | 0                      | 0.6             |
| 113    | WHITE        | CR    | 5051/11919  | 2      | 0.6        | 50       | 300                 | 0.5                   | 200        | 1005          | 0                      | 0.6             |
| 114    | WHITECAP     | CR    | 5043/12218  | 2      | 0.73       | 200      | 950                 | 0.52                  | 1100       | 2415          | 1                      | 0.52            |
| 118    | ADRIAN       | CR    | 4948/12527  | 3      | 1.8        | 50       | 625                 | 0.87                  | 700        | 2352          | 0                      | 0.65            |
| 119    | AHAMINGUS    | CR    | 4941/12607  | 3      | 0.99       | 40       | 100                 | 0.52                  | 300        | 1155          | 0.5                    | 0.65            |
| 126    | BIG          | TREE  | 5015/12545  | 3      | 1.7        | 100      | 1900                | 0.92                  | 1300       | 3889          | 1.5                    | 0.67            |
| 130    | CANTON       | CR    | 4949/12628  | 3      | 3.1        | 30       | 800                 | 1.2                   | 700        | 3447          | 1.5                    | 0.65            |
| 144    | HEADQUARTERS | CR    | 4942/12507  | 3      | 1.5        | 50       | 250                 | 0.68                  | 600        | 1668          | 1.4                    | 0.65            |
| 174    | OKTWANCH     | R     | 4947/12615  | 3      | 1.6        | 30       | 400                 | 0.83                  | 400        | 2072          | 0.9                    | 0.65            |
| 185    | SOMBRIO      | R     | 4831/12417  | 3      | 0.87       | 50       | 380                 | 0.6                   | 300        | 1365          | 0.5                    | 0.51            |
| 192    | TLOOLS       | CR    | 4952/12545  | 3      | 3          | 50       | 625                 | 1.1                   | 1200       | 2971          | 1                      | 0.65            |
| 205    | UNNAMED      | CR    | 4948/12625  | 3      | 1.2        | 30       | 200                 | 0.65                  | 300        | 1310          | 0.5                    | 0.65            |
| 211    | UNNAMED      | CR    | 4948/12617  | 3      | 2          | 30       | 400                 | 0.9                   | 500        | 2061          | 1.5                    | 0.65            |
| 216    | UNNAMED      | CR    | 5030/12654  | 3      | 1.4        | 60       | 500                 | 0.73                  | 700        | 2032          | 1.6                    | 0.68            |
| 220    | UNNAMED      | CR    | 5005/12625  | 3      | 2          | 60       | 1250                | 0.99                  | 900        | 3051          | 0.8                    | 0.64            |
| 224    | UNNAMED      | CR    | 5005/12628  | 3      | 1.5        | 90       | 1320                | 0.83                  | 1100       | 3038          | 1.2                    | 0.64            |
| 232    | UPANA        | CR    | 4948/12605  | 3      | 5.8        | 30       | 800                 | 1.5                   | 1400       | 4587          | 0.1                    | 0.65            |
| 236    | WARD         | CR    | 4947/12604  | 3      | 0.86       | 30       | 200                 | 0.58                  | 200        | 1122          | 0.4                    | 0.65            |
| 255    | SWIFT        | CR    | 5251/11916  | 4      | 3.7        | 61       | 1425                | 1.3                   | 1800       | 5154          | 0.9                    | 0.5             |
| 265    | MCLEESE      | CR    | 5220/12217  | 5      | 0.3        | 150      | 1300                | 0.45                  | 400        | 1424          | 0                      | 0.45            |
| 268    | UNNAMED      | CR    | 5155/12444  | 5      | 0.5        | 61       | 750                 | 0.53                  | 200        | 1487          | 1                      | 0.4             |
| 269    | UNNAMED      | CR    | 5144/12427  | 5      | 0.4        | 425      | 3700                | 0.47                  | 1300       | 4129          | 1                      | 0.45            |
| 274    | NOOMST       | CR    | 5226/12613  | 6      | 3.4        | 61       | 550                 | 1                     | 1600       | 3712          | 1                      | 0.65            |
| 275    | NOOSGULCH    | CR    | 5226/12623  | 6      | 8.4        | 30       | 700                 | 1.7                   | 2000       | 5904          | 1                      | 0.65            |
| 276    | TASTSQUAN    | CR    | 5222/12645  | 6      | 1.9        | 91       | 250                 | 0.67                  | 1400       | 2240          | 0.5                    | 0.65            |
| 288    | ALICE        | CR    | 5440/12847  | 8      | 1.9        | 92       | 1200                | 0.89                  | 1400       | 3388          | 1                      | 0.6             |
| 299    | HANKIN       | CR    | 5435/12826  | 8      | 1          | 91       | 950                 | 0.67                  | 700        | 3406          | 1                      | 0.6             |
| 310    | TROUT        | CR    | 5451/12719  | 8      | 1.6        | 50       | 500                 | 0.79                  | 600        | 1753          | 0                      | 0.6             |
| 325    | UNNAMED      | CR    | 5410/12956  | 9      | 0.1        | 650      | 2000                | 0.23                  | 500        | 2342          | 0.5                    | 0.7             |
| 353    | TELEGRAPH    | CR    | 5754/13110  | 13     | 0.56       | 152      | 1200                | 0.51                  | 700        | 2048          | 0                      | 0.45            |

Source: BC Hydro, Microhydro/small hydro potential, INVENTORY OF UNDEVELOPED OPPORTUNITIES AT POTENTIAL MICROHYDRO SITES IN BRITISH COLUMBIA, March 2000

| Size (kW) | Cost/KW (power curve) | Cost/KW (linear model) |
|-----------|-----------------------|------------------------|
| 20        | \$ 15,386             | \$ 4,685               |
| 30        | \$ 12,799             | \$ 4,668               |
| 40        | \$ 11,232             | \$ 4,652               |
| 60        | \$ 9,344              | \$ 4,618               |
| 80        | \$ 8,200              | \$ 4,585               |
| 100       | \$ 7,410              | \$ 4,551               |
| 300       | \$ 4,500              | \$ 4,215               |
| 500       | \$ 3,568              | \$ 3,880               |
| 1000      | \$ 2,605              | \$ 3,041               |

**Table 17. Summed Average Stream Flow for all Available Stream Data in the Specified County  
(Average Taken over a Five Year Period)**

|           | Jan     | Feb     | Mar     | Apr     | May     | Jun     | Jul    | Aug    | Sep    | Oct    | Nov     | Dec     | # streams (n) |
|-----------|---------|---------|---------|---------|---------|---------|--------|--------|--------|--------|---------|---------|---------------|
| Whatcom   | 26,812  | 17,526  | 18,798  | 18,047  | 19,782  | 21,939  | 16,907 | 10,357 | 9,792  | 17,213 | 29,304  | 21,953  | 20            |
| Skagit    | 68,642  | 50,266  | 49,824  | 46,188  | 52,094  | 64,099  | 48,141 | 29,870 | 28,863 | 46,460 | 80,168  | 57,785  | 8             |
| Jefferson | 15,641  | 7,578   | 11,045  | 6,692   | 4,872   | 4,361   | 3,427  | 1,937  | 2,064  | 7,550  | 14,328  | 12,563  | 4             |
| King      | 36,237  | 24,457  | 26,522  | 23,221  | 24,109  | 20,538  | 10,089 | 6,996  | 8,385  | 13,950 | 34,339  | 27,140  | 44            |
| Pierce    | 14,874  | 9,962   | 10,456  | 10,838  | 11,903  | 12,113  | 8,674  | 6,562  | 5,608  | 6,961  | 11,622  | 12,738  | 20            |
| Thurston  | 13,708  | 8,422   | 8,669   | 5,880   | 3,509   | 2,594   | 1,784  | 1,547  | 1,692  | 2,658  | 9,380   | 11,019  | 8             |
| Kitsap    | 165     | 71      | 86      | 49      | 29      | 18      | 15     | 13     | 13     | 38     | 81      | 131     | 3             |
| Kittitas  | 1,557   | 1,733   | 2,313   | 2,431   | 2,662   | 2,922   | 3,752  | 3,681  | 1,537  | 1,019  | 1,332   | 1,142   | 1             |
| Island    | -       | -       | -       | -       | -       | -       | -      | -      | -      | -      | -       | -       | -             |
| Total     | 177,636 | 120,015 | 127,713 | 113,347 | 118,962 | 128,584 | 92,788 | 60,962 | 57,954 | 95,849 | 180,555 | 144,471 |               |
| % of max  | 98%     | 66%     | 71%     | 63%     | 66%     | 71%     | 51%    | 34%    | 32%    | 53%    | 100%    | 80%     |               |

## Small Wind

Wind energy is converted to mechanical or electrical energy through the use of a wind turbine. Wind energy is an intermittent resource, meaning that the energy output varies and is unpredictable. Despite the intermittency of the wind, the wind energy industry is growing; small wind saw an average growth of 14 percent. The total installed capacity of small wind (<100 kW) in the U.S. is estimated to be between 55-60 MW as of 2007.<sup>20</sup>

Small wind turbines are generally defined as having an installed capacity of up to 100 kW. For this analysis, the focus was on residential systems of 1.9 kW and 10 kW. Residential systems tend to be smaller, due to both cost constraints and the amount of energy needed.

The AWEA Small Wind Turbine Global Market Study 2008 conducted a survey with many players in the small wind industry, including researchers, component vendors, manufacturers, engineers, consultants, utilities, local government offices, and dealers/distributors/installers<sup>21</sup>. The survey found that the top market barrier to installing small wind turbines was cost to the customer. Additional key barriers included restrictive zoning and permitting rules, and lack of financial incentives.

## Small Wind Energy Costs

The cost for a wind turbine varies by the size of the system installed. In general, as the installed capacity of wind turbines increases, the installed cost per kW decreases. Costs are assumed to be nominally constant. However, it should be recognized that costs may increase due to tighter steel supplies. Costs were taken primarily from turbine manufacturer and distributor websites or discussions with manufacturers.

**Table 18. Basic Information and Assumptions**

|                                |         |
|--------------------------------|---------|
| Residential Retail Rate        | 0.098   |
| Discount Rate                  | 8.25%   |
| Wind Turbine Measure Life      | 25      |
| O&M costs per KW               | \$20.00 |
| Washington State Tax Incentive | \$0.12  |
| Inflation                      | 3%      |

**Table 19. Turbine Installed and O&M Costs**

|  | Installed Cost | O&M cost, yearly |
|--|----------------|------------------|
| Abundant Renewable Energy Model: ARE 442 10KW  | \$90,000       | \$200.00         |
| Southwest Windpower Model: Skystream 3.7 1.9KW | \$11,000       | \$38.00          |

<sup>20</sup> Compiled from American Wind Energy Association. Home and Farm Wind Energy Systems: Reaching the Next Level. AWEA. June 2005. and American Wind Energy Association. AWEA Small Wind Turbine Global Market Study 2008. AWEA. June 2008.

<sup>21</sup> American Wind Energy Association. AWEA Small Wind Turbine Global Market Study 2008. AWEA. June 2008.

**Table 20. Costs, Measure Life and Capacity Factor for Clean Energy Resources**

|                        | Cost    |
|------------------------|---------|
| Average Installed Cost | \$8,197 |
| Average O&M Cost       | \$20    |

**Table 21. Annual kWh Production by location, per turbine**

|         | Abundant Renewable Energy Model: ARE 442 10KW | Southwest Windpower Model: Skystream 3.7 1.9KW |
|---------|---|--|
| Seattle | 5,972   | 1,435  |
| Olympia | 3,997   | 965  |
| Yakima  | 4,762   | 1,113  |

**Table 22. Estimated Pay-back Period, in years, with tax incentives**

|         | Abundant Renewable Energy Model: ARE 442 10KW | Southwest Windpower Model: Skystream 3.7 1.9KW |
|---------|---|--|
| Seattle | 69  | 35   |
| Olympia | 103   | 52   |
| Yakima  | 87  | 45   |

**Table 23. NPV of Total Cost and Levelized Cost by Turbine and Wind Region**

|                                | Abundant Renewable Energy Model:<br>ARE 442 10KW | Southwest Windpower Model: Skystream<br>3.7 1.9KW |
|--------------------------------|--|---|
| NPV of total cost              | \$92,090   | \$11,397  |
| Seattle Levelized Cost per kWh | \$1.49   | \$0.76  |
| Olympia Levelized Cost per kWh | \$2.20   | \$1.13  |
| Yakima Levelized Cost per kWh  | \$1.85   | \$0.98  |

**Table 24. Power Supply Curves**

| Company Name:        | Abundant Renewable Energy | Southwest Windpower |
|----------------------|---------------------------|---------------------|
| Model:               | ARE 442                   | Skystream 3.7       |
| Rating (kW):         | 10                        | 1.9                 |
| Installed Cost (\$): | \$90,000                  | \$11,000            |
| O&M Cost (\$/year)   | \$200                     | \$38                |
|                      |                           |                     |
| Windspeed (m/s)      | Power (kW)                | Power (kW)          |
| 0                    | 0                         | 0                   |
| 2                    | 0                         | 0                   |
| 4                    | 0.8                       | 0.2                 |
| 6                    | 2                         | 0.5                 |
| 8                    | 6                         | 1.3                 |
| 10                   | 9.2                       | 2                   |
| 12                   | 10.5                      | 2.5                 |
| 14                   | 10.3                      | 2.6                 |
| 16                   | 10                        | 2.3                 |
| 18                   | 10                        | 2.1                 |
| 20                   | 10                        | 2                   |
| 22                   | 10                        | 2                   |
| 24                   | 10                        | 2                   |



**Table 25. Technical Potential in 2029 (aMW)**

| Sector       | aMW          |
|--------------|--------------|
| Residential  | 53.01        |
| Commercial   | 12.94        |
| Industrial   | 0.44         |
| <b>TOTAL</b> | <b>66.39</b> |

**Table 26. Nameplate Potential**

| Sector       | MW           |
|--------------|--------------|
| Residential  | 800          |
| Commercial   | 445          |
| Industrial   | 17           |
| <b>TOTAL</b> | <b>1,261</b> |

**Table 27. Peak Hour MW Produced**

| Sector       | MW           |
|--------------|--------------|
| Residential  | 53           |
| Commercial   | 7,608        |
| Industrial   | 206          |
| <b>TOTAL</b> | <b>7,867</b> |

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