RPAG meeting

2025 IRP

December 12, 2023

PSE *PUGET SOUND ENERGY*
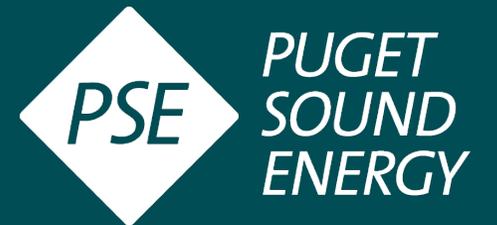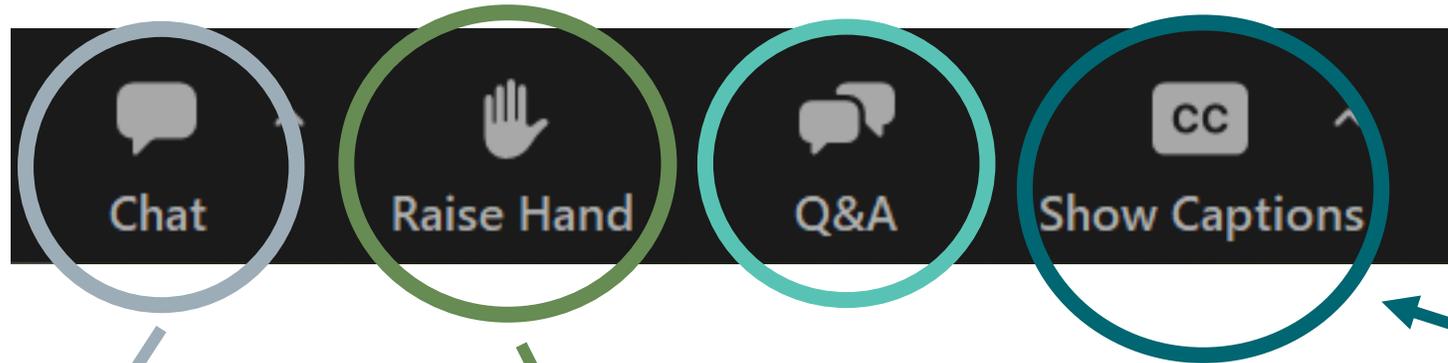
Welcome to the webinar!

The Q&A tool will be turned off during the meeting

RPAG members and PSE staff are welcome to use the chat feature

During the public comment period, raise your hand if you would like to make a verbal comment

Click to see real-time closed captioning

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Safety moment

- Replace smoke detectors in your home every 10 years
- Replace carbon monoxide and combination alarms every 7 years
- Replace batteries in smoke detectors at least once a year
- Visit National Fire Protection Association website for more home fire safety tips

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Facilitator requests

- Engage constructively and courteously towards all participants
- Respect the role of the facilitator to guide the group process
- Avoid use of acronyms and explain technical questions
- Use the Feedback Form for additional input to PSE
- Aim to focus on the webinar topic
- Public comments will occur after PSE's presentations

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Agenda

Time	Agenda Item	Presenter / Facilitator
10:00 a.m. – 10:05 a.m.	Introduction and agenda review	Sophie Glass, Triangle Associates
10:05 a.m. – 10:10 a.m.	RPAG feedback update	Sophie Glass, Triangle Associates
10:10 a.m. – 10:20 a.m.	Public webinar feedback update	Kara Durbin, PSE
10:20 a.m. – 10:35 a.m.	IRP timeline and work plan updates	Phillip Popoff, PSE
10:35 a.m. – 11:05 a.m.	Gas scenario themes	Phillip Popoff, PSE
11:05 a.m. – 11:15 a.m.	Break	All
11:15 p.m. – 11:45 p.m.	Electric scenario themes	Elizabeth Hossner, PSE
11:45 a.m. – 12:45 a.m.	Conservation Potential Assessment (CPA) scope and design	Aquila Velonis, Cadmus Group
12:45 p.m. - 1:00 p.m.	Next steps and public comment opportunity	Sophie Glass, Triangle Associates
1:00 p.m.	Adjourn	All

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Today's speakers

Sophie Glass

Facilitator, Triangle Associates

Phillip Popoff

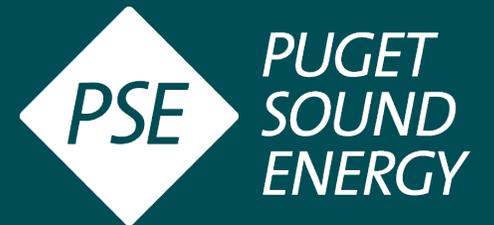Director, Resource Planning Analytics, PSE

Elizabeth Hossner

Manager, Resource Planning and Analysis

Aquila Velonis

Cadmus Group

RPAG feedback update

Sophie Glass, Triangle Associates

Convening Assessment

- Facilitation team conversations with 7 members so far
    - 2 pending response
    - 2 rescheduled
    - Western Energy Storage Taskforce withdrew participation from the RPAG

- Asked questions related to member hopes and concerns re: RPAG

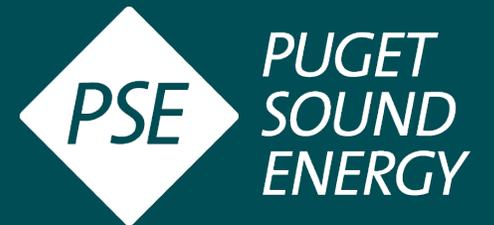- Reviewed the draft RPAG charter
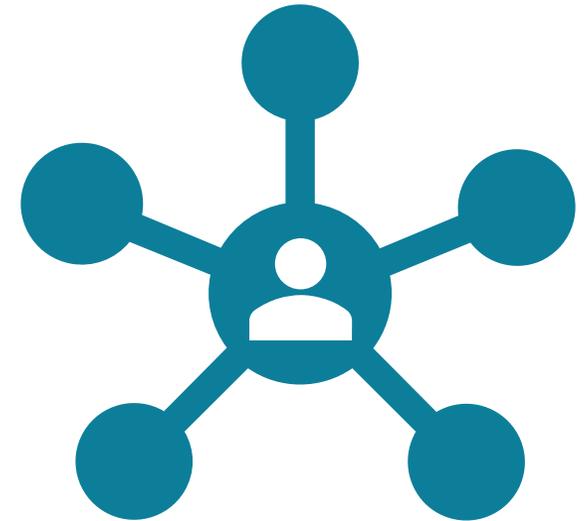
TRIANGLE

Next Steps

- Schedule a 1-on-1 with Triangle if you haven't already

- Receive a tracked changes version of the charter with RPAG member edits in January

- Receive a full thematic summary from this convening assessment in January
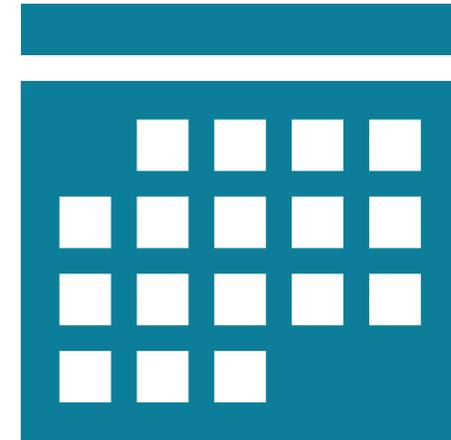
Public webinar feedback

Kara Durbin, PSE

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November 6 Equity in Delivery System Planning public webinar

- Meeting summary and feedback report available on the [PSE IRP website](#)

- PSE received 15 questions or comments during the meeting and one comment via feedback form

- Post-meeting poll received 11 responses

- 38 people participated via Zoom, 49 views on [YouTube](#)

- Feedback themes included:
  - Desire to see changes to public meeting format
  - Interest in PSE's Virtual Power Plant (VPP) and vehicle to grid plans
  - Desire to see PSE increase renewable energy supply and decommission gas system

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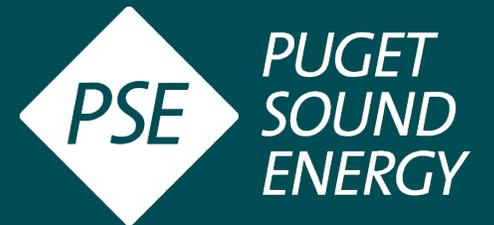# November 15 Energy Efficiency and Demand-side Resources public webinar

- Meeting summary and feedback report available on the [PSE IRP website](#)

- PSE received 32 questions or comments during the meeting and one comment via feedback form

- 45 people participated via Zoom, 53 views on [YouTube](#)

- Feedback themes included:
    - Interest in PSE's Virtual Power Plant (VPP) and vehicle to grid plans
    - Interest in solar rebates
    - Interest in PSE's Time Varying Rates (TVR) and [Time of Use](#) (TOU) pilot program
    - Interest in PSE's [Flex Smart](#) program
    - Positive responses to community solar initiatives
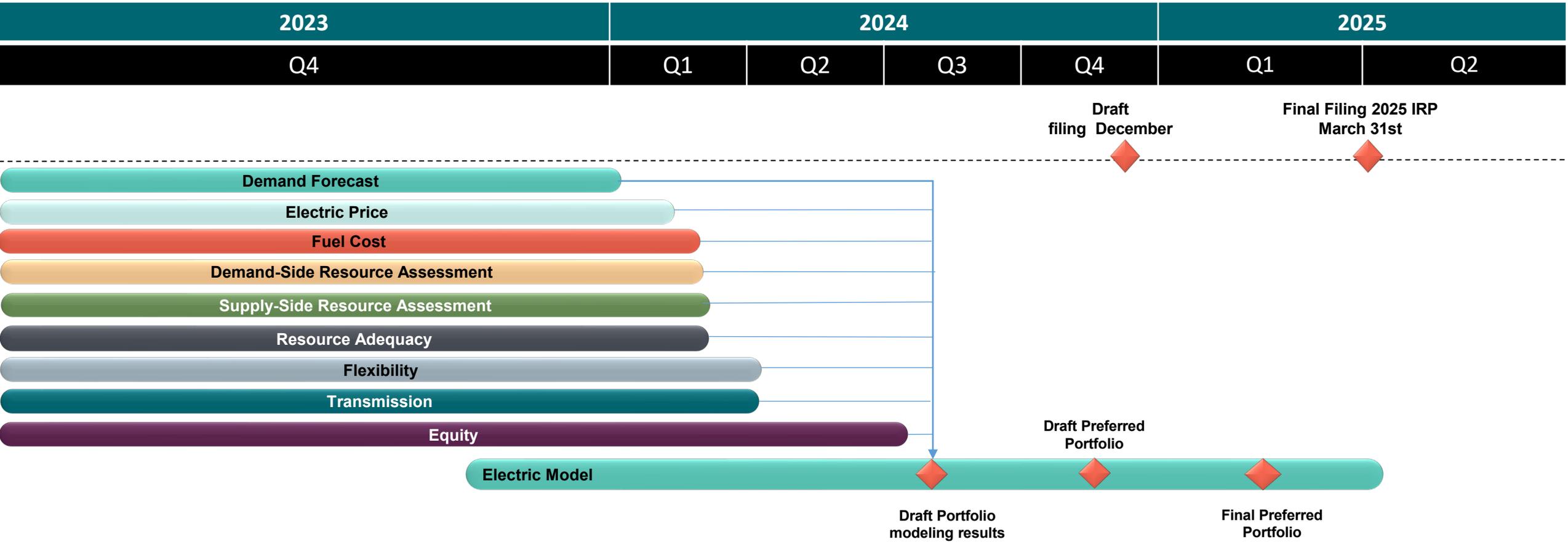   - Desire to see PSE pursue electrification of the natural gas system

PSE
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IRP timeline and work plan updates

Phillip Popoff, PSE

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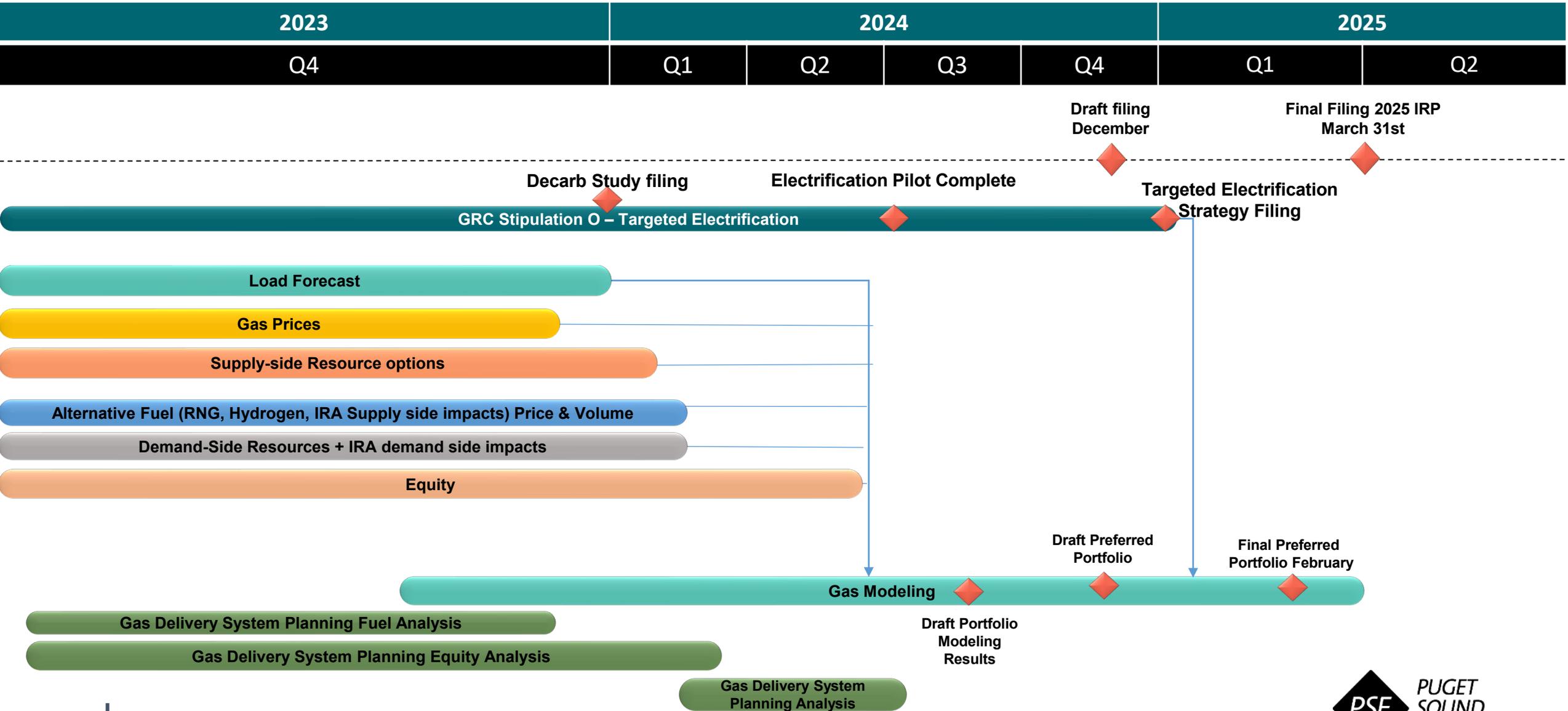
Electric IRP March 31, 2025

Draft public and RPAG meeting topics

Public

1. Public engagement approach
2. Biennial Clean Energy Implementation Plan Update
3. Energy Efficiency and Demand-side Resources
4. Resource Alternatives
   a. Hydrogen (emerging)
   b. Energy storage
   c. Small modular nuclear
   d. Alternative fuels (renewable natural gas, biodiesel)
   e. Local and regional delivery infrastructure needs
5. Equity in Delivery System Planning
6. 2023 Decarbonization Study results
7. Equity Considerations in the Gas Utility IRP
8. Equity Considerations in the Electric Utility IRP
9. Draft Electric and Gas Integrated Resource Plan
10. Final Electric and Gas Integrated Resource Plan

Resource Planning Advisory Group (RPAG)

1. RPAG kickoff
2. Conservation Potential Assessment (electric and gas)
3. Scenario themes (electric and gas)
4. Load forecast before conservation (electric and gas)
5. Resource adequacy modeling and resource needs (electric)
6. Decarbonization in the IRP (electric and gas)
7. Equity in Delivery System Planning
8. Conservation Potential Assessment results (electric and gas)
9. Resource alternatives: supply-side, alternative fuels, scenarios and sensitivities
10. Draft portfolio results and equity considerations (electric, w/ extension)
11. Draft results and equity considerations (gas)
12. Draft Integrated Resource Plan (electric and gas)
13. Final Integrated Resource Plan (electric and gas)

Notes: 1) Multiple topics may be combined in one meeting agenda. 2) The updated meeting schedule will be published in the updated IRP work plan on December 15, 2023.

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Gas scenario themes

Phillip Popoff, PSE
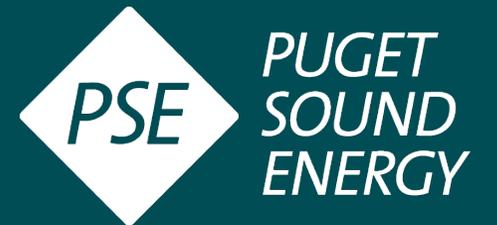
Gas scenario themes that are being considered for the development of the scenarios

Traditional Factors

Gas Prices $

Demand 🏠

Climate Commitment Act CO_2 ↓

Renewable fuels: Biomethane/Hydrogen

Policy driven electrification of buildings

NEW

Targeted Electrification Strategy

Decarbonization Factors

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Gas scenario whiteboard exercise

Sophie Glass, Triangle Associates
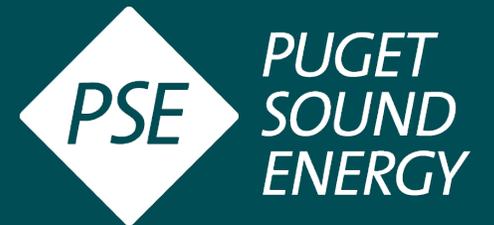
Break

Please return in 10 minutes

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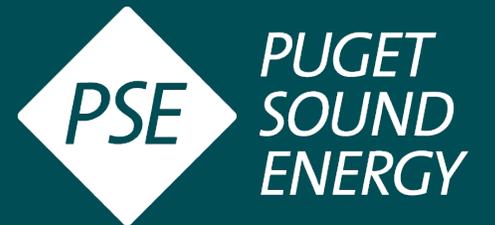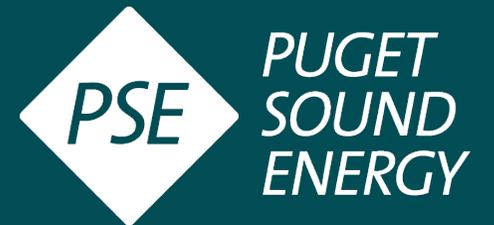
Scenarios and sensitivities

WAC 480-100-620 (10)

- Must include a range of possible future scenarios and input sensitivities to test robustness of resource portfolio under various parameters; descriptions of scenarios and sensitivities the utility used, including those informed by the advisory group process

- Scenarios must include:
    - Alternative lowest reasonable cost and reasonably available portfolio
    - Future climate change scenario incorporating best science available to analyze impacts of climate change (e.g., snowpack, streamflow, rainfall, heating and cooling degree days, and load changes)
    - Maximum customer benefit scenario prior to balancing against other goals

- Must ensure all customers benefit from the transition to clean energy

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Electric scenario themes that are being considered in the development of the scenarios

(a) CETA and SCGHG*

$

(b) Climate Change* – incorporated in reference case

(c) Maximum Customer Benefit*

Planning Standards

Demand

Resource Alternatives

Transmission

*Required by WAC 480-100-620 (10)

Electric scenario whiteboard exercise
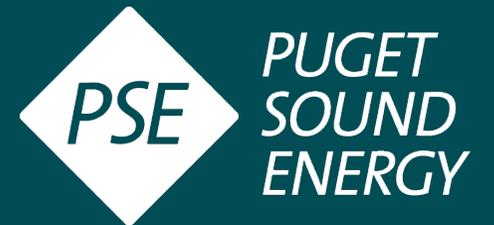
Sophie Glass, Triangle Associates

2025 IRP: Conservation Potential Assessment (CPA)

Tuesday, December 12th, 2023

Meeting Agenda

1. Overview of the CPA – Main Themes

2. CPA Methodology

3. CPA Timeline

4. Questions & Feedback

Overview of the CPA – Main Themes

Energy Efficiency Electric & Natural Gas	Climate Change	Building Electrification	Demand Response	IRA Research and Impacts
Rooftop Solar PV	Underserved Communities	Scenario Analysis, Locational Analysis & IRP Bundles	Combined Heat & Power	Process Evaluation Research

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Types of Energy Efficiency Potential
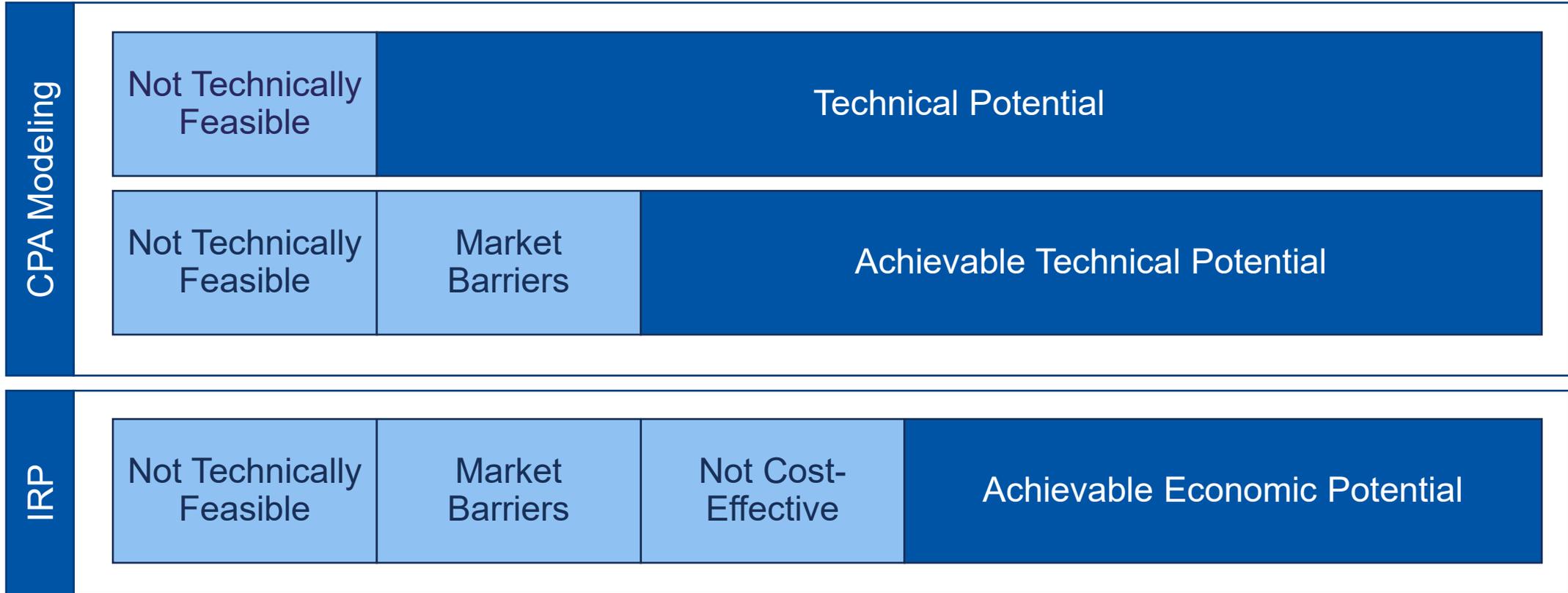
Methodology

Steps for estimating conservation potential

1 Compile Measure Data

2 Develop End-Use Forecast

3 Calculate Levelized Costs

4 Calculate Technical Potential

5 Calculate Achievable Technical Potential

6 Develop Supply Curves for IRP Modeling

Load Disaggregation
Sales by Market Segment Consumption by End Use

Technology Characteristics
Savings Fraction Fuel Share Saturation Feasibility Interactions

Load Shapes
Sector, Segment, End Use

Utility Sales Forecast by Sector

Baseline End Use Consumption by Sector and Market Segment

Energy-Efficiency Technology

Technical Potential

Achievable Technical Potential

IRP Resource Supply Curves

Data Collection
Secondary Data Collection

Market Constraints

Levelized Cost Bundling

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Energy Efficiency - Electric & Natural Gas

Estimating technical and achievable electric and natural gas energy efficiency potential for PSE's residential, commercial, and industrial sectors (including streetlighting and indoor agriculture)

Incorporating electrification end uses such as cold climate heat pumps and hybrid heat pumps

Incorporating 2029 furnace standard as there is a prelim final action date set

Including federal, state, and local codes and standards and considering state and local policy implications - e.g., Seattle's Energy Benchmarking Program (SMC 22.920), Clean Buildings' bill (E3SHB 1257), and the Clean Energy Transformation Act (194-40-330)

CLIMATE CHANGE

- Account for climate change on weather-sensitive measures

- Weather impact on end-use consumption based on the data from PSE's load forecasting team

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Energy Efficiency - Electric & Natural Gas

CPA Energy Efficiency Measures

Secondary Sources
-DOE Industrial Assessment Center Database
-TRMs (gas measures)

Council's 2021 Power Plan
Includes future climate change impacts + adjust to PSE climate assumptions

Regional Technical Forum (RTF)
Climate change adjustments

PSE Business Cases
Climate change adjustments +NEI

Saturation and Measure Input Data

PSE 2021 Residential Characteristics Study (RCS)
Provides residential equipment saturation data

NEEA 2017 RSBA II
Includes PSE oversample and provides detailed residential equipment saturation data

NEEA 2019 CBSA IV
Includes PSE oversample and provides commercial equipment saturation data

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Energy Efficiency - Electric & Natural Gas

Measure characterization within the 2025 CPA focuses on selected measures in four measure categories: water heating, thermostats, weatherization, and furnaces.

Other CPA Updates and Considerations:

- Economic assumptions (inflation rate, discount rates, avoided costs, and other cost assumptions)
- IRA assumptions (incentives and adoption rates)
- Revisit measure ramp rates
- Incorporate recent programmatic accomplishments
- Incorporate non-energy benefits to inform the IRP cost bundles

Key Changes From Prior CPA:

- Update to 10-year flat ramp for discretionary natural gas measures to align Council discretionary ramp rates and informed by recent PSE program adoption trends

- Updated NEI data within latest PSE Business Cases

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Program Process Evaluation & IRA Funding Opportunities Research

Program Process Evaluation

- Cadmus conducted in-depth interviews with personnel that develop, administer, and deliver the programs for weatherization, furnaces, thermostats, water heating

- Explored successes, opportunities, organizational barriers, training, tracking procedures, marketing

- At portfolio level and tied directly to needs of CPA

IRA Funding Opportunities Research

- Cadmus had interviews with state policymakers or agency staff on direction of IRA funding and opportunities to leverage existing PSE programs

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Building Electrification

As part of Scenario Analysis;

Estimating reductions in natural gas usage and increased electric energy usage and peak demand - and customer costs for the full suite of natural gas to electric measures

Space/water heating systems, stoves/cooktops, and clothes dryers for existing customers and new constructions in the residential and commercial sectors

Accounting for the **interactions** between energy efficiency and electrification impacts (increase in electric EE potential and reduction in natural gas EE potential) – e.g., weatherization measures

Leverage research from PSE 2023 IRP and Decarbonation Study
- Cold Climate Heat Pump performance research
- Customer survey (willingness to convert to electric equipment) and contractor interviews (conversion costs)

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Underserved Communities & Equity

Used **CETA and CEIP as a starting point** aligned with geographic areas to inform the potential for Highly Impacted Communities and Vulnerable Populations

- The vulnerable population data best aligned with CPA geographic areas (e.g., county level built up from block groups)
- Vulnerable population data as the primary identifier for the CPA (somewhat similar overlay with Highly Impacted Communities)
- Segmented PSE residential accounts for vulnerable populations by county (SF, MN, and MF)

Used PSE 2021 RCS data to inform equipment saturations and fuel shares for vulnerable population (based on income)

Vulnerable Populations Attributes
- Adverse socioeconomic factors including unemployment, high housing and transportation costs relative to income, access to food and health care, and linguistic isolation
- Sensitivity factors, such as low birth weight and higher rates of hospitalization

Highly Impacted Communities defined by the Washington Department of Health
- Ranks communities with environmental burdens including fossil fuel pollution and vulnerability to climate change impacts that contribute to health inequities
- Any census tract with tribal lands

https://doh.wa.gov/data-statistical-reports/washington-tracking-network-wtn/climate-projections/clean-energy-transformation-act

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Demand Response

Estimating the technical and achievable potential for the **demand response options of reducing peak load in both winter and summer.**

Residential	Commercial and Industrial
• Direct load control (DLC) for space heating / central cooling - smart thermostats • DLC for electric resistance water heating (grid-connected and grid-enabled) • DLC for heat pump water heating (grid-connected and grid-enabled) • Electric vehicle supply equipment DLC • EV managed charging • Time of use (TOU) • Peak time rebates • Behavioral DR	• Small commercial DLC for space heating / central cooling - smart thermostats • Commercial curtailment • Industrial curtailment • Commercial critical peak pricing (CPP) • Industrial CPP • Commercial TOU • Heavy duty EV DLC • Fleet EV load management • Non-Fleet EV load management

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Combined Heat and Power (CHP) and Rooftop Solar (PV)

CHP

Assessing the technical and achievable CHP potential for the commercial and industrial sectors along with wastewater treatment plants, landfills, and livestock farms

Technologies include non-renewable and renewable systems – levelized cost is calculated for each technology from a total resource cost (TRC) perspective

Solar PV

Using **NREL's Distributed Generation Market Demand (dGen) model** to simulate customer adoption of rooftop solar PV technology and determine solar PV achievable market potential.

To enable bottom-up analysis, **Google Project Sunroof** data will establish solar PV potential at the zip code level

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IRP Bundles and Locational Analysis

SUPPLY CURVE BUNDLES

Developing IRP bundles by technology levelized cost

LOCATIONAL ANALYSIS

Disaggregate potential into geographic areas (zip codes)

SUPPLY CURVE GRANULARITY

Identify underserved community status, new v. existing, base load
v. heat load, and IRA v. non-IRA funded

REPORTING

Separate gas and
electric reports

Draft reports
March-April '24
(Actual Date TBD)

Final reports
April-May '24
(Actual Date TBD)

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Next steps

Sophie Glass, Triangle Associates
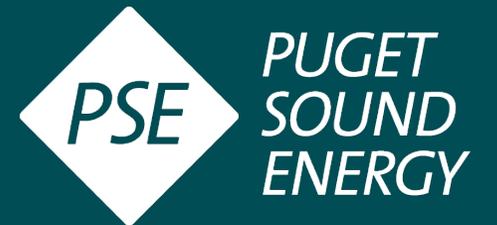
Upcoming activities

Date	Activity
December 14, 2023	Feedback form for Emerging Resources: Hydrogen public webinar closes
December 15, 2023	Revised IRP work plan due to UTC
December 19, 2023	Feedback form for RPAG meeting closes

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Public comment opportunity

Please raise your "hand" if you would like to provide comment.

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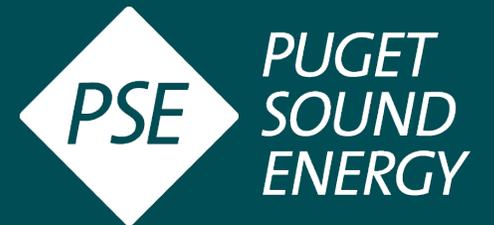
Thanks for joining us!

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Appendix - Energy Efficiency Methodology

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Methodology Details (Next Slides)

Steps for estimating conservation potential

1 Compile Measure Data

2 Develop End-Use Forecast
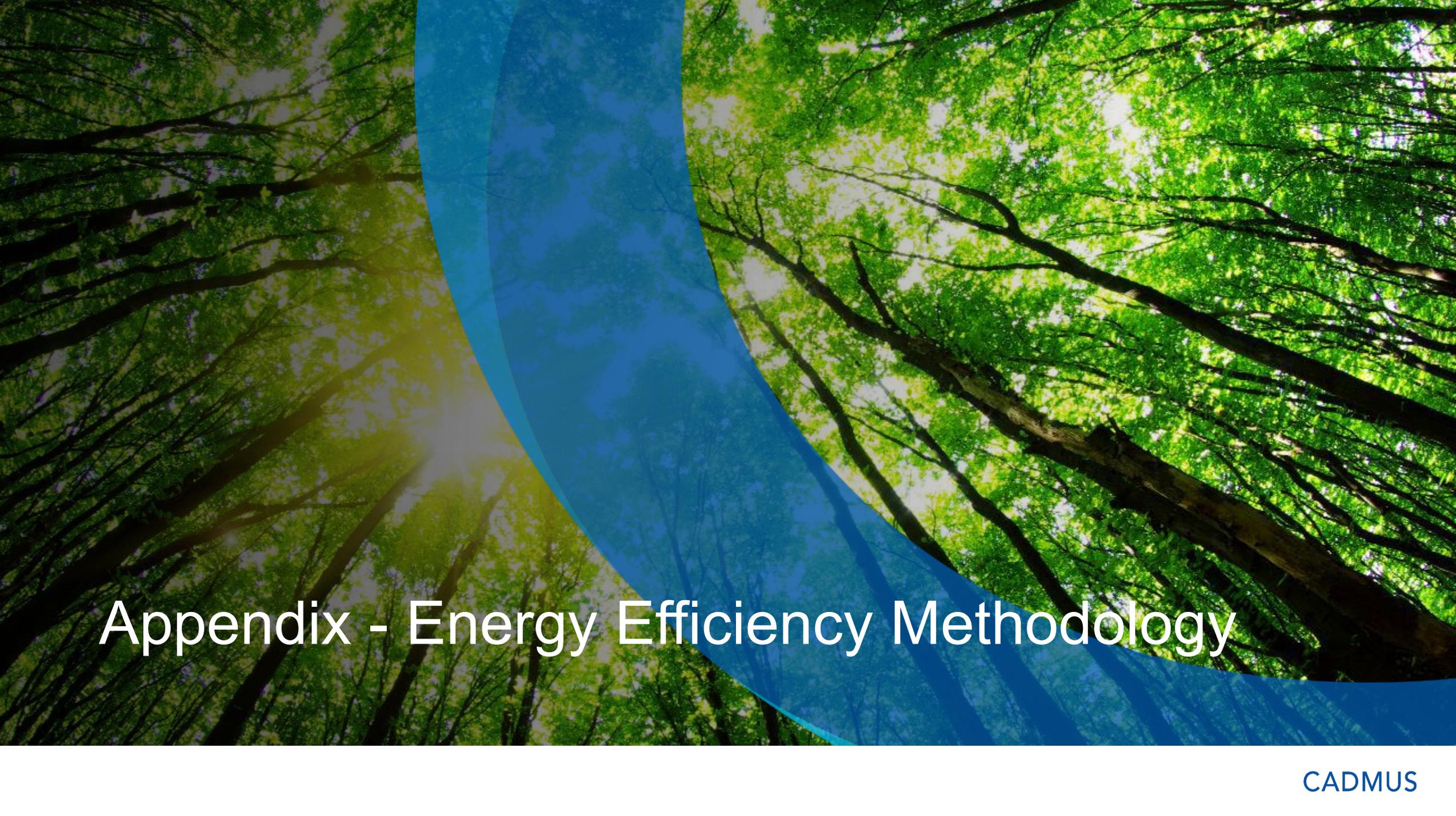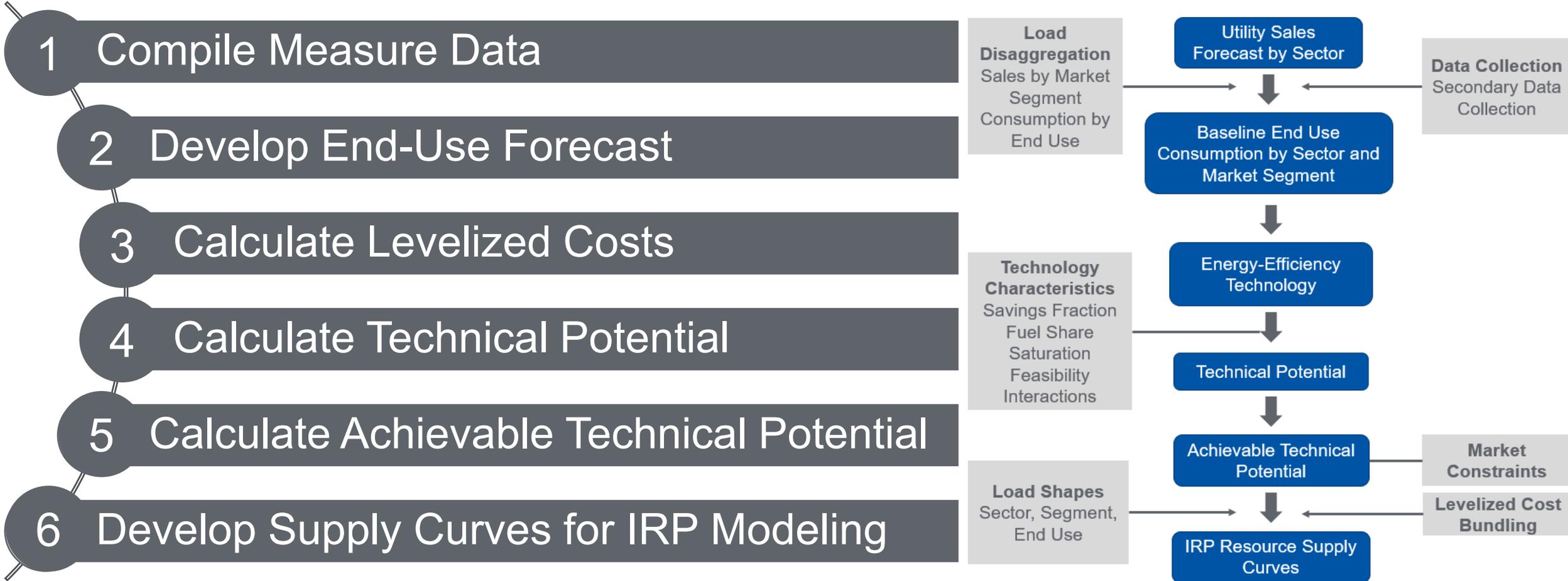
3 Calculate Levelized Costs

4 Calculate Technical Potential

5 Calculate Achievable Technical Potential

6 Develop Supply Curves for IRP Modeling

Load Disaggregation
Sales by Market Segment Consumption by End Use

Technology Characteristics
Savings Fraction
Fuel Share
Saturation
Feasibility
Interactions

Load Shapes
Sector, Segment, End Use

Utility Sales Forecast by Sector

Data Collection
Secondary Data Collection

Baseline End Use Consumption by Sector and Market Segment

Energy-Efficiency Technology

Technical Potential

Achievable Technical Potential

Market Constraints

Levelized Cost Bundling

IRP Resource Supply Curves

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Step 1. Compile Measure Data
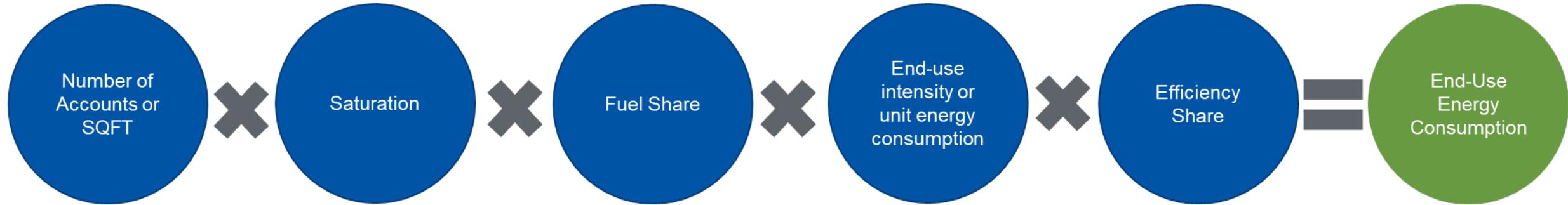
1

Determine measures from:
- PSE Business Measure Cases
- RTF Unit Energy Savings
- Council's 2021 Power Plan
- Cadmus supplemental measures

2

Compile measure data and determine PSE-specific inputs:

- Costs
- Applicability
- Per-unit savings
- Measure lives
- Saturations

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Step 2. Develop End-Use Forecasts

Number of Accounts or SQFT ✖ Saturation ✖ Fuel Share ✖ End-use intensity or unit energy consumption ✖ Efficiency Share = End-Use Energy Consumption
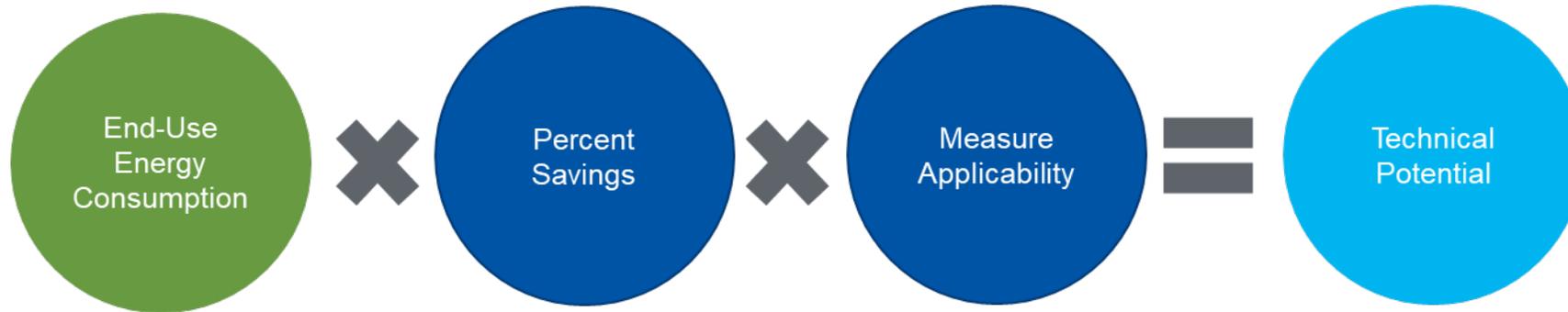
Data Sources

- PSE customer and load forecast
- PSE Residential Characteristics Study (RCS)
- PSE Non-residential customer database
- PSE supplemental customer data files (e.g. indoor ag)
- Regional stock assessment data (CBSA and RBSA)
- Council's Power Plans
- U.S. Census Bureau American Community Survey

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Step 3. Calculate Levelized Costs

- Compiled PSE financial assumptions
  - discount rates, line losses, etc.
- Includes IRA incentives
- Levelized costs calculated using the costs and benefits below:

Costs Included	Benefits Netted Out
Capital and Labor	Deferred T&D Expansion
Annual O&M	Regional Act Credit
Program Administration	Avoided Periodic Replacement
Periodic Replacement	Other Fuel Benefits
Other Fuel Costs	Non-Energy Impacts
Non-Energy Impacts	
IRA Incentives	

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Step 4. Estimate Technical Potential

End-Use Energy Consumption ✕ Percent Savings ✕ Measure Applicability = Technical Potential
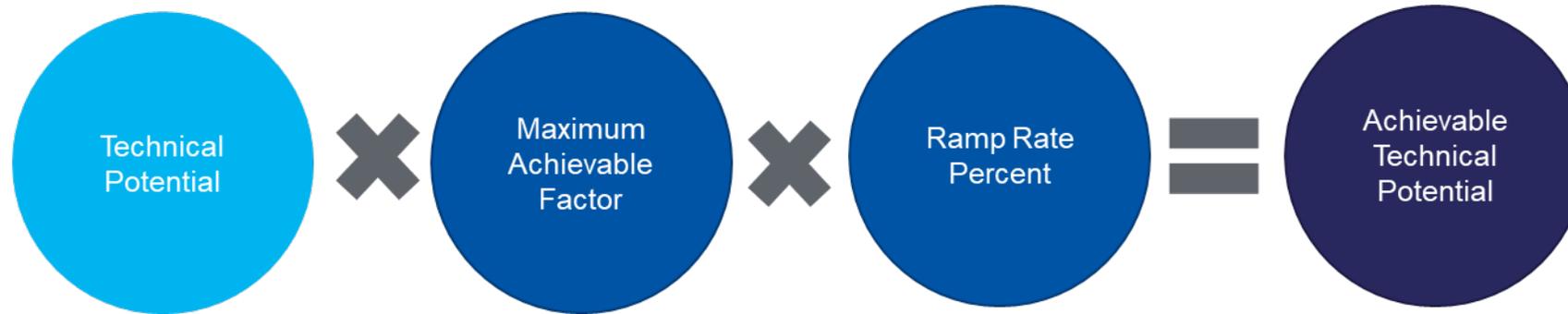
Unit Energy Savings derived from:	▪ PSE measure business cases, ▪ RTF UES workbooks, ▪ 2021 Power Plan, and ▪ Cadmus supplemental measures (e.g. Boiler controls)

- For a number of measures, Cadmus will change inputs of some RTF and PSE-specific values to account for climate change
- Cadmus may change RTF and 2021 Power Plan measures with PSE-specific values (e.g., PSE program data and/or PSE 2021 Residential Characteristics Study)

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Step 5. Estimate Achievable Technical Potential

Technical Potential × Maximum Achievable Factor × Ramp Rate Percent = Achievable Technical Potential

Maximum Achievability Factor	▪ 2025 CPA and Previous CPA: Council 2021 Plan
Ramp Rate Percent	▪ Previous CPA: 10-year flat ramp for discretionary measures ▪ 2025 CPA update: Council recommended ramp rates for discretionary measures; may adjust based on PSE program data ▪ Start with 2021 Power Plan ramp rates for lost opportunity measures; may adjust based on PSE program data

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Step 6. Develop Supply Curves for IRP Modeling

For each fuel type, the supply curve graph shows the relationship of:
- cumulative achievable technical potential, and
- levelized cost

Costs are levelized over the study time frame, accounting for "end effects"

Potential is then "bundled" or "binned" by levelized cost ranges

Finally, annual potential is disaggregated into hourly (for electric) and monthly (for gas) estimates using load shapes and disaggregated into geographic areas

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Example Supply Curve: CPA 2023 Electric 27-Year Cumulative Energy Efficiency Supply Curve

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