



EXISTING RESOURCE INVENTORY

APPENDIX C



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1. Introduction

Puget Sound Energy (PSE) uses supply-side and demand-side resources to meet customer loads. Supply-side resources provide electricity to meet the load; these resources originate on the utility side of the meter. Demand-side resources contribute to meeting the need by reducing demand. An integrated resource plan includes both supply- and demand-side resources. This appendix describes PSE's existing electric supply- and demand-side resources.

1.1. Capacity Values

We describe PSE's existing electric resources using the net maximum capacity of each generation facility in megawatts (MW). Net maximum capacity is the capacity a unit can sustain over a specified period — in this case, 60 minutes — when not restricted by ambient conditions or de-ratings, less the losses associated with auxiliary loads, and before the losses incurred in transmitting energy over transmission and distribution lines. This explanation is consistent with how we described capacities in the annual 10K report¹ that PSE files with the U.S. Securities and Exchange Commission and the Form 1 report filed with the Federal Energy Regulatory Commission (FERC).

We referenced different capacity values in other PSE publications because output varies depending on a variety of factors, among them ambient temperature, fuel supply, whether a natural gas plant is using duct firing, whether a combined-cycle facility is delivering steam to a steam host, outages, upgrades, and expansions. Selecting a single reference point based on a consistent set of assumptions is necessary to describe the relative size of resources. Depending on the nature and timing of the discussion, these assumptions, and therefore the expected capacity value, may vary.

1.2. CETA-qualifying Capacity

The Clean Energy Transformation Act (CETA) requires PSE to supply electricity free of greenhouse gas emissions by 2045; we must generate all electricity from renewable or non-emitting resources. PSE's total existing CETA-qualifying capacity is 2,969 MW, which includes 1,020 MW of PSE-owned and 1,465 MW of contracted resources. The final 483 MW of CETA-qualifying capacity are load-reducing contracted resources.

The following tables summarize PSE's existing supply-side resources, in MW of net maximum capacity, that meet CETA's renewable or non-emitting requirements. Additional details on these resources are in subsequent sections of this appendix.

Table C.1 presents all CETA-qualifying PSE-owned resources.

Table C.1: Existing PSE-owned CETA-qualifying Electric Generating Resources

Resource	Type	Net Maximum Capacity (MW)
Upper Baker River	Hydroelectric	91
Lower Baker River	Hydroelectric	105

¹ PSE's most recent 10K report was filed with the U.S. Securities and Exchange Commission in February 2022 for the year ending December 31, 2021. See <http://www.pugetenergy.com/pages/filings.html>.



Resource	Type	Net Maximum Capacity (MW)
Snoqualmie Falls	Hydroelectric	48
Hopkins Ridge	Wind	157
Wild Horse	Wind	343
Lower Snake River	Wind	273
Wild Horse	Solar	0.5
Glacier Battery Demonstration Project	Storage	2
Total Capacity, PSE-owned	All	1,020

The majority of our CETA-qualifying energy is generated from contracted hydroelectric and wind resources. These are presented in Table C.2.

Table C.2: Existing Contracted CETA-qualifying Electric Generating Resources

Resource	Type	Net Maximum Capacity (MW)
Priest Rapids	Hydroelectric	6
Rock Island I & II	Hydroelectric	156
Rocky Reach	Hydroelectric	325
Wanapum	Hydroelectric	7
Wells	Hydroelectric	228
Canadian Entitlement Return	Hydroelectric	-33
Baker Replacement	Hydroelectric	7
Energy Keepers	Hydroelectric	40
BPA Capacity Product	Hydroelectric	100
Klondike III	Wind	50
Golden Hills	Wind	200
Clearwater	Wind	350
SPI Biomass	Biofuel/Biogas	17
Farm Power Rexville	Biofuel/Biogas	0.75
Rainier Biogas	Biofuel/Biogas	1
Vander Haak Dairy	Biofuel/Biogas	0.60
Edaleen Dairy	Biofuel/Biogas	0.75
Blocks Evergreen Dairy	Biofuel/Biogas	0.19
Emerald City Renewables	Biofuel/Biogas	4.5
Emerald City Renewables 2	Biofuel/Biogas	4.5
Total Capacity, Contracted Resources	All	1,465

Table C.3 details the existing resources allocated to serving PSE's customer renewable energy programs. We describe these programs in Section 3.2 of this appendix.



Table C.3: Existing CETA-qualifying Load Reducing Customer Program Electric Resources

Resource	Customer Program ²	Type	Net Maximum Capacity (MW)
City of Bonney Lake	Community Solar	Solar	0.45
Olympia High School	Community Solar	Solar	0.2
Pine Lake Middle School	Community Solar	Solar	0.175
Urtica Solar	Community Solar	Solar	5
Penstemon Solar	Community Solar	Solar	5
Lund Hill	Green Direct	Solar	150
Skookumchuck	Green Direct	Wind	137
Camas Solar	Green Power/PURPA QFs	Solar	5
Koma Kulshan	PURPA QFs	Hydroelectric	13
Twin Falls	PURPA QFs	Hydroelectric	20
Weeks Falls	PURPA QFs	Hydroelectric	4.6
Cascade Community Solar #1 and #2 (combined)	PURPA QFs	Solar	0.03
Finn Hill (Lake Wash SD)	PURPA QFs	Solar	0.36
IKEA	PURPA QFs	Solar	0.83
Port of Coupeville	PURPA QFs	Solar	0.08
3 Bar-G Wind	PURPA QFs	Wind	0.12
Knudson Wind	PURPA QFs	Wind	0.11
Swauk Wind	PURPA QFs	Wind	4.3
Net Metering ¹	Net Metering	--	137
Total Capacity, Load Reducing Resources		All	483

Notes:

1. Existing net metered customers are captured in the base demand forecast. Therefore we do not include this as a resource in our IRP or progress report modeling.
2. PURPA QFs are Public Utility Regulatory Policies Act of 1978 Qualifying Facilities; Community Solar, Green Direct, Green Power, and Net Metering customer programs are described in section 4.7 of this appendix.

2. Supply-side Resources

We primarily use supply-side resources to meet customer load. We describe PSE's existing supply-side resources in the following sections and explain:

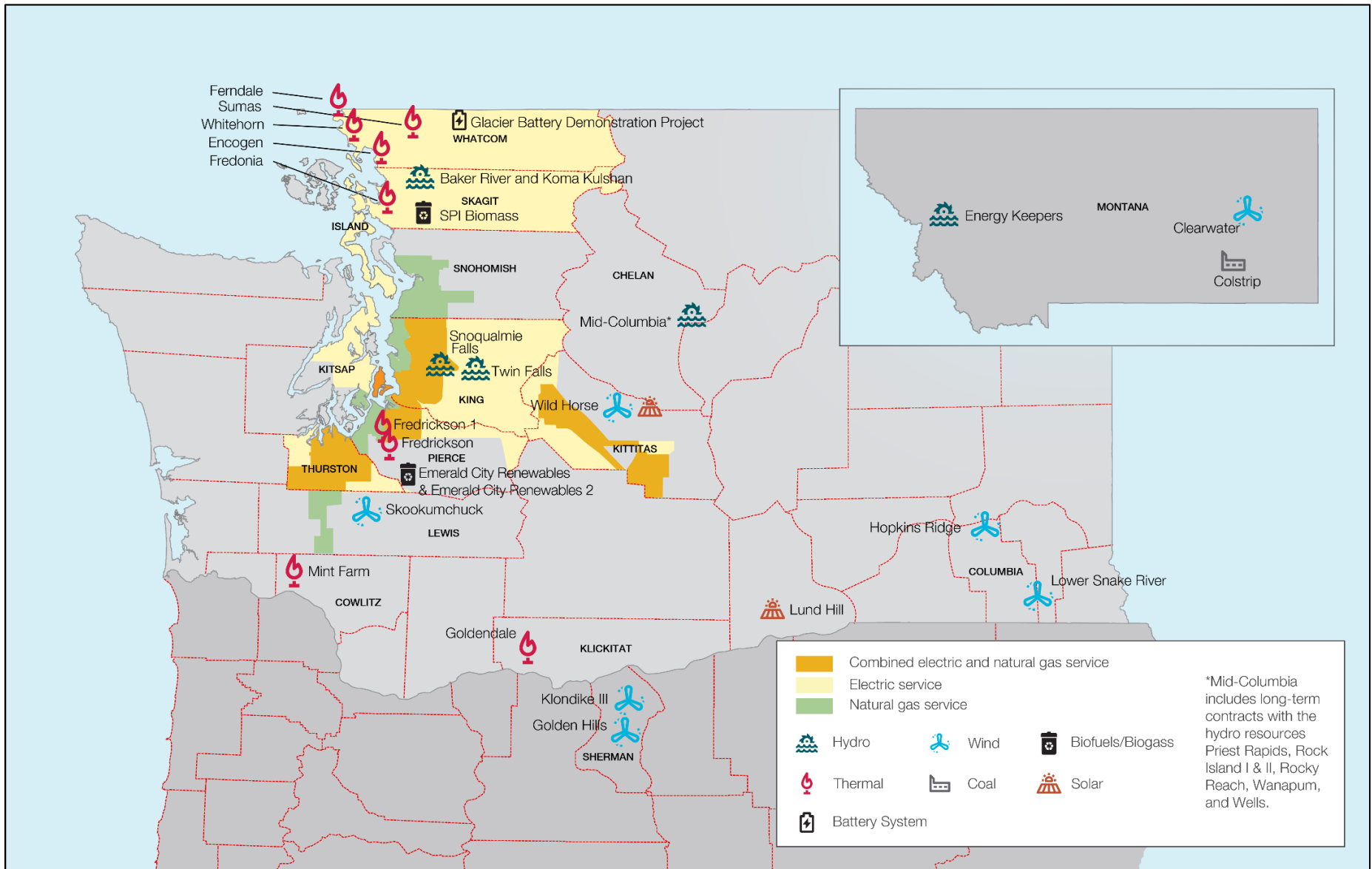
- **Generating and storage resources:** Hydroelectric, wind, solar, battery, coal, and combustion turbines (baseload and peakers)
- **Long-term contracts:** Negotiated with independent producers to supply electricity from various fuel sources
- **Transmission contracts:** Negotiated with Bonneville Power Administration (BPA) to carry electricity from the short-term wholesale market purchases to our service territory



Figure C.1 displays electricity-generating resources that PSE owns or contracts with independent energy producers. In this figure, we included only contracted projects with a maximum capacity greater than 5 MW. We show all PSE-owned facilities regardless of capacity.



Figure C.1: PSE's Existing Resources Inventory





2.1. Renewable Resources

Renewable resources use renewable fuels such as water, wind, sunlight, and biomass to generate electricity. Hydroelectricity generation provides flexible baseload energy production, which means it produces energy at a constant rate over long periods and is used to meet some or all a region’s continuous energy demand. Hydroelectricity can also perform peaking functions when needed. Alternatively, wind and solar are intermittent resources – also known as variable energy resources – because their generating patterns vary due to uncontrollable environmental factors. These resources cannot consistently deliver energy when customers need it, such as when the wind dies down or clouds cover the sun, so we need additional energy sources to back up intermittent resources.

Hydroelectricity and wind generation are PSE’s primary renewable resources. Utility-scale wind and solar are PSE’s largest intermittent resources. Other intermittent resources include small-scale power production generated by customers, including rooftop solar.

Energy storage has the potential to provide multiple services to the PSE system, including backup power for intermittent renewable generation, efficiency, reliability, and ancillary services. Storage can benefit the entire system — generation, transmission, distribution, and customers. However, these benefits vary by location and how we apply the technology or resource. For instance, storage in one place could relieve transmission congestion and thereby defer the cost of transmission upgrades, while storage at another location might back up intermittent wind generation and reduce integration costs.

Puget Sound Energy’s energy storage resources include hydroelectric reservoirs behind dams and oil backup for peaking facilities and batteries. Battery and pumped hydroelectric energy storage (PHES) operate for a limited time and require energy from other sources.

Table C.4 summarizes PSE’s total renewable resources, and the subsections describe PSE’s existing hydroelectricity, wind, and solar generating resources and PSE’s storage facilities.

Table C.4: Total Renewable Resources

Type	Net Maximum Capacity (MW)
Hydroelectric — owned	244
Hydroelectric — contracted	722
Wind	773
Solar	0.5
Battery Storage	2.0
Total	1,742

2.1.1. Hydroelectricity

Puget Sound Energy’s hydroelectric resources are precious clean energy sources that provide a net maximum capacity of 966 MW (Table C.3). These resources can instantly respond to customer load and have relatively low operating costs. Hydroelectric resources are limited operationally by protections for endangered species and environmental conditions. High precipitation and snowpack levels generally allow us to generate more hydroelectricity, and low-water



years produce less hydroelectricity. During low-water years, we must rely on other, more expensive, self-generated power or market resources to meet the load. Our analysis for this 2023 Electric Progress Report (2023 Electric Report) accounts for both seasonality and year-to-year variations in hydroelectric generation. Puget Sound Energy owns hydroelectric projects in western Washington and has long-term power purchase contracts with three public utility districts (PUDs) that own and operate extensive hydroelectric facilities on the Columbia River in central Washington. These resources are described in this section and summarized in Table C.5.

Table C.5: PSE-owned and Contracted Hydroelectric Resources

Plant	Owner	PSE Ownership (%)	NET Maximum Capacity (MW) ¹	Contract Expiration Date
Upper Baker River	PSE	100	91	None
Lower Baker River	PSE	100	105	None
Snoqualmie Falls ²	PSE	100	48	None
Wells ³	Douglas Co. PUD	27.1	228	9/30/28
Rocky Reach ⁴	Chelan Co. PUD	25.0	325	10/31/31
Rock Island I & II ⁴	Chelan Co. PUD	25.0	156	10/31/31
Wanapum	Grant Co. PUD	0.6	7	03/31/52
Priest Rapids	Grant Co. PUD	0.6	6	03/31/52
Total Owned	-	-	244	-
Total Contracted	-	-	722	-
Total All	-	-	966	-

Notes:

1. Net maximum capacity reflects PSE's share only.
2. The FERC license authorizes the full 54.4 MW. However, the project's water right, issued by the state Department of Ecology, limits flow to 2,500 square cubic feet and, therefore, output to 47.7 MW.
3. In March 2017, PSE entered a new PPA with Douglas County PUD for Wells Project output that began on August 31, 2018, and continues through September 30, 2028. PSE also agreed in June 2018 to purchase an additional 5.5 percent of the Wells project through September 2021. This agreement for the additional 5.5 percent from the Wells project was extended through September 2025.
4. In 2021, PSE purchased an additional 5 percent share from 2022 through 2025.

Puget Sound Energy also contracts smaller hydroelectric generators in PSE's service territory. We discuss these hydroelectric resources in the [Long-term Contracts](#) section and provide summaries in Tables C.12 and C.13.

Baker River Hydroelectric Project

Baker River Hydroelectric project is in Washington's north Cascade Mountains. The facility comprises two dams and is the largest of PSE's hydroelectric power facilities. The project contains modern fish-enhancement systems, including a floating surface collector (FSC) to safely capture juvenile salmon in Baker Lake and transport them downstream around both dams. There is a second, newer FSC on Lake Shannon to move young salmon around Lower Baker Dam. In addition to generating electricity, the project provides public access to recreation and significant flood-control storage for people and property in the Skagit Valley.



Hydroelectric projects require a license from FERC for construction and operation. These licenses typically are for 30 to 50 years, and after that initial period, they must be renewed to continue operations. After a lengthy renewal process, FERC issued a 50-year license in October 2008, allowing PSE to generate approximately 710,000 MWh per year (average annual output) from the Baker River project. Puget Sound Energy also completed a new powerhouse and 30 MW generating unit at Lower Baker dam in July 2013. The replacement unit improves river flows for fish downstream of the dam while producing more than 100,000 additional MWh of energy each year. This incremental energy qualifies as a renewable resource under the State of Washington Energy Independence Act, RCW 19.285.²

Snoqualmie Falls Hydroelectric Project

Located east of Seattle on the western slope of the Cascade Mountains, the Snoqualmie Falls Hydroelectric Project consists of a small diversion dam upstream from Snoqualmie Falls and two powerhouses. The first powerhouse, encased in bedrock 270 feet beneath the surface, was the world's first underground power plant. Built in 1898–99, Snoqualmie Falls Hydroelectric Project was also the Northwest's first large hydroelectric power plant.

The FERC issued PSE a 40-year license for the Snoqualmie Falls Hydroelectric Project in 2004. The terms and conditions of the license allow PSE to generate an estimated 275,000 MWh per year (average annual output). The facility underwent a significant redevelopment project between 2010 and 2015, which included substantial upgrades and enhancements to the power-generating infrastructure and public recreational facilities. Efficiency improvements completed as part of the redevelopment increased annual output by more than 22,000 MWh. This incremental energy qualifies as a renewable resource under the State of Washington Energy Independence Act, RCW 19.285.²

Mid-Columbia Long-term Purchased Power Contracts

Under long-term power purchase agreements with three PUDs, PSE purchases a percentage of the output of five hydroelectric projects on the Columbia River in central Washington. Puget Sound Energy pays the PUDs a proportionate share of the cost of operating these hydroelectric projects. In March 2017, PSE entered into a new power sales agreement with Douglas County PUD that began on August 31, 2018, and continues through September 30, 2028.

Under this new agreement, PSE will continue to take a percentage of the output from the Wells project. The actual rate available to PSE will be calculated annually and based primarily on Douglas PUD's retail load requirements. As Douglas PUD's retail load grows or declines, they will reserve a greater or lesser share of Wells project output for their customers, and the percentage we purchase will decrease or increase. Puget Sound Energy has a 20-year agreement with Chelan County PUD to purchase 25 percent of the output of the Rocky Reach and Rock Island projects that extends through October 2031. Puget Sound Energy also has an agreement with Grant County PUD for a 0.64 percent share of the combined output of the Wanapum and Priest Rapids developments. The agreement with Grant County PUD continues through the term of the project's FERC license, which ends on March 31, 2052.

² [RCW 19.285](#)



2.1.2. Wind Energy

Puget Sound Energy is the largest utility owner and operator of wind power facilities in the Pacific Northwest. The maximum capacity of the company's three wind farms is 773 MW (Table C.6). The farms produce more than 2 million MWh of power per year on average, which is about eight percent of PSE's energy needs. These resources are integral to meeting renewable resource commitments.

- **Hopkins Ridge** in Columbia County, Washington, with an approximate maximum capacity of 157 MW, began commercial operation in November 2005.
- **Lower Snake River** in Garfield County, Washington, with an approximate maximum capacity of 343 MW, began operation in February 2012 and is PSE's third and largest wind farm.
- **Wild Horse** in Kittitas County near Ellensburg, Washington, with an approximate maximum capacity of 273 MW, began commercial operation in December 2006 at 229 MW and was expanded by 44 MW in 2010.

Table C.6: PSE-owned Wind Resources

Unit	PSE Ownership (%)	Net Maximum Capacity (MW)
Hopkins Ridge	100	157
Lower Snake River, Phase 1	100	343
Wild Horse	100	273
Total	100	773

2.1.3. Solar Energy

The Wild Horse facility contains 2,723 photovoltaic solar panels, including the first made-in-Washington solar panels.³ The array can produce up to 0.5 MW of electricity with full sun (Table C.6). Panels can also produce power under cloudy skies — 50 to 70 percent of peak output with bright overcast and 5 to 10 percent with dark overcast. The site receives approximately 300 days of sunshine yearly, roughly the same as Houston, Texas. On average, this site generates 780 MWh of power per year.

In addition to the Wild Horse solar facility, we own three small solar facilities that provide energy for our Community Solar program, which is a customer renewable energy program described in Section 4.2. These facilities are located in western Washington on the roofs of public buildings, including schools and a municipal water storage facility. The first facility opened in November 2021.

Table C.7: PSE's Owned Solar Resources

Unit	PSE Ownership (%)	Net Maximum Capacity (MW)
Wild Horse Solar Demonstration Project	100	0.50
City of Bonney Lake	100	0.45
Olympia High School	100	0.20

³ Outback Power Systems (now Silicon Energy) in Arlington produced the first solar panels in Washington. The Wild Horse Facility was Outback Power Systems' launch facility and used 315 of their panels. The remaining panels were produced by Sharp Electronics in Tennessee.



Unit	PSE Ownership (%)	Net Maximum Capacity (MW)
Pine Lake Middle School	100	0.18
Total	100	1.33

2.1.4. Battery Energy Storage System

Puget Sound Energy's only battery energy storage system, the Glacier Battery Demonstration Project, was installed in early 2017 (Table C.8). The 2 MW / 4.4 MWh lithium-ion battery storage system is adjacent to the existing Glacier, Washington substation in Whatcom County. The Glacier project serves as a short-term backup power source (up to 2.2 hours at capacity with a full charge) to a core island of businesses and residences during outages, reduces system load during periods of high demand, and helps balance energy supply and demand.

The project was partly funded by a \$3.8 million Smart Grid Grant from the Washington State Department of Commerce. Between January and June of 2018, Pacific Northwest National Laboratory (PNNL) performed two use test cases. Since then, PSE has continued to test the battery's capabilities under planned outage scenarios – working toward successfully responding to unplanned outages.

We have two additional battery projects in the planning phases. The first project plans to install a 3.3 MW utility-scale battery as part of a larger project to improve reliability and modernize the grid on Bainbridge Island. The battery system will serve electricity during peak periods when customer demand is high (e.g., cold winter mornings), and we expect it to be online by the end of 2023. The second project plans to install a 1 MW lithium-ion battery at PSE's Blumaer substation and a solar array on adjacent land. Both installations will complement existing solar panels at nearby Tenino High School. The combined system will form a microgrid capable of providing temporary backup power to the school during an outage. Performance testing by PSE and PNNL is planned through 2024.

Table C.8: PSE-owned Battery Storage Resources

Unit	PSE Ownership (%)	Net Maximum Capacity (MW)
Glacier Battery Demonstration Project	100	2.0
Total	100	2.0

2.2. Thermal Resources

Thermal resources use fossil fuels (natural gas, oil, coal) or alternative fuels (biodiesel, hydrogen, renewable natural gas) to generate electricity. Puget Sound Energy's existing thermal resources include combustion turbines and coal-fired generating facilities, which serve as baseload or peaking resources.

Baseload resources produce energy at a constant rate over long periods at a lower cost than other production facilities available to the system. They are typically used to meet some or all a region's continuous energy demand. Baseload resources usually have a high fixed cost, but low marginal cost and are the most efficient thermal units PSE operates.

Thermal baseload plants can take up to several hours to start and have limited ability to ramp up and down quickly, so they are not very flexible. Peaking resources are quick-starting units that can ramp up and down quickly to meet short-term spikes in need. They also provide flexibility for load following wind integration and spinning reserves. Peaking



resources generally have a lower fixed cost but are less efficient than baseload resources. Historically, peaking units have low-capacity factors because they are often not economical compared to market purchases.

Table C.9 summarizes, and the following subsections describe, PSE's thermal resources, which include combined-cycle combustion turbines (CCCTs), coal, and simple-cycle combustion turbines (CT peakers).

Table C.9: Total Thermal Resources

Type	Use	Net Maximum Capacity (MW)
CCCT	Baseload	1,293
Coal	Baseload	370
CT	Peaker	612
Total baseload thermal resources	-	1,663
Total CT peaking resources	-	612
Total thermal resources	-	2,275

2.2.1. Combined-cycle Combustion Turbines

Puget Sound Energy's six baseload CCCT plants have a combined net maximum capacity of 1,293 MW and are summarized in Table C.10. In a CCCT, the heat that a simple-cycle combustion turbine produces when it generates power is captured and used to create additional energy, making it more efficient than the CT peakers. Puget Sound Energy's baseload CCCTs include:

- **Encogen, Ferndale, and Sumas** in Whatcom County, Washington
- **Frederickson 1** in Pierce County, Washington. Puget Sound Energy owns 49.85 percent of this plant; Atlantic Power Corporation owns the remainder
- **Goldendale** in Klickitat County, Washington
- **Mint Farm** in Cowlitz County, Washington.

Table C.10: CCCT Resources by Facility

Name	PSE Ownership (%)	Net Maximum Capacity (MW) ¹
Encogen	100	165
Ferndale ²	100	253
Frederickson 1 ^{2,3}	49.85	136
Goldendale ²	100	315
Mint Farm ²	100	297
Sumas	100	127
Total	-	1,293

Notes:

1. Net maximum capacity reflects PSE's share only.
2. Maximum capacity of Ferndale, Frederickson 1, Goldendale, and Mint Farm includes duct firing capacity.



- Frederickson 1 CCCT unit is co-owned with Atlantic Power Corporation, USA.

The Colstrip Generating Plant Retirement and Shutdown Plan

After a request in June 2019 by PSE's Unit 1 and 2 co-owner and plant operator, Talen Montana LLC, PSE agreed to retire the units. We based our decision on economic considerations. In January 2020, the facility ceased to generate electricity and work commenced to place it in a secure and safe condition. We are currently overseeing environmental remediation of the impacted water and will continue, in compliance with all local, state, and federal regulations, as we retire the physical structures.

Units 3 and 4 are owned by six separate entities with different interests. Puget Sound Energy is limited in its ability to act unilaterally since operational decisions are dictated by the rules governing the ownership agreement. After 2025, CETA restricts PSE from serving load from Colstrip without penalty. As a result this EPR only includes generation from Colstrip 3 and 4 through 2025.

2.2.2. Coal

The Colstrip Generating Plant in eastern Montana, about 120 miles southeast of Billings, consists of four coal-fired steam electric plant units. Puget Sound Energy owns 25 percent each of Units 3 and 4 (Table C.11). Puget Sound Energy's ownership in Colstrip contributes 370 MW net maximum capacity to our existing portfolio.

Table C.11: Coal Resources by Facility

Name	PSE Ownership (%)	Net Maximum Capacity (MW) ¹
Colstrip 3 & 4	25	370
Total	-	370

Note: Net maximum capacity reflects PSE's share only.

2.2.3. Combustion Turbine Peakers

Combustion Turbine (CT) peakers provide important peaking capability and help PSE meet operating reserve requirements. We displace these resources when their energy is not needed to serve load or we can purchase lower-cost energy. Puget Sound Energy's three peaker plants (eight total units) contribute a net maximum capacity of 612 MW (Table C.12). When pipeline capacity is unavailable to supply them with natural gas fuel, these units can operate on distillate fuel oil.

- Frederickson Units 1 and 2** are south of Seattle in east Pierce County, Washington.
- Fredonia Units 1, 2, 3, and 4** are near Mount Vernon, Washington, in Skagit County.
- Whitehorn Units 2 and 3** are in northwestern Whatcom County, Washington.



Table C.12: CT Peaking Resources

Name	PSE Ownership (%)	Net Maximum Capacity (MW)
Fredonia 1 & 2	100	207
Fredonia 3 & 4	100	107
Whitehorn 2 & 3	100	149
Frederickson 1 & 2	100	149
Total CT Peakers	-	612

2.3. Long-term Contracts

Long-term contracts include agreements with independent producers and utilities to supply electricity to PSE. Fuel sources for those contracts include hydropower, wind, solar, natural gas, coal, waste products, and system deliveries without a designated supply resource. We contract 1,882 MW of electric capacity, of which 58 percent (1,094 MW) is CETA-compliant. We did not include short-term wholesale market purchases negotiated by our energy trading group in this list.

2.3.1. Power Purchase Agreements

Most of PSE's long-term contracts are Power Purchase Agreements (PPAs) with independent power producers. This section provides a brief description of each PPA. Schedule 91 contracts define PPAs from small producers whose total capacity is 5 MW or less. We summarize these contracts in Table C.13 and Table C.14.

Table C.13: Power Purchase Agreements for Electric Power Generation

Name	Type	Contract Start	Contract Expiration	Contract Capacity (MW)
BPA Capacity Product	Hydroelectric	1/1/2022	12/31/2026	100
Energy Keepers	Hydroelectric	3/1/2020	7/31/2035	40
Clearwater Wind	Wind	11/30/2022	11/29/2042	350
Golden Hills Wind	Wind	4/29/2022	4/28/2042	200
Klondike III	Wind	12/1/2007	11/30/2027	50
Skookumchuck Wind ¹	Wind	6/30/2020	12/31/2045	137
Lund Hill Solar ¹	Solar	12/1/2022	11/30/2042	150
SPI Biomass	Biomass	1/1/2021	12/31/2037	17
MSCG System	System	1/3/2022	12/31/2026	100
Pt. Roberts ²	System	10/1/2022	9/30/2025	8
Coal Transition ³	Coal	12/1/2014	12/31/2025	380
Total, CETA-compliant	-	-	-	1,044
Total	-	-	-	1,532

Notes:

1. Output from this resource serves subscribers to PSE's Green Direct program (Schedule 139 Contracts).
2. Point Roberts is not physically connected to PSE's system and relies on power from a single intertie point on BC Hydro's distribution grid.



3. The capacity of the TransAlta Centralia PPA is designed to ramp up over time to help meet PSE's resource needs. According to the contract, PSE will receive 280 MW from Dec. 1, 2015, to Nov. 30, 2016, 380 MW from Dec. 1, 2016, to Dec. 31, 2024, and 300 MW from Jan. 1, 2025, to Dec. 31, 2025.

Table C.14: Schedule 91 Power Purchase Agreements for Electric Power Generation

Name	Type	Contract Start	Contract Expiration	Contract Capacity (MW)
Black Creek	Hydroelectric	3/26/2021	12/31/2032	4.2
Koma Kulshan	Hydroelectric	12/1/1990	3/31/2037	13.3
Nooksack Hydro	Hydroelectric	1/1/2014	12/31/2023	3.5
Skookumchuck Hydro	Hydroelectric	2/25/2011	12/31/2025	1
Smith Creek	Hydroelectric	1/12/2011	12/31/2025	0.12
Sygitowicz – Kingdom Energy ¹	Hydroelectric	3/25/2016	12/31/2030	0.448
Twin Falls	Hydroelectric	12/1/1989	3/18/2025	20
Weeks Falls	Hydroelectric	12/1/1987	12/31/2023	4.6
3 Bar-G Wind ²	Wind	8/31/2011	12/31/2029	0.12
Knudson Wind	Wind	6/16/2011	12/31/2029	0.108
Swauk Wind	Wind	12/14/2012	12/31/2023	4.25
Cascade Community Solar #1 and #2 (combined)	Solar	9/28/2012	12/31/2024	0.026
Finn Hill Solar (Lake Wash SD)	Solar	7/16/2012	12/31/2032	0.355
IKEA	Solar	1/1/2017	12/31/2031	0.828
Port of Coupeville ³	Solar	1/1/2022	12/31/2023	0.075
Camas Solar	Solar	8/1/2018	12/31/2036	4.99
Penstemon Solar	Solar	1/1/2020	12/31/2036	4.99
Urtica Solar	Solar	8/1/2018	12/31/2036	4.99
Blocks Evergreen Dairy	Biogas	6/1/2017	12/31/2031	0.19
Edaleen Dairy	Biogas	8/21/2012	12/31/2023	0.75
Emerald City Renewables ⁴	Biogas	11/6/2013	12/31/2029	4.5
Emerald City Renewables ²	Biogas	11/6/2013	12/31/2029	4.5
Farm Power Rexville	Biogas	8/28/2009	12/31/2032	0.75
Rainier Biogas	Biogas	11/30/2012	12/31/2032	1
VanderHaak Dairy ⁵	Biogas	11/5/2004	12/31/2023	0.6
Total, CETA-compliant	-	-	-	80
Total	-	-	-	80

Notes:

1. The site was purchased by Hillside Clean Energy on May 1, 2020, with PSE's consent.
2. The agreement was initially for 1.395 MW, but only 0.120 MW was constructed; the contract was amended to reflect this change.



3. Formerly Island Solar, ownership was transferred to the Port of Coupeville on July 1, 2020, with PSE's consent.
4. Emerald City Renewables was formerly known as BioFuels Washington.
5. VanderHaak has two generators with a combined capacity of 0.60 MW. However, VanderHaak primarily runs only the larger generator, which has a capacity of 0.45 MW.

Energy Keepers Hydroelectric

Puget Sound Energy contracted with Energy Keepers, Inc., a corporation owned by the Confederated Salish and Kootenai Tribes, to purchase 40 MW of zero-carbon energy produced by the Selis Ksanka Qlispe hydroelectric project through July of 2035.

Bonneville Power Administration Capacity Product Hydroelectric

Under a five-year agreement beginning in January 2022, the Bonneville Power Administration (BPA) will offer to sell PSE up to 100 MW of surplus power generated from the Federal Columbia River Power System. Hydroelectricity can quickly increase and decrease to meet power demand and help the region achieve its renewable goals by dovetailing with more variable output resources such as wind and solar.

Run-of-River Hydroelectric

Among our power purchase agreements are several long-term contracts for production output from hydroelectric projects within our balancing area. These contracts include Twin Falls, Koma Kulshan, and Weeks Falls. We show the contracts in Table C.13. The projects are run-of-river, meaning they do not hold back, store water, or provide flexible capacity.

Klondike III Wind

Puget Sound Energy's wind portfolio includes a power purchase agreement with Avangrid Renewables for a 50 MW share of electricity generated at the Klondike III wind farm in Sherman County, Oregon. The wind farm has 125 turbines with a project capacity of nearly 224 MW. This agreement remains in effect until November 2027.

Golden Hills Wind

Puget Sound Energy executed a 20-year power purchase agreement with Avangrid Renewables for the output of a 200 MW wind farm they will build in Sherman County, Oregon. Avangrid expects to complete the project by mid-2022. The project will help us meet our goals to reduce greenhouse gas emissions and provide additional capacity to serve customers, particularly during winter periods of high electricity demand.

Clearwater Wind

Puget Sound Energy executed a 20-year power purchase agreement in early 2021 with NextEra Energy Resources to buy the output of 350 MW of wind-generated power. The wind farm is in Rosebud, Custer, and Garfield Counties, Montana, and began operation in November 2022. The project will allow PSE to use existing transmission lines from Colstrip, Montana, to bring energy to our customers in western Washington. This project also supports our environmental and deep decarbonization commitment by investing in more wind energy.



Skookumchuck Wind

Puget Sound Energy executed a 20-year power purchase agreement with Southern Power Company to purchase the output from the Skookumchuck Wind Project. The wind project is in Thurston and Lewis counties and became operational in November 2020. Along with the production from the Lund Hill Solar facility, the Skookumchuck facility output serves subscribers to our Green Direct program (Schedule 139), described in the Demand-side Resources section of this appendix.

Lund Hill Solar

Puget Sound Energy executed a 20-year power purchase agreement with Avangrid Renewables (through the project company Lund Hill Solar, LLC) to purchase the output from the Lund Hill Solar Project, located in Klickitat County, Washington. We expect the project to come online in late 2022. We will use the output from the facility to serve subscribers to PSE's new Green Direct program (Schedule 139), described in the [Demand-Side Resources section](#) of this appendix.

Sierra Pacific Industries Biomass

Puget Sound Energy has a 17-year contract with Sierra Pacific Industries (SPI) to purchase 17 MW of renewable energy from SPI's Mt. Vernon Mill; deliveries began in 2021. The cogeneration facility is an operational plant that uses wood byproducts from its manufacturing process to generate steam that makes electricity and heat kilns to dry lumber. An air pollution control device filters fine particles and other emissions from the burning wood.

Point Roberts System

This contract provides power deliveries to PSE's Point Roberts, Washington, retail customers. The Point Roberts load, physically isolated from PSE's transmission system, connects to British Columbia Hydro's electric distribution facilities. We pay a fixed price for each MWh of energy delivered during the contract term.

Morgan Stanley Commodities Group System

Puget Sound Energy is in the Western System Power Pool (WSPP) agreement with the Morgan Stanley Commodities Group (MSCG) for a system PPA to deliver 100 MW of firm heavy load hour energy in the first and fourth quarters only, commencing in January 2022.

Coal Transition

Puget Sound Energy began purchasing 180 MW of firm, baseload coal transition power from TransAlta's Centralia coal plant in December 2014. On December 1, 2015, the contract increased to 280 MW. From December 2016 to December 2024, the contract is for 380 MW; in the last year of the contract, 2025, the volume drops to 300 MW. This contract conforms to a separate TransAlta agreement with state government and the environmental community to phase out coal-fired power generation in Washington by 2025.

In 2011, the State Legislature passed a bill codifying a collaborative agreement between TransAlta, lawmakers, environmental advocacy groups, and labor representatives. The timelines agreed to by the parties enable the state to



transition to cleaner fuels while preserving the family-wage jobs and economic benefits associated with the low-cost, reliable power provided by the Centralia plant. The legislation allows long-term contracts, through 2025, for sales of coal transition power associated with the 1,340 MW Centralia facility, Washington’s only coal-fired plant.

Schedule 91 Contracts

Puget Sound Energy's portfolio includes several electric power contracts with small power producers in our electric service area (see Table C.14). These qualifying facilities offer output pursuant to WAC chapter 480-106.⁴ WAC 480-106-020 states: "A utility must purchase, in accordance with WAC 480-106-050 Rates for purchases from qualifying facilities, any energy and capacity that is made available from a qualifying facility: (a) Directly to the utility; or (b) Indirectly to the utility in accordance with subsection (4) of this section."⁵ A qualifying facility is defined in WAC 480-106-007 as a “cogeneration facility or small power production facility that is a qualifying facility under 18 C.F.R. Part 292 Subpart B.”⁶

2.3.2. Other Contract Agreements

In addition to PPAs, PSE has a long-term agreement with the U.S. Army Corps of Engineers (USACE), a treaty agreement between the U.S. and Canada, and a power exchange with Pacific Gas & Electric (PG&E). We describe these contracts in Table C.15 and the next section.

Table C.15: Other Contract Agreements for Electric Power Generation

Name	Type	Contract Start	Contract Expiration	Contract Capacity (MW)
Baker Replacement	Hydro	10/1/2019	9/30/2029	7
Canadian Entitlement Return	Hydro	1/1/2004	9/15/2024	-32.5
PG&E Seasonal Exchange — PSE	System	10/11/1991	Ongoing	300
Total, CETA-compliant	-	-	-	-26
Total	-	-	-	275

Baker Replacement

Under a 20-year agreement signed with the USACE, PSE provides flood control for the Skagit River Valley. Early in the flood control period, we draft water from the Upper Baker Reservoir at the request of the USACE. Then, during high precipitation and runoff between October 15 and March 1, PSE stores water in the Upper Baker Reservoir and controls its release to reduce downstream flooding. In return, PSE receives a total of 7,000 MWh of energy and 7 MW of net maximum capacity from BPA in equal increments per month for the months of November through February to compensate for the lower generating capability caused by reduced head due to the early drafting at the plant during the flood control months.

⁴ [WAC 480-106](#)

⁵ [WAC 480-106-020](#)

⁶ [WAC 480-106-007](#)



Canadian Entitlement Return

Under a treaty between the United States and Canada, one-half of the firm power benefits produced by additional storage capability on the Columbia River in Canada accrue to Canada. We see benefits and obligations from this storage based on the percentage of our participation in the Columbia River projects. Agreements with the Mid-Columbia PUDs specify PSE's obligation to return our share of the firm power benefits to Canada during peak hours until the expiration of the PUD contracts or expiration of the Columbia River Treaty, whichever occurs first. This is energy that PSE provides rather than receives, so it is a negative number. Puget Sound Energy's share of energy returned during 2021 was approximately 23 aMW, with a peak capacity return of 42.5 MW. The Columbia River Treaty has no end date but can be terminated after 2024 with 10 years' notice. The United States and Canada recently concluded the ninth round of negotiations to modernize the treaty to ensure effective flood risk management, provide a reliable and economical power supply, and improve the ecosystem.

Pacific Gas and Electric Seasonal Exchange

Under this system-delivery power exchange contract, PSE exchanges 300 MW of seasonal capacity and 413,000 MWh of energy with PG&E on a one-for-one basis each calendar year. Puget Sound Energy has historically been a winter-peaking utility and PG&E is a summer-peaking utility, so PG&E has the right to call for the power in the months of June through September, and PSE has the right to call for the power in the months of November through February.

2.4. Transmission Contracts

In addition to owning and purchasing power from electric generating resources, PSE fulfills loads by buying electricity from the short-term wholesale market. Puget Sound Energy participates in two markets. The first is the Mid-Columbia (Mid-C) market hub, the principal electricity market hub in the Northwest and one of the major trading hubs in the Western Electricity Coordinating Council (WECC). The Mid-C market hub is also the central market for northwest hydroelectric generation. The second is the Western Energy Imbalance Market (EIM), which allows participants to trade electricity in real-time across neighboring grids throughout the western United States. To carry this electricity to PSE's service territory, PSE has negotiated transmission contracts with BPA. This section describes these transmission contracts.

2.4.1. Mid-C Transmission

Puget Sound Energy has 2,481 MW of transmission capacity to the Mid-C market; of that, we contract 2,031 MW from BPA (Table C.16) long-term and own 450 MW (Table C.16).⁷ Puget Sound Energy Merchant owns the BPA transmission rights. PSE Transmission sells 450 MW of transmission as the transmission provider. Currently, our 449 customers hold the rights to the 450 MW of transmission; however, when the 449 customers do not entirely utilize these rights, the rights are allocated to PSE Merchant or sold on the open access same-time information system

⁷ PSE also owns transmission and transmission contracts to markets in addition to the Mid-C market transmission detailed here.



(OASIS). We use approximately 1,500 MW of this transmission capacity to the Mid-C wholesale market for short-term market purchases to meet our peak need.⁸

Table C.16: BPA Mid-C Hub Transmission Resources

Name	Effective Date	Termination Date	Transmission Demand (MW)
Midway	11/1/2017	11/1/2027	100
Midway	4/1/2008	11/1/2035	5
Rock Island	7/1/2007	7/1/2037	400
Rocky Reach ¹	11/1/2017	11/1/2027	100
Rocky Reach	11/1/2017	11/1/2027	100
Rocky Reach	11/1/2019	11/1/2024	40
Rocky Reach	11/1/2019	11/1/2024	40
Rocky Reach	11/1/2019	11/1/2024	40
Rocky Reach	11/1/2019	11/1/2024	5
Rocky Reach	11/1/2019	11/1/2024	55
Rocky Reach	9/1/2014	11/1/2031	160
Vantage	11/1/2017	11/1/2027	100
Vantage	12/1/2019	12/1/2024	169
Vantage	10/1/2013	3/1/2025	3
Vantage	11/1/2019	11/1/2024	27
Vantage	11/1/2019	11/1/2024	27
Vantage	11/1/2019	11/1/2024	27
Vantage	11/1/2019	11/1/2024	3
Vantage	11/1/2019	11/1/2024	36
Vantage	11/1/2019	11/1/2024	5
Wells	9/1/2018	9/1/2023	266
Vantage	3/1/2017	2/28/2026	23
Midway	10/1/2018	10/1/2023	115
Midway	3/1/2019	3/1/2024	35
Wells/Sickler	11/1/2018	11/1/2023	50
Vantage	11/1/2018	11/1/2023	50
Vantage	12/1/2019	11/1/2027	50
Total BPA Mid-C Transmission	-	-	2,031

Note: Contract split between Mid-C and EIM Imports below.

We own two transmission resources, described in Table C.17.

⁸ See Chapter Eight: Electric Analysis, for a more detailed discussion of PSE reliance on wholesale market capacity to meet peak need.



Table C.17: PSE-Owned Mid-C Hub Transmission Resources

Name	Transmission Demand (MW)
McKenzie to Beverly	50
Rocky Reach to White River	400
Total PSE Mid-C Transmission	450

2.4.2. Energy Imbalance Market Transmission

When PSE joined the Energy Imbalance Market (EIM) in October 2016, we redirected 300 MW of Mid-C transmission capacity contracted from BPA annually for EIM imports. Starting in June 2020, Mid-C transmission shifted for EIM imports was reduced to 150 MW to align with PSE's market-based rate authority. This amount is required to maintain market-based authority and allows PSE to redirect beyond this amount for use in the EIM. Although these redirects reduce the transmission capacity available to support PSE's peak need, PSE still maintains sufficient capacity to meet the winter peak. We will need to renew the amount of redirected Mid-C transmission on an ongoing basis, allowing us to reevaluate our EIM transfer capacity needs considering future winter peak needs. Table C.18 details the transmission capacity currently redirected for EIM.

We redirect an additional 300 MW, reserved under the PG&E Seasonal Exchange contract, for EIM exports during certain months of the year on an as-feasible basis. When our obligations to PG&E during summer months prevent this redirect, we instead redirect our existing Mid-C transmission, bringing the total redirected Mid-C transmission for EIM during summer months up to 450 MW.

Table C.18: Mid-C Hub Transmission Resources Redirected for EIM Imports as of 1/1/2023

Name	Effective Date	Termination Date	Transmission Demand (MW)
Rocky Reach	11/1/2017	11/1/2027	150
Total ¹	-	-	150

Note: Total BPA Mid-C Transmission Redirected for EIM Imports

3. Demand-side Resources

This section describes PSE's existing demand-side resources (DSR), which we implement on the customer side of the meter. The DSR programs include energy efficiency and demand response (DR) programs. We also describe the customer renewable energy programs PSE offers. In this 2023 Electric Report analysis, we account for the electricity contribution from DSR programs as a reduction in demand.

3.1. Demand-side Resource Programs

Puget Sound Energy's currently available DSR programs include the following:

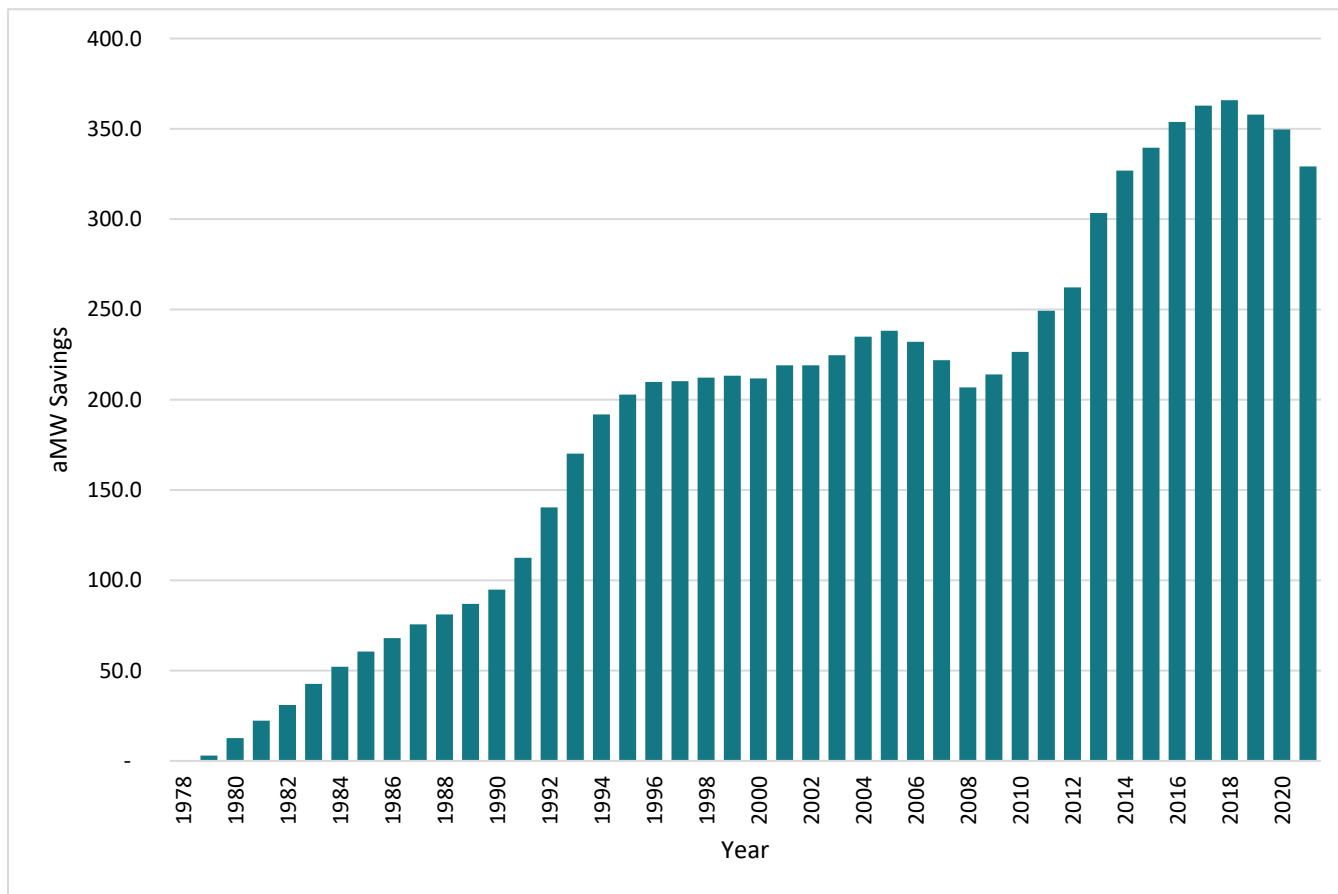
- Demand Response
- Distributed Generation
- Distribution Efficiency



- Energy Efficiency
- Generation Efficiency

Puget Sound Energy has led the Pacific Northwest in implementing demand-side resource programs. Since 1978, our annual first-year savings (as reported at the customer meter) have grown by more than 200 percent, from 9 aMW in 1978 to 19.4 aMW in 2021 (Figure C.2). On a cumulative basis, these savings reached 329 aMW by 2021⁹. To achieve these savings, the company spent approximately \$1.77 billion in incentives to customers and for program administration from 1978 to 2021.

Figure C.2: Cumulative Electric Energy Efficiency Savings from DSR, 1978–2021



3.1.1. Energy Efficiency

Energy efficiency is by far PSE’s largest electric demand-side resource. Energy efficiency consists of measures and programs that replace existing building components and systems, such as lighting, heating, water heating, insulation, and appliances, with more energy-efficient versions. There are two types of measures: retrofit measures (when

⁹ Savings are adjusted for measure life and then retired so they no longer count towards the cumulative savings. For the purposes of the PR analysis, measure life is assumed to be 10 years.



replacement is cost-effective before the equipment reaches its end of life); and lost opportunity measures (when replacement is not cost-effective until the existing equipment burns out).

Puget Sound Energy's energy efficiency programs serve all customers — residential (including low-income), commercial, and industrial. We establish program savings targets every two years in collaboration with key external stakeholders represented by the Conservation Resource Advisory Group (CRAG) and the Integrated Resource Plan (IRP) public participation process. We fund most electric energy efficiency programs with electric conservation rider funds collected from all customer classes.¹⁰

In the most recently completed program cycle, the 2020–2021 tariff period, energy efficiency saved 44.3 aMW. The target for the current 2022–2023 program cycle is 61.3 aMW.

We made the following changes in the 2022–2023 program cycle:¹¹

- Added 85,000 home energy reports to participating gas-only customers
- Added a new industrial pay-for-performance option for industrial systems optimization participants to encourage bundling of capital and O&M measures
- Added a new residential midstream heating ventilation and cooling (HVAC) and water heat program with a focus on engaging distributors to increase sales by reducing first costs and increasing stock
- Added the lean buildings accelerator program to help building owners comply with the new clean buildings requirement
- Increased equipment and weatherization incentives and customized home energy reports for manufactured home customers
- Increased natural gas targets leading to a focus on residential space heat programs, home energy reports, and commercial/industrial retrofit natural gas programs
- Raised the income threshold for the low-income weatherization program from 60 to 80 percent of the area median income (AMI) or 200 percent of the federal poverty level (FPL), whichever is higher
- Reintroduced the lodging rebates program for hotel and motel customers

We anticipate PSE's 2022–2023 electric energy efficiency programs will cost just over \$240 million and save 61.3 aMW of electricity.

3.1.2. Distribution Efficiency

The production and distribution efficiency program includes implementing energy conservation measures that prove cost-effective, reliable, and feasible within our distribution facilities.

We implement improvements at PSE's electric substations for efficiency in transmission and distribution (T&D). These improvements focus on phase balancing and conservation voltage reduction (CVR). The methodology used to

¹⁰ See [Electric Schedule 120](#), Electricity Conservation Service Rider, for more information.

¹¹ See [2020-21 Biennium Conservation Plan Overview](#) for more details on efficiency programs, especially low-income weatherization programs.



determine CVR savings is the Simplified Voltage Optimization Measurement and Verification Protocol provided by the Northwest Power and Conservation Council Regional Technical Forum.¹²

Table C.19 below lists the CVR-related projects completed to date. Going forward, we plan to significantly expand CVR projects tied to implementing the Advanced Metering Infrastructure (AMI) and substation automation projects. These two projects will enable Volt-Var optimization (VVO), an improved CVR method that allows for deeper savings compared to PSE's current CVR implementation method of line drop compensation (LDC).

Savings associated with CVR are affected by several variables, including but not limited to the increasing penetration of distributed energy resources (DERs) we expect in the future. Therefore, the savings from these projects can vary significantly. We are investigating the need for a study that provides an updated energy savings methodology for Volt-Var CVR projects.

Table C.19: Energy Savings from Conservation Voltage Reduction, Cumulative Savings to Date, kWh

Substation	Year Savings Claimed	Date of Implementation	kWh Savings / Year	Savings as (%) of Baseline kWh
South Mercer	2013	11/1/2013	607,569	1.3
Mercerwood	2013	12/8/2013	357,240	0.9
Mercer Island	2014	8/8/2014	859,586	1.3
Britton	2014	12/5/2014	636,197	5.6
Panther Lake	2016	8/27/2015	804,326	1.3
Hazelwood	2016	9/18/2015	1,352,149	1.4
Pine Lakes	2016	9/17/2015	1,163,150	1.3
Fairwood	2018	5/1/2018	768,367	1.2
Rhode Lakes	2018	5/23/2018	1,639,803	1.6
Rolling Hills	2018	5/24/2018	1,359,515	1.5
Phantom Lake	2019	12/19/2018	343,748	0.8
Overlake	2019	12/6/2019	326,644	1.0
Lake McDonald	2020	5/26/2020	404,699	1.0
Maplewood	2021	7/28/2021	911,874	0.9
Marine View	2021	12/2/2021	742,569	1.0
Cambridge	2021	12/13/2021	597,420	1.0
Avondale	2022	12/2/2021	995,168	1.1
Lake Hills	2022	11/15/2021	671,548	1.2
Wayne	2022	12/3/2021	505,679	0.8
Wilkeson	2022	7/28/2021	232,538	0.9
North Bothell	2022	12/2/2021	576,033	1.0

¹² rtf.nwccouncil.org.



Substation	Year Savings Claimed	Date of Implementation	kWh Savings / Year	Savings as (%) of Baseline kWh
Average to Date	-	-	755,039	1.3
Total to Date	-	-	15,855,822	-

3.1.3. Generation Efficiency

In 2014, PSE worked with the Conservation Resource Advisory Group (CRAG) to refine the boundaries of what to include as savings under generation efficiency. We determined we would include only parasitic loads¹³ served directly by a generator in the savings calculations available for generation efficiency upgrades; we would not include generators that serve parasitic loads from the grid. Using this definition, we completed site assessments in 2015. The assessments did not yield any cost-effective measures. Most of the opportunities were in lighting, and meager operating hours made these opportunities not cost-effective.

Puget Sound Energy staff will continue to study efficiency opportunities in these facilities and report on cost-effective savings we identify and implement in the 2022 and 2023 Annual Conservation Reports.

3.1.4. Distributed Generation

Puget Sound Energy offers cogeneration and combined heat and power incentives in our commercial and industrial programs. However, to date, we have not implemented any projects.

We discuss renewable distributed generation programs in this appendix's [Customer Renewable Energy Programs](#) section.

3.1.5. Demand Response

To meet PSE's Clean Energy Implementation Plan (CEIP) target of 23.7 MW of DR capacity reduction by 2025, we issued a distributed energy resource (DER) request for proposals (RFP) on February 7, 2022. Puget Sound Energy received responses from nine unique bidders proposing DR programs utilizing various technologies, including HVAC, water heat, battery energy storage, electric vehicle, sighting, building automation systems, and behavioral. The proposals total 161 MW of winter capacity. Puget Sound Energy plans to evaluate all proposals and implement the DR program(s) in 2023.

In the meantime, PSE's Customer Energy Management group plans to operate geographically targeted pilots in both a natural gas (Duvall) and an electric (Bainbridge Island) program. We implemented these programs in late 2022, following some initial contracting delays.

¹³ Electric generation units need power to operate the unit, including auxiliary pumps, fans, electric motors and pollution control equipment. Some generating plants may receive this power externally, from the grid; however, many use a portion of the gross electric energy generated by the unit for operations – this is referred to as the parasitic load.



3.2. Customer Renewable Energy Programs

This section describes PSE’s customer renewable energy programs. We divide these programs into two general categories. The voluntary subscription products serve customers who want additional renewable energy, including Green Power, Solar Choice, Community Solar, and Green Direct programs. The Customer Connected Solar products include Net Metering and Local Energy Development, which serve customers who generate distributed renewable energy on a small scale.

3.2.1. Renewable Power Purchasing Programs

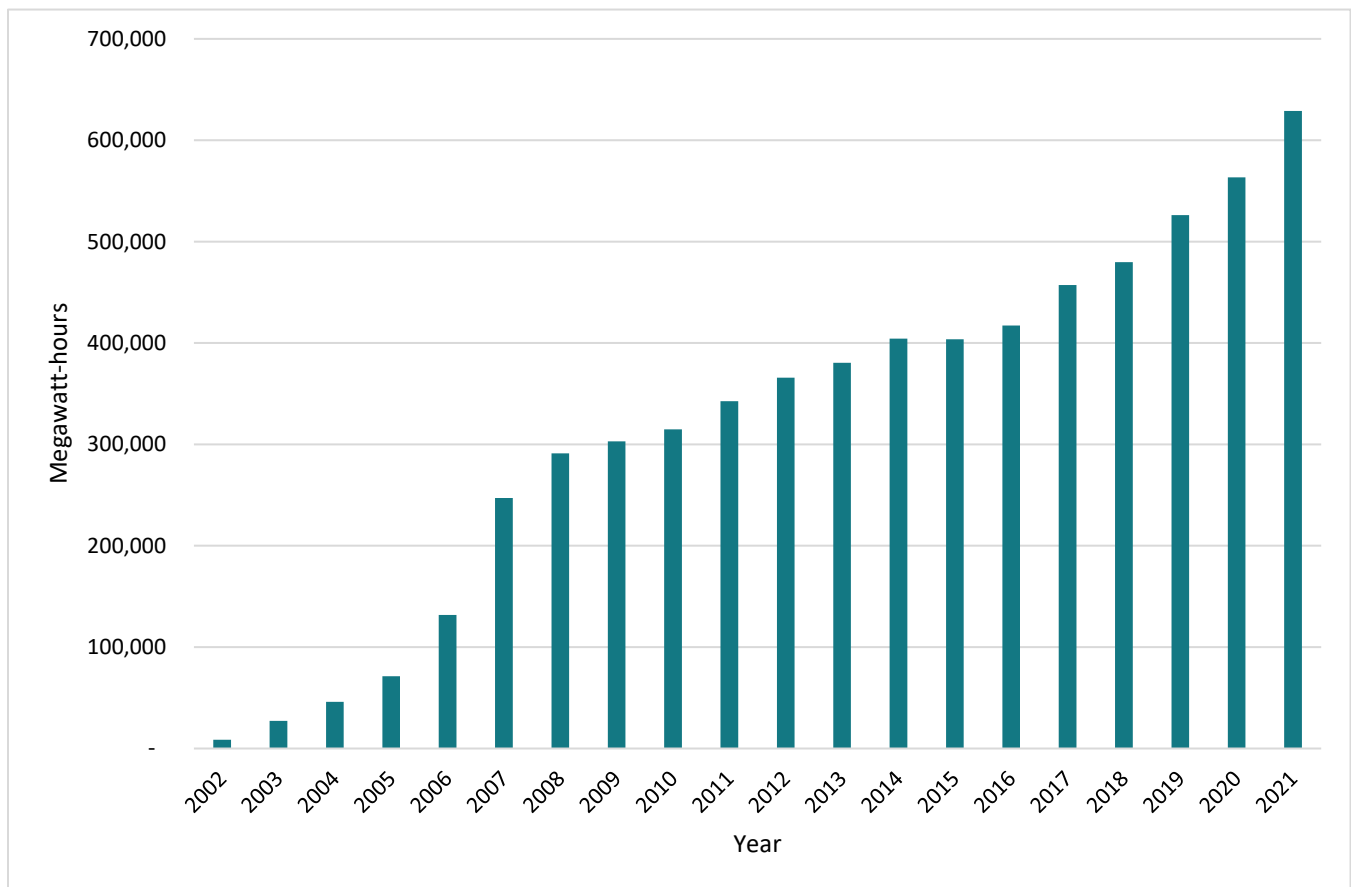
In the following sections, we describe the voluntary subscription products for customers interested in purchasing additional renewable energy.

Green Power Program

We launched the Green Power Program in 2001. This program allows customers to voluntarily purchase Renewable Energy Credits (RECs) from qualified renewable energy resources. The program has grown to include more than 66,000 participants at the end of 2021. Customers purchased an additional approximately 19.5 percent of MWh during 2019–2021, ending the period with sales of 628,945 MWh in 2021 (Figure C.3).



Figure C.3: Green Power MWh Sold 2002–2021



The Green Power Program built a portfolio of RECs from various renewable energy technologies and projects in the Pacific Northwest. In mid-2020, we requested a quote (RFQ) seeking RECs to supply the Green Power program for 2021–2023. The Green Power Program also purchased RECs from small, local, and regional producers to support small-scale renewable resources. These small producers included:

- FPE Renewables
- Farm Power Rexville
- Edaleen Cow Power
- Van Dyk-S Holsteins
- Rainier Biogas
- 3Bar G Community Wind
- First Up! Knudson Community Wind
- Ellensburg Community Solar
- Swauk Wind
- LRI Landfill Gas



Many of these entities also provide power to PSE under the Schedule 91 contracts discussed in the [Long-Term Contracts](#) section of this appendix.

Increasing the number of utility-scale solar projects in Idaho and Oregon allowed us to grow the number of RECs sourced from solar projects. We would prefer to source RECs first from projects in Washington and then from Oregon and Idaho. However, the supply of Pacific Northwest RECs continues to tighten as voluntary program sales have grown and we dedicate more resources to serving compliance targets. This constricted market has made it more difficult to source all our supplies from the region. To maintain current program pricing, we have begun sourcing from other locations in the WECC, including Montana, Utah, Colorado, California, British Columbia, and partly from national REC sources for the Large Volume Green Power product. We believe this trend will continue as CETA compliance increases the demand for renewable energy in the region.

Green Power Community Grants

Over the past 15 years, the Green Power program has also committed more than \$3,700,000 in grant funding to 15 cities and 45 local organizations in our electric service area to install solar projects to support low-income or Black, Indigenous, and People of Color (BIPOC) communities and the organizations that serve them. For example, in late 2020, PSE awarded solar grants to 14 organizations in six counties to be installed in 2021. The following organizations received more than \$1,000,000 to install more than 500 new kW of solar:

- Boys and Girls Clubs of Skagit County
- Boys and Girls Club of South Puget Sound
- Camp Korey
- Friends of the Manchester Library
- Helping Hands Food Bank
- Hopelink, Institute for Washington's Future
- King County Housing Authority – Vantage Point
- Lummi Nation School
- Nisqually Indian Tribe
- Skagit Valley Hospitality House Association
- South Whidbey Good Cheer Food Bank
- Sustainable Connections
- YWCA

In 2021, PSE issued another solicitation and awarded over \$900,000 in grant funding to 11 organizations for solar installations to non-profits, public housing authorities, or tribal entities serving low-income or BIPOC community members in PSE's electric service area. We expect most projects to be installed by early 2023. We issued another solicitation in mid-2022 for \$750,000 for solar projects installed in 2023.

Green Power Rates

Puget Sound Energy provides two rate schedules in the Green Power program. The first, under Schedule 135, serves residential and commercial Green Power customers and was launched in 2001. The current rate for green power is \$0.01 per kWh. Customers can purchase 200 kWh blocks for \$2.00 per block with a two-block minimum or participate in the 100 percent Green Power Option. We introduced this program option in 2007; it adjusts the customer's monthly green power purchase amount to match their monthly electric usage. In 2021, the average residential customer purchase was 708 kWh per month, and the average commercial customer purchase was 1530 kWh. There are more than 80,000 subscribers to the Green Power and Solar Choice programs.



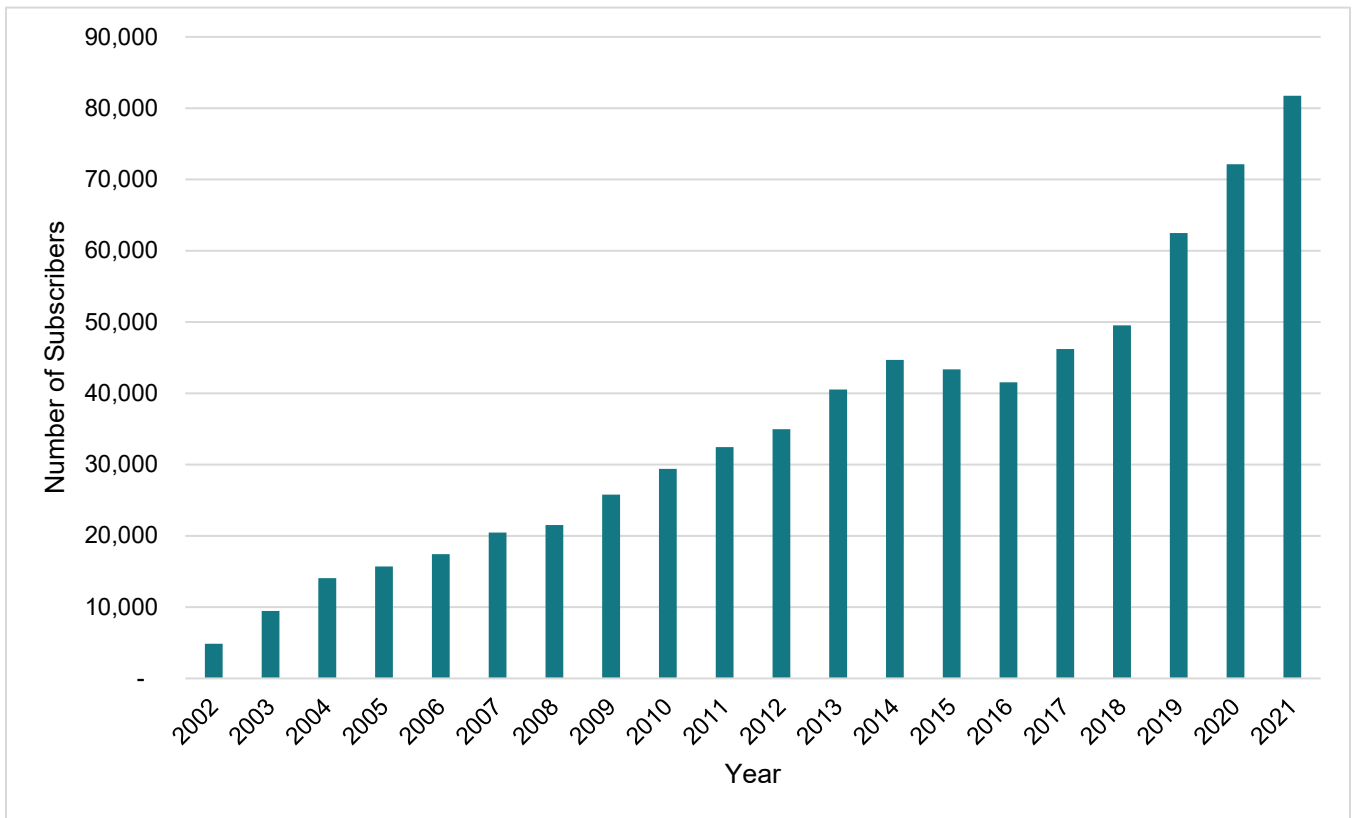
The second schedule is for customers who purchase more than one million kWh annually from the Green Power program and is detailed under Schedule 136. In 2022, PSE received approval from the Commission to increase the large-volume green power rate from \$0.0035 per kWh to \$0.006 per kWh. We made this latest change to better align the large volume rate with regional and national REC pricing. We will work to balance pricing with a mix of national and regionally produced RECs. The average 2021 large-volume purchase under Schedule 136 was 43,617 kWh per month. This product has attracted approximately 35 customers since we introduced it in 2005.

Solar Choice

In September 2016, the Commission approved PSE’s Solar Choice program, a renewable energy product for residential and small to mid-size commercial customers. Like the Green Power program, Solar Choice allows customers to purchase retail electric energy from qualified renewable energy resources voluntarily; in this case, all the resources are solar energy facilities in Washington, Oregon, and Idaho. Customers can elect to purchase solar in \$5.00 blocks for 150 kilowatt-hours. We add the purchases to their monthly bill. We officially launched the program in April 2017. As of December 2021, the program had 15,612 participants. These customers purchased 42,526 megawatt-hours of solar energy in 2021, a 37 percent increase from 2020 to 2021.

Figure C.4 illustrates the number of subscribers in our Green Power and Solar Choice offerings, by year. Of our 81,739 Green Power and Solar Choice subscribers at the end of 2021, 80,514 were residential customers, 1,115 were commercial accounts, and 110 accounts were under a large-volume commercial agreement. Cities with the most residential and commercial participants include Bellingham with 7,350, Olympia with 6,909, and Kirkland with 4,564.

Figure C.4: Green Power and Solar Choice Subscribers, 2002–2021





Community Solar

The Commission approved the PSE Community Solar Program for up to 20 MW in January 2021. Community Solar allows PSE electric customers to share the benefits of 100 percent local solar power. By subscribing to shares of a local solar array of their choice, PSE electric customers can replace some or all of their regular electricity use from solar energy projects located in western and central Washington and interconnected to PSE's distribution system. Each Community Solar share is \$20 per month; however, PSE dedicates 20 percent of the available program shares to serving income-eligible customers at no cost. All Community Solar participants receive a monthly bill credit of \$0.045 per kWh generated by the customer's solar energy share(s). Monthly energy credits vary based on the real-time production of the solar energy sites. One share is equal to 1.46 kW. Customers must commit to an initial one-year term and can cancel their subscription any time after that year.

The first Community Solar site opened in November 2021 on the roof of Olympia High School. Another site started operating in March 2022 at Pine Lake Middle School in Sammamish. A third site in Bonney Lake was completed in October 2022. We additionally contract power from Penstemon and Urtica solar sites, both located in Kittitas County. These sites opened in January and November of 2022, respectively. As we put additional Community Solar sites in service, subscriptions will become available for restricted shares per site. When a solar site is fully subscribed, we add customers to a waitlist for future availability at that site, or they may choose to subscribe to a different site if one is available.

Green Direct

We launched the Green Direct program on September 30, 2016, after the Commission approved it. Like the Green Power program and Solar Choice, Green Direct falls under the rules governing utility green pricing options found in Washington RCW 19.29A,¹⁴ Voluntary Option to Purchase Qualified Alternative Energy Resources. Green Direct is a product that allows the utility to procure and sell fully bundled renewable energy to large commercial (10,000 MWh per year or more of load in PSE's service area) and government customers from specified wind and solar resources.

For Phase I, PSE signed a 20-year PPA for the output from the 137 MW Skookumchuck Wind project in Lewis County. Customers could elect to enroll for 10, 15, or 20 years. The customer continues to receive and pay for all the standard utility services for safety and reliability. We charge customers for the total energy cost from the new plant, but they receive a credit for the energy-related power costs from the company.

Phase I of Green Direct held its first open enrollment period in November and December 2016, followed by a second open enrollment period that opened on May 1, 2017. By the end of June 2017, less than two months later, the wind facility was fully subscribed to 21 customers. Enrollees include companies like Starbucks, Target Corporation, REI, and government entities like King County and the City of Olympia. The Skookumchuck Wind project reached commercial operation in November 2020.

For Phase II, PSE issued an RFP to identify a new resource (or resources) in August 2017. In early 2018, PSE selected a 120 MW solar project in south-central Washington that we expected to achieve full commercial operation in 2022. Following selection, we proposed a blended rate of the Phase I wind and Phase II solar projects, which the

¹⁴ [RCW 19.29A](#)



Commission approved in July 2018. Phase II enrollment opened on August 31, 2018, and was entirely subscribed by 16 customers; four were wait-listed. We subsequently requested to expand the project size from 120 MW to 150 MW, which the Commission approved. The expansion allowed all 20 customers to participate. Phase II customers include the following:

- Amazon
- Bellevue College
- Kaiser Permanente
- Port of Bellingham
- Providence Health & Services
- Several customers from Phase I requesting additional supply
- Six Washington State agencies
- The cities of Kent and Redmond
- The Issaquah School District
- T-Mobile
- UW Bothell
- Walmart

3.2.2. Customer Connected Renewables Programs

Puget Sound Energy offers two customer programs for customers who install small-scale generation: a net metering program and the Washington State Renewable Energy Production Incentive Program. These are not mutually exclusive, and most customer-generators were enrolled in both programs until the Production Incentive Program closed to new participants in 2019.

Net Metering Program

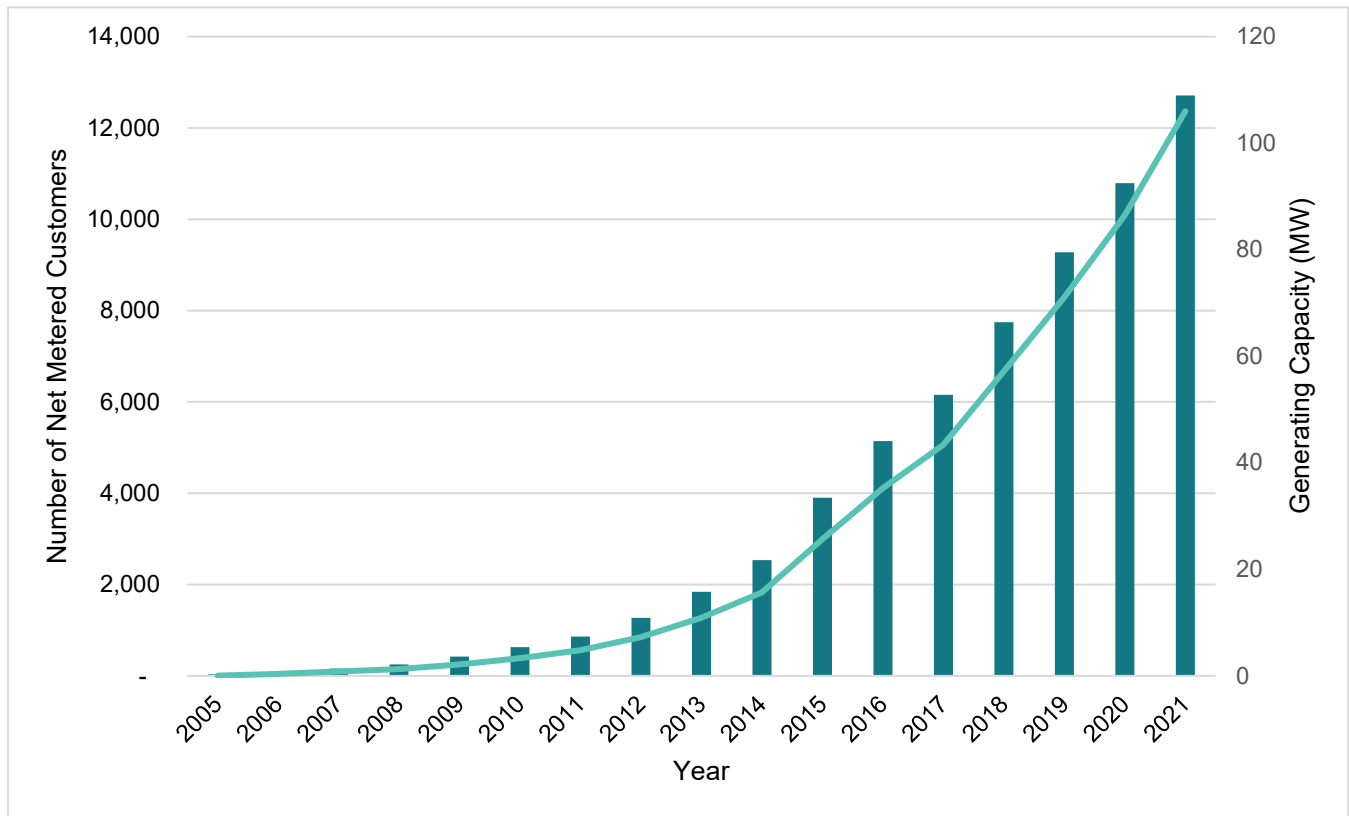
The Net Metering Program is defined in Rate Schedule 150 and governed by RCW 80.60.¹⁵ This program began in 1999 and was most recently updated by the Washington State Legislature in Engrossed Substitute Senate Bill 5223 on July 28, 2019. Net metering allows customers who generate renewable electricity to offset the electricity provided by PSE. We subtract the amount of electricity the customer generates and sends back to the grid from the amount provided by PSE, and the net difference is what the customer pays monthly. A kWh credit is carried over to the next month if the customer generates more electricity than PSE supplies over a month. According to state law, customers can carry over the banked energy until March 31 each year, when we reset the account to zero. The interconnection capacity allowed under net metering is 100 kW alternating current (AC).

Customer interest in small-scale renewables has increased significantly over the past 20 years, as shown. The program has more than doubled the number of participating customers in the last five years, with strong growth continuing even after the closure of the State Production Incentive Program. As of May 1, 2022, the program has more than 13,500 participants (Figure C.5).

¹⁵ [RCW 80.60](#)



Figure C.5: Net Metered Customers, 1999–2021



Most customer systems (99 percent) are solar photovoltaic (PV) installations with an average generating capacity of 8 kW, but there are also small-scale hydroelectric generators and wind turbines (Table C.20). By mid-2022, PSE was net metering more than 113 MW (AC) of generating capacity.

Table C.20: Interconnected System Capacity by Type of System, as of Q2 2022

System Type	Number of Systems	Average Capacity per System Type (kW [MW])	Sum of All Systems by Type (kW [MW])
Hybrid: solar/wind	16	9.3 [0.0093]	184 [0.184]
Micro hydro	6	15.7 [0.0177]	101 [0.101]
Solar array	13,546	8.37 [0.008]	113,422 [113]
Wind turbine	28	2.7 [0.0027]	80 [0.08]
Total	13,597	8.0 [0.008]	113,82 [113.827]

These small-scale renewable systems are distributed over a wide area of PSE’s service territory (Table C.21).



Table C.21: Net Metered Systems by County

County	Number of Net Meters
Whatcom	2,744
King	4,362
Skagit	1,230
Island	646
Kitsap	1,308
Thurston	1,775
Kittitas	681
Pierce	851
Total	13,597

Customer preference, declining prices, and federal tax incentives drive customer solar PV adoption. Residential customers were 92 percent of all solar PV by number and 83 percent by nameplate capacity. In 2021, we engaged in a project to link our Interconnection portal with our customer billing system, Systems Applications, and Products in Data Processing (SAP) and attach system information to the customer premise. This upgrade allows for a smoother interconnection process, greater visibility of customer generation on our distribution system, and a streamlined move-in and move-out process for customers with solar. We continue to examine our processes to scale up customer generation.

Renewable Energy Production Incentive Payment Program

The Washington State Renewable Energy Production Incentive Program is a production-based financial incentive for solar, wind, and bio-digester-generating systems customers. Puget Sound Energy has voluntarily administered this state incentive to qualified customers under Schedule 151 since 2005. For a PSE customer-generator to participate in Schedule 151, they must:

- Be a PSE customer with a valid interconnection agreement with PSE to operate their grid-connected renewable energy system.
- Be certified (as named on the PSE account) by the Washington State Program Administrator as eligible for annual incentive payments.
- Have a system that includes production metering capable of measuring the energy output of the renewable energy system.

In June 2019, the Washington State Program Administrator issued a notice that this program's budget was fully obligated, and we formally withdrew our voluntary participation effective December 12, 2019. We continue to administer annual incentive payments to all certified program participants, but customers installing new solar systems after December 12, 2019, are not eligible to participate in this program. Thus, the State Production Incentive Program is no longer a driver of solar energy adoption.



Annual Production Reporting and Payments

Puget Sound Energy measures and reports the kilowatt hours generated by participants' renewable energy systems annually and makes incentive payments to eligible customers as determined by the Washington State Program Administrator. Legacy participants (those certified to participate by the Department of Revenue before October 1, 2017) with valid certifications received payments of up to \$5,000 per year for electricity produced through June 30, 2020, at rates ranging from \$0.14 to \$0.504 per kWh. The year 2020 was the final payment year for 5,300 legacy program participants.

Participants who obtained state certification on or after October 1, 2017, and who maintain ongoing eligibility requirements are eligible for up to eight years of annual incentive payments on kilowatt-hours generated from July 1, 2017, through June 30, 2029. The incentive rate for these participants ranges from \$0.02 to \$0.21 per kWh based on system size, technology, and certification date. The Washington State Program Administrator determines participant eligibility, rates, terms, payment limits, and incentive payment amounts.

Puget Sound Energy has administered more than \$95 million to our customers in production incentive payments through 2021. We recover these payments through state tax credits.