Appendix E. Existing and contracted resources

PGE operates a diverse portfolio of resources to meet PGE's system energy and capacity needs. The appendix describes existing resources and resources with executed agreements that may not yet be in service.

E.1 Existing resources

E.1.1 Thermal resources

The technology and size characteristics for each plant are provided in the following sections. Note that these descriptions and capacity (in MW) represent the annual average net capacity of the power plant, which includes any duct-firing capabilities and excludes any de-rates for maintenance or forced outage rates. In contrast, energy (in MWa) represents the annual average availability after projected forced outages and maintenance. Also, note that the capacity of combined-cycle combustion turbines (CCCTs) varies across seasons as turbine operations are more sensitive to temperature changes. When the temperature is high during the summer, the turbines provide less capacity as operations are affected, while other steam technologies have more consistent capacity regardless of temperature change. In the following sections, each thermal resource is described in greater detail. The annual average energy availability, MWa, for each resource is for the period between 2023 to 2050, unless noted otherwise.

Carty

Carty is a CCCT resource built adjacent to PGE's Boardman coal plant in Boardman, Oregon. The plant became operational in 2016. It provides 391 MW of annual average capacity. The plant has a highly efficient Mitsubishi Heavy Industries (MHI) G-class combustion turbine. The annual average energy availability is 369 MWa. Finally, the plant has 47 MW of duct firing for capacity needs.

Coyote Springs

Coyote Springs is a gas fired CCCT facility in Boardman, Oregon, which became operational in 1995. Coyote Springs has an annual average capacity of 252 MW (including 2 MW of additional capacity when operating an auxiliary boiler to supply steam-to-steam customers) and an annual average energy availability of 228 MWa.

Port Westward 1

Port Westward 1 (PW1) reached commercial operation in June 2007. This CCCT plant is in Clatskanie, Oregon. The plant supplies approximately 411 MW of annual average capacity (including approximately 17 MW of duct firing) and has an annual average energy availability of 367 MWa.

Beaver

Beaver is a CCCT facility in Clatskanie, Oregon. PGE placed the plant into service in 1976. Beaver has an annual average capacity of 486 MW. The six combustion turbines (CTs) operate primarily on natural gas but can also be fueled with No. 2 diesel fuel oil via on-site tank storage. The CTs each have heat recovery steam generators that connect to a single steam turbine, allowing PGE to operate the plant either in simple-cycle mode or in combined–cycle mode. A separate simple cycle unit, Beaver 8, was added to the site in 2001 and has an annual average capacity of 23 MW.

Port Westward 2

Port Westward 2 (PW2) is in Clatskanie, OR, adjacent to PGE's PW1 plant. PW2 began commercial operations in December 2014. It comprises 12 natural gas-fired reciprocating engines with an annual average capacity of approximately 225 MW. In addition to providing peak capacity, the modular configuration offers a wide range of dispatch flexibility for wind, load following, and additional energy value.

Boardman

Boardman came into service in 1980 and went offline on October 15, 2020. It was decommissioned and demolished on September 15, 2022. Boardman was a coal plant in Boardman, Oregon, with an annual capacity of approximately 575 MW when it was operational.

Colstrip

Colstrip is a four-unit coal-fired plant located in Colstrip, Montana, with coal transported by conveyor belt directly from the on-site mine to the boiler. Colstrip units 1 and 2 became operational in 1975 and 1976, respectively. The units were owned by Talen Energy and Puget Sound Energy and were shut down in 2019.

PGE owns 20 percent of Colstrip units 3 and 4, representing approximately 296 MW (or 20 percent of the combined units 3 and 4) of annual average capacity. The average annual energy availability for PGE's share of Colstrip Units 3 and 4 is 262 MWa for the remaining operating period, 2023-2029. PGE has plans to discontinue usage of and exit its 20 percent ownership of the Colstrip plant by the end of 2029.

E.1.2 Hydropower plants

PGE owns and operates eight hydroelectric plants on the Deschutes, Clackamas, and Willamette River systems. Pelton and Round Butte plants have reservoir storage capability, while the remaining plants have limited ability to store water and shape energy. These plants are operated as run-of-river projects.

Pelton-Round Butte hydropower project

PGE operates the Pelton and Round Butte plants on the Deschutes River near Madras, Oregon. These plants provide peaking and load-following capabilities. A portion of PGE's hydropower capacity also contributes to meeting the required spinning and supplemental (non-spin) operating reserve requirements, which are necessary for responding to system contingencies.

In an average hydro condition, the plants have a combined annual average dependable capacity of approximately 447 MW and an expected annual energy production of 165 MWa. PGE owns 50.1 percent of each plant (approximately 224 MW, 82 MWa), with the remaining share owned by the Confederated Tribes of the Warm Springs Reservation (Tribes). The Tribes agreed to sell all their output to PGE through 2040. See **Section E.2.2, Pelton, Round Butte, and the Re-regulating dam**, for more details on the agreement.

Clackamas River hydropower projects

PGE owns and operates six plants on the Clackamas River system. Under average hydropower generation conditions, the plants have the following average annual capacities:

- Timothy Powerhouse, 1.2 MW (OR RPS compliant)[445]
- Harriet Powerhouse, 0.5MW
- Oak Grove, 27MW
- North Fork, 27 MW (OR RPS compliant)
- Faraday, 27 MW (OR RPS compliant)
- River Mill, 15 MW (OR RPS compliant)

Under average hydro conditions, the aggregated expected annual energy production from each of these projects is 84 MWa.

Willamette Falls hydropower project

PGE owns and operates the Sullivan plant on the Willamette River at Willamette Falls. Under average hydropower generation conditions, the plant's nameplate capacity is 14 MW, and the expected annual energy production is 14 MWa.

E.1.3 Wind and Solar plants

Biglow Canyon

The Biglow Canyon Wind Farm was completed in three phases in 2007, 2009, and 2010. The wind farm in the lower Columbia River Gorge near Wasco, Oregon, has a total nameplate generating capacity of 450 MW. Based on an expected capacity factor of approximately 26 percent, PGE estimates Biglow's annual average energy production at 118 MWa. Biglow's generation is RPS compliant as it is renewable energy that contributes towards the RPS requirement of being 50 percent renewable by 2040.

[445] The Oregon Renewable Portfolio Standard (RPS) sets a requirement for how much of the electricity used in Oregon must come from renewable resources. The passage of Oregon Senate Bill 1547 increased Oregon's Renewable Portfolio Standard requirement to 50 percent renewables by 2040. RPS is discussed in **Section 6.7, RPS need**.

Clearwater wind

The Clearwater wind farm will span Rosebud, Garfield, and Custer counties in Montana. It is a 775 MW wind site in Montana being developed by NextEra Energy Resources, LLC. PGE will procure 311 MW of energy from the Clearwater Wind project, scheduled to be operational by December 31, 2023. PGE's power from Clearwater will be generated by 112 General Electric wind turbines. The Clearwater project is expected to deliver higher levels of production during the winter and summer. The power will be served to PGE customers through existing transmission on the Northwestern Energy and Bonneville Power Administration (BPA) systems.

Tucannon River wind farm

Located near Dayton, Washington, PGE's Tucannon River Wind Farm (Tucannon) consists of 116 2.3- MW Siemens wind turbine generators with a total nameplate capacity of 267 MW. The plant's 35 percent expected capacity factor results in an expected output of 94 MWa. The project was completed and became operational in December 2014. Generation from Tucannon is Renewable Portfolio Standard (RPS) compliant RPS compliant as it is a renewable energy that contributes towards the RPS requirement of being 50 percent renewable by 2040.

Wheatridge renewable energy facility

In 2019, PGE entered into agreements with NextEra for the Wheatridge Renewable Energy Facility in Morrow County, Oregon. The facility consists of 300 MW of wind, 50 MW of solar, and 30 MW of battery storage. The wind portion of the facility entered service at the end of 2021, and the solar and storage components began service in 2022. PGE owns 100 MW of the wind resources and entered into a long-term purchase agreement with NextEra for the remainder of the project.

E.1.4 Energy storage

HB 2193 Energy storage

In compliance with HB 2193, PGE submitted its fourth annual report on the progress of its energy storage proposal on September 2, 2022.[446] The report provides evaluation and progress updates of the energy storages: Baldock, Coffee Creek, Microgrid pilot, Port Westward 2 (PW2), Residential Storage pilot (called the "Smart Battery Pilot"), and the controls for the energy storage systems.

As of September 2, 2022, the energy storages have the following status:[447]

- Baldock, 2 MW, undetermined
- Coffee Creek, 17-20 MW, COD in 2024
- Microgrid pilot (Beaverton Public Safety Center), 0.25 MW, operating
- Microgrid pilot (ARC), 0.5 MW, COD in Q1 2023
- Port Westward 2, 5 MW, operating
- Smart Battery Pilot, active program

Salem smart power center (SSPC)

As part of the Pacific Northwest Smart Grid Demonstration, PGE invested approximately $6 million, which was matched by Department of Energy (DOE) and other partner's three-to-one investment, to deploy a 5-MW (1.25 MWh) Li-ion battery inverter system at the Salem Smart Power Center (SSPC). This advanced Li-ion battery system provides uninterrupted power, reactive power (value at risk (VAR) support), and ancillary services. It can also be configured for energy storage for small-scale ancillary services in firming and shaping variable resources, such as solar and wind generation. The SSPC fulfilled a regional and visionary transactive control demonstration project that was co-funded by the US DOE under the American Recovery and Reinvestment Act. The primary contractor was Battelle, with PGE serving as a subcontractor on the project.

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[446] H.B. 2193, 78TH Oregon Legislative Assembly, (2015) https://olis.oregonlegislature.gov/liz/2015R1/Downloads/MeasureDocument/HB2193

[447] A full evaluation of the energy storage updates can be found in PGE UM 1856 PGE Draft Storage Potential Evaluation 2022 Annual Energy Storage Update, September 2, 2022. Available at: https://edocs.puc.state.or.us/efdocs/HAD/um1856had133540.pdf

PGE formally launched the project in 2010 and became fully operative in May 2013. When the demonstration concluded in January 2015, PGE confirmed that project assets are responsive to transactive control. Since the battery inverter system continues to operate as part of PGE's transmission and distribution system. It currently provides a routine automatic under-frequency response in compliance with North American Electric Reliability Corporation (NERC) BAL-003-1.

E.2 Contracted resources

Contracts provide a diversity of energy and capacity to PGE's resource portfolio. This section summarizes the contracts included in this IRP. The hydropower capacity value in this section represents annual average dependable values, not plant capacities.

E.2.1 Mid-Columbia and Canadian entitlement allocation

PGE has a project share of some hydropower facilities on the mid-section of the Columbia River (Mid-C). This means that PGE has proportional rights to the project reservoirs, allowing for energy shaping across hours and days. PGE can utilize these resources to provide ancillary services, including regulation and spinning reserves.

Wells

The Wells Dam is located downstream of Chief Joseph and was completed in 1967. The 10-turbine facility is operated by the Douglas County PUD No. 1 (Douglas Public Utility District). Upon the contractual expiration on August 31, 2018, and per Oregon Public Utility Commission (OPUC) Order No. 14-415, PGE sought to renew all or a portion of the Wells contract if a cost-effective agreement could be reached. PGE reached a new agreement with Douglas PUD for projects through September 30, 2028.

Douglas Country PUD Contract

PGE and Douglas County Public Utility District No.1 signed a five-year power purchase agreement to supply PGE customers with up to 160 MW of additional capacity from the Wells Hydroelectric Project on the Columbia River north of Wenatchee, Washington. The five-year agreement began in January 2021.

Priest Rapids project

The Priest Rapids Project is located downstream of Rock Island and consists of the Wanapum Dam (10 units, completed in 1964) and the Priest Rapids Dam (10 units, completed in 1961). Both facilities are operated by the Grant County Public Utility District (PUD) No. 2 (Grant PUD). PGE has contractual rights to approximately 8.62 percent of each facility through the spring of 2052. The combined annual average dependable capacity of PGE's share is approximately 131 MW, and the expected annual average energy under average hydro conditions is 44 MWa. Both values are prior to PGE's associated Canadian Entitlement obligations as discussed in the following section.

Canadian entitlement allocation

An agreement was entered between the US and Canada in which the US shares a portion of the generation benefits from the Columbia River storage reservoirs in Canada.[448] This agreement for the entitlement benefits ended in 2003 but was extended to 2024. PGE's share of Mid-C projects (Wells, Wanapum, and Priest Rapids) are subject to the Canadian Entitlement Allocation Extension (CEAE) obligations. For the IRP, PGE reflects the Columbia River Treaty by assuming that the CEAE renews after 2024 (or that the net effect of any operating changes after the expiration is approximately the same as if the agreement is renewed). PGE models this as the delivery of on-peak power to Canada.

E.2.2 Pelton, Round Butte, and the Re-regulating dam

As discussed in **Section E.1.2, Hydropower plants**, the Confederated Tribes of the Warm Springs Reservation (Tribes) have a 33.33-percent ownership share of the Pelton and Round Butte plants which included contractual rights to increase their ownership to 49.99 percent at the end of 2021. The Tribes also own 100 percent of the associated Re-regulating Dam (Re-reg Dam, 10 MW, 10 MWa), which PGE operates. PGE and the Tribes entered into an agreement for PGE to purchase the Tribes' shares of Pelton, Round Butte, and the Re-reg Dam through 2040.

[448] The Columbia River Treaty, ratified in 1964, required the U.S. to deliver one-half of three storage dams to Canada under the Canadian Entitlement Allocation Agreements (CEAA).
Canadian Entitlement Allocation Extension Agreements - April 29, 1997 (bpa.gov)

E.2.3 Wheatridge Energy Facility

PGE entered into agreements with Next Era for the Wheatridge Energy Facility, including long-term purchase agreements for 200 MW of wind, 50 MW of solar, and 30 MW of battery storage. The wind portion of the facility began service at the end of 2020, and the solar and storage components began service at the beginning of 2021.

E.2.4 Bilateral capacity agreements

Bilateral negotiations for capacity resulted in three agreements signed in early 2018.

Bonneville Power Administration (BPA)

PGE executed two agreements with BPA, each having 100 MW of annual capacity, with a five-year term beginning in 2021.

Avangrid renewables

PGE executed an agreement with Avangrid Renewables for 100 MW of seasonal peak capacity during summer and winter, with a five-year term beginning in July 2019.

E.2.5 Additional contracts

Table 108 summarizes additional contract resources in PGE's existing portfolio excluding qualifying facility (QF) agreements, which are covered in **Section E.2.6, Qualifying facility contracts**.

Table 108. Additional contracts by technology, MW[449]

	2023	2024	2025	2030	2035	2040	2043
Solar	311	397	404	453	453	93	93
Hydropower	875	875	875	36	-	-	-
Wind	99	99	99	75	75	-	-
Battery	-	-	-	-	-	-	-

[449] Solar includes green future initiatives, community solar PPA, and PPA. Hydropower includes hydro efficiency upgrades and hydro RPS.

	2023	2024	2025	2030	2035	2040	2043
Storage	4	4	4	4	-	-	-
Total	**1,289**	**1,376**	**1,382**	**568**	**528**	**93**	**93**

E.2.6 Qualifying facility contracts

PGE has contracted to purchase the output of numerous QF projects. The 2023 IRP includes QF contracts executed as of June 02, 2022, up to 601MW during 2023 to 2043. **Table 109** and **Table 110** summarize the QF contracts by technology and year-end capacity.

Table 109. Qualifying facility by technology, MWa

	2023	2024	2025	2030	2035	2040	2043
Solar	108	129	132	132	96	1	1
BioGas	9	9	9	4	4	-	-
Biomass	5	5	5	5	-	-	-
Hydropower	4	4	4	4	2	-	-
Wind	3	3	3	3	-	-	-
Total	**129**	**151**	**154**	**148**	**102**	**1**	**1**

Table 110. Qualifying facility by technology, MW (year-end)

	2023	2024	2025	2030	2035	2040	2043
Solar	471	553	564	564	455	6	4
BioGas	10	10	10	5	5	-	-
Biomass	10	10	10	10	-	-	-
Hydropower	7	7	7	7	3	-	-
Wind	9	9	9	9	-	-	-
Total	**508**	**590**	**601**	**594**	**463**	**6**	**4**

E.3 Customer side

E.3.1 Energy efficiency

PGE has a long history of working with the Energy Trust of Oregon (Energy Trust) to identify and acquire cost-effective energy efficiency measures to help customers reduce their energy use. Oregon is a national leader in capturing energy efficiency through the combined efforts of the Energy Trust, customers, and utilities. **Section 8.2, Additional distributed energy resources, Chapter 8, Resource options**, discusses the long-term energy efficiency savings forecast for the 2023 IRP, and **Ext. Study-II, EE methodology** contains a report from Energy Trust describing their forecasting methodology.

E.3.2 Demand response

In June 2021, the Commission accepted PGE's Flexible Load Plan, which laid out a holistic plan to accelerate flexible load development.[450] In 2022, PGE enrolled 93 MW of available summer demand response (DR) capacity and 63 MW of available winter DR capacity. **Section 6.2.2, Demand response, Chapter 6, Resource needs** describes PGE's current demand response programs.

E.3.3 Dispatchable standby generation

PGE's dispatchable standby generation (DSG) program provides PGE with additional generation capacity by contracting with large nonresidential customers for the right to operate their generation resources for the purpose of providing grid services and averting situations that could lead to power quality problems for the power supply in the local region.[451]

Effective June 1, 2022, Schedule 200 was updated to include battery energy storage resources in addition to the existing generator tariff. The new tariff update enrolls large battery resources for ancillary services in addition to demand response and peak shaving activities. This update is anticipated to add up to 8 MW of enrolled storage in 2023 to support PGE's decarbonization and flexible load objectives.

[450] Order No. 21-158.
[451] Schedule 200, Dispatchable Standby Generation, Issued April 7, 2022, Microsoft Word - 200 22-05 Eff June 1.2022 (ctfassets.net)

As of September 2022, PGE had agreements for approximately 127.8 MW of Dispatchable Standby Generation (DSG) capacity as a low-cost resource (approximately $42/kW-yr., including capital and fixed O&M, 2023$).

E.3.4 Distributed generation

Distributed generation is electrical generation and storage performed by a variety of small, grid-connected or distribution system-connected devices. It can be sited at a customer premise located behind the meter (e.g., rooftop solar or municipal biogas projects) or can be small power producing projects such as qualifying facilities. Distributed generation and storage provide a supply of energy from many sources and may lower environmental impacts and improve the security of supply.

As of February 2023, the In-Service Net Metering program produces approximately 183 MW, in which 53 percent of that capacity comes from rooftop solar facilities. Estimated nameplate capacity of 124 MW come from 47 in-service qualified facilities (QFs). There are 36 MW of nameplate capacity that are not yet producing power but have applied for integration with the grid. Owned resources are included in **Section E.1, Existing resources**, and contracted resources are included in **Section E.2, Contracted resources**.

The other distributed generators include low-impact hydropower, small-scale wind, fuel cells, biogas generators, and combined heat and power (CHP). Most of these are contracted for by PGE and are included in **Section E.2, Contracted resources**.