

PUGET SOUND ENERGY
Annual Energy and Emissions Intensity (“EEI”) Metrics Report
Pursuant to WAC 480-109-300
May 31, 2024

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PSE's Annual Energy and Emissions Intensity (EEI) Metrics Report for operating year 2023

Section 1: Executive Summary

Compared to the 2022 operating year, Puget Sound Energy's (PSE's) 2023 carbon dioxide equivalent (CO₂e) emissions intensity from total electricity delivered to customers increased slightly from 863.1 lb/MWh to 877.5 lb/MWh.¹ This report provides the metrics, analyses, and descriptions behind that change. Further, it demonstrates that PSE delivers electricity to customers from a combination of sources that the Company owns and purchases from other providers via firm contracts or the spot market.

Per the requirements of WAC 480-109-300, PSE submits the following report outlining its energy and emissions intensity metrics for the previous ten years (reporting period). This report includes the following metrics for all PSE generating resources serving customers:

- Average megawatt-hours (aMWh) per residential customer
- Average megawatt-hours (aMWh) per commercial customer
- Megawatt-hours (MWh) per capita
- Annual carbon dioxide equivalent (CO₂e) emissions measured in metric tons
- Comparison of annual CO₂e emissions to CO₂ emissions in 1990

PSE and the other utilities purchase a percentage of their energy to serve native load from the spot market. The generation sources from purchases made on the spot market are unknown. Therefore, this report also includes a subset of metrics for spot market purchases based on the unspecified emission rate factor provided by the Washington State Department of Ecology ("Ecology"). Those metrics include:

- Annual CO₂e emissions (metric tons) from unknown generation sources
- Annual megawatt-hours (MWh) delivered to retail customers from unknown generation sources
- Percentage of load served by unknown generation sources

In addition to the raw data included in Attachment A to this report, the tables and sections below provide trend analysis, narrative descriptions, and graphics to help contextualize PSE's data and trends for the reporting period. Table 1 below summarizes PSE's greenhouse gas

¹ Beginning in 2022, adjusted to apply Bonneville Power Administration (BPA) Asset-Controlling Supplier (ACS) System emission factors for BPA specified purchases. See Sections 3 and 4 for more information.

(GHG) emissions intensity and energy metrics for the calendar year 2023. Summaries of the previous nine years in the reporting period are included in Attachment A to this report. Section 2 below provides a 10-year “lookback” analysis of the reporting period (to the operating year 2014) of the metrics mentioned above and benchmarks those metrics to a 1990 emissions baseline. Section 3 provides a discussion of the trends observed in the metrics and the broader regional market. Section 4 includes appendices that provide more detail on the methodologies used in this report.

Summarized in Table 1 and narrative below are PSE’s 2023 energy and emissions intensity metrics. The energy intensity metrics represent the metered sale of energy to customers (by class) as reported under the Federal Energy Regulatory Commission (FERC) Form-1 protocols, i.e., Total Load Served. Busbar energy tallies represent the total load PSE served (to Washington) generated and purchased, net of bilateral sales, as reported in PSE’s Energy Accounting (EA) database, i.e., Busbar MWh.

Table 1. 2023 Energy and Intensity Metrics

Summary Energy and Emissions Intensity Report				
Utility :	Puget Sound Energy			
Reporting for year :	2023	MWh per Capita		
Population Served :	2,677,220	7.91		

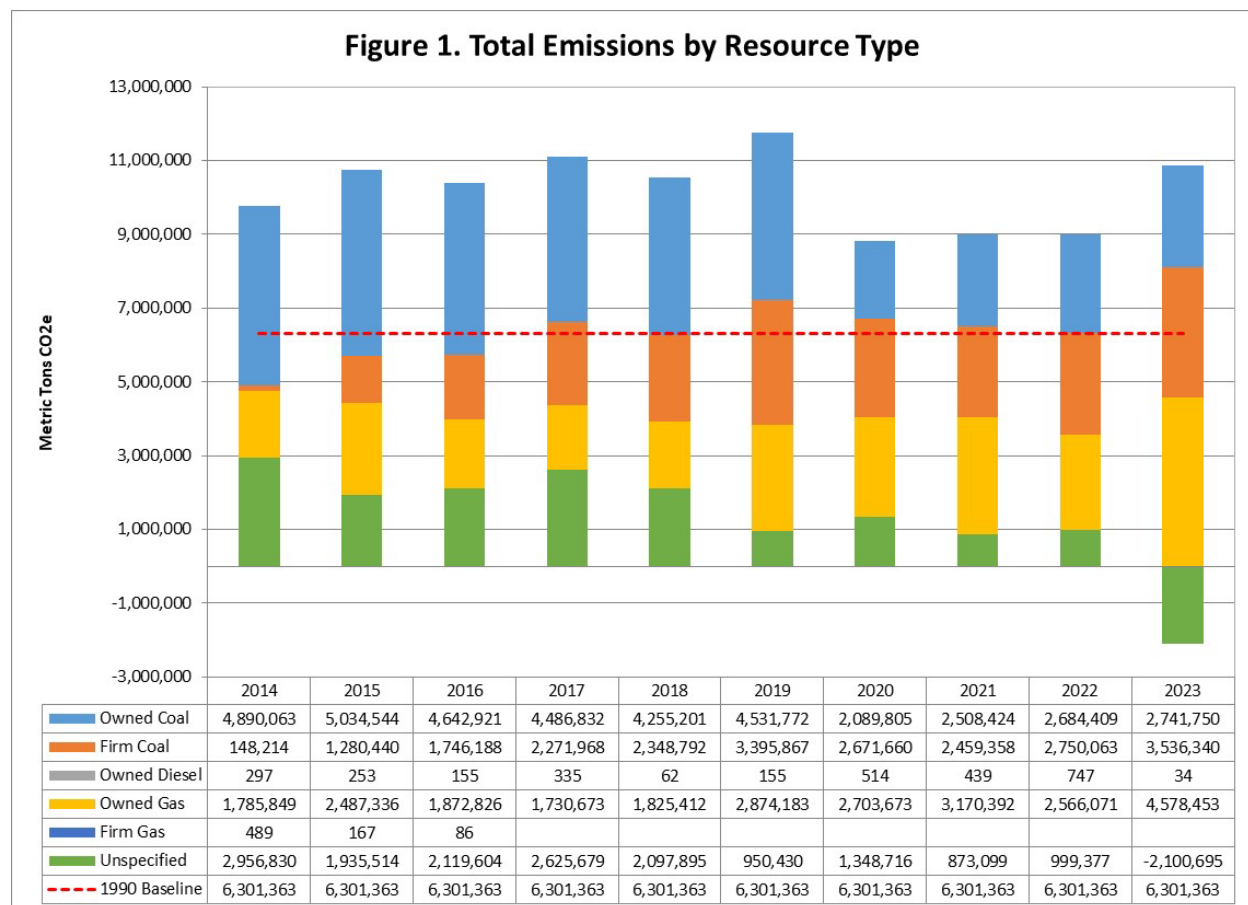
<i>Energy Intensity Metrics</i>				
	MWh at Meter	MWh Proportion	Customer Count	MWh per Customer
Residential Customers	11,387,971	53.8%	1,077,406	10.6
Commercial Customers	8,637,063	40.8%	134,375	64.3
Industrial Customers	1,070,933	5.1%		
Other Customers	76,495	0.4%		
Total Load Served	21,172,462	100.0%		

<i>Emissions Intensity Metrics</i>				
	Busbar MWh	Percent of Total Load	Metric Tons CO ₂ e	
Known Resources Serving WA				
EPA Methodology	27,014,805	121.2%	10,969,906	
EIA Methodology	0	0.0%	0	
Unknown Resources Serving WA	(4,732,543)	-21.2%	(2,100,695)	% of 1990 CO ₂
Total Busbar MWh	22,282,262	Total Metric Tons:	8,869,210	140.8%
			1990 Metric Tons CO ₂	6,301,363

Section 2: Prior 10-year annual metrics for all generating resources serving Washington customers

Figure 1 provides a comparison of annual PSE CO₂e emissions measured in metric tons from generation sources for the previous 10 years. Figure 1 also includes a 1990 emissions baseline.

Until 2020, WAC 480-109-300 specified that the EEI report only include CO₂ output. In 2020, as a result of rulemaking conducted to implement the Clean Energy Transformation Act (CETA), revised WAC 480-109-300 now requires all greenhouse gas emissions in the EEI report be based on CO₂e. This change means the inclusion of methane (CH₄) and nitrous oxide (N₂O) as CO₂e² for all resources and years presented in this report.



² Principle combustible constituents in natural gas and coal are carbon, hydrogen, and their compounds, and in the combustion process, these compounds and elements oxidize to CO₂ and water vapor. However, small amounts of methane (CH₄) result from incomplete fuel combustion, and nitrous oxide (N₂O) formation results from post-combustion thermal reactions.

Figure 2 provides a comparison of the average MWh per residential customer, average MWh per commercial customer, and MWh per capita delivered in each of the years during the reporting period in PSE’s service territory.

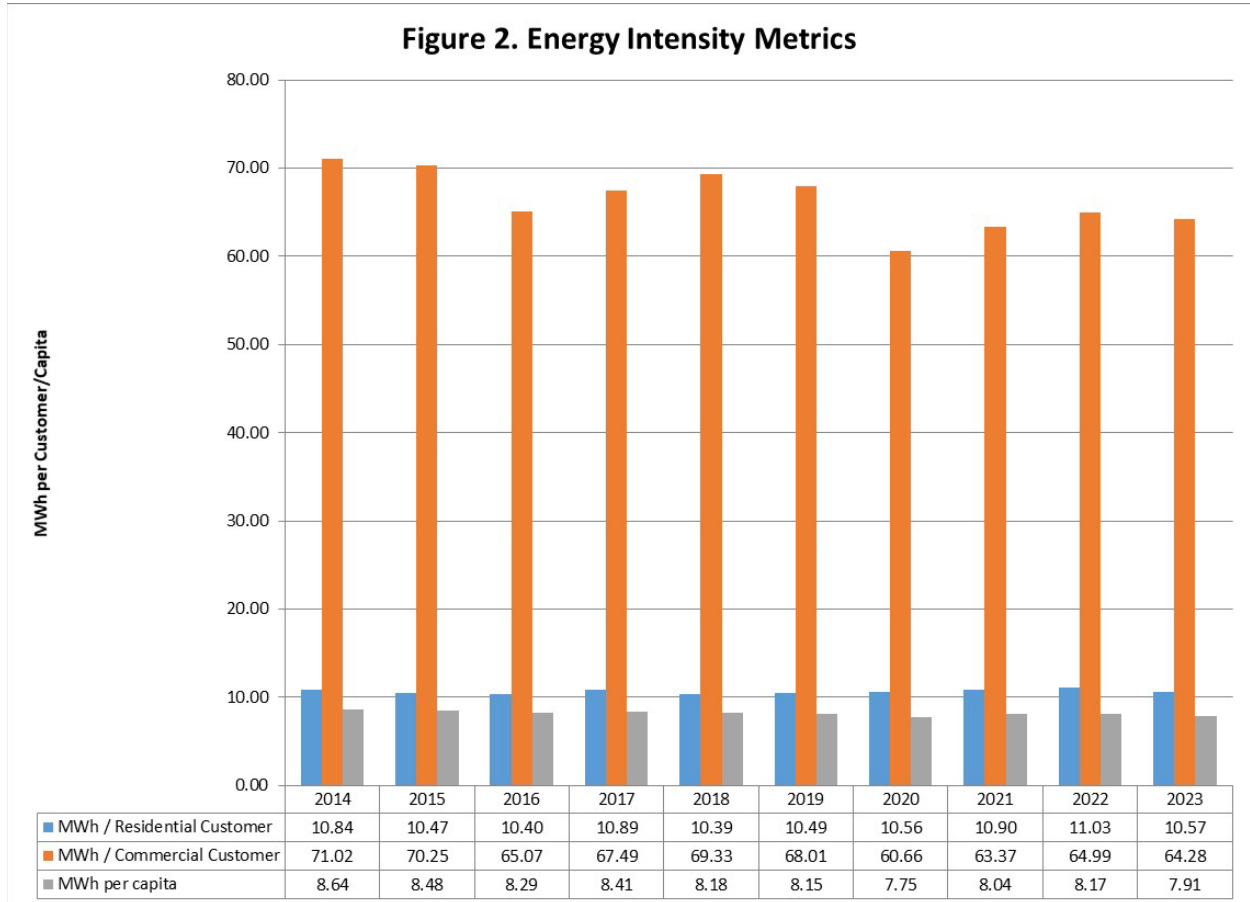


Figure 3 provides a comparison of the ratios of PSE’s annual CO₂e emissions from known sources for the reporting period compared to CO₂ emission in 1990.

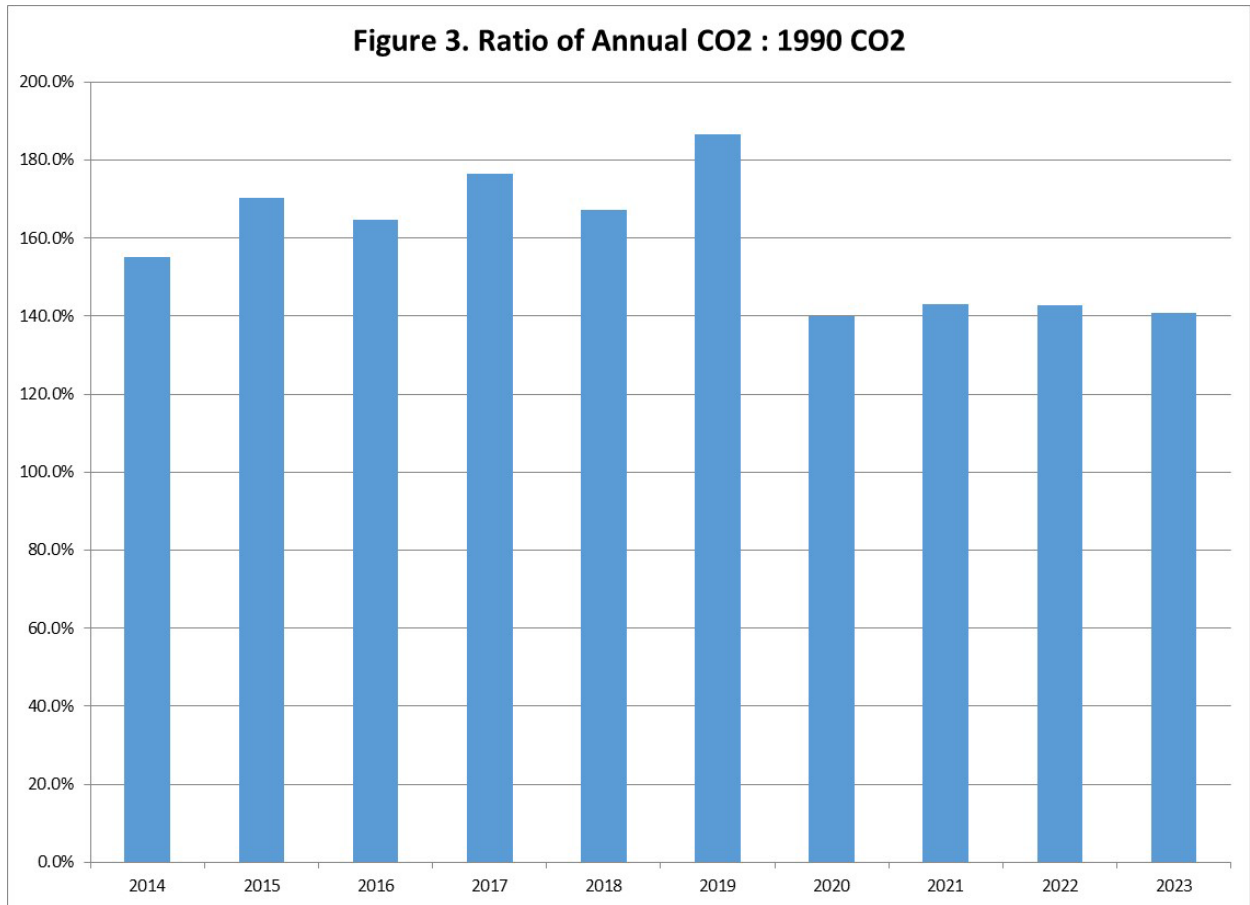
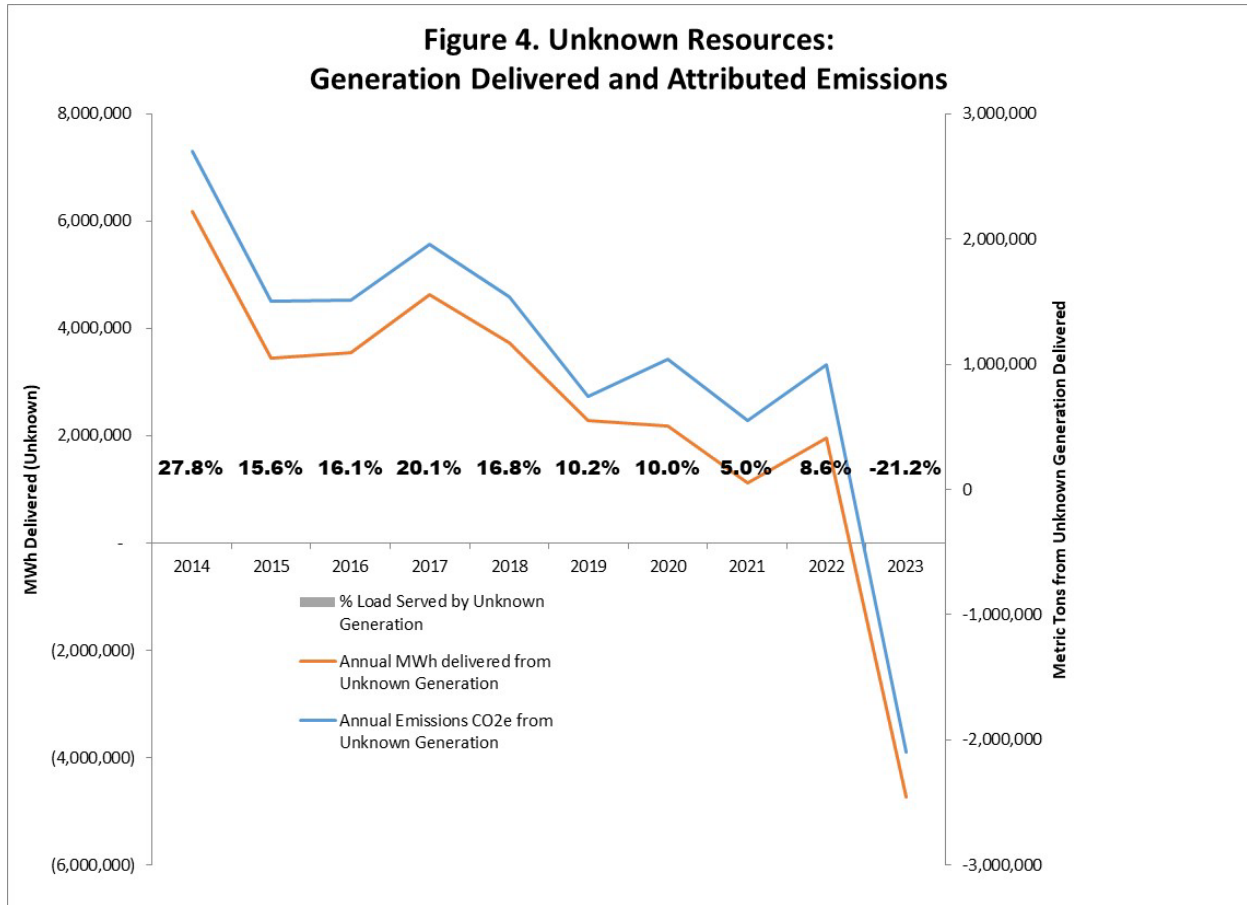


Figure 4 provides a 10-year comparison of generation delivered to PSE from unknown sources and the attributed emissions. Those metrics include annual CO₂e emissions (metric tons), annual MWh delivered to retail customers, and the percentage of load served. As discussed in the executive summary, the generation sources and attributed emissions for spot market purchases are unknown. Therefore, emissions factors for each of the previous ten years in the reporting period were applied according to methodology provided by the Department of Ecology.



Section 3: Trend Analysis

This section addresses the requirement in WAC 480-109-300(5) to include narrative text describing trends and an analysis of the likely causes of changes, or lack of changes, in the metrics.

Electric Supply

In 2023, PSE's electric power resources, which include company-owned or controlled resources and those under long-term contract, had a total capacity of approximately 6,512 megawatts (MW). PSE purchases electric energy under long-term firm-purchased power contracts with other utilities and marketers in the Western Interconnection. PSE is generally not obligated to make payments under these contracts unless power is delivered.

Energy supply and demand across the Western Interconnection is maintained on a second-to-second basis, and PSE dispatches its resources based on market prices in the Interconnection. When the dispatch cost of a specific PSE-owned unit is lower than the market price, the unit runs, and the net revenue credits back to customers to reduce rates. When the cost to run the PSE-owned unit is greater than the market price, the units are not dispatched. Dispatch decisions are independent of the demand by PSE's customers. If PSE's customers need power when its units are uneconomic to run, PSE purchases the energy from wholesale markets – other utilities or registered power marketers with energy to sell. If PSE's generation is dispatched and there is a surplus above PSE's customers' needs, that surplus will be sold in the wholesale market (net revenue from such sales is credited back to customers through rates), meaning whatever is happening to PSE's load is unrelated. The primary driver of generation dispatch is whether a generator's variable cost of dispatch is lower than the market price.

PSE tracks its firm and non-firm power transactions in its Energy Accounting (EA) database on a calendar year basis. Table 2 shows all firm energy transactions made in 2023, including the total dispatch of all of PSE-owned units. Emissions from PSE's units and from each firm purchase are calculated using the methodologies described in Appendix 2.1 and 2.2, respectively. For unspecified electricity purchases, PSE uses the emissions intensity metrics according to WAC 480-109-300(4)³. PSE employed Commission Staff's net-by-counterparty approach to calculate emissions from its non-firm (unspecified) power transactions. Details of these transactions are

³ Bonneville Power Administration (BPA) Asset-Controlling Supplier (ACS) System emission factors are used for BPA specified purchase claims beginning in reporting year 2022 (<https://apps.ecology.wa.gov/publications/documents/2302002.pdf>). For all other unspecified electricity purchases, the default emission factor provided by the Washington State Department of Ecology is used (RCW 19.405.070).

presented in Table 3, and the calculation methodology is described in Appendix 2.3. Staff requested in its compliance letter to PSE's 2017 EEI report that the Company explain how PSE determines whether a source is known or unknown. Staff correctly assumes that PSE classifies non-unit specific purchases as unknown sources. PSE-owned resources and unit-specific firm deliveries are classified as known sources because their fuel source is known and reported in the U.S. Energy Information Administration (EIA) databases, described in Appendix 2.1 and 2.2.

Table 2. Known Resources Serving WA Customers

Resource	WA MWh	Metric Tons CO ₂ e	Type	Fuel
Lower Baker	262,830	-	Own	Hydro
Snoqualmie Falls #1	61,874	-	Own	Hydro
Snoqualmie Falls #2	104,364	-	Own	Hydro
Upper Baker	270,839	-	Own	Hydro
Colstrip 3 & 4	2,673,671	2,741,750	Own	Coal
Crystal Mountain	34.2	34.0	Own	Diesel
Encogen	903,027	427,033	Own	Gas
Ferndale Co-Generation	1,529,332	715,257	Own	Gas
Freddie #1	909,290	353,287	Own	Gas
Fredonia	967,080	641,257	Own	Gas
Fredrickson 1 & 2	159,587	118,491	Own	Gas
Goldendale	2,212,693	826,172	Own	Gas
Mint Farm	1,989,583	798,750	Own	Gas
Sumas	834,873	389,614	Own	Gas
Whitehorn 2&3	448,958	308,591	Own	Gas
Hopkins Ridge (W184)	328,737	-	Own	Wind
Lower Snake River	711,413	-	Own	Wind
Wild Horse (W183)	525,312	-	Own	Wind
Bio Energy Washington (BEW)	435	-	Firm	Biogas
Blocks Dairy Farm	35	-	Firm	Biogas
Edaleen Dairy LLC	3,753	-	Firm	Biogas
Emerald City Renewables	33,975	-	Firm	Biogas
Farm Power Rexville LLC	3,718	-	Firm	Biogas
Rainier Bio Gas	4,038	-	Firm	Biogas
VanderHaak Dairy Digester	4,398	-	Firm	Biogas
Sierra Pacific Industries	134,938	-	Firm	Biomass
Powerex Seasonal Capacity	1,696,000	-	Firm	Carbon Free
Transalta Centralia Generation LLC	3,326,355	3,536,340	Firm	Coal
HF Sinclair (Mar Pt)	-51,975	(17,976)	Firm	Gas
HF Sinclair (Mar Pt)	379,651	131,305	Firm	Gas

Resource	WA MWh	Metric Tons CO _{2e}	Type	Fuel
Black Creek Hydro Inc	8,646	-	Firm	Hydro
Chelan PUD - RI & RR	323,977	-	Firm	Hydro
Chelan PUD - RI & RR	1,640,658	-	Firm	Hydro
Douglas PUD - Wells Project	997,571	-	Firm	Hydro
Grant PUD - Priest Rapids Project	333,842	-	Firm	Hydro
KERR DAM-ENERGY KEEPER	350,345	-	Firm	Hydro
Koma Kulshan Associates	26,187	-	Firm	Hydro
Nooksack	15,008	-	Firm	Hydro
Skookumchuck Hydro	3,319	-	Firm	Hydro
Sygitowicz Creek	781	-	Firm	Hydro
Twin Falls Hydro	49,979	-	Firm	Hydro
Weeks Falls	8,699	-	Firm	Hydro
Bonney Lake CS	482	-	Firm	Solar
CAMAS SOLAR	10,429	-	Firm	Solar
CC Solar 1 and CC Solar 2	30	-	Firm	Solar
Ikea Solar	35	-	Firm	Solar
Lake Washington -- Finn Hill	206	-	Firm	Solar
Lund Hill Solar, LLC	291,130	-	Firm	Solar
Olympia High School CS	263	-	Firm	Solar
Penstemon Solar	10,492	-	Firm	Solar
Pine Lake Middle School CS	140	-	Firm	Solar
Port of Coupeville	57	-	Firm	Solar
TACOMA GLASS	185	-	Firm	Solar
URTICA SOLAR	11,509	-	Firm	Solar
3 Bar G Wind Turbine #3 LLC	31	-	Firm	Wind
Avangrid Renewable (Golden Hills)	653,232	-	Firm	Wind
Clearwater Wind	1,311,795	-	Firm	Wind
Klondike Wind Power III	115,990	-	Firm	Wind
Knudsen Wind Turbine #1	5	-	Firm	Wind
Skookumchuck Wind PPA	414,999	-	Firm	Wind
Swauk Wind	673	-	Firm	Wind
Swauk Wind	5,293	-	Firm	Wind

Table 3. Unknown Resources Serving WA Customers

Resource	Net-by-Counterparty MWh	Rate mtCO _{2e} /MWh	Metric Tons CO _{2e} equiv.
Avista Corp. WWP Division	33,397	0.437	14,594
Avista Nichols Pump	15,024	0.437	6,565
BASIN ELECTRIC POWER	-846	0.406	-344
BC Hydro (Point Roberts)	20,317	0.437	8,878
BP Energy Co.	-436,794	0.406	-177,369

Resource	Net-by-Counterparty MWh	Rate mtCO _{2e} /MWh	Metric Tons CO _{2e} equiv.
BPA Purchases	590,425	-- ⁴	48,814
BPA Sales	-325,153	0.437	-142,092
British Columbia Transmission Corp	-30	0.406	-12
Brookfield Energy Marketing	-123,494	0.406	-50,147
California ISO	604,905	0.437	264,343
Chelan County PUD #1	31,794	0.437	13,894
Citigroup Energy Inc	-68,002	0.406	-27,614
Clatskanie PUD	-4,656	0.406	-1,891
Conoco, Inc.	-417,477	0.406	-169,525
CONSTELLATION ENERGY	-99,107	0.406	-40,244
CP Energy Marketing (Epcor)	3,197	0.437	1,397
Deviation	-199,721	0.406	-81,101
DYNASTY POWER INC	-82,359	0.406	-33,444
EDF Trading NA LLC	-38,969	0.406	-15,824
Energy Keepers Inc.	304	0.437	133
Eugene Water & Electric	-15,998	0.406	-6,496
Grant County PUD #2	-10,810	0.406	-4,390
GRIDFORCE ENERGY MANAGEMENT, LLC.	-775	0.406	-315
Iberdrola Renewables (PPM Energy)	-739,327	0.406	-300,219
Idaho Power Company	-25,347	0.406	-10,293
MERCURIA ENERGY	-127,294	0.406	-51,690
Merrill Lynch Commodities	-15,600	0.406	-6,335
Morgan Stanley CG	-184,863	0.406	-75,067
Natur Ener USA	-50	0.406	-20
Northwestern Energy	-7,976	0.406	-3,239
Pacific Gas & Elec - Exchange	0	0.406	0
Pacificorp	-82,668	0.406	-33,569
PHILLIPS 66 ENERGY	-22,340	0.406	-9,072
Portland General Electric	-158,381	0.406	-64,314
Powerex Corp.	-1,065,273	0.406	-432,576
Rainbow Energy Marketing	-2,656	0.406	-1,079
Sacramento Municipal	100	0.437	44
Seattle City Light Marketing	-85,166	0.406	-34,583
Shell Energy (Coral Pwr)	-805,564	0.406	-327,115
Snohomish County PUD #1	-140,253	0.406	-56,953
Tacoma Power	1,718	0.437	751
The Energy Authority	-97,842	0.406	-39,731

⁴ BPA specified purchases use 0.0174; BPA unspecified purchases use 0.437.

Resource	Net-by-Counterparty MWh	Rate mtCO _{2e} /MWh	Metric Tons CO _{2equiv.}
TransAlta Energy Marketing	-541,342	0.406	-219,823
TransCanada Energy Sales Ltd	-4,113	0.406	-1,670
Turlock Irrigation District	2,032	0.437	888
Vitol Inc.	-105,510	0.406	-42,844

Columbia River Energy Supply Contracts

During 2023, approximately 14.3 percent of PSE’s energy supply requirement was obtained through long-term contracts with three Washington Public Utility Districts (PUDs) that own and operate hydroelectric projects on the Columbia River (Mid-Columbia). PSE's portion of the power output of the PUD projects is shown in Table 4.

Table 4. Columbia River Electric Energy Supply Contracts

Project	Contract Expiration	Percent of Output (PSE Share)	MW Capacity (PSE Share, approx.)
Rock Island Project (Chelan County PUD)	2031	25%	156
Rocky Reach Project (Chelan County PUD)	2031	25%	325
Wells Project (Douglas County PUD)	2028	27.1%	228
Priest Rapids Development (Grant County PUD)	2052	0.6%	6
Wanapum Development (Grant County PUD)	2052	0.6%	7

2023 Carbon Dioxide Emissions - Results & Discussion

Overall, PSE’s CO_{2e} emissions intensity from total electricity delivered to customers increased slightly from 863.1 lb/MWh in 2022 to 877.5 lb/MWh in 2023 (as seen in Table 6). As shown in Table 5, in 2023, 66.8 percent of electricity delivered to PSE customers was generated by the company, 33.2 percent of electricity was purchased via firm contracts (54.4%) and non-firm contracts, i.e., spot market (-21.2%)⁵. Of the CO_{2e} emissions associated with electric delivery, 82.5percent were from electricity generated by PSE, and 17.5 percent were from purchased electricity (41.1percent via firm contracts and -23.7percent via non-firm contracts).

It is important to remember that CO_{2e} emissions vary based on the fuel source or technology used to generate the electricity. Some sources are more emissions intense than others. “Intensity” is the relationship between emissions and production, and utilities can measure that

⁵ This is net of all unspecified purchases.

intensity using a metric called pounds of CO₂e per megawatt-hour (lb/MWh) of electricity produced. For instance, in 2023 (as seen in Table 5), about 18.0 percent of the electricity generated by PSE came from coal combustion, but this fuel source represented about 37.5 percent of the CO₂e emissions from electricity generated by PSE. Natural gas accounted for 66.8 percent of the electricity generated by PSE; however, this fuel source represented 62.5 percent of the CO₂e emissions from electricity generated by PSE. Renewable energy accounted for 15.2 percent of the electricity generated by PSE-owned generation resources and produced zero CO₂e emissions.

Compared to 2022 (as seen in Table 7), total electricity delivered to customers in 2023 decreased slightly, by 3.1 percent, and total emissions decreased slightly, by 1.5 percent. This trend is due primarily to a decrease in residential, commercial and industrial usage of 3.1%, 0.5% and 3.9%, respectively. Customer usage decreased due to a decrease in heating and cooling degree days of 8.5% and 6.0%, respectively, in 2023 as compared to 2022. Additionally, lower natural gas fuel prices made natural gas-fired generation more economic to dispatch in 2023 compared to 2022. As a result, PSE gas generation increased, while market purchases to support system load decreased.

Table 5. Summary of Total Energy Delivered (MWh) and Total Emissions (metric ton CO₂e)

Source	MWh Total	MWh % of PSE All-owned Total	MWh % of PSE Thermal Only	MWh % of Total	Metric Ton Total	Metric Ton % of PSE All-owned Total	Metric Ton % of PSE Thermal Only	Metric Ton % of Total
PSE Owned Coal	2,673,671	18.0%	21.2%	12.0%	2,741,750	37.5%	37.5%	30.9%
PSE Owned Gas	9,954,456	66.8%	78.8%	44.7%	4,578,487	62.5%	62.5%	51.6%
PSE Owned Renewable	2,265,369	15.2%		10.2%	0	0.0%		0.0%
Firm Coal	3,326,355			14.9%	3,536,340			39.9%
Firm All Other	8,794,954			39.5%	113,329			1.3%
Unspecified	-4,732,543			-21.2%	-2,100,695			-23.7%
Total (from energy)	22,282,262				8,869,210			
PSE Own plus Firm PPA	27,014,805				10,969,906			
Total PSE Only	14,893,496			66.8%	7,320,237			82.5%
Total Firm Only	12,121,309			54.4%	3,649,669			41.1%
Total Unspecified Only	-4,732,543			-21.2%	-2,100,695			-23.7%

Table 6. 2022 and 2023 Total Energy Delivered (MWh), Total Emissions (metric ton CO₂e), and Emission Intensity (lb/MWh)

	2023					2022				
	Energy MWh	%	Emissions Metric Ton	%	Intensity (lb/MWh)	Energy MWh	%	Emissions Metric Ton	%	Intensity (lb/MWh)
PSE Owned Coal	2,673,671	12.0%	2,741,750	30.9%	2,260.8	2,726,665	12%	2,684,409	30%	2,170.5
Firm Coal	3,326,355	14.9%	3,536,340	39.9%	2,343.8	2,458,047	11%	2,750,063	31%	2,466.5
PSE Owned Gas	9,954,456	44.7%	4,578,487	51.6%	1,014.0	6,028,682	26%	2,566,817	29%	938.7
PSE Owned All Other	2,265,369	10.2%	0	0.0%	0.0	2,443,589	11%	0	0%	0.0
Firm All Other	8,794,954	39.5%	113,329	1.3%	28.4	7,367,272	32%	0	0%	0.0
Unspecified	-4,732,543	-21.2%	-2,100,695	-23.7%	978.6	1,967,130	9%	999,377	11%	1,120.0
PSE Owned Plus Firm PPA	27,014,805		10,969,906		895.2	21,024,255		8,001,289		839.0
PSE Owned	14,893,496	66.8%	7,320,237	82.54%	1,083.6	11,198,936	48.7%	5,251,226	58.3%	1,033.8
Firm	12,121,309	54.40%	3,649,669	41.15%	663.8	9,825,319	42.7%	2,750,063	30.6%	617.1
Unspecified	-4,732,543	-21.24%	-2,100,695	-23.69%	978.6	1,967,130	8.6%	999,377	11.1%	1,120.0
Total (Own, Firm, Unspecified)	22,282,262		8,869,210		877.5	22,991,385		9,000,666		863.1

Table 7. Comparison to Previous Year: Total Energy Delivered (MWh), Total Emissions (metric ton CO₂e), and Emission Intensity (lb/MWh)

	2023 vs. 2022				
	Energy MWh	%	Emissions Metric Ton	%	Intensity (lb/MWh)
PSE Owned Coal	-52,994	-1.9%	57,341	2.1%	90.3
Firm Coal	868,308	35.3%	786,277	28.6%	-122.7
PSE Owned Gas	3,925,774	65.1%	2,011,670	78.4%	75.3
PSE Owned All Other	-178,220	-7.3%	0	0.0%	0.0
Firm All Other	1,427,682	19.4%	113,329	0.0%	28.4
Unspecified	-6,699,673	-340.6%	-3,100,073	-310.2%	-141.4
PSE Owned	3,694,560	33.0%	2,069,011	39.4%	49.8
Firm	2,295,990	23.4%	899,606	32.7%	46.7
Unspecified	-6,699,673	-340.6%	-3,100,073	-310.2%	-141.4
Total (Own, Firm Unspecified)	-709,124	-3.1%	-131,456	-1.5%	14.5

Trends Discussion

The relative amount of GHG emissions from the electricity sources did not align with the amount of power produced from each electricity source. This trend is due to factors related to the intensity of emissions from each source, which reflects the relationship between CO₂e and power production of each source.

For example, about 18.0 percent of the electricity generated by PSE came from coal combustion, which has a high CO₂e emission intensity compared to natural gas and oil combustion sources. Of CO₂e emissions from electricity generated by PSE (direct emissions), about 37.5 percent were from coal-combustion generation. The high CO₂e emission intensity of coal-combustion generation made the overall CO₂e emission intensity of PSE’s electric operations high.

Another example highlighting this trend occurs in purchased electricity. Roughly 70.0 percent of firm contract electricity purchased by PSE came from renewable plants in the Pacific Northwest (primarily hydroelectric), while the remaining purchases were sourced from thermal plants.

Since hydroelectric generation is considered a non-GHG emitting source, almost all of the CO₂e emissions generated from firm contract purchased electricity come from coal and natural gas generated electric operations.

A third example relates to how emissions are calculated for electricity purchased by PSE on the spot market (i.e., non-firm contracted electricity purchases). Again, these purchases are sourced from different utilities and non-utilities via the “grid” system of electric distribution, making the source of energy challenging to track and measure. Therefore, regional average emission factors were used to estimate non-firm contract purchased electricity. For instance, electricity purchased by a utility from an energy trader could have been purchased by the energy trader from a hydroelectric facility near the utility's operational territory or from a utility generating electricity using coal outside the utility's operational territory. The emissions associated with the generation are not known because they could be significantly different for each source. Therefore, the emissions associated with non-firm contract purchased electricity were calculated using the unspecified emission rate factor provided by Ecology that generally reflects the suite of generation sources that produced the purchased electricity.

Centralia Coal Transition Power

It is important to distinguish between emissions from PSE's owned thermal resources above and the contract PSE signed with TransAlta for coal transition power from the Centralia power station (“Centralia”). In this report, PSE incorporates a breakdown of energy and emissions from Centralia and differentiates Centralia generation and Centralia supply, which is power purchased by the owner of Centralia (i.e., TransAlta), and supplied to PSE. PSE's report will apply different emissions factors for energy supplied versus generated from Centralia to reflect known sources of emissions more accurately.

PSE reports the difference between supplied and generated power each year from Centralia in its Annual Report of Energy Delivery to PSE from TransAlta-Centralia Transition Coal in Docket No. UE-121373 (“Coal Transition Report”).

PSE's sources of Centralia generation and supply in this report are consistent with its Coal Transition Report.

For power generated from Centralia coal, PSE applied the emission factor following the methodology and data reported to the Environmental Protection Agency (EPA). For power supplied by the Centralia market option, PSE applied the Ecology unspecified rate, 963 lbs per CO₂e/MWh. PSE determined the Ecology unspecified rate was reasonable because it provides consistency given the uncertainty of sources purchased by TransAlta from other Balancing

Authority Areas. PSE plans to use this same methodology to differentiate Centralia generation and supply in this report for the Centralia coal transition contract duration.

Population Data

PSE tracks customers served by class of service but does not track the number of people (population) served. Therefore, population data in this report is estimated based upon methodology agreed to by PSE, UTC Staff, and the other utilities.

The total service area population was estimated by multiplying the total residential customers in PSE's service area by the average household size (AHS) of occupied homes, using data from the most recent five-year estimates from the U.S. Census Bureau's American Community Survey (ACS).

Unspecified Market Purchases

This report includes energy that PSE has purchased from the spot market associated with the corresponding generation year where the actual generating unit is unknown (unspecified). As stipulated in this rule, PSE uses an unspecified emissions rate for these spot market purchases where the energy source is unknown (WAC 480-109-300(3))⁶. The net system mix emissions rates for PSE and the other utilities during the reporting period have been calculated and provided by Ecology.

⁶ Bonneville Power Administration (BPA) Asset-Controlling Supplier (ACS) System emission factors are used for BPA specified purchase claims beginning in reporting year 2022 (<https://apps.ecology.wa.gov/publications/documents/2302002.pdf>). For all other unspecified electricity purchases, the default emission factor provided by the Washington State Department of Ecology is used (RCW 19.405.070).

Section 4. Appendices

Appendix 1: Estimation of PSE Service Territory Population

This appendix documents how PSE estimated the population within its service territory to meet the reporting requirement of WAC 480-109-300(2)(c): Megawatt-hours per capita. The estimated population for each reporting year is the product of PSE residential customer count for the year multiplied by the weighted average household size of the counties that PSE provides electric service. The methodology is consistent with the preferred Per Capita Methodology described in the UTC Staff's final report⁷ and the Commission's Final Order⁸ on the estimation of population in an electric utility service territory. As prescribed in the Commission's Final Order paragraph 17, "To produce the reports required by WAC 480-109-300(2)(c), the utilities should use the methodology agreed upon by stakeholders and described in the final report and this order."⁹

PSE's customer information system is the ultimate source of the annual residential customer count data, which represents the number of households within PSE service territory. These customer count data are as reported in PSE's FERC financial reporting Form No. 1: Annual Report of Major Electric Utilities, Licensees, and Others. Not all residents in a multi-family or mixed-use commercial and residential building are included in PSE's residential customer count at this time. PSE does not have reliable data to make a separate adjustment to account for the persons residing in master-metered residential buildings.

The average household size used in PSE's WAC 480-109-300: Energy and emissions intensity metrics is 2.48. This number is the overall average of persons per household for PSE's service territory weighted by the population size for each county.

The source of the five-year average of county-level data is the United States Census Bureau's American Communities Survey, which can be accessed using the Bureau's web-based application QuickFacts at www.census.gov/quickfacts/table/PST045215/00.

The following table details the data and the calculation of the 2.48 persons average household size that used in the determination of PSE service territory population for megawatt hours per capita (WAC 480-109-300(3)(c)).

⁷ UE-131732 Proposed EE Metrics Workgroup Results – Final Report, August 7, 2015, (Report at 2-3).

⁸ UE-131732, Final Order, General Order R-581: Order Adopting Rule Permanently, September, 10, 2015, (Order at 6 §17).

⁹ UE-131732, Final Order, General Order R-581: Order Adopting Rule Permanently, September, 10, 2015, (Order at 6 §17).

<i>2016-2020 Census Bureau, Updated July 2021</i>			
County	Population	Per House	Total
Skagit	130,696	2.55	333,275
Pierce	925,708	2.64	2,443,869
Island	87,432	2.31	201,968
King	2,252,305	2.43	5,473,101
Kitsap	274,314	2.46	674,812
Kittitas	45,499	2.32	105,558
Thurston	297,977	2.5	744,943
Whatcom	228,831	2.47	565,213
	Weighted Average		2.48

Appendix 2: Emissions Reporting Methodology

1. Owned Thermal Resources

PSE wholly owns three dual-fuel combustion turbine generation facilities (Frederickson, Fredonia, and Whitehorn), five natural gas combined cycle generation facilities (Encogen, Goldendale, Mint Farm, Ferndale and Sumas), and one internal diesel combustion generation facility (Crystal Mountain). Also, PSE partially owns one coal-combustion generation facility (Colstrip) and one natural gas combined cycle generation facility (Freddy 1).

PSE's CO₂e emissions from electric operations are calculated using the EPA GHG Mandatory Reporting Rule Subparts C and D (Tiers 2 & 4) calculation methodologies. Utilizing Subparts C & D, carbon dioxide mass is calculated based on the amount of fuel consumed by each generation facility.

Thermal facilities utilizing the Subpart C method include Frederickson, Fredonia Units 1 & 2 and Whitehorn. Annual CO₂e mass emissions using Subpart C are calculated with these plant measurements: 1) fuel heat content (HHV), 2) the amount of fuel burned (volume)¹⁰ and, 3) a default specific emission factor (EF). An example calculation is provided below.

Example = Volume gas x fuel heat content HHV x EF =

(334,172,000 scf natural gas measured) x (0.0010920 MMBtu/scf measured) x
(53.06 kg CO₂/MMBtu) = 21,343 short ton CO₂

Thermal facilities utilizing the Subpart D method include Encogen, Goldendale, Mint Farm, Ferndale, Sumas, Fredonia Units 3 & 4, Freddy 1 and Colstrip. This method utilizes direct continuous emissions measurement systems (CEMS) as prescribed in Part 75 of the EPA Acid Rain Program. Stack gas and flow measurements are measured continuously, and this data is used in prescribed equations (via the CEMS system) to determine total GHG mass. Part 75 also includes certification and Quality Assurance (QA)/Quality Control (QC) requirements to ensure that data validity is confirmed at the beginning of a monitoring program.

2. Firm Contract Purchases

PSE calculated firm contract purchased emissions using the Ecology methodology outlined in WAC 177-444-040(2).

- Step 1: Obtain plant GHG emissions. GHG emissions for this method are defined as the sum of all Subpart C and Subpart D emissions from the individual power plant as

¹⁰ Measured in standard cubic feet (scf).

published by EPA based on 40 CFR¹¹ Part 98 reporting consistent with the methods adopted in WAC 173-441-120. Emissions are on a calendar year basis and in units of metric tons CO₂e. Use emissions values specific to the calendar year in the calculation.

- Step 2: Obtain plant net electric generation. Net electric generation is the sum of all annual net generation (MWh) from Form EIA-923 for the power plant for the calendar year for all reported fuel type codes.
- Step 3: Calculate transmission losses using the following method as directed by the regulatory agency. Transmission losses are zero MWh if utility claims are reported on a plant net output basis, like utility claims measured at the busbar.
- Step 4: Obtain cogeneration correction factor. Account for nonelectric heat use at the power plant by dividing the sum of annual electric fuel consumption (MMBtu) by the sum of annual total fuel consumption MMBtu from Form EIA-923.
- Step 5, Firm Contract Plant Emission Rate Equation (Ecology Method) =

$$\frac{\text{EPA plant GHG emissions} \times \text{cogeneration correction factor}}{\text{plant net electric generation}} \times (\text{utility claims} + \text{transmission losses})$$

3. Non-Firm Contract Purchases

PSE's emissions from non-firm contract purchased electricity were estimated using the net-by-counterparty methodology for purchases and sales of non-firm contract purchased electricity pursuant to the Staff directive described below:

“ 3. Unknown Sources – Purchase and sales reporting methodology: After several rounds of discussion last year and after reviewing analysis performed by the utilities, Staff believes the appropriate methodology for reporting purchases and sales is the net-by-counterparty approach:

(a) for each transaction partner whose generation is from an unknown resource, subtract the total annual sales to this party from the total annual purchases from this party;

(b) if the result is positive, apply the Ecology unspecified intensity factor to calculate emissions associated with the net purchase;

(c) if the result is negative, apply an aggregate, fleet-wide emissions intensity factor for the utility's known sources to calculate emissions associated with the net sale.

Staff understands that this approach has largely been implemented by PSE in prior reports. Staff contends that the net-by-counterparty approach represents an optimal

¹¹ CFR stands for Code of Federal Regulations.

balance among the three competing priorities of accuracy, consistency, and burden on company and commission resources.”¹²

4. Non-Firm Purchases in the Energy Imbalance Market (EIM)

1. For non-PSE units:

- Apply net-by-counterparty calculus described in 3) above

2. For PSE units:

- If end-of-year net (by plant) is greater than zero, then PSE was a net purchaser (from the California Independent System Operator, CAISO); assign Commerce rate. If end-of-year net (by plant) is less than zero, then PSE had excess generation.
- For excess generation from PSE units, will assign “zero” emission rate because emissions are accounted for under “Generation” (to avoid double counting)

¹² UE-170696. *PSE 2007-2016 EEI report Staff Compliance Letter* (June 26, 2018). Staff compliance letter recommending that the Commission acknowledge Puget Sound Energy's compliance with WAC 480-109-300. ATTACHMENT Staff feedback re: PSE's 2007-2016 EEI Report, page 1 of 2.