Annual Energy and Emissions Intensity ("EEI") Metrics Report

Pursuant to WAC 480-109-300

June 1, 2021

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Energy and Emissions Intensity (EEI) Metrics Report

Section 1: Executive Summary

Compared to the 2019 operating year, Puget Sound Energy's (PSE's) CO2 equivalent (CO2e) emissions intensity from total electricity delivered to customers decreased from 1,167 lb/MWh to 890 lb/MWh. 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 (GHG) emissions intensity and energy metrics for the calendar year 2020. 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 2011) 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 2020 energy and intensity metrics. Staff requested in its compliance letter to PSE's 2017 EEI report that the Company explains the difference between "total load served" and the sum of "Busbar MWh" included in Table 1. 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. 2020 Energy and Intensity Metrics

Utility :	Puget Sound Energy	
Reporting for year :	2020	**MWh per Capita**
Population Served :	2,593,480	**7.75**

Energy Intensity Metrics

	MWh at Meter	MWh Proportion	Customer Count	**MWh per Customer**
Residential Customers	10,976,068	54.6%	1,039,596	**10.6**
Commercial Customers	7,942,292	39.5%	130,924	**60.7**
Industrial Customers	1,095,916	5.5%		
Other Customers	81,261	0.4%		
Total Load Served	20,095,537	100.0%		

Emissions Intensity Metrics

	Busbar MWh	Percent of Total Load	**Metric Tons CO_2e**	
Known Resources Serving WA				
EPA Methodology	19,727,043	94.7%	7,774,271	
EIA Methodology	0	0.0%	0	
Unknown Resources Serving WA	1,112,771	**5.3%**	640,956	**% of 1990 CO_2**
Total Busbar MWh	**20,839,814**	Total Metric Tons:	**8,415,227**	**133.5%**

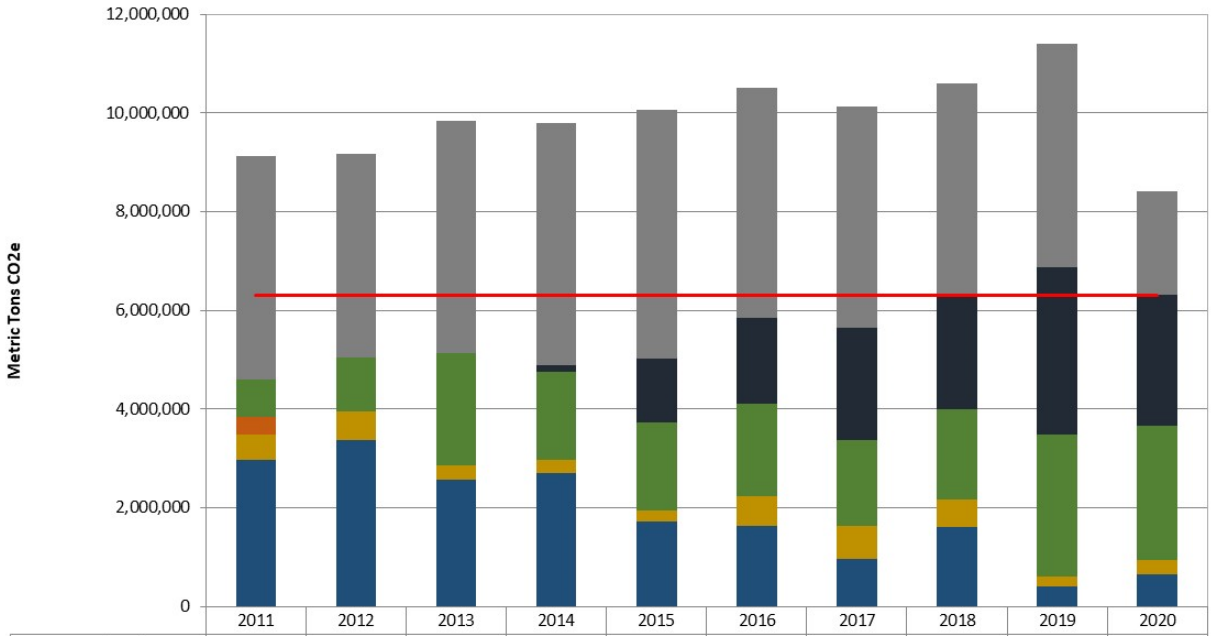
1990 Metric Tons CO_2	6,301,363

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 CO2e[1].

Figure 1. Total Emissions by Resource Type

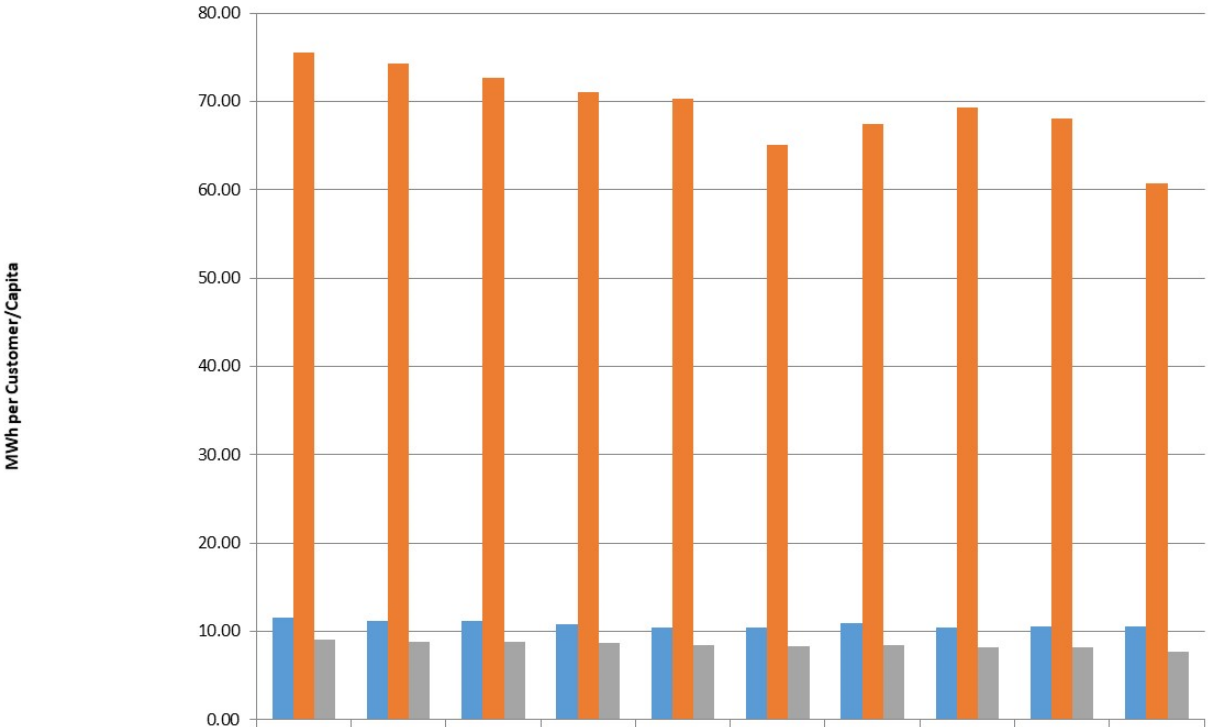


	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Owned Coal	4,535,010	4,135,425	4,704,400	4,890,063	5,034,544	4,642,921	4,486,832	4,255,201	4,531,772	2,089,805
Firm Coal	0	0	0	148,214	1,280,440	1,746,188	2,271,968	2,348,792	3,395,867	2,671,660
Owned Gas	755,812	1,098,380	2,265,896	1,786,146	1,801,800	1,872,981	1,731,008	1,825,474	2,874,338	2,704,187
Firm Gas	345,567	201	3,332	489	167	86	0	0	0	0
Firm Unspecified	528,400	567,640	296,343	256,356	204,129	604,480	667,110	562,500	205,822	308,619
Market Unspecified	2,960,560	3,376,702	2,568,351	2,704,920	1,732,370	1,632,628	973,864	1,609,938	397,521	640,956
1990 Baseline	6,301,363	6,301,363	6,301,363	6,301,363	6,301,363	6,301,363	6,301,363	6,301,363	6,301,363	6,301,363

[1] 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 2. Energy Intensity Metrics



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
MWh / Residential Customer	11.54	11.17	11.20	10.84	10.47	10.40	10.89	10.39	10.49	10.56
MWh / Commercial Customer	75.58	74.28	72.63	71.02	70.25	65.07	67.49	69.33	68.01	60.66
MWh per capita	9.03	8.82	8.82	8.64	8.48	8.29	8.41	8.18	8.15	7.75

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.

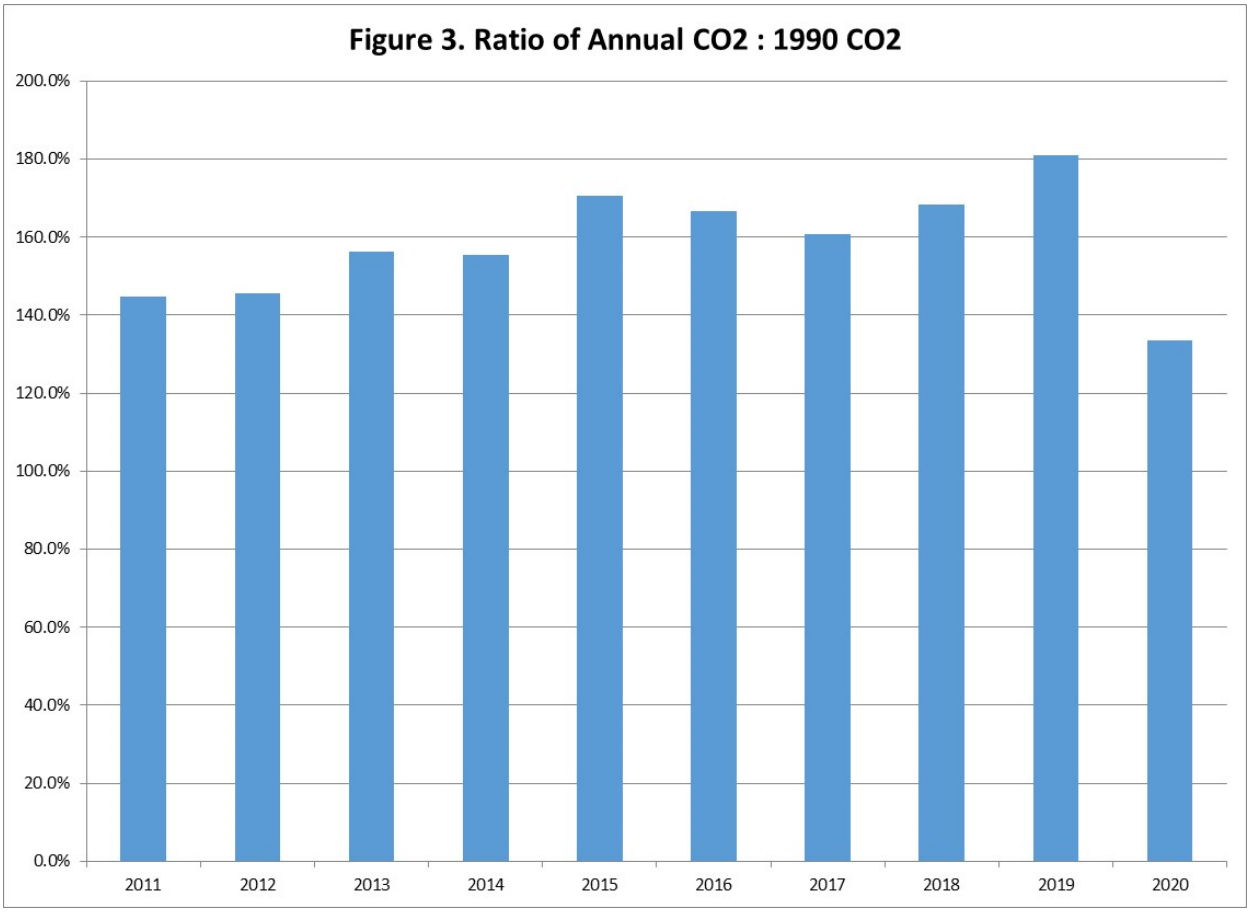
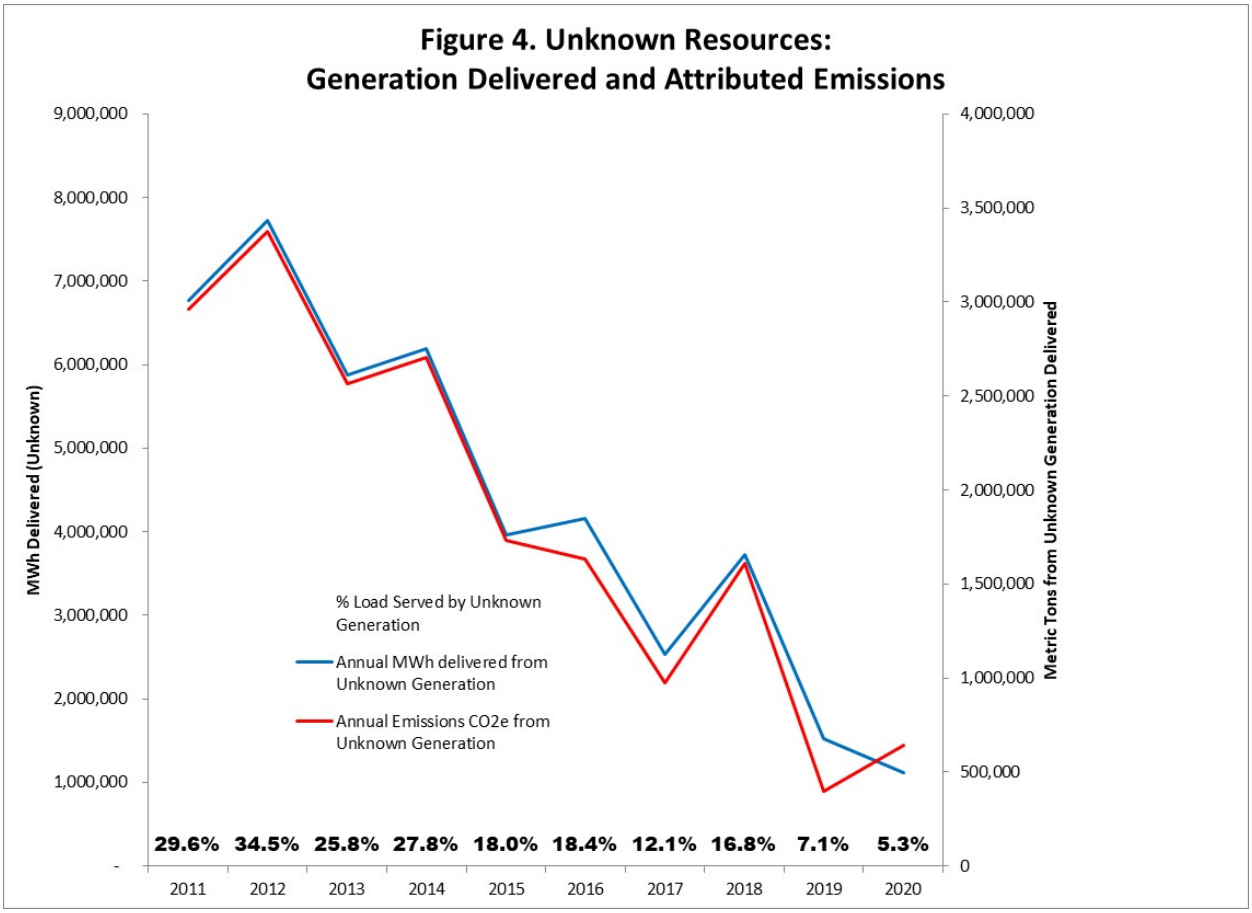


Figure 4 provides a 10-year comparison of generation delivered to PSE from unknown sources and the attributed emissions. Those metrics include annual CO_2e emissions (metric tons), annual MWh delivered to retail customers, and the percentage of load served. As discussed in the executive summary, the 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 2020, PSE's electric power resources, which include company-owned or controlled resources and those under long-term contract, had a total capacity of approximately 4,600 megawatts (MW). PSE's historical peak load of approximately 4,912 MW occurred on December 10, 2009. PSE purchases electric energy under long-term firm-purchased power contracts with other utilities and marketers in the western interconnect. 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 Interconnect. 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. Table 2 shows all firm energy transactions made in 2020, 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 all firm BPA transactions and "non-unit-specific" purchases, PSE defaults to the Ecology emissions intensity metric according to WAC 480-109-300(4). PSE employed Commission staff's net-by-counterparty approach to calculate emissions from its non-firm (unspecified) power transactions. Details of these transactions are 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 also classifies firm deliveries from the BPA and BC Hydro systems as unknown resources because the system mix of energy behind the delivery can vary at any moment in time. PSE-owned resources and unit-specific firm deliveries are classified as known sources because their fuel source is known and reported in EIA databases, described in Appendix 2.1 and 2.2.

Table 2. Known Resources Serving WA Customers

Resource	WA MWh	Metric Tons $CO_{2equiv.}$	Type	Fuel
Lower Baker	383,706	-	Own	Hydro
Snoqualmie Falls #1	52,935	-	Own	Hydro
Snoqualmie Falls #2	181,415	-	Own	Hydro
Upper Baker	362,138	-	Own	Hydro
Colstrip Unit 1	2,589	3,264	Own	Coal
Colstrip Unit 2	5,420	6,402	Own	Coal
Colstrip Unit 3	1,124,165	1,189,079	Own	Coal
Colstrip Unit 4	970,164	891,060	Own	Coal
Crystal Mountain	534	514	Own	Diesel
Encogen 1	118,590	55,032	Own	Gas
Encogen 2	127,822	62,155	Own	Gas
Encogen 3	126,606	61,128	Own	Gas
Ferndale 1	563,397	253,456	Own	Gas
Ferndale 2	559,920	255,693	Own	Gas
Frederickson 1	24,261	18,556	Own	Gas
Frederickson 2	8,041	6,298	Own	Gas
Fredonia 1	75,907	57,284	Own	Gas
Fredonia 2	86,701	76,895	Own	Gas
Fredonia 3	16,301	10,733	Own	Gas
Fredonia 4	10,424	7,095	Own	Gas
Frederickson Unit 1	478,493	184,103	Own	Gas
Goldendale	2,020,178	730,202	Own	Gas
Mint Farm	1,794,975	694,037	Own	Gas
Sumas	489,120	226,353	Own	Gas
Whitehorn 2	3,863	3,310	Own	Gas
Whitehorn 3	1,618	1,344	Own	Gas
Wild Horse (W183)	764,890	-	Own	Wind
Lower Snake River	972,680	-	Own	Wind
Hopkins Ridge (W184)	478,169	-	Own	Wind
Bio Energy Washington (BEW)	1	-	Firm	Biogas
Blocks Dairy Farm	151	-	Firm	Biogas
Edaleen Dairy LLC	495	-	Firm	Biogas
Emerald City Renewables	31,179	-	Firm	Biogas
Farm Power Lynden LLC	4	-	Firm	Biogas
Farm Power Rexville LLC	3,770	-	Firm	Biogas
Lake Washington -- Finn Hill	373	-	Firm	Biogas
Rainier Bio Gas	1,591	-	Firm	Biogas

Resource	WA MWh	Metric Tons $CO_{2equiv.}$	Type	Fuel
Van Dyk - S Holsteins	111	-	Firm	Biogas
VanderHaak Dairy Digester	2,615	-	Firm	Biogas
Transalta Centralia Generation LLC	2,500,968	2,671,660	Firm	Coal
Black Creek Hydro Inc	12,986	-	Firm	Hydro
Chelan PUD - RI & RR	2,114,198	-	Firm	Hydro
Chelan PUD - Rock Island Syst #2	-38,838	-	Firm	Hydro
Chelan PUD - Rocky Reach	-80,626	-	Firm	Hydro
Douglas PUD - Wells Project	1,348,999	-	Firm	Hydro
Electron Hydro, LLC	95,825	-	Firm	Hydro
Grant PUD - Priest Rapids Project	453,108	-	Firm	Hydro
KERR DAM-ENERGY KEEPER	293,721	-	Firm	Hydro
Koma Kulshan Associates	40,696	-	Firm	Hydro
Nooksack	24,137	-	Firm	Hydro
Skookumchuck Hydro	4,476	-	Firm	Hydro
Smith Creek Hydro	66	-	Firm	Hydro
Twin Falls Hydro	88,706	-	Firm	Hydro
Weeks Falls	15,902	-	Firm	Hydro
CC Solar 1 and CC Solar 2	25	-	Firm	Solar
Port of Coupeville	31,593	-	Firm	Solar
Ikea Solar	212	-	Firm	Solar
Island Community Solar LLC	-31,528	-	Firm	Solar
BC Hydro (Point Roberts)	18,325	8,008	Firm	System
BPA	7,000	3,059	Firm	System
Transalta Centralia Generation LLC - Bookout Source Other Adjustment	680,896	297,552	Firm	System
3 Bar G Wind Turbine #3 LLC	91	-	Firm	Wind
Klondike Wind Power III	136,728	-	Firm	Wind
Knudsen Wind Turbine #1	135	-	Firm	Wind
Skookumchuck Wind PPA	150,505	-	Firm	Wind
Swauk Wind	13,427	-	Firm	Wind

Table 3. Unknown Resources Serving WA Customers

Resource	Net-by-Counterparty MWh	Fuel Mix lbs CO_2/MWh	Metric Tons $CO_{2equiv.}$
Avista Corp. WWP Division	-12,055	869	-4,751
Avista Nichols Pump	18,587	963	8,122
Black Hills Power	445	963	194
Book Outs - EITF 03-11	437,600	963	191,231
BP Energy Co.	997,090	963	435,728
BPA	-774,812	869	-305,347
BPA - CA Wind Integration	692,532	963	302,636
BPA - NWPP Reserve Sharing Energy	-18	869	-7
BPA - PTP Transactions	-32	869	-13
BPA - Spin Reserv Requirement	30,558	963	13,354
BPA IS - Hourly Non-Firm	997	963	436
British Columbia Transmission Corp	-38	869	-15
Brookfield Energy Marketing	-206,005	869	-81,185
CAISO EESC Load Undistributed Costs	-1,429	869	-563
CAISO PRSC Undistributed Costs	-55,497	869	-21,871
California ISO	2,606	963	1,139
Chelan County PUD #1	97,274	963	42,509
Chelan PUD - RI & RR	-81,503	869	-32,120
Citigroup Energy Inc	578,332	963	252,731
City of Roseville	-9,503	869	-3,745
Clatskanie PUD	-6,564	869	-2,587
Colstrip - Energy Imbalance Market	-6,912	869	0
Conoco, Inc.	245,199	963	107,152
CP Energy Marketing (Epcor)	750	963	328
Deviation	-71,667	869	-28,244
Douglas County PUD #1	-9,618	869	-3,790
Douglas PUD - Wells Project	-25,885	869	-10,201
DTE Energy Trading	-139,450	869	-54,956
EDF Trading NA LLC	-63,487	869	-25,020
Encogen	-8,664	869	0
Energy Keepers Inc.	96	963	42
Eugene Water & Electric	-25,318	869	-9,978
Exelon Generation Co LLC	132,140	963	57,745
Ferndale Co-Generation	-12,667	869	0
Freddie #1	2,617	963	1,144
Fredonia - Energy Imbalance Market	9,949	963	4,348
Fredrickson 1 & 2	9,764	963	4,267
Goldendale	-26,234	869	0
Grant County PUD #2	13,328	963	5,824
Grant PUD - Priest Rapids Project	-43,878	869	-17,292
GRIDFORCE ENERGY MANAGEMENT, LLC.	-257	869	-101
Iberdrola Renewables (PPM Energy)	645,718	963	282,179

Resource	Net-by-Counterparty MWh	Fuel Mix lbs CO_2/MWh	Metric Tons $CO_{2equiv.}$
Idaho Power Company	-68,426	869	-26,966
Lower Baker	1,745	0	0
MID-C for Energy Imbalance Market	-267	869	-105
Mint Farm	-15,043	869	0
Morgan Stanley CG	-125,335	869	-49,394
Natur Ener USA	-141	869	-56
NextEra Energy Power Marketing	5,169	963	2,259
Northwestern Energy	-47,261	869	-18,625
Okanogan PUD	2,643	963	1,155
Pacific Gas & Elec - Exchange	0	869	0
Pacificorp	-158,047	869	-62,285
Portland General Electric	-139,259	869	-54,881
Powerex Corp.	-479,796	869	-189,084
Public Service of Colorado	-316	869	-125
Rainbow Energy Marketing	-9,090	869	-3,582
Sacramento Municipal	-4,827	869	-1,902
Seattle City Light Marketing	55,062	963	24,062
Shell Energy (Coral Pwr)	105,975	963	46,311
Skookumchuck Wind PPA	-7,906	869	-3,116
Snohomish County PUD #1	2,845	963	1,243
Snoqualmie-Energy Imbalance Market	-1,333	0	0
Sumas	7,178	963	3,137
Tacoma Power	121,224	963	52,975
Tenaska Power Services Co.	604	963	264
The Energy Authority	-208,154	869	-82,032
TransAlta Energy Marketing	-214,392	869	-84,490
TransCanada Energy Sales Ltd	-15,398	869	-6,068
Turlock Irrigation District	-4,705	869	-1,854
Upper Baker	19,268	0	0
Vitol Inc.	4,786	963	2,091
Western Area Power Association	-7,880	869	-3,105
Whitehorn 2&3	1,692	963	739
Wild Horse (W183)	-4,036	0	0
Williams Power Company	-37,895	869	-14,934
Total:	**1,112,771**		**640,956.09**

Columbia River Energy Supply Contracts

During 2020, approximately 18.2 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

Energy Imbalance Market (EIM)

Staff requested in its compliance letter to PSE's 2017 EEI report that the Company clarify how its participation in the Energy Imbalance Market (EIM), operated by the California Independent System Operator (CAISO), is represented in this EEI report. For several reasons described below, it would be premature to make any assumptions in this report regarding the emissions impact to PSE from participation in the EIM because there is simply not enough information available from the market operator at this time to make any reasonable conclusions.

PSE joined the EIM in October 2016 and has realized significant benefits from participation in this real-time energy imbalance trading market operated by the CAISO that automatically finds the lowest-cost energy to serve intra-hour incremental changes across a wide geographic area of the western United States. PSE is reliant upon the CAISO market model's identification of sources and sinks in the EIM and, therefore, must look to the CAISO to calculate any state-specific emissions impacts of the EIM. At the current time, the CAISO calculates and publishes GHG emission impacts across the entire EIM footprint, but does not calculate state-specific or utility-specific emissions impacts for EIM participants. The CAISO's calculation of emissions is based on "avoided renewable curtailments" across the entire EIM footprint and it assumes that those avoided renewable curtailments displace generation from a resource with a default emissions rate of 0.428 metric tons CO2/MWh. Currently, the CAISO's model cannot provide PSE with the information necessary to make its own state- or utility-specific emissions impact calculation. The CAISO only calculates the sink point for generators dispatched to the state of California, and this calculation is not based on physical dispatch, but is based on a least-cost dispatch run by the market model.

2020 Carbon Dioxide Emissions - Results & Discussion

Overall, PSE's CO2e emissions intensity from total electricity delivered to customers decreased from 1,167 lb/MWh to 890 lb/MWh. In 2020, 56.5 percent of electricity delivered to PSE customers was generated by the company, 43.5 percent of electricity was purchased via firm contracts 38.0%) and non-firm contracts, i.e., spot market (5.3%). Of the CO2e emissions associated with electric delivery, 57.0 percent were from electricity generated by PSE, and 43.1 percent were from purchased electricity (35.4 percent via firm contracts and 7.6 percent via non-firm contracts).

It is important to remember that CO2e 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 intensity using a metric called pounds of CO2e per megawatt-hour (lb/MWh) of electricity produced. For instance, about 17.8 percent of the electricity generated by PSE came from coal combustion, but this fuel source represented about 43.6 percent of the CO2e emissions from electricity generated by PSE. Natural gas accounted for 55.1 percent of the electricity generated by PSE; however, this fuel source represented 56.4 percent of the CO2e emissions from electricity generated by PSE. Renewable energy accounted for 27.1 percent of the electricity generated by PSE and produced zero CO2e emissions.

Compared to 2019, total electricity delivered to customers in 2020 decreased slightly, by just 3.3 percent, while total emissions decreased appreciably, by 26.2 percent. This trend is due primarily to the retirement of Colstrip 1&2, totaling 307 MW of coal capacity, effective December 31, 2019. PSE supplemented this decrease in capacity by utilizing its firm resources and by securing more energy from the non-emitting resources it owns (wind and hydro). PSE discusses these trends in more detail below.

In 2020, firm deliveries increased by 20.1 percent, and unspecified deliveries (i.e., spot market) decreased by 26.8 percent as compared to 2019. Firm thermal purchases come from three contracted sources: BC Hydro, BPA, and Centralia ("Market & Coal"). Firm deliveries from BC Hydro, BPA, and "Centralia Market" are assigned a system emissions rate due to a market option in the contract structure. PSE assigns calculated rates to the firm deliveries from "Centralia Coal" according to the WAC 177-44-040 methodology described in Appendix 2.

Trends Discussion

Interestingly, 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 several factors related to the intensity of emissions from each source. Again, emission intensity is the relationship between CO2e emissions and power production, i.e., pounds CO2e/kWh.

For example, about 17.8 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 43.6 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 60.0 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.

2020

Summary of Total Energy Delivered, Total Emissions

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	2,102,338	17.8%	24.4%	10.1%	2,089,805	43.6%	43.6%	24.8%
PSE Owned Gas	6,506,752	55.1%	75.6%	31.2%	2,704,187	56.4%	56.4%	32.1%
PSE Owned Renewable	3,195,933	27.1%		15.3%	0	0.0%		0.0%
Firm Coal	2,500,968			12.0%	2,671,660			31.7%
Firm Renewable	4,714,831			22.6%	0			0.0%
Firm Unspecified	706,221			3.4%	308,619			3.7%
Unspecified	1,112,771			5.3%	640,956			7.6%
Total	20,839,814				8,415,227			
PSE Own plus Firm PPA	19,727,043				7,774,271			
Total PSE Only	11,805,023			56.6%	4,793,992			57.0%
Total Firm Only	7,922,020			38.0%	2,980,279			35.4%
Total Unspecified Only	1,112,771			5.3%	640,956			7.6%

Comparison to Previous Year

	2020					***2019***				
	Energy MWh	%	Emissions Metric Ton	%	Intensity (lb/MWh)	Energy MWh	%	Emissions Metric Ton	%	Intensity (lb/MWh)
PSE Owned Coal	2,102,338	10.1%	2,089,805	24.8%	2,191	4,251,239	20%	4,531,772	40%	2,350
Firm Coal	2,500,968	12.0%	2,671,660	31.7%	2,355	3,036,992	14%	3,395,867	30%	2,465
PSE Owned Gas	6,506,752	31.2%	2,704,187	32.1%	916	6,799,329	32%	2,874,338	25%	932
PSE Owned All Other	3,195,933	15.3%	0	0.0%	0	2,380,216	11%	0	0%	0
Firm All Other	5,421,052	26.0%	308,619	3.7%	126	3,560,370	17%	205,822	2%	127
Unspecified	1,112,771	5.3%	640,956	7.6%	1,270	1,520,376	7%	397,521	3%	576
PSE Owned Plus Firm PPA	19,727,043		7,774,271		869	20,028,147		11,007,799		1,212
PSE Owned	11,805,023	56.6%	4,793,992	57.0%	895	13,430,784	62%	7,406,110	65%	1,216
Firm	7,922,020	38.0%	2,980,279	35.4%	829	6,597,362	31%	3,601,689	32%	1,204
Unspecified	1,112,771	5.3%	640,956	7.6%	1,270	1,520,376	7%	397,521	3%	576
Total (Own, Firm Unspecified)	20,839,814		8,415,227		890	21,548,523		11,405,320		1,167

Comparison to Previous Year

	2020 v. 2019				
	Energy MWh	%	Emissions Metric Ton	%	Intensity (lb/MWh)
PSE Owned Coal	-2,148,901	-50.5%	-2,441,967	-53.9%	-159
Firm Coal	-536,024	-17.6%	-724,206	-21.3%	-110
PSE Owned Gas	-292,577	-4.3%	-170,151	-5.9%	-16
PSE Owned All Other	815,717	34.3%	0	0.0%	0
Firm All Other	1,860,681	52.3%	102,797	49.9%	-2
Unspecified	-407,605	-26.8%	243,435	61.2%	693
PSE Owned	-1,625,761	-12.1%	-2,612,118	-35.3%	-320
Firm	1,324,657	20.1%	-621,410	-17.3%	-374
Unspecified	-407,605	-26.8%	243,435	61.2%	693
Total (Own, Firm Unspecified)	-708,709	-3.3%	-2,990,093	-26.2%	-277

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 EPA. For power supplied by Centralia, 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)). The net system mix emissions rates for PSE and the other utilities during the reporting period have been calculated and provided by Ecology.

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 report[2] and the Commission's Final Order[3] 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." [4]

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 2.49. 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 2.49 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)).

[2] UE-131732 Proposed EE Metrics Workgroup Results – Final Report, August 7, 2015, (Report at2-3).
[3] UE-131732, Final Order, General Order R-581: Order Adopting Rule Permanently, September, 10, 2015, (Order at 6 §17).
[4] UE-131732, Final Order, General Order R-581: Order Adopting Rule Permanently, September, 10, 2015, (Order at 6 §17).

Families & Living Arrangements	Skagit County, Washington	Pierce County, Washington	Island County, Washington	King County, Washington	Kitsap County, Washington	Kittitas County, Washington	Whatcom County, Washington	Thurston County, Washington
Households 2015-2019	48,493	323,296	34,768	882,028	103,913	18,347	86,523	109,983
Persons per Household 2015-2019	2.55	2.65	2.31	2.45	2.48	2.36	2.49	2.51

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) and, 3) a default specific emission factor. 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 CO2 mass. Part 75 also includes certification and QA/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 published by EPA based on 40 CFR 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 balance among the three competing priorities of accuracy, consistency, and burden on company and commission resources."*

4. Non-Firm Purchases in the 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 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)