EXH. BDM-1CT
DOCKET UE-23____
2022 PCA COMPLIANCE FILING
WITNESS: BRENNAN D. MUELLER

BEFORE THE
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

In the Matter of the Petition of **PUGET SOUND ENERGY** **For Approval of its 2022 Power Cost Adjustment Mechanism Report**	**DOCKET UE-23____**

PREFILED DIRECT TESTIMONY (CONFIDENTIAL) OF

BRENNAN D. MUELLER

ON BEHALF OF PUGET SOUND ENERGY

SHADED INFORMATION IS DESIGNATED AS CONFIDENTIAL PER WAC 480-07-160

REDACTED VERSION

APRIL 28, 2023

PUGET SOUND ENERGY

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I. INTRODUCTION

Q. Please state your name, business address, and position with Puget Sound Energy.

A. My name is Brennan Mueller. My business address is P.O. Box 97034, Bellevue, Washington, 98009. I am employed by Puget Sound Energy ("PSE") as Manager Power Costs & Energy Analysis.

Q. Have you prepared an exhibit describing your education, relevant employment experience, and other professional qualifications?

A. Yes, I have. It is Exhibit BDM-2.

Q. What are your duties as Manager Power Costs & Energy Analysis?

A. As Manager Power Costs & Energy Analysis my primary responsibilities include:

(i) providing analytical support and performance reporting for PSE's Energy Supply Management operations, and

(ii) forecasting power costs and natural gas supply costs for PSE financial planning and regulatory filings.

Q. Please summarize the contents of your testimony.

A. First, I provide background information regarding PSE's Power Cost Adjustment ("PCA") mechanism. I then describe PSE's resource portfolio compared to the

portfolio assumptions included in rates for the 2022 PCA Period. Next, I explain the drivers of PSE's 2022 power cost under-recovery and provide analysis of the variances between actual power costs and power costs included in the PCA variable baseline rate for 2022. Finally, I describe two notable market events to illustrate how PSE managed power costs during periods of extreme weather and extraordinary commodity price volatility.

The baseline power cost rate approved in PSE's 2020 power cost only rate case, Docket UE-200980 ("2020 PCORC") went into effect July 1, 2021 and was the effective rate for all of the 2022 PCA Period. The Prefiled Direct Testimony of Susan E. Free, Exh. SEF-1T, contains further information regarding the baseline rate in effect for the 2022 PCA Period.

II. BACKGROUND REGARDING THE PCA MECHANISM

Q. Why does PSE have a PCA mechanism?

A. Volatility in wholesale energy markets coupled with variations in power supply and load volumes lead to differences between the actual cost of PSE's power supply portfolio and the costs currently included in customer rates. The PCA mechanism seeks to balance the risk of such power cost differences between customers and PSE by providing a method to share costs and benefits if power costs deviate significantly from those embedded in rates.

The PCA mechanism originally took effect on July 1, 2002, following a settlement agreement that originated in PSE's 2001 general rate case. As part of

PSE's 2013 power cost only rate case, Docket UE-130617, PSE and parties to that proceeding initiated a collaborative process to address issues relevant to the PCA mechanism. That process resulted in a multiparty settlement that changed certain elements of the PCA. The multiparty settlement was approved by the Commission and changes became effective on January 1, 2017.

Q. How does the PCA mechanism work?

A. The PCA mechanism accounts for differences in PSE's actual power costs relative to the power cost baseline recovered in rates. The costs or benefits of such variances are shared between PSE and customers according to three graduated levels of power cost variance, or bands. The dead band includes the first $17 million of power cost variance (positive or negative). Within the dead band, 100 percent of costs or benefits are retained by PSE. The first sharing band includes power cost variances between $17 and $40 million (positive or negative). Within this band, costs (under-recoveries) are shared 50 percent to PSE and 50 percent to customers while benefits (over-recoveries) are shared 35 percent to PSE and 65 percent to customers. The second sharing band includes power cost variances over $40 million (positive or negative). All variances in this band are shared 10 percent to PSE and 90 percent to customers, regardless of whether they are costs or benefits.

The customers' share of power cost variances is accounted for each year and deferred until the cumulative balance in the deferral account triggers a refund or

allows a surcharge. The Prefiled Direct Testimony of Susan E. Free, Exh. SEF-1T, contains further information regarding accounting for the cumulative balance.

III. 2022 PCA PERIOD POWER COSTS

A. PSE's 2022 PCA Period Power Supply Resources

Q. Were there changes to PSE's electric supply resources during the 2022 PCA Period relative to those included in the baseline rate?

A. Yes. As noted above, the baseline rate in effect during the 2022 PCA Period reflected the power portfolio from PSE's 2020 PCORC during all twelve months of the year. PSE's actual 2022 PCA Period power supply portfolio included actual resources, power contracts, and contract rates in effect during 2022. Specifically, the changes to PSE's electric supply resources during the 2022 PCA Period relative to resources included in rates include:

1. Different market purchases and sales made in response to changes in load, resource availability, and market heat rates, which guide PSE's decisions of whether to dispatch gas-fired generation or to buy power in the market;
2. A 200 MW wind power purchase agreement ("PPA") with Golden Hills Wind Farm LLC ("Golden Hills Wind PPA"), which began on March 25, 2022, but was not included in PSE's 2020 PCORC and therefore not reflected in rates for 2022;
3. A 350 MW wind PPA with Clearwater Energy Resources LLC ("Clearwater Wind PPA"), which began on November 8, 2022, but was not included in PSE's 2020 PCORC and therefore not reflected in rates for 2022;
4. A [redacted] MW PPA with Powerex ("Powerex Summer Peak PPA"), which began on June 1, 2022, but was not included in PSE's 2020 PCORC and therefore not reflected in rates for 2022.
5. Two separate [redacted] MW PPAs with Powerex ("Powerex Winter

Peak PPAs") which began on [redacted] 2022[1] but were not included in PSE's 2020 PCORC and therefore not reflected in rates for 2022.

6. A larger share of Wells Hydroelectric Project output and costs under PSE's long-term PPA with Douglas County Public Utility District ("PUD"), which was not included in the forecast for the 2020 PCORC and therefore not reflected in rates for 2022;

7. Extension of a PPA with Douglas County PUD for 5.5 percent of the output from the Wells Hydroelectric Project ("Wells Colville slice"), which began October 1, 2021, but was only included in four months of the 2020 PCORC and therefore not reflected in rates for eight months of 2022;

8. A PPA with Chelan County PUD for an additional 5 percent of the output of the Rocky Reach and Rock Island Hydroelectric Projects which was not included in the forecast for the 2020 PCORC and therefore not reflected in rates for 2022;

9. Termination of a 22 MW PPA with Electron Hydro, which was not reflected in the forecast for the 2020 PCORC and therefore the PPA was still included in rates during 2022.

Q. Please summarize PSE's actual electric energy supply during the 2022 PCA Period compared to the amounts included in rates.

A. Table 1 below provides a comparison of the generated and purchased energy volumes used to serve load during 2022 relative to the resource volumes included in rates.

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[1] The Prefiled Direct Testimony of Philip Haines, Exh. PAH-1CT, includes detailed discussion of the Powerex Winter Peak PPAs.

Table 1: Actual 2022 Energy Supply Volumes versus Volumes Included in Rates (MWh)

	Actual	Rates	Variance
Coal-fueled generation (Colstrip)	2,726,665	2,358,663	368,002
Natural gas-fueled generation	6,028,682	3,546,031	2,482,651
Long-term contracts (PPAs)	5,957,186	4,633,572	1,323,613
Hydro (PSE-owned + Mid-C contracts)	5,110,509	4,245,982	864,528
Wind (PSE-owned)	1,684,974	1,938,034	(253,060)
Net market purchases & sales	1,211,474	4,080,924	(2,869,449)
Total supply (load, before system losses)	22,719,490	20,803,205	1,916,285

B. PSE's 2022 PCA Period Power Cost Under-Recovery

Q. How did PSE's actual power costs for the 2022 PCA Period compare to power costs recovered through rates?

A. During the 2022 PCA Period, PSE recovered $814.8 million of power costs through the PCA variable baseline rate and incurred actual allowable power costs of $925.0 million. This $110.1 million under-recovery is outside of the $17 million dead band, so PSE will share a portion of these costs with customers according to the PCA sharing bands. The customer share of 2022 PCA Period under-recovery before interest is $74.6 million.

Q. Why do actual power costs differ from those set in rates?

A. Power costs included in rates are estimated for a particular twelve-month period, or rate year, that often does not align with the period during which rates are in effect. For example, the rate year for which PSE forecasted power costs in its 2020 PCORC was June 2021 through May 2022. Rates established based on this

rate year did not go into effect until July 1, 2021, and then remained the effective rates through January 10, 2023. This misalignment between the period for which power costs are estimated to establish rates and the period for which rates are actually in effect creates differences in resource assumptions, market prices, and load that ultimately lead to PCA under or over-recovery prior to accounting for volatility and forecast variances in these same variables. While resource assumptions, prices, and forecasted load for the first five months of 2022 were directly forecast as part of the rate year in the 2020 PCORC, the rate went into effect five months before the start of 2022 and was based on resource and portfolio assumptions as of May 28, 2021, so the rate assumptions for those months were already seven months outdated when the 2022 year began. For the last seven months of 2022, the effective rate was based on forecasted 2021 costs, which created additional PCA variances in those months.

In addition, even if rate year forecast periods and rate effective periods were perfectly aligned, actual costs of power delivered to PSE's system would still differ from those established in rates because actual power costs reflect the realized outcome of multiple power cost variables. These variables include:

(i) customer demand (load),
(ii) the supply of hydroelectric energy,
(iii) output from variable energy resources such as wind and solar,
(iv) unplanned generation outages and the timing of planned outages,
(v) contract rates,
(vi) transmission and natural gas transportation constraints, and
(vii) market energy prices.

Finally, while power costs included in rates are estimated "as closely as possible to costs that are reasonably expected to be actually incurred,"[2] estimates are limited by regulatory normalizing assumptions. Specifically, rates established in the 2020 PCORC normalized power cost variables by utilizing:

(i) a weather normalized load forecast,
(ii) hydro generation from 80 years of streamflow data,
(iii) forecasts of long-term average wind generation,
(iv) historical average generator forced outage rates,
(v) gas prices equal to a historical three-month average of forward market prices, and
(vi) model-generated market power prices

Q. What caused the difference between PSE's actual power costs and power costs recovered in rates during the 2022 PCA Period?

A. During the 2022 PCA Period, PSE's total actual allowable power costs were $110.1 million higher than power costs recovered in rates. This under-recovery was the result of actual allowable costs that were $170.2 million higher than costs included in rates offset by baseline rate revenue that was $60.0 million higher than revenue assumed in rates. Higher baseline rate revenue was due to actual delivered load that was 8.0 percent higher than the delivered load forecast used to establish rates.

The $110.1 million total actual PCA under-recovery was due to differences in resources, load, and market prices between the power cost forecasts used to

[2] *Wash. Utils. & Transp. Comm'n. v. Puget Sound Energy, Inc.,* Docket UE-040640, *et al.,* Order 06 at ¶ 108 (Feb. 18, 2005).

establish rates and actual operations. These differences were primarily the result of changes to actual resource availability and cost information not being fully reflected in rates, higher actual PSE load than the forecasted load used to establish rates, and wholesale market power and natural gas prices that were consistently higher than the prices used in rates.

Q. Please summarize PSE's actual 2022 power cost variance relative to the costs included in rates and the 2022 PCA under-recovery.

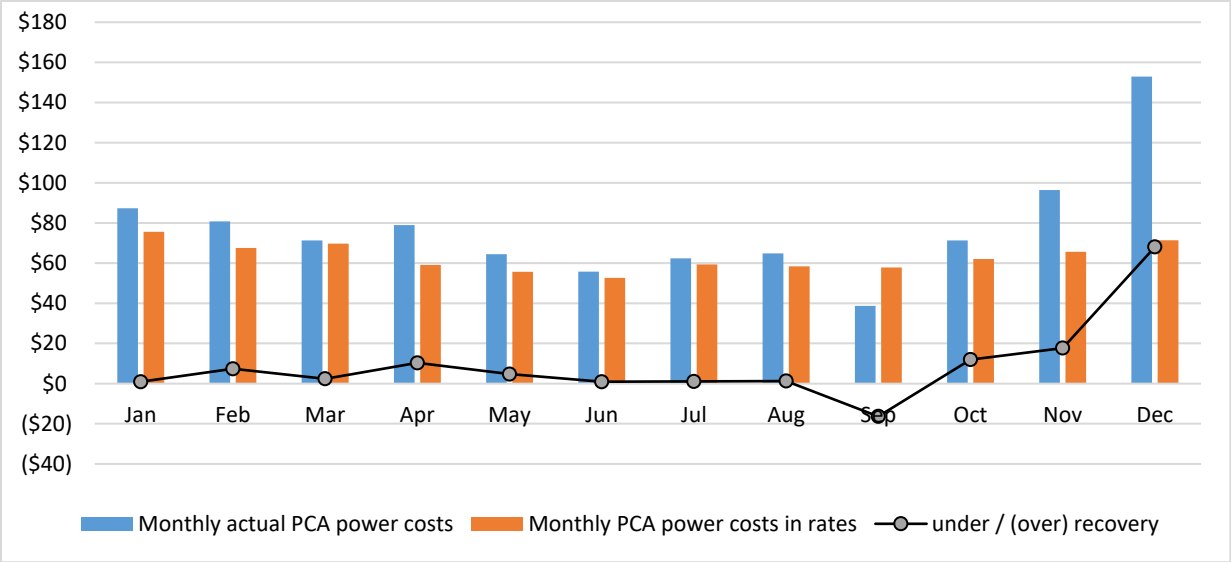
A. Table 2 below provides a comparison of 2022 actual power costs relative to those included in rates by resource type and the impact of load variance on baseline rate revenue. These variances sum to the $110.1 million total under-recovery and are discussed below.

Table 2. Actual 2022 PCA Costs and Revenue versus Amounts in Rates ($ in millions)

	Actual	Rates	Variance
Coal fuel	$57.9	$41.8	$16.1
Natural gas fuel and transportation	$178.9	$97.6	$81.4
Long-term contract purchases	$534.1	$382.0	$152.1
Net market purchases & sales	$3.6	$99.7	($96.1)
Transmission	$144.9	$128.3	$16.7
Other PCA items	$5.5	$5.4	$0.0
Total PCA variable cost	$925.0	$754.7	$170.2
PCA revenue from delivered load	($814.8)	($754.7)	($60.1)
2022 PCA under-recovery	$110.2	$0.0	$110.1

Figure 1 below shows monthly actual 2022 power costs compared to power costs in rates as well as the monthly actual PCA under or (over) recovery.

Figure 1. Actual 2022 PCA Costs versus Costs in Rates and Monthly Actual PCA Under / (Over) Recovery ($ in millions)



Q. How did differences between PSE's actual resource portfolio and resource assumptions used to establish rates impact the 2022 PCA under-recovery?

A. The power cost baseline included in rates for 2022 was established in PSE's 2020 PCORC. Forecasted power costs in that case were for the rate year ending May 2022 and based on resource and portfolio assumptions as of May 28, 2021. Timing differences between actual resources and those included in the forecast used to set the baseline rate contributed to under-recovery in the first five months of 2022. For example, the three-year extension of the Wells Colville slice contract, which allows PSE to receive a 5.5 percent slice of the output from the Wells Project beginning in October 2021, was not included in the PCORC forecast used to set the baseline rate because the contract had not been executed at the time PSE prepared its forecast in that case. Rates established in the 2020 PCORC also did not reflect termination of PSE's PPA with Electron Hydro, the

actual increase to BPA transmission rates, or tariff rate updates for PSE's natural gas pipeline contracts.

The difference in the forecast period used to establish rates and the actual rate effective period meant that for the last seven months of 2022, the power cost baseline rate did not include current information for PSE's resource portfolio, contract rates, load forecast, or market prices. More specifically, power costs in rates for the last seven months of 2022 did not include new PPAs, changes to the prices of existing PPAs, changes to the cost and PSE's share of output from its Mid-Columbia hydroelectric contracts, or updates to the cost of PSE's transmission and gas-transportation contracts.

Overall, differences in portfolio resource assumptions embedded in rates relative to actual 2022 portfolio resources and contract rates — which were unrelated to changes in load, variability in resource output, or commodity prices — contributed an estimated $127.5 million to PSE's 2022 PCA under-recovery, or 115.7 percent of the total under-recovery. Table 3 below summarizes the impact of the individual items discussed above. These are variances that the PCA mechanism was not specifically intended to address. The overview of the PCA in both the original settlement stipulation and the revised settlement stipulation states that "the factors influencing the variability of power costs included in the mechanism are primarily weather or market related."[3]

[3] Dockets UE-130583, UE-130617 and UE-131099, Attachment A to Settlement Stipulation, page 1 at A.1; Dockets UE-11570 and UG-11571, Exh. A to Settlement Stipulation, page 1 at B2.

PSE's remaining 2022 PCA variance was primarily attributable to higher actual 2022 load than the load forecasts used in rates combined with market prices that were higher than the prices assumed in rates.

Table 3: Estimated Impact of Resource Information Not Updated in Rates ($ x 1000)

	Total impact on 2022 under-recovery
Mid-C hydro contract costs & share of output	$ 20,142
New PPAs (Powerex, Clearwater, Golden Hills, Morgan Stanley)	$ 90,309
Termination of Electron hydro PPA	$ (6,357)
Transmission and gas pipeline contracts	$ 23,424
Total net cost not included in rates	$ 127,518

C. 2022 PCA Variance Discussion

Market prices

Q. How did actual 2022 market energy prices compare to the prices assumed in rates?

A. Actual market prices for both power and natural gas during 2022 were significantly higher than prices assumed in rates from the 2020 PCORC. Abnormally cold conditions fueled market price spikes in December. Warmer-than-normal conditions throughout the summer were punctuated by record-setting temperatures in September across much of the Western United States that resulted in all-time high demand for electricity across the region.[4] These market events are described in more detail in Section IV below.

[4] *See* http://www.caiso.com/Documents/SummerMarketPerformanceReportforSeptember2022.pdf

While abnormal weather conditions were a key contributor to high market power and gas prices in 2022, variances between actual prices and those included in rates were also the result of timing differences between when rates were established and the actual rate effective period, combined with longer-term trends in commodity markets and the regional resource mix. Relatively high actual market prices in 2022 drove variances in the cost of market purchases, the cost of fuel for power generation, and changes in the dispatch of PSE's coal- and natural gas-fired resources relative to the forecasts used to establish rates. Figure 2 below compares 2022 actual natural gas prices to the gas prices assumed in rates. Figure 3 compares actual 2022 power prices to the power prices assumed in rates.

Figure 2: 2022 actual Sumas gas prices versus Sumas gas prices in rates ($/MMBtu)

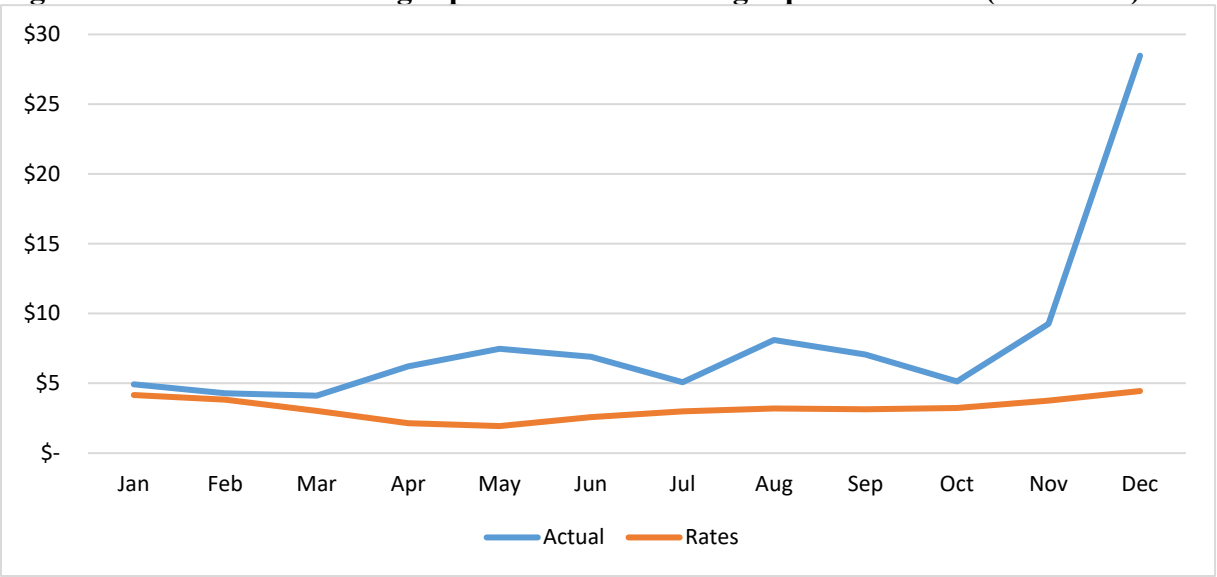
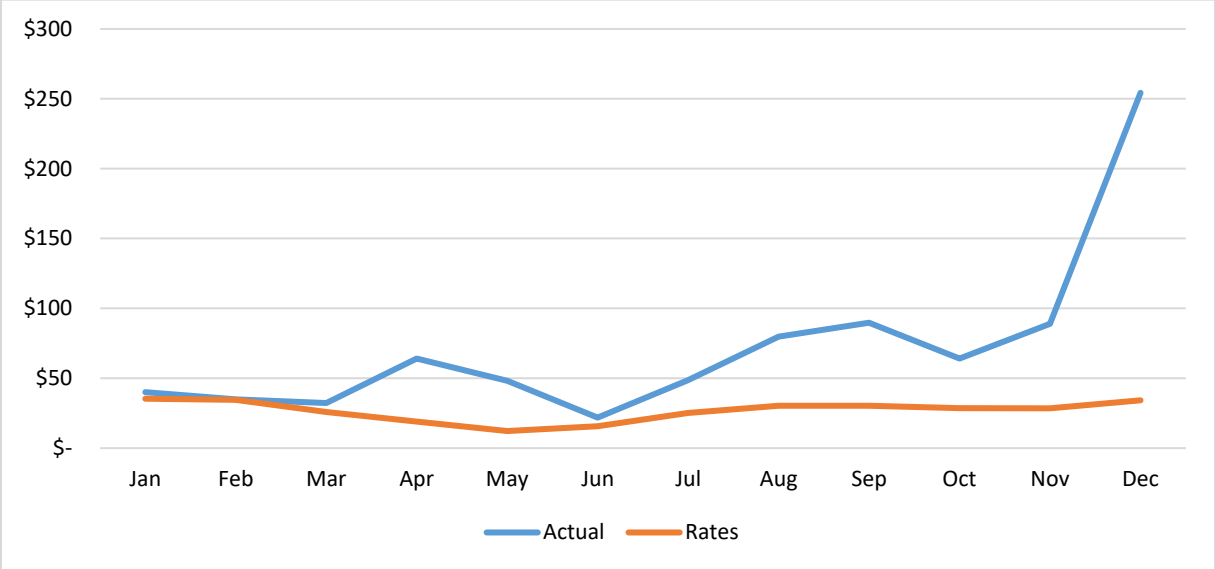


Figure 3. 2022 actual Mid-C power prices versus Mid-C power prices in rates ($/MWh)



Load

Q. How did variances in actual load relative to the forecast in rates impact PSE's 2022 PCA Period under-recovery?

A. Actual PSE load in 2022 was approximately 9.2 percent higher than the load forecasts used to establish rates in effect during 2022. These higher actual loads had two different, partially off-setting impacts on the 2022 PCA under-recovery. First, higher load increases PSE's actual power costs because it increases the amount of energy that must be purchased in the wholesale markets or decreases the amount of surplus energy that can be sold in the wholesale markets. Second, higher load increases retail sales (delivered load), which increases revenue collected via the power cost baseline rate. During 2022 baseline rate revenue was $60.1 million higher than revenue included in rates due to higher delivered loads. This higher revenue, however, was not sufficient to offset the cost of additional

market purchases (or fewer market sales) needed to serve the higher load. Actual load that was higher than the load forecasts included in rates increased power costs approximately $175.9 million[5] during 2022.

Market purchases and sales

Q. How did market purchases and sales during the 2022 PCA Period compare to amounts in rates?

A. In 2022 PSE's actual electric market purchases were 1.2 million MWh more than actual market sales. The forecasts in rates for 2022 estimated PSE would be a net purchaser of 4.1 million MWh. Lower actual net market purchase volume for the year was the result of increased generation from PSE's coal and natural gas-fired resources, more generation from PSE's Mid-Columbia hydroelectric resources, and a greater volume of energy from PPAs than forecast in rates.

While the actual volume of market purchases in 2022 was 10.5 percent below the forecasts in rates for 2022, the cost of these purchases was 119.3 percent or $173.8 million above the cost included in rates driven by higher market prices than included in rates. The average cost of actual market purchases in 2022 was $64.90 per MWh compared to only $26.47 per MWh included in rates. Similarly, the actual volume of market sales in 2022 was 153.6 percent above the forecasts in rates for 2022, while the revenue from these sales was 609.9 percent above the wholesale sales revenue included in rates. The average price of actual market

[5] Estimate based on actual flat Mid-C monthly market power prices and monthly load variances. Higher loads frequently coincided with periods of higher prices at the daily or hourly level, so this is likely to be a low estimate.

sales in 2022 was $91.01 per MWh compared to only $32.51 per MWh included in rates.

Colstrip

Q. How did actual coal fuel costs compare to costs in rates during the 2022 PCA Period?

A. Actual fuel cost for PSE's Colstrip Units 3&4 was $16.1 million higher than the cost included in rates for 2022. This cost variance was primarily the result of increased generation driven by higher actual power prices than assumed in rates. Per-unit coal supply costs are relatively fixed, so higher power prices made it more economic to run the plant at higher output levels. Actual Colstrip output in 2022 was 15.6 percent, or 368,002 MWh, higher than generation included in rates. In addition to higher energy volumes, a portion of the 2022 Colstrip fuel cost variance is attributable to higher actual per unit coal costs than assumed in rates. Actual Colstrip unit fuel cost of $19.92 per MWh was higher in 2022 than the $17.48 per MWh included in rates for 2022. Higher actual unit fuel costs were primarily due to annual escalation in PSE's coal supply contract, which was higher than the forecast in rates, as well as misalignment between the 2022 calendar year and the rate year included in the 2020 PCORC.

Natural gas generation and transportation

Q. Why were actual 2022 natural gas fuel and transportation costs higher than the costs included in rates?

A. Total actual natural gas fuel and transportation costs during 2022 were 83.4 percent, or $81.4 million higher than costs included in rates. These higher costs were the result of increased generation, higher gas prices, and higher costs of gas transportation contracts offset by gains from financial gas hedges and higher revenue from pipeline optimization transactions.

Generation from PSE's natural gas-fired resources was 2.5 million MWh, or 70.0 percent higher than generation included in rates for 2022. This increased output relative to the forecast in rates was the result of higher market heat rates (a measure of the relative price of natural gas versus power), which made it more economical to run the facilities more often. Figure 4 and Figure 5 below show PSE's actual natural gas-fired generation and market heat rates relative to forecasts in rates for 2022.

Figure 4: 2022 actual gas-fired generation versus gas-fired generation in rates (MWh)

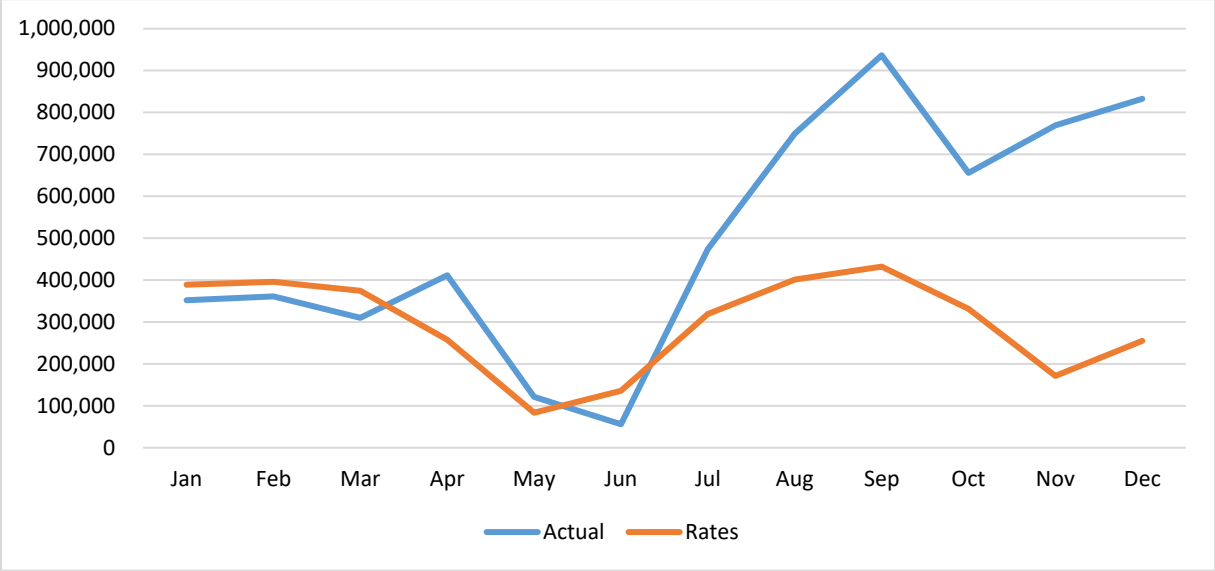
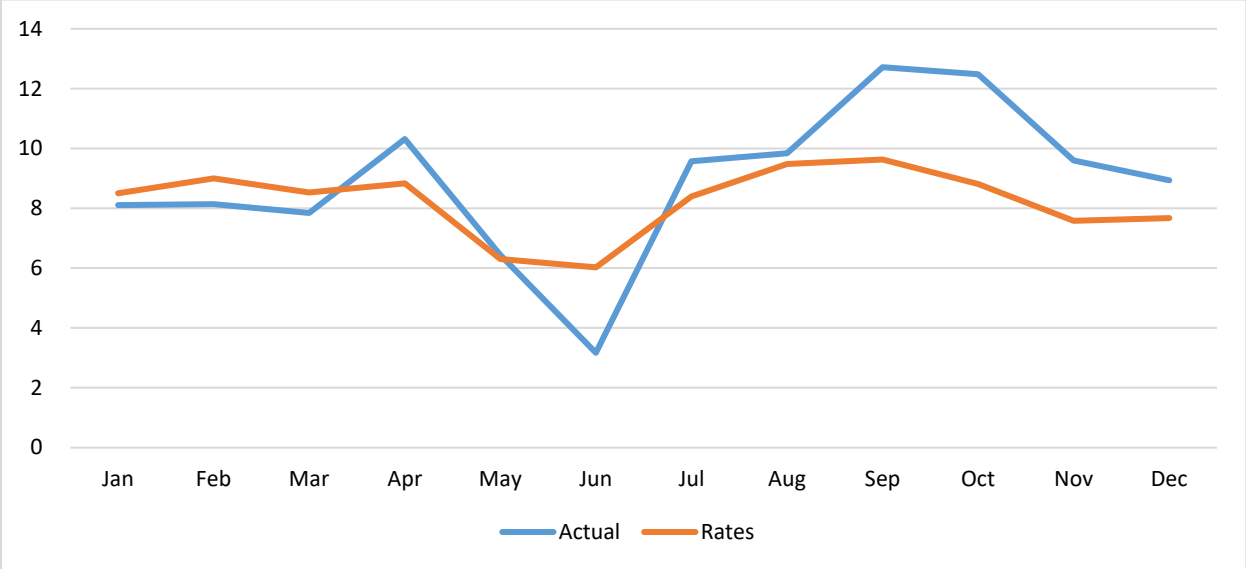


Figure 5: 2022 actual flat market heat rates versus flat market heat rates assumed in rates (MMBtu/MWh)



While PSE's gas-fired resources generated more than forecasted in rates for 2022, higher natural gas prices meant that the average cost of fuel for these resources was also higher than assumed in rates. The average actual unit fuel cost for PSE's

gas-fired resources in 2022 was $51.00 per MWh compared to $28.33 per MWh included in rates, before variances in fixed gas transportation costs and benefits from gas hedges and pipeline optimization. Actual fixed gas transportation costs in 2022 were $6.8 million higher than the fixed transportation costs included in rates due to pipeline tariff rate increases that were not reflected in rates established in the 2020 PCORC. The impact to power costs of higher fuel prices and higher transportation cost was offset by gains from financial gas hedges and net revenue from sales of gas utilizing surplus pipeline capacity (pipeline optimization). Gains on financial gas hedges in 2022 were $79.1 million, or $58.2 million more than included in rates. Pipeline optimization net revenue in 2022 was $111.3 million, or $74.6 million more than included in rates.

Long-term contracts (Power Purchase Agreements)

Q. How did long-term power contracts impact costs during the 2022 PCA Period?

A. In 2022 PSE received 5,957,186 MWh from its long-term contracts (excluding Mid-Columbia hydroelectric PPAs), which was a 28.6 percent increase over the volume included in rates during 2022 (4,633,572 MWh). The combined actual cost of these contracts was $384.6 million, 45.6 percent higher than the cost included in rates. These overall results are the net outcome of the addition of several new PPAs, the inclusion of a full year of cost and volumes associated with several PPAs that were only partially included in rates, and several offsetting variances in individual PPA volumes and prices. As discussed earlier, rates in

effect during calendar year 2022 did not fully include the Powerex Summer and Winter Peak PPAs, the Clearwater Wind PPA, the Golden Hills Wind PPA, the Morgan Stanley PPA, termination of the Electron Hydro PPA, or changes to the price of existing PPAs. The estimated impact to PSE's 2022 under-recovery was offset by changes in the energy received from contracts with variable output. Actual energy from PSE's Schedule 91 contracts — contracts with small wind, solar, hydro, and bio-fueled generators — was 38.4 percent below the energy included in rates for these facilities. The average price of these Schedule 91 PPAs in 2022 was higher than market energy prices, so lower volumes reduced PSE's actual power costs. Energy from the Clearwater Wind PPA was not included in rates for 2022. The price of this PPA was lower than market energy prices, so the additional volume reduced PSE's actual power costs.

Q. Why were Mid-C hydroelectric contract costs higher than the amounts included in rates?

A. The variance in the cost of PSE's Mid-C hydroelectric contracts in 2022 relative to the cost in rates was the result of changes to PSE's share of output under its PPA with Douglas County PUD for output from the Wells Project, higher actual costs based on updated budgets from Chelan and Grant County PUDs, and the new Wells Colville contract that was not included in rates for eight months of 2022. The cost of the contract with Grant County PUD was $25.8 million in 2022, an increase of $11.1 million or 75.4 percent over the cost forecast in rates (net of a small difference in energy volumes).

PSE wind and hydro

Q. How did output from PSE-owned wind and hydro resources affect power costs in 2022?

A. There are no fuel or purchased power costs associated with PSE-owned wind and hydroelectric assets, so there are no direct cost variances associated with these resources in 2022 actual PCA results relative to costs in rates. Instead, variances in the output of PSE's wind and hydroelectric resources drive changes in PSE's market purchases and sales relative to the forecasts in rates. Each MWh that is not generated by a wind or hydro resource requires PSE to purchase (or not sell) one MWh in the market.

Actual output from PSE's wind resources in 2022 was 13.1 percent, or 253,060 MWh below wind generation included in rates for 2022. This generation variance relative to rates increased the net cost of PSE's actual 2022 market purchases and sales approximately $27.5 million (based on actual monthly flat Mid-C power prices).

Actual output from PSE-owned hydro resources in 2022 was 11.8 percent, or 101,780 MWh lower than generation included in rates for 2022. This generation variance relative to rates increased the net cost of PSE's actual 2022 market purchases and sales approximately $14.3 million (based on monthly actual flat Mid-C power prices).

Transmission

Q. Why did actual transmission expense vary from the amount in rates during the 2022 PCA Period?

A. During the 2022 PCA Period, the total net cost of purchased transmission was $16.7 million higher than the costs included in rates. These higher costs were the result of transmission contract costs that were $17.6 million higher than the amount in rates offset by revenue from transmission reassignments (short-term sales of surplus transmission capacity) that was $0.9 million higher than the amount in rates. Transmission contract costs in 2022 were higher than the amount in rates primarily due to significantly higher costs associated with the Bonneville Power Administration ("BPA") transmission loss charge following high market prices in November and December[6]. Additionally, a BPA transmission rate increase effective October 1, 2021, that was not fully included in rates established in the 2020 PCORC contributed to the higher cost of purchased transmission in 2022.

IV. 2022 MARKET EVENTS

Q. Were there any notable market events that impacted PSE's power supply operations in 2022?

A. Yes. During 2022 two distinct periods of extreme weather caused extraordinary volatility in power and gas market prices and increased PSE electric demand,

[6] BPA transmission loss charges are determined after-the-fact by multiplying transmission losses by actual market energy prices.

prompting concerns about the availability of reliable power and natural gas supply. Each of these events is notable from a power supply risk and reliability perspective and helps illustrate how volatility in commodity prices is often the result of a combination of factors impacting supply and demand both in the Pacific Northwest and throughout the wider Western grid area. These events also highlight the risks inherent in relying on wholesale markets for energy supply during peak load periods. In terms of PSE's overall 2022 PCA under-recovery, however, the impact of these short-duration and well-managed events was masked by the more significant impacts of outdated resource assumptions in rates, average overall higher loads (as opposed to very high, but brief, peak loads), and consistently higher market commodity prices discussed earlier in my testimony. For example, referring to Figure 1, PSE actually over-recovered power costs in September 2022, even with the market volatility described below.

Q. Please describe the September 2022 market event.

A. From September 1, 2022 through September 9, 2022, California and much of the Western United States experienced record-setting heat resulting in historical electrical demand across the region.[7] Despite high temperatures and load in California, conditions in PSE's service territory remained relatively temperate. Average actual PSE electric load during this period was 2,222 aMW, only 83 aMW or 3.9 percent above the forecast included in rates for this period. During this same period, average on-peak power prices averaged $178.65 per MWh and

[7] http://www.caiso.com/Documents/SummerMarketPerformanceReportforSeptember2022.pdf

off-peak power averaged $88.33 per MWh, compared to September prices of $31.66 per MWh on-peak and $28.26 per MWh off-peak used in rates from the 2020 PCORC. Hourly power prices spiked to $997.20 per MWh during September 6, 2022. Sumas gas prices averaged $8.44 per MMBtu over this period, 188 percent higher than the previous 10-year average September price and a 169 percent increase relative to the $3.14 per MMBtu September Sumas price included in rates from the 2020 PCORC.

Q. How did PSE manage its power supply operations during the September event?

A. As mentioned above, PSE's load did not experience the same increase during the market event as seen in California and the rest of the region. Because of this, PSE was able to optimize surplus supply and sell power into the wholesale market at the elevated prices. Over the full month of September, PSE's gas-fired generation resources produced 1,301 aMW at an average price of $53.35 per MWh and PSE sold 830 aMW into the market at an average price of $133.19 per MWh. This resulted in significantly more revenue from market sales than was included in rates, when PSE's gas-fired resources were forecast to produce 600 aMW at an average price of $25.53 and only sell 84 aMW at an average price of $34.93 per MWh.

PSE's actual power costs also benefitted from gains on gas-for-power hedges during the September 2022 event. PSE utilized fixed-for-float swaps[8] to financially hedge the cost of natural gas-for-power throughout the month. The mechanics of a financial fixed-for-float swap, in combination with a physical index purchase or sale, result in a fixed price position identical to purchasing or selling fixed price physical supply. PSE executed financial gas-for-power deals at Sumas to purchase 257,500 MMBtu/day at an average fixed price of $5.34 per MMBtu compared to the settlement price of $7.76 per MMBtu, resulting in net benefit of $2.42 per MMBtu/day. Similarly, PSE executed financial gas-for-power deals at AECO to purchase 87,500 MMBtu/day at an average price of $3.15 per MMBtu compared to the settlement price of $3.73 per MMBtu, resulting in net benefit of $0.58 per MMBtu/day. The total impact of these financial gas-for-power deals was a $20.2 million reduction to PSE's PCA allowable costs for September. PSE's total PCA over-recovery for September was $16.4 million.

Q. Please describe the December 2022 market event.

A. From December 15 to December 23, 2022, average temperatures were 10 degrees Fahrenheit below 30-year historical averages, reaching as low as 19 degrees below normal on December 22, 2022. Average actual PSE electric load during

[8] Fixed-for-float swaps fix the price of a commodity to the market "index" price of a commodity and settlement is done financially. For example, PSE may enter into a fixed-for-float Sumas gas contract for a future month at a fixed price of $3.00 per MMBtu/day. When the future month occurs, the contract is settled by comparing the fixed $3.00 per MMBtu/day to the market price of, say $6.00 per MMBtu/day. In this example, the counterparty would pay PSE the difference between the fixed price and the market price, or $3.00 per MWh. For a 30-day month, this would be a payment of $90 for a 1 MMBtu contract.

this period was 3,668 aMW, an increase of 609 aMW or 19.9 percent above the forecast included in rates for this period. Between December 10 and December 28, 2022 Sumas gas prices averaged $36.02 per MMBtu, 830 percent higher than the previous 10-year average December price and 710 percent higher than the $4.45 per MMBtu December Sumas price included in rates from the 2020 PCORC. On-peak power prices averaged $335.69 per MWh and off-peak power averaged $286.22 per MWh compared to December prices of $27.48 per MWh on-peak and $25.37 per MWh off-peak used in rates from the 2020 PCORC. Hourly power prices spiked to $901.36 per MWh on December 22, 2022, while the on-peak average for the day was $679.22 per MWh.

Q. Did factors other than cold weather impact energy supply conditions and wholesale energy markets during the December 2022 event?

A. Yes. Concerns about natural gas supply across the western region contributed to elevated gas prices during the December 2022 market event. In California, the average volume of working gas in storage during December 2022 was 140,210 million cubic feet ("MMcf"), a reduction of 105,482 MMcf or 43 percent from the 2013-2021[9] average. This limitation on gas supply exacerbated already volatile gas prices and concerns about supply reliability during the event. Further, the Direct Current South to North transmission line had previously been derated below 50 percent of normal capacity beginning on November 16, 2022, and remained at this reduced limit throughout the December 2022 market event. This

[9] Excludes 2018 and 2019, when pipeline disruption events created outlier data.

derate did not have a direct impact on PSE's ability to procure power supply to meet peak load, but it nonetheless contributed to the tight supply and demand balance in the region during this period and the resulting high market power prices.

Q. How did PSE manage its power supply operations during the December 2022 event?

A. PSE's power supply operations mitigated exposure to high Sumas gas spot market prices during the December event. PSE hedged risk by locking in supply for its gas-fired generation resources in the term markets prior to the event, purchasing gas supply from upstream Canadian gas hubs at a lower price and flowing to PSE's system via contracted pipeline capacity, withdrawing gas from storage, and purchasing diesel to run dual-fuel (typically gas-fired) generation resources when economic to do so.

Between December 15 and December 23, 2022, the average daily Sumas gas price was $31.38 per MMBtu, with a peak of $50.53 per MMBtu on December 22, 2022. Prior to the December 2022 event, amid rising gas price expectations for December, PSE's hedging program locked in physical gas supply in an effort to reduce spot market exposure. PSE entered December with 95,000 MMBtu/day of physical gas supply at a fixed price of $17.47 per MMBtu at Sumas.

During this same period of extremely high Sumas gas prices, because of constrained capacity along upstream pipelines, the average daily AECO gas price

was relatively muted at $5.31 per MMBtu with a peak of $5.64 per MMBtu, while the average daily Station 2 gas price was $5.01 per MMBtu with a peak of $5.55 per MMBtu. PSE utilized its contracted pipeline capacity to purchase physical gas supply in the daily spot markets from the low-priced upstream Canadian hubs. During the nine-day December 2022 market event, PSE purchased an average of 9,478 MMBtu/day at $4.45 per MMBtu from AECO and 10,030 MMBtu/day at $5.33 per MMBtu from Station 2, saving an average of more than $25 per MMBtu relative to the available Sumas spot market.

PSE also selectively withdrew gas from its Jackson Prairie storage facility for use at its gas-fired generation facilities. During the nine-day market event, PSE withdrew[10] an average of 22,022 MMBtu/day. Over the same nine-day period in the previous two years, PSE had averaged 6,850 MMBtu/day of net injections. This change reflected concerns about constrained gas supply in the market and was done to ensure gas could be supplied to PSE's gas-fired generation fleet in the most economical manner.

PSE exercised all options to fuel its gas-fired generation fleet during the December 2022 event, including purchasing 9,404 gallons of distillate fuel at an average price of $3.52/gallon or $25.41/MMBtu when it became more economic than natural gas.

New winter peak capacity contracts (the Powerex Winter Peak PPAs) also provided needed capacity [redacted] during the December 2022 event and

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[10] Withdrawal net of any injections taking place during the same period.

throughout the rest of the month. These contracts delivered [redacted] MW of reliable supply [redacted], providing a net reduction to December 2022 power costs of approximately [redacted].

V. CONCLUSION

Q. Were PSE's power costs during the 2022 PCA Period prudently incurred?

A. Yes, PSE's power costs for the 2022 PCA Period were prudently incurred. PSE's management of its power costs during the 2022 PCA Period was reasonable. PSE has structures and processes in place to formulate strategies for managing power costs and executed those strategies, taking into account information and variables associated with managing a complex resource portfolio within a dynamic market environment. PSE applied these structures and processes in managing its power costs prior to, and during 2022, resulting in significant power cost savings for the company and its customers. The deferral balance set forth in PSE's 2022 PCA Period report is calculated in accordance with the amended PCA settlement and the Commission's orders in Docket UE-011570.

Q. Does that conclude your testimony?

A. Yes, it does.

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