EXH. PKW-42C
DOCKETS UE-190529/UG-190530
UE-190274/UG-190275
2019 PSE GENERAL RATE CASE
WITNESS: PAUL K. WETHERBEE

BEFORE THE
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION, **Complainant,** **v.** **PUGET SOUND ENERGY,** **Respondent.**	**Docket UE-190529** **Docket UG-190530 (*Consolidated*)**
In the Matter of the Petition of **PUGET SOUND ENERGY** **For an Order Authorizing Deferral Accounting and Ratemaking Treatment for Short-life IT/Technology Investment**	**Docket UE-190274** **Docket UG-190275 (*Consolidated*)**

EIGHTH EXHIBIT (CONFIDENTIAL) TO THE PREFILED REBUTTAL TESTIMONY OF

PAUL K. WETHERBEE

ON BEHALF OF PUGET SOUND ENERGY

REDACTED VERSION

JANUARY 15, 2020

REDACTED
VERSION

PUGET SOUND ENERGY

To: Paul Wetherbee

From: [redacted]

CC: [redacted]

Date: October 28, 2019

Re: Short-term RFP for Colstrip 1&2 Resource Adequacy Replacement

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Background and Need Determination

Talen Energy LLC announced on June 11th that Colstrip 1&2 will shut down at the end of 2019. At the time of the announcement, PSE had begun the process of identifying alternatives that would add winter capacity to address uncertainty with ongoing Colstrip operations.

The early shutdown of Colstrip 1&2 created a resource adequacy need over the next three winters, November 2019 through December 2021. The forecast resource adequacy need is based on the methodology in the Integrated Resource Plan (IRP) and is shown in Figure 1 and Table 1 below. Firm delivered energy, firm capacity, or a combination of the two, are eligible to meet PSE's need. PSE's 2018 All Resources Request for Proposals (RFP) was conducted to replace Colstrip 1&2 capacity by the previous retirement date of 2022. The Short-term RFP was designed as a bridge solution until the resources acquired through the All Resources RFP reach commercial operations. The need is covered by energy delivered during peak hours 6am to 10pm seven days per week, including Sundays and NERC holidays in the months indicated in Figure 1.

Figure 1. PSE Reliability Need for 2019-2021 Winters

Table 1. Resource Adequacy Table (MW)

Note: Red "adjusted need" numbers represent deficit resource adequacy positions

Identification of Alternatives

PSE considered the following alternatives to mitigate the capacity deficit resulting from the Colstrip 1&2 early shutdown.

Generation Solutions

1. Acceleration of the development of new generation that is selected in the All Resources RFP
2. Pursuit of commercial arrangements to keep Colstrip 1&2 online

Market Solutions

1. Redirect BPA transmission previously used for Colstrip 1&2 from Montana to Mid C or to a specific generator
2. Purchase energy supply delivered to PSE's system
3. Purchase energy supply in Montana utilizing BPA transmission previously used for Colstrip 1&2 and delivered from Montana to PSE's system

The generation solutions were determined to not be feasible. Due diligence and planning for projects identified in the All Resources RFP takes considerable time, so building resources in the time period covered by the Short-term RFP was not possible. A scenario of extending Colstrip 1&2 operations was considered to be fraught with operational risks and not consistent with PSE and Washington environmental goals.

All three market solutions were pursued contemporaneously through the Short-term RFP along with associated transmission analysis to assess the feasibility of BPA transmission redirects. BPA analysis showed that 100 MW of the 300 MW of BPA transmission associated with the Colstrip 1&2 generation was feasible to redirect to Mid C from the Colstrip path. PSE requested this transmission redirect on June 17, 2019 and was granted the transmission redirect on July 30, 2019.

RFP Details

Commercial development staff created a comprehensive list of 27 Pacific Northwest market participants to receive the RFP. The list included public utility districts (PUDs), marketers, banks, investor owned

utilities, and project developers. The distribution list was developed through research and input from PSE trading staff and members of the All Resources RFP team.

PSE issued the RFP on May 24, 2019 and requested proposals by June 17 (See Figure 2 for the RFP timeline and Appendix A for the RFP and responses). Nine proposals were received representing 1,000 MW of supply. However, the majority of proposals did not closely fit PSE's need because they used delivery points that did not fit well with PSE's available transmission, or delivery months that did not fit well with PSE's resource adequacy position.

Figure 2. Timeline of RFP activities

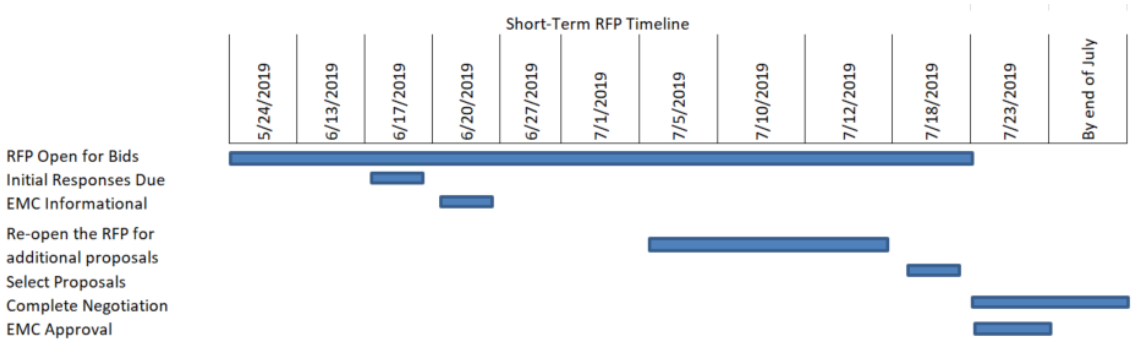


Table 2: RFP Proposal Summary

[redacted]

After the June 17th deadline, PSE received additional interest from two counterparties who had missed the deadline. PSE extended the RFP two weeks for all counterparties and emphasized the preference for a set of delivery points that fit well with PSE's available transmission capacity. PSE received two additional proposals and updates to proposals that had been submitted by the initial deadline.

PSE's resource adequacy need required a customized solution in terms of delivery months, contract volumes, and delivery points. Standardized power products transacted in the Pacific Northwest power market are transacted for the same volume over consecutive months typically representing a quarter or a calendar year and delivered at the Mid C trading hub. Based on RFP responses and follow up counterparty discussions, three counterparties demonstrated interest and capability to provide PSE with customized delivery months, volumes and delivery points that closely matched PSE's resource adequacy need.

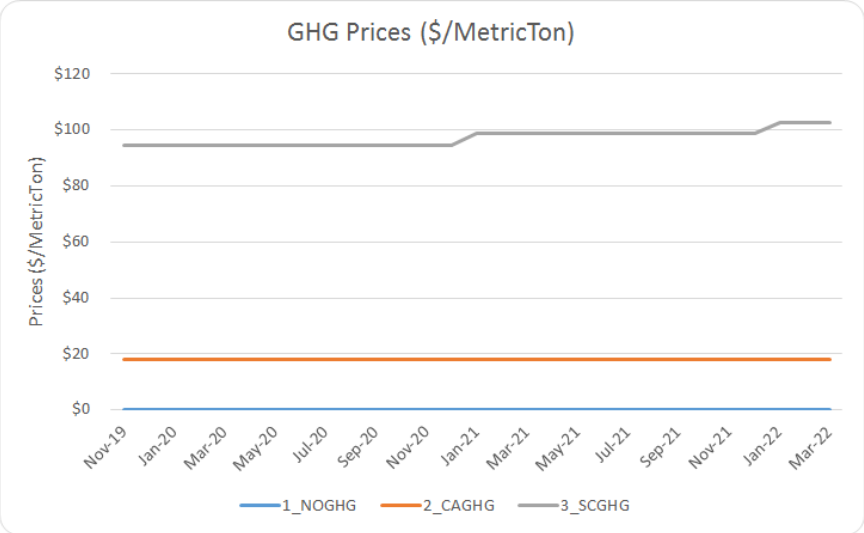
Analysis

PSE analysts prepared a model to identify the least cost combination of proposals to meet PSE's need. The goal of the valuation was to identify a least cost solution from among the counterparties' bids, subject to volume limits, seasonal volume constraints, and transmission constraints. The mathematical formulation is presented in Appendix B. The optimal solution could potentially be a combination of proposals from different counterparties. Sensitivity to greenhouse gas (GHG) costs was tested using three different carbon prices in the valuations:

1. Zero Carbon Price: $0 GHG price (1_NOGHG)
2. California Cap and Trade Program GHG Scenario: Current California GHG prices (2_CAGHG)
3. Social Cost GHG Scenario: GHG prices (3_SCGHG).

GHG prices were obtained from market prices for California Carbon Allowances (CCAs) and from a table of Social Cost of Carbon values provided by the IRP team. GHG prices are illustrated in Figure 3.

Figure 3. GHG Pricing Scenarios (change to social cost)



Contract and emissions cost are summarized in Table 3. Net contract cost is the cost paid to the counterparties minus market resales revenue in the hours the contract volume exceeds the need. Net

emission cost is the total emission compliance cost minus the emission compliance cost associated with the market resales volume.

Table 3. Contract and Emission Cost Summary ($)

Case	Net Contract Cost	Net Emission Cost	Total	Preferred Proposals
1 No GHG Cost	[redacted]	[redacted]	[redacted]	[redacted]
2 Current CA GHG Cost	[redacted]	[redacted]	[redacted]	[redacted]
3 Social Cost of Carbon	[redacted]	[redacted]	[redacted]	[redacted]

The optimization results were as follows:

- In the no GHG cost scenario, [redacted] and [redacted] proposals were selected at a net contract cost of $[redacted]
- In the California GHG cost scenario, selection was *identical to* that from the no GHG cost scenario selection at a net contract cost of $[redacted] The net emission cost in this case is $[redacted] This scenario signifies that a GHG compliance cost of $18/metric ton such as California's current rate is not high enough to change the merit order of the bids.
- In the social cost of carbon scenario, [redacted] and [redacted] bids were selected at a net contract cost of $[redacted] The net emission cost is $[redacted] This scenario shows that a very high GHG compliance cost ($95-100/metric ton) would make [redacted] thermal resources, which have an emissions rate of 0.42 metric ton/MWh, less attractive than [redacted] clean resources.

The least cost combination of new resources based on analysis of no GHG cost and California GHG cost cases is Morgan Stanley and Avangrid. The Morgan Stanley deal provides 100-300 MW of energy during peak winter months and Avangrid provides [redacted]. Deal volumes relative to need are shown below in Figure 4. Both deals are incremental to resource adequacy capacity because they do not encumber existing Mid C transmission capacity that is being counted towards resource adequacy. The Energy Management Committee (EMC) recommendation excluded [redacted] because of the higher costs associated with the seasonal constraints that the [redacted] proposal applied and the premium associated with the environmental attributes. The [redacted] proposal required PSE to purchase the same volume for all winter months November-March, resulting in [redacted] of additional volume not required for resource adequacy.

Figure 4. Resource adequacy need relative to counterparty proposals

Conclusion

On July 23, 2019 PSE's EMC approved the recommendation to execute the least cost combination of supply proposals from Avangrid and Morgan Stanley, representing the no carbon cost and California carbon cost scenarios. This combination of proposals meets PSE's resource adequacy need and provides expected carbon reductions relative to Colstrip capacity. The cost for the recommended solution is $ below the cost of a lower-carbon supply combination that includes (Table 4). PSE executed both transactions under existing WSPP contracts.

Table 4. Summary comparison of proposal combinations

Note: Table 3 and Table 4 show different figures for incremental cost between the and the combination because of different methodologies. Table 3 represents results from the optimization model and Table 4 is a simple comparison between proposals and market prices.

PSE will begin to submit a Clean Energy Implementation Plan for four year periods that begin in 2022. The Short-term RFP addressed resource adequacy prior to the first four year interim compliance period.

Washington's Clean Energy Transformation Act (CETA) provides guidance for utilities to use the social cost of carbon when evaluating and selecting intermediate and long-term resource options. However, "intermediate" has not been defined and will likely be addressed in workshops that occur before 2022. PSE staff recommended that the EMC approve the preferred proposal under both the zero carbon cost and California carbon case for the following three reasons:

1. The combination of Morgan Stanley and Avangrid represents the least cost alternative for customers,

2. Resource adequacy need addressed by Short-term RFP does not fall into the first four year interim CETA compliance period, and

3. Guidance has not been received for what constitutes an intermediate and long-term resource option that should consider the social cost of carbon.

Appendix A: RFP and Responses

Request for Proposal

Puget Sound Energy

Request for Proposals

Buyer: Puget Sound Energy, Inc. (PSE)

Puget Sound Energy is seeking to purchase up to 300 MW of firm energy delivered to the points listed below. PSE will consider any and all sources of generation and any and all product structures within the term requested, however, zero carbon, specified resource proposals are encouraged.

Term:

- Product 1: November 1, 2019- December 31, 2022 winter-only (November-March) 7x16 (HE 7-22 Sunday-Saturday including holidays)
- Product 2: November 1, 2019- December 31, 2022 year-round HE 1-24
- PSE will also review multi-month or quarterly proposals that are within the term of November 1, 2019 – December 31, 2022 but do not fit into the definitions of "Product 1" and "Product 2"

Quantity: Up to 300 MW

Energy: Firm Energy

Price: Either Fixed Price or ICE Daily MidC Index

POD: BPAT. PSEI, BC.US.BORDER, BPAT.NWMT, MIDC, SNOH.PUD, SCL.SYSTEM, & TPWR.STAR. PSE will also consider other proposed delivery points.

Proposal Timeline:

Bids must be submitted to Puget Sound Energy no later than 10:00 a.m. PST on June 17, 2019.

Puget Sound Energy will, by or prior to EOD on June 27, 2019, notify each bidder whether PSE has selected such counterparty's proposal.

Disclaimer: PSE reserves the right to accept any offer(s) or to reject any and all offers and to re-solicit for additional offers at its sole discretion.

Contact: Please direct any questions and submit proposals to

[redacted]

Email: [redacted]

Phone: [redacted]

[redacted]

Email: [redacted]

Phone: [redacted]

Request For Proposal Extension

Due to additional counterparty interest in PSE's short-term RFP, PSE is reopening the RFP for a period of one week. Interested parties should submit proposals to Puget Sound Energy no later than 2:00 p.m. PST on July 12, 2019.

PSE's preferred product is described as "product 1" in the original RFP and listed below, and PSE's preferred delivery points are the following points BPAT. PSEI, BC.US.BORDER, BPAT.NWMT, SNOH.PUD, SCL.SYSTEM, TPWR.STAR, or any other points interconnected to PSE's system.

Product 1: November 1, 2019- December 31, 2022 winter-only (November-March) 7x16 (HE 7-22 Sunday-Saturday including holidays)

Disclaimer: PSE reserves the right to reject any and all offers and to re-solicit for additional offers at its sole discretion.

Timeline: Puget Sound Energy will, by or prior to EOD on July 16, 2019, notify each bidder whether PSE has selected their proposal for additional consideration and discuss a mutually agreeable plan for execution of a definitive contract.

Contact: Please direct any questions and submit proposals to

[redacted]

Email: [redacted]

Phone: (425) 457-9015

[redacted]

Email: [redacted]

Phone: [redacted]

RFP Responses

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

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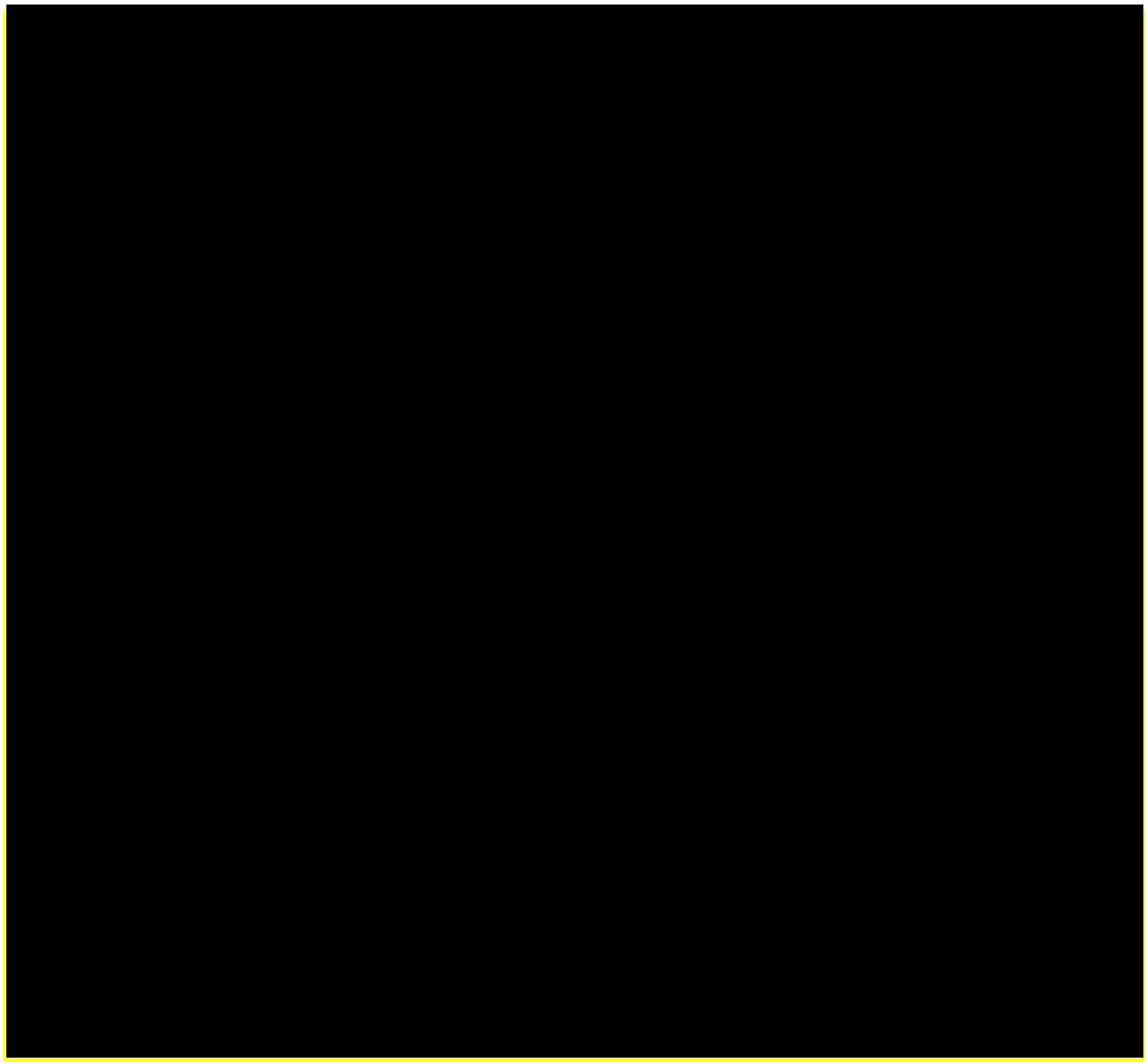

[redacted] *(received in 2nd round)*

[redacted]

[redacted]

[redacted] *(received in 2nd round)*

[redacted]

Appendix B: Mathematical Optimization Formulation

Mathematical Optimization Formulation

$$\min \sum_{i=1}^{ndeals} \sum_{j=1}^{nmonths} sign_{i,j} \times nhours_j \times price_{i,j} \times d_{i,j} + sign_{i,j} \times nhours_j \times price\_ghg_{i,j} \times ed_{i,j} - sign_{i,j} \times nhours_j \times price\_ghg_{i,j} \times ew_{i,j}$$

Subject to:

1) ***Need constraint***:

$$\sum_{i=1}^{ndeals} sign_{i,j} \times d_{i,j} = PSE_{Need\ j}$$

2) ***25MW block constraint***:

$$d_{i,j} = 25 \times k_{i,j}$$

3) ***Intertemporal constraint***:

$$d_{i^*,j} = d_{i^*,l}$$

4) ***Limit constraints***:

$$u_{i,j} \times d_{i,j}^{min} \leq d_{i,j} \leq u_{i,j} \times d_{i,j}^{max}$$

5) ***Wheel constraints***:

$$w_{i,j} \leq d_{i,j}\ and \sum_{\substack{i=1 \\ i \neq market\ sales}}^{ndeals} w_{i,j} = d_{market\ sales,j}$$

6) ***Emission constraints***:

$$ed_{i,j} = ghg\_rate_{i,j} \times d_{i,j}$$

7) ***Emission wheel constraints***:

$$ew_{i,j} = ghg\_rate_{i,j} \times w_{i,j}$$

Where:

$i = 1..ndeals, ndeals\ is\ total\ of\ deals\ including\ market\ sales$
$i^*is\ index\ of\ a\ subset\ of\ deals\ with\ linking\ constraints$
$j, l = 1..nmonths\ and\ j \neq l, nmonths\ is\ total\ of\ months$
$sign_{i,j} = -1\ for\ MarketSales, 1\ otherwise$
$nhours_j\ is\ number\ of\ peak\ hours\ in\ month\ j$
$price_{i,j}$ is deal price ($\$/MWh$)

$price\_ghg_{i,j}$ is greenhouse gas price ($\$/MWh$)
$d_{i,j}$ *is dispatch variable for deal i in month j* (MW)
$k_{i,j}$ *is integer number of* $25MW$ *block to be solved* $(0, 1, 2, \dots)$
$u_{i,j}$ *is the deal decision variable*$(0\ or\ 1)$
$w_{i,j}$ *is wheel variable for deal i in month j* (MW)
$ed_{i,j}$ *is emission variable due to* $d_{i,j}$ *dispatch for deal i in month j* $(MetricTon/h)$
$ew_{i,j}$ *is emission variable due to* $w_{i,j}$ *wheel for deal i in month j* $(MetricTon/h)$