

**EXH. PKW-13  
DOCKETS UE-22 \_\_\_/UG-22 \_\_\_  
2022 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-22 \_\_\_  
Docket UG-22 \_\_\_**

**TWELFTH EXHIBIT (NONCONFIDENTIAL) TO THE  
PREFILED DIRECT TESTIMONY OF**

**PAUL K. WETHERBEE**

**ON BEHALF OF PUGET SOUND ENERGY**

**JANUARY 31, 2022**



# Review of Puget Sound Energy's EIM Accounting Methodology

December 16, 2021

## **Overview**

Puget Sound Energy (PSE) engaged Energy & Environmental Economics, Inc. (E3) to review PSE's proposed methodology to account for the impact of PSE's participation in the Western Energy Imbalance Market (EIM) on PSE's expected power costs for the utility's power rate case.

E3's team has significant expertise modeling the economic impact of the EIM for utilities throughout the Western U.S. and has completed studies for over 15 entities between 2013-2021 to forecast the prospective benefits those entities may expect to gain from choosing to become an EIM participant. E3 has implemented and customized cases on a range of production simulation platforms to model EIM impact, including as part of the initial formation of the EIM between CAISO and PacifiCorp, as well as for other entities in the Pacific Northwest, including Portland General Electric, Seattle City Light, Idaho Power, and Bonneville Power Administration. Our experience has given us useful insight into the complexities of reflecting EIM dynamics in a modeling context. From this experience, we recognize that there is no single perfect approach to modeling the EIM for all regions and applications, and we focus on identifying the best techniques that reflect the underlying framework of the EIM while also capturing individual differences for particular participants that could most impact their resulting benefits from the EIM.

## **Summary of Review**

E3's staff thoroughly reviewed the materials developed by PSE for the five Energy Imbalance Collaborative Workshops, which were held with stakeholders over June to September 2021. E3 also had three detailed phone and web-based discussions with PSE's power cost analytics team to ask questions and clarify understanding of PSE's approach, inputs, and results.

From this review, PSE's proposed accounting methodology appears to be a fundamentally sound approach for modeling the economic impact of the EIM for this rate case. The results of PSE's calculations, which

were used to demonstrate this approach, produced \$13.5 million in EIM benefit for the study year,<sup>1</sup> which is generally consistent with the \$13.3 million average annual EIM benefits that CAISO has estimated for PSE over 2017-2020.<sup>2</sup>

The PSE approach is based on fundamental simulation modeling in the AURORA software platform of loads and generation balancing for PSE on an hourly and sub-hourly basis, which allows for a detailed exploration of EIM purchases (imports) and sales (exports) expected to occur in the sub-hourly time frame.

### **Summary of Approach**

As E3 understands, PSE's approach first models PSE transactions with an external market on an hourly basis to reflect the pre-EIM bilateral day-ahead or hour-ahead market transactions that PSE would include in its base schedule before the EIM time stage. Market prices at which PSE can transact are based on an hourly WECC-wide production simulation run. PSE then models a sub-hourly time stage. In a "no market" case, the model requires PSE to balance its own sub-hourly load and wind variation with internal dispatchable generation. In the "EIM participation" sub-hourly case, PSE is also able to purchase or sell up to 900 MW from the market in any sub-hourly interval.<sup>3</sup>

PSE compares the resulting system net costs (dispatch costs plus the cost of market purchases less the revenue from market sales) in the EIM participation case against the sub-hourly no-market case as well as against the hourly portfolio cost model for the study year.<sup>4</sup> It is useful to note that the sub-hourly no-market case shows an increase to PSE's net cost compared to the hourly case. This is consistent with E3's experience in modeling EIM benefits in other areas, and it is likely the result of sub-hourly variation in PSE's load and wind resulting in balancing challenges that require PSE to dispatch its generator portfolio in a less efficient manner with short notice and without the opportunity to make incremental market purchases or sales to address these intra-hour net load changes. In the EIM case, by contrast, PSE's costs are lower than the sub-hourly no market case because the EIM market access allows for an additional source of flexibility from the market to supplement PSE's ability to move its own generation. Moreover, PSE's net costs in the EIM case are lower than those of the hourly model. This likely reflects the incremental opportunity of PSE to make purchases from the EIM when EIM prices are low, or to sell to the EIM when PSE has additional generation available and EIM prices are elevated due to the sub-hourly needs of other participants. This opportunity for incremental sub-hourly sales and purchases reflected in PSE's approach is also consistent with the general opportunities E3 has identified in a range of other jurisdictions.

### **Drivers of EIM impact**

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<sup>1</sup> PSE, EIM Collaborative Workshop #3, p. 17.

<sup>2</sup> PSE, EIM Collaborative Workshop #2, p. 15.

<sup>3</sup> Based on description in PSE, EIM Collaborative Workshop #3, p. 6-7.

<sup>4</sup> Based on calculations in table from PSE, EIM Collaborative Workshop #3, p. 17.

The magnitude of potential benefits from these opportunities for purchases and sales is determined by a combination of generator flexibility, transmission access, and market price volatility. For this work, PSE has modeled 900 MW<sup>5</sup> of EIM transmission access for sub-hourly purchases or sales, which is consistent with the upper range of actual PSE EIM transfers and also may reflect incremental transaction levels when additional Northwest entities planning to become EIM participants are active.

PSE has reported the general volatility of sub-hourly prices reflected in the market model on a monthly basis; this volatility is generally larger than the hourly variation. E3 confirms these results are generally consistent with EIM actual operations, in which sub-hourly EIM prices typically exhibit similar average levels but more volatility than hourly market prices. These results support the validity of PSE's results.

For this effort, PSE has used a linear interpolation of its hourly loads and wind resources to reflect output on a sub-hourly basis. This interpolation approach is useful for creating a straightforward sub-hourly dataset for modeling. Interpolation of load and wind may in some cases understate the impact that sub-hourly balancing – in the absence of the EIM – would have on generation costs, because it may not capture situations in which actual load is quite different than the hourly forecast, or when load during a portion of time within an hour deviates more widely from the general hour-to-hour trends, which may be more challenging for PSE to balance without the support of a sub-hourly EIM market. To the extent that these issues affect the modeling cases, they primarily would impact on the sub-hourly no market case, potentially leading to a larger cost variance between the sub-hourly EIM and no-market cases. These considerations, however, would not materially affect the cost difference in the EIM case compared to the hourly modeled case used for portfolio costing, because both the EIM case and the hourly model case have access to external markets for energy balancing. Therefore, these factors do not pose a problem for the application intended by PSE: accounting for the impact of EIM participation compared to what is already captured in PSE's existing portfolio cost estimates (based on hourly data).

### **Conclusion**

Based on E3's review of PSE's accounting for EIM impact on power costs, the proposed methodology appears to be a useful application of sub-hourly production modeling with sufficiently accurate inputs and assumptions to produce reasonable EIM impact estimates.

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<sup>5</sup> PSE, EIM Collaborative Workshop #3, p. 6.