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July 27, 2016

Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Re: Puget Sound Energy, Inc., Docket No. ER10-2374-____
Brea Generation LLC, Docket No. ER12-673-___
Brea Power II LLC, Docket No. ER12-672-___

Supplement to Notice of Non-Material Change in Status

Dear Secretary Bose:

Puget Sound Energy, Inc. ("PSE"), Brea Generation LLC ("Brea Generation"), and Brea Power II LLC ("Brea II" and, together with PSE and Brea Generation, "Sellers") hereby submit for filing this supplement to the notice of change in status filed on March 9, 2016 in the above-referenced proceedings.[1] Sellers submitted the March 9 Notice to apprise the Federal Energy Regulatory Commission ("FERC" or "Commission") of a non-material change in the facts and circumstances previously relied upon by the Commission in authorizing Sellers to make sales at market-based rates. Specifically, PSE will join the California Independent System Operator Corporation ("CAISO") Energy Imbalance Market ("EIM") as a participating balancing authority area ("BAA") on October 1, 2016. The Commission has indicated that the EIM constitutes "a new relevant geographic market for market power purposes,"[2] and that commencing

[1] Puget Sound Energy, Inc., *et al.*, Notice of Non-Material Change in Status, Docket Nos. ER10-2374-010, *et al.* (filed March 9, 2016) ("March 9 Notice").

[2] *PacifiCorp*, 147 FERC ¶ 61,227, at P 206 ("PacifiCorp EIM Order"), *reh'g denied*, 149 FERC ¶ 61,057 (2014), *reh'g denied*, 150 FERC ¶ 61,084 (2015).

participation therein represents a change from the facts and circumstances the Commission relied upon in granting a seller market-based rate ("MBR") authority.

Commission Staff has requested additional information concerning PSE's transmission interconnection to the EIM and whether the characteristics of such interconnection create the possibility that the PSE BAA is a submarket within the broader EIM. The March 9 Notice concluded that PSE lacks market power within the geographic market defined by the six-BAA EIM market (the "EIM Footprint"). The ensuing discussion in this filing letter and the attached documentation, including a supplemental market analysis conducted by Lloyd Reed of Reed Consulting, confirms that the PSE BAA is not a submarket within the EIM Footprint. Specifically, this supplemental filing will demonstrate that: (i) based on the accuracy of historical hour-ahead load and variable generation forecasts within the PSE BAA, the demand for in-hour imbalance energy in the PSE BAA is likely to average 43.2MW, and be 108.5 MW or less during 95% of all 15-minute scheduling intervals; (ii) PSE has committed bi-directional firm transmission capacity across the Bonneville Power Administration ("BPA") transmission system exclusively for EIM transfers; (iii) PSE's EIM-dedicated transmission reservation is capable of transferring 300 MW of EIM energy from the PacifiCorp West ("PACW") BAA to the PSE BAA; and (iv) the relevant paths and flowgates on the PACW, BPA, and PSE systems have experienced little or no congestion, indicating that 300 MW of external, non-PSE generation would be available to compete with PSE-owned generation for the limited quantity of imbalance energy demand within the PSE BAA.

Accordingly, there is no PSE BAA submarket within the EIM in which Sellers could exercise market power and for which a separate market power analysis of generation owned or controlled by Sellers would be appropriate or necessary. Even in the unlikely event that a non-competitive constraint were to occur on PSE's transmission reservation across the BPA system, CAISO's local market power mitigation measures were recently extended, effective October 1, 2016, to apply to all BAA interties within the EIM footprint every 15 minutes. CAISO filed additional proposed tariff changes last month that would apply monitoring and mitigation of EIM internal interties every five minutes, effective January 30, 2017. Therefore, supply offers from generation owned or controlled by Sellers will be appropriately mitigated by the CAISO Department of Market Monitoring ("DMM") to a cost- or market-based default energy bid ("DEB") under applicable provisions of the CAISO Open Access Transmission Tariff ("CAISO Tariff") when a binding constraint results in a non-competitive supply offer within the PSE BAA. For these reasons, Sellers maintain that the March 9 Notice, as supplemented by the instant filing, demonstrates that PSE's participation in the EIM constitutes a non-material change-in-status.

I. BACKGROUND

Historically, the Commission has indicated that the relevant geographic market for sellers of energy at market-based rates is the BAA or submarket, as applicable, where

the seller's generation is physically located.[3] The Commission has offered guidance on the market power analysis required for new EIM entrants in a series of orders,[4] and instructed EIM participants to define the "relevant geographic market to be the combined geographic footprint" of the BAAs constituting the EIM.[5] In evaluating market power studies submitted by new EIM participants Nevada Power Company and Sierra Pacific Power Company (together, "NV Energy") and PacifiCorp (together with NV Energy, the "Berkshire EIM Sellers"), the Commission additionally noted that the potential existence of constraints between CAISO and the NV Energy BAA or the PACW and PacifiCorp East BAAs "causes us to question whether submarkets exist in the NV Energy and PacifiCorp-East balancing authority areas."[6] The Commission had previously directed the Berkshire EIM Sellers to consider "whether the existence of frequently binding transmission constraints into PacifiCorp-East that limit the transfer capability into that BAA create a separate relevant geographic submarket which must also be studied."[7] In May of this year, FERC further clarified that future market power analyses of the EIM "must also consider scheduling limit constraints and whether there are submarkets; to the extent submarkets exist within the EIM footprint, Berkshire EIM Sellers would need to demonstrate that they do not have, or mitigation sufficiently addresses, their market power in the EIM, including any submarkets within the EIM."[8]

Sellers submitted the March 9 Notice to satisfy Commission directives to prospective participants in the EIM with MBR authorization. As a transmission owner and operator, PSE administers its own BAA, and also has MBR authority to make sales

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[3] *See Market-Based Rates for Wholesale Sales of Electric Energy, Capacity and Ancillary Services by Public Utilities*, Order No. 697, FERC Stats. & Regs. ¶ 31,252, at P 232, *clarified*, 121 FERC ¶ 61,260 (2007), *order on reh'g*, Order No. 697-A, FERC Stats. & Regs. ¶ 31,268, *clarified*, 124 FERC ¶ 61,055, *order on reh'g*, Order No. 697-B, FERC Stats. & Regs. ¶ 31,285 (2008), *order on reh'g*, Order No. 697-C, FERC Stats. & Regs. ¶ 31,291 (2009), *order on reh'g*, Order No. 697- D, FERC Stats. & Regs. ¶ 31,305 (2010), *aff'd sub nom. Mont. Consumer Counsel v. FERC*, 659 F.3d 910 (9th Cir. 2011), *cert. denied*, 133 S. Ct. 26 (2012); *see also AEP Power Mktg., Inc.*, 107 FERC ¶ 61,018, at P 41, *order on reh'g*, 108 FERC ¶ 61,026, at P 31 (2004).

[4] *See Cal. Indep. Sys. Operator Corp*., 147 FERC ¶ 61,231, *order on reh'g*, 149 FERC ¶ 61,058 (2014); PacifiCorp EIM Order, 147 FERC ¶ 61,227.

[5] *Nev. Power Co*., 151 FERC ¶ 61,131, at P 202 (2015) ("NV Energy EIM Order").

[6] *Nev. Power Co., et al.*, 153 FERC ¶ 61,206, at P 23 (2015).

[7] NV Energy EIM Order, 151 FERC ¶ 61,131 at P 201, n.384.

[8] *Nev. Power Co., et al.*, 155 FERC ¶ 61,186, at P 21 (2016). In that order, the Commission indicated that the Berkshire EIM Sellers should submit additional information on constraints over interties to alleviate the Commission's concerns about the potential for submarkets in their BAAs. ("Although none of the parties present evidence in this proceeding to demonstrate how often the interties between the CAISO and NV Energy balancing authority areas are constrained, or how often the interties between the PacifiCorp-West and PacifiCorp-East balancing authority areas are constrained, the existence of such constraints causes us to question whether submarkets exist in the NV Energy and PacifiCorp-East balancing authority areas."). *Id.* P 23.

of energy within and outside its BAA. As described in the March 9 Notice, PSE lacks direct transmission interconnections with the PACW BAA, or any other current EIM BAA, and will initially utilize transmission service across the BPA system to facilitate transfers of imbalance energy into and out of the PSE BAA once PSE enters the EIM.[9] With the March 9 Notice, Sellers provided a Generation Market Power Analysis performed by Mr. Reed ("March 9 Analysis") which demonstrates that Sellers and their affiliates pass the Commission's indicative pivotal supplier and market share screens when the EIM Footprint as a whole is evaluated as the relevant geographic market for purposes of assessing horizontal market power. The March 9 Analysis shows that Sellers' uncommitted capacity in the EIM Footprint is considerably less than the net uncommitted supply in the EIM Footprint, and that Sellers own or control no more than 0.47% of the uncommitted capacity within the EIM Footprint during any of the four seasons.[10] Sellers additionally note that, within the PSE BAA, imbalance energy will be almost entirely consumed by PSE load, which constitutes 95% of BAA load during peak conditions,[11] significantly reducing any incentive Sellers might have to manipulate locational prices within the PSE BAA. With production revenues associated with sales into the EIM from PSE generation credited to retail rates, PSE's incentive to manipulate locational prices, even if it had the ability to do so, is further diminished.[12]

The March 9 Analysis additionally states that in order to effectuate transfers of energy between the PSE BAA and the rest of the EIM Footprint, PSE has dedicated 300 MW of long-term firm transmission rights that it has on the BPA transmission system to effectively interconnect the PSE BAA with the PACW BAA. PSE's transmission rights on the BPA system are bi-directional and will allow PSE to both deliver power to and receive power from the EIM.[13]

Since the submission of the March 9 Notice, Commission staff has requested additional information to determine whether the PSE BAA constitutes a submarket within the EIM Footprint. Specifically, the Commission has requested that PSE supplement the March 9 Notice by providing additional information about the transmission path between PSE and PACW so as to assess whether the PACW-PSE intertie across the BPA system creates a likelihood that the PSE BAA will be an EIM submarket.

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[9] March 9 Notice at 2.

[10] March 9 Notice at 18.

[11] Peak historical load in the PSE BAA, recorded during December 2008, was 5,165 MW, of which 4,901 MW is PSE native load.

[12] The Commission has recognized that a requirement to credit retail customers with profits from wholesale sales reduces the incentive for a market participant to exercise market power. *See, e.g., Nev. Power Co.*, 149 FERC ¶ 61,079, at PP 33-34 (2014) ("The requirement to credit retail customers with profits from wholesale sales reduces the incentive to exercise market power because the seller will not receive any benefit from the additional revenue received from manipulating market prices.").

[13] March 9 Notice at Attachment B, p. 9.

II. SUPPLEMENTAL NOTICE OF NON-MATERIAL CHANGE IN STATUS

A. The Demand for Imbalance Energy in the PSE BAA Will be Significantly Less Than 300 MW

To assess whether PSE's interconnection with the EIM across the BPA transmission system is appropriately sized and sufficiently free of congestion so as to preclude the existence of a PSE BAA submarket, it is first essential to quantify the anticipated demand for imbalance energy within the PSE BAA. The attached CAISO Energy Imbalance Market Size Analysis ("Supplemental Analysis") prepared by Mr. Reed and attached hereto as Attachment A, achieves this objective by utilizing two different study methodologies.

Each methodology employed by Mr. Reed, as described below, quantifies the size of the market for in-hour imbalance energy by comparing forecasts of hourly load and/or generation to actual metered values. This overall approach is reasonable to quantify the size of the EIM market because BAAs participating in the EIM must submit a balanced resource plan no later than 40 minutes prior to the operating hour based on the best available forecast of load, generation, and interchange during the ensuing operating hour.[14] Any deviations from the forecasted values comprising the resource plan during the operating hour can result in in-hour imbalances (unless, for example, the deviation in forecasted load is offset by a corresponding deviation in forecasted variable generation). In-hour imbalances within a participating BAA are in turn resolved by CAISO's economic dispatch model, which could result in the dispatch of an EIM participating resource within the BAA where the imbalance occurs, or from a generating resource in a different EIM BAA, in which case an EIM transfer would be utilized to bring imbalance energy into the unbalanced BAA. The need for the market to respond to in-hour deviations within a BAA from a balanced, hour-ahead resource plan thus approximates EIM demand within the BAA, and establishes a framework for evaluating whether sufficient transmission capacity is available to supply that demand with third-party generation from outside the BAA, or whether the BAA should be evaluated as a submarket within the EIM Footprint.

1. Utilizing Data Specific to the PSE BAA, Mr. Reed's Study 1 Indicates the Demand for Imbalance Energy in the PSE BAA Will Average 43.2 MW

In Study 1, Mr. Reed compared hour-ahead load and variable generation forecasts for the PSE BAA to actual 15-minute metered values during the December 2013 to November 2014 period of the March 9 Analysis. After taking into account any offsetting deviations between load and variable generation, a BAA-wide net deviation was established as an absolute value for each 15-minute scheduling interval during the year-long study period.[15] The use of 15-minute values allows for four different in-hour

[14] *See* CAISO Tariff, Section 29.34.

[15] Attachment A, Supplemental Analysis at p. 7.

measuring points during each hour, and also matches the frequency of CAISO's 15-minute EIM market runs.

The average BAA-wide deviation in the PSE BAA during the study period was 43.2 MW using this methodology as shown in Table 3.6 of Mr. Reed's Supplemental Analysis.[16] This figure amounts to 1.4% of PSE's average on-peak hourly BAA load during the study period. This value falls somewhere in between the 0.99% average value determined by APS for the NV Energy and PacifiCorp region and the 2.61% determined for the CAISO BAA during July 2014, each of which is described below in the discussion of Study 2. PSE's BAA-wide deviations in Study 1 were 108.5 MW or less in 95% of all 15-minute scheduling intervals, and exceeded 300 MW in just eighteen 15-minute intervals out of 35,040 total intervals during the study period (0.05%).[17]

2. Applying Data Specific to the CAISO BAA and Other BAAs Participating in the EIM, Mr. Reed's Study 2 Predicts the Demand for Imbalance Energy in the PSE BAA Will Average Between 30.7 MW and 85.0 MW

As described in Mr. Reed's Supplemental Analysis, Study 2 quantified the size of the market for imbalance energy in the PSE BAA by comparing hourly base schedules for net load in the CAISO BAA submitted during the day-ahead timeframe to actual peak hour metered load for each operating day during July 2014.[18] The resulting average of 2.61%, when applied to PSE's July 2014 average weekday BAA peak load, suggests an average peak hour demand for imbalance energy of 80.5 MW, as shown in Table 4.1 of the Mr. Reed's Supplemental Analysis. When CAISO's average weekday peak hour information is utilized across the entire December 1, 2013 to November 30, 2014 study period, the seasonal average amount of peak hour energy imbalance ranged from a low of 2.00% in the Fall to 2.85% in the Spring as shown in Table 4.2. Applying these seasonal values to average PSE BAA peak hour weekday demand during the four seasons results in an annual average PSE BAA energy imbalance market size of 85.0 MW.[19]

Mr. Reed compared his Study 2 results to similar information prepared and submitted by APS in its April 8, 2016 market power filing in Docket No. ER10-2437-004. In APS's filing, a similar methodology – comparison of hourly resource plans to hourly net load – was applied to transactions in the PacifiCorp East, PACW, and NV Energy BAAs utilizing a five-month study period spanning 2015-2016. The resulting average hourly deviation across the three non-CAISO BAAs currently participating in the EIM was 0.99%. Using this value, Mr. Reed calculated PSE's average annual imbalance energy market size to be 30.7 MW.[20] Given that the characteristics of generation and

[16] *Id*. p. 14.

[17] *Id*. p. 15.

[18] *Id.* p. 17.

[19] *Id*. p. 19.

[20] *Id*. p. 20.

load in the PSE BAA are likely more similar to generation and load in the three non-CAISO BAAs than in CAISO, the 30.7 MW value is a more accurate representation of the size of the market for imbalance energy in the PSE BAA than the 80.5 MW calculated using CAISO data during the 2013-2014 study period.

Mr. Reed's Supplemental Analysis concludes, based on the expected size of the market and the existence of a firm 300 MW reservation to support imports of in-hour imbalance energy dispatched by the EIM, "that 1) sufficient transmission import capacity into the PSE BAA will be available to allow non-PSE affiliated generation to compete with PSE generation to meet the energy imbalance need within the PSE BAA, and 2) that the PSE BAA is not a separate sub-market within the combined 6-BAA EIM footprint."[21]

B. PSE's 300 MW of Firm Transmission Capacity Rights Across BPA Will Ensure a Competitive External Supply of Generation is Available to Serve EIM Demand in the PSE BAA

Mr. Reed's Supplemental Analysis described above demonstrates that the demand for imbalance energy within the PSE BAA is likely to average 43.2 MW and remain less than 108.5 MW during 95% of 15-minute scheduling intervals. The ensuing discussion demonstrates that PSE's 300 MW firm transmission across the BPA transmission system, which effectively interconnects the PSE BAA with the rest of the EIM Footprint through the PACW BAA, is sufficiently sized and free from congestion so as to ensure that a competitive supply of external, non-PSE generation from the EIM Footprint will be available from EIM import transfers to compete with PSE generation for the anticipated imbalance energy demand in the PSE BAA.

1. PSE's 300 MW Reservation from PACW Across BPA to the PSE Interface is Firm and Fully Committed for Use in the EIM

PSE's BAA currently lacks direct transmission interconnections with any other EIM entity's BAA. PSE can use donations of transmission rights from interchange rights holders and e-Tagged available transfer capability over its own transmission facilities to effectuate transfers into and out of its BAA in response to CAISO dispatch instructions. However, to access other BAAs in the EIM, PSE will require the use of intervening transmission facilities owned and operated by BPA to reach the PACW BAA, which is the nearest BAA to the PSE BAA that is currently participating in the EIM. As other BAAs join the EIM over time, PSE may gain additional transmission paths for accessing the market.[22]

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[21] *Id*. p. 23.

[22] *See* Puget Sound Energy, Inc., Amendments to the Puget Sound Energy, Inc. Open Access Transmission Tariff to Facilitate Entry into the Energy Imbalance Market, Docket No. ER16-923-000 (filed Feb. 10, 2016).

To effectuate EIM exports across the BPA transmission system to PACW, in November 2015 PSE submitted and BPA approved long-term firm requests on the BPA Open Access Same-Time Information System ("OASIS") to redirect 300 MW of capacity from an existing BPAT.PSEI to John Day reservation to multiple BPAT.PSEI to BPAT.PACW reservations. Simultaneously, to effectuate EIM imports from PACW into the PSE BAA across the BPA transmission system, PSE submitted and BPA approved long-term firm requests on the BPA OASIS to redirect 300 MW of capacity from existing Mid-C to BPAT.PSEI reservations to multiple BPAT.PACW to BPAT.PSEI reservations.[23] These redirect requests dependably provide 300 MW for EIM transfers between the PSE BAA and the PACW BAA in both directions, which is fully available in 15-minute and five-minute intervals.

PSE will use transmission on BPA's system in accordance with its rights under the BPA transmission tariff and business practices to make the 300 MW of capacity exclusively available for EIM transfers for at least the first year of PSE's participation in the EIM, from October 2016 to October 2017. After this period, PSE will evaluate whether 300 MW of firm capacity is the correct amount to consistently allow for economic dispatch between the PSE BAA and the remainder of the EIM Footprint, or whether the 300 MW of firm capacity could be reduced or supplemented with other transmission products. If so directed by the Commission, PSE would propose to make a subsequent change in status filing in the event it determines a significantly different amount of firm transmission capacity across the BPA transmission system should be committed to utilization for EIM transfers after the first year of market participation.

2. Binding Constraints Will Be Rare or Non-Existent On the BPAT.PACW to BPAT.PSEI Path, Ensuring That Inbound Transfers into the PSE BAA From the EIM Footprint Will not Be Impeded by Congestion

PSE has conducted an analysis of historic congestion on transmission paths to determine whether there are any instances of congestion on the PacifiCorp, BPA, and PSE transmission paths which comprise the 300 MW BPAT.PACW to BPAT.PSEI point-to-point reservation.[24] PSE has concluded as a result of its study that congestion is not likely to impede inbound EIM transfers into the PSE BAA, such that the full 300 MW will be available in virtually all 15- and five-minute market intervals, and any rare *pro rata* curtailments are likely to leave the majority of capacity unaffected. Accordingly, PSE's 300 MW reservation of the BPAT.PACW to BPAT.PSEI path is more than sufficient to serve imbalance energy demand in the PSE BAA with EIM transfers from outside the BAA.

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[23] The transmission service request numbers as reported on OASIS for imports are 81853154, 81853158, and 81853190. The transmission service request numbers for exports are 81853128, 81853138, 81853144, 81856467, 81856480, and 81856482. Collectively, these transmission service requests add up to 300 MW in each direction, connecting between BPAT.PSEI and BPAT.PACW on BPA transmission.

[24] The data gathered for the analysis is shown on Attachment B hereto.

Before describing in greater detail specific historical instances of congestion on the 300 MW path during the market power study period, it is first helpful to provide a qualitative explanation for why congestion on the path has been rare or nonexistent historically and is likely to remain that way in the future. At a high level, the 300 MW BPAT.PACW to BPAT.PSEI "path" should not be thought of as a single linear pipeline, but rather as a web of interconnected transmission paths offering beneficial redundancy and culminating in multiple points of interconnection across both the BPAT.PACW and BPAT.PSEI interfaces. For example, the BPAT.PSEI interface consists of 27 discrete points of interconnection accommodating 4,800 MW of Total Transfer Capability during PSE's peak season, and even greater amounts of thermal transfer capability. The interface between BPA and PACW that forms the southern end of the transmission reservation consists of approximately 80 points of interconnection accommodating 4,950 MW of Total Transfer Capability year-round.

Given the robust design of the transmission system linking the two BAAs and the multiple interconnection points available, it is not surprising that historical congestion between the PACW and PSE BAAs across the BPA system is virtually non-existent. PSE studied congestion on all three transmission providers' systems that will be utilized for EIM transfers into the PSE BAA: (i) PacifiCorp (PACW to BPAT.PACW); (ii) BPA (BPAT.PACW to BPAT.PSEI); and (iii) PSE (BPAT.PSEI to PSEI.SYSTEM). During the December 2013 to November 2014 historical period,[25] for the BPA segment of the EIM transfer, PSE analyzed transmission provider notices posted on BPA's OASIS to identify congestion that would have impacted flowgates utilized by EIM transfer imports into the PSE BAA if PSE had been participating in the EIM market at the time.[26] Because PSE will use firm transmission on the BPA system, an archive of e-Tags was analyzed to determine which congestion events impacting the relevant BPA flowgates resulted in curtailment of an e-Tag utilizing firm transmission.[27] As BPA curtails e-Tags

[25] This study period coincides with that for Mr. Reed's March 9 Analysis, as well as with the study period of the Supplemental Analysis appended hereto at Attachment A.

[26] Attachment B-6 utilizes the BPA Power Transfer Distribution Factor short-term calculator to show where BPA flowgate congestion could impact transfers on the BPAT.PACW to BPAT.PSEI path. Information on PSE's 300 MW transfer was entered into the calculator's data fields. The resulting calculations show the impact of that transfer on each of BPA's internal flowgates, with impact shown in MW. Any path with a value of more than zero MW was considered to be impacted by PSE's 300 MW transfer for purposes of the analysis. Attachment B-3 shows all curtailment messages for BPA during the study period. A single curtailment event is shown on an impacted internal flowgate – at North of Echo Lake (or "NOEL") for March 31, 2014 Hour Ending ("HE") 07 to April 2, 2014 HE23 (at row 43). During the curtailment period, firm transmission was only actually curtailed for one hour on April 1.

[27] *See* Attachment B-2, which contains all curtailed firm transmission e-Tags in the PSE OATI web-based archive from the NOEL curtailment timeframe identified in Attachment B-3. PSE's archive contains all e-Tags utilizing PSE transmission, but since almost all PSE interchange transactions also utilize the BPA system, the archive is an appropriate proxy for the relevant e-Tags on the BPA paths that will be affected by PSE's EIM transfers. These 33 curtailed e-Tags are analyzed in Attachment B-1.

utilizing firm transmission *pro rata*, the curtailment calculation in Attachment B-1 uses the percent curtailment as a metric of congestion risk, rather than estimating the curtailed energy amount.

PSE also gathered congestion data on the PacifiCorp and PSE systems by searching OASIS for instances of energy transaction curtailments on the paths utilized by the PACW to BPAT.PACW and BPAT.PSEI to PSEI.SYSTEM paths, as these paths on the PacifiCorp and PSE transmission systems will be scheduled for the EIM transfer imports. [28]

PSE's analysis found that, during the December 2013 to November 2014 period coinciding with the March 9 Analysis:

- no instances of transmission congestion (firm or non-firm) were identified on PacifiCorp's PACW to BPAT.PACW transmission path;[29]
- one instance of firm transmission congestion was identified on flowgates utilized by BPA's BPAT.PACW to BPAT.PSEI transmission path (on April 1, 2014, regarding the North of Echo Lake internal flowgate);[30] and
- no instances of transmission congestion (firm or non-firm) were identified on the BPAT.PSEI to PSEI.SYSTEM transmission path.[31]

On average, 12.6% of the firm energy scheduled was curtailed during the April 1, 2014 congestion event affecting BPA's North of Echo Lake flowgate.[32] Assuming *pro rata* curtailment of PSE's 300 MW reservation by BPA, this single instance of congestion would have curtailed the scheduling capability of PSE's reservation to 262.2 MW during a single hour. The full 300 MW of capacity would have been available in every other hour during the December 2013 to November 2014 study period for EIM transfers, meaning that only 0.0014% of EIM transfer import energy would have been at risk of

[28] Attachment B-4 shows all curtailment messages for PSE during the study period, none of which affect the BPAT.PSEI to PSEI.SYSTEM path. Attachment B-5 shows that PACW issued no curtailment messages during the study period.

[29] *See* Attachment B-5, which shows no PACW curtailments during the study period, including of the PACW to BPAT.PACW path.

[30] *See* Attachment B-3 at row 43 for NOEL curtailment message; *see also* Attachment B-2 for the static e-Tags utilizing BPA firm transmission that were curtailed on April 1, 2014 HE11.

[31] *See* Attachment B-4, which shows no PSE curtailments during the study period of the BPAT.PSEI to PSEI.SYSTEM path.

[32] *See* Attachment B-1.

curtailment during the historical study period if PSE had been participating in the EIM market during that time.[33]

C. The CAISO Tariff Currently Provides for Mitigation of Non-Competitive Supply Offers in the Unlikely Event That a Transmission Constraint Binds between PACW and PSE

The foregoing analysis demonstrates that, based on the anticipated 40 – 100 MW quantity of demand for imbalance energy in the PSE BAA, and the virtually unconstrained 300 MW transmission interconnection between the PSE BAA and the PACW BAA, it is likely that PSE will be competing with non-PSE generation from outside the PSE BAA for every MW of demand for imbalance energy in the PSE BAA at all times. However, in the unlikely event that a transmission constraint were to result in non-competitive supply offers within the PSE BAA, the application of Commission-accepted, enhanced market monitoring and mitigation measures to constrained internal paths and interties between the six BAAs in the EIM will ensure that PSE and other sellers cannot exercise market power. Indeed, from the outset of PSE's October 1, 2016 entry into the market, PSE's intertie with the PACW BAA across the BPA transmission system will be monitored by the DMM as part of every 15-minute market run for price separation indicative of a binding constraint.[34] If the constraint binds, it will be tested for competitiveness by the DMM, and any supply found to be non-competitive will be mitigated.

In its recent CAISO EIM Mitigation Order, the Commission accepted proposed revisions to Section 29.39 of the CAISO Tariff providing that CAISO's "Real-Time Local Market Power Mitigation procedure in Section 39.7" of the CAISO Tariff will be applied "to the Energy Imbalance market, ***including EIM Transfer constraints into an EIM Balancing Authority Area on an EIM Internal Intertie***."[35] To identify and mitigate EIM transfer constraints into the PSE BAA, the DMM will initially monitor CAISO's full network model run every 15 minutes to identify price separation between the PSE BAA and the rest of the EIM Footprint that would be indicative of a binding transmission constraint. CAISO has proposed to further enhance mitigation by monitoring constraints in every five-minute interval beginning January 30, 2017.[36] CAISO's full network model simulates market outcomes using real time transmission information from the entire EIM Footprint, including any anticipated transfer or ramping

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[33] *Id.* The risk of curtailment over the study period is calculated by multiplying the average percent of curtailed energy analyzed in the attachment (12.6%) by the number of hours curtailed (1 hour), and dividing the product by the number of hours in the study period (8,760 hours).

[34] *See Cal. Indep. Sys. Operator Corp.*, 155 FERC ¶ 61,329 (2016) ("CAISO EIM Mitigation Order"). The revisions to Section 29.39 of the CAISO Tariff extending local market power mitigation to interties between EIM BAAs will become effective on October 1, 2016.

[35] CAISO Tariff, Section 29.39(a) (effective October 1, 2016) (emphasis added).

[36] *See* Cal. Indep. Sys. Operator Corp., Tariff Amendments to Enhance Local Market Power Mitigation Procedures, Docket No. ER16-1983-000 (filed June 21, 2016).

restrictions on BPA's internal flowgates and interties with the PACW and PSE BAAs.[37] In the unlikely event that CAISO's model identifies price separation resulting from a binding constraint on PSE's 300 MW BPAT.PACW to BPAT.PSEI EIM transfer path, CAISO's DMM would test this constraint for competitiveness in accordance with the local market power mitigation measures described in Section 39.7.2 of the CAISO Tariff.[38] Under these provisions, a generator's energy bids will be subject to mitigation in the event that congestion occurs and the supply that can relieve the congestion is deemed uncompetitive.[39] A constrained path is designated as non-competitive when "the sum of the supply counter-flow from all portfolios of potentially pivotal suppliers to the Transmission Constraint and the fringe supply of counter-flow to the Transmission Constraint from all portfolios of suppliers that are not identified as potentially pivotal is less than the demand for counter-flow to the transmission constraint."[40] If subject to mitigation, energy bids are capped by the higher of a competitive market clearing price or the DEB.[41] The bidding resource can only be dispatched based on its mitigated bids during the ensuing 15-minute market interval, when the energy produced by the resource is necessary to meet a local need within an non-competitive area.[42]

In its recent CAISO EIM Mitigation Order, FERC concluded that "CAISO's proposal to always include EIM transfers into every EIM Entity BAA in its market power mitigation procedures ***will ensure that all EIM internal interties will be mitigated whenever conditions warrant, and will result in consistent treatment of all constraints in the EIM area***."[43] Thus, while PSE does not expect frequently binding constraints on its BPAT.PACW – BPAT.PSEI intertie with the EIM Footprint, CAISO's application of local market power mitigation to this intertie will prevent PSE from exercising of market power in the event a binding constraint does arise that is deemed to be non-competitive by the DMM.

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[37] CAISO's full network model captures all BPA internal flowgates, including the five flowgates shown on Attachment B-6 as utilized by PSE's 300 MW BPAT.PACW to BPAT.PSEI reservation. In addition to the predictive capabilities of the CAISO full network model at forecasting congestion, PSE is also required to notify CAISO once PSE receives notification that BPA has actually curtailed an e-Tag for an EIM transfer.

[38] *See* CAISO Tariff, Section 39.7.

[39] *See id*. *See also* CAISO Tariff, Section 34.1.5 (describing mitigation of bids in the real-time market).

[40] CAISO Tariff, Section 39.7.2.2 (B)(b).

[41] *See* CAISO Tariff, Section 39.7.1 (describing calculation of DEB).

[42] *See id*., Section 34.1.5.

[43] CAISO EIM Mitigation Order, 155 FERC ¶ 61,329 at P 36 (emphasis added).

III. REQUEST FOR PRIVILEGED AND CONFIDENTIAL TREATMENT

Pursuant to sections 35.37(f) and 388.112 of the Commission's regulations,[44] Sellers requests privileged and confidential treatment of selected commercially sensitive data supporting the analysis on historic transmission congestion conducted by PSE and included in Attachment B.[45] The documents for which Sellers are seeking privileged and confidential treatment contain detailed information on PSE e-Tags that is commercially sensitive or is not publicly available and the disclosure of which would adversely affect PSE, its customers, and other market participants. All such materials are labeled "Contains Privileged Information - Do Not Release."

IV. ATTACHMENTS

- Attachment A: CAISO Energy Imbalance Market Size Analysis for Puget Sound Energy, Inc.
- Attachment B: Puget Sound Energy, Inc. Curtailment Study Data, comprised of:
  - Attachment B-1: Calculation of curtailed energy on e-Tags using firm transmission and risk of curtailment
  - Attachment B-2: Record of curtailed e-Tags using firm BPA transmission
  - Attachment B-3: Record of BPA curtailment category messages
  - Attachment B-4: Record of PSE curtailment category messages
  - Attachment B-5: Record of PACW curtailment category messages (showing no curtailment messages were posted during the study period)
  - Attachment B-6: BPA Power Transfer Distribution Factor short-term calculator

[44] 18 C.F.R. §§ 35.37(f) and 388.112 (2016).

[45] The March 9 Notice contains a proposed form of protective agreement for privileged materials in the instant proceedings.

V. CONCLUSION

Because PSE's firm transmission rights across BPA will ensure a competitive supply of generation that exceeds the demand for imbalance energy in the PSE BAA, the PSE BAA is not a submarket within the EIM. Accordingly, for the reasons set forth above and in Sellers' March 9 Notice of Non-Material Change in Status, PSE's participation in the EIM does not alter the facts the Commission relied upon in granting Sellers MBR authority.

Respectfully submitted,

/s/ Justin P. Moeller
Justin P. Moeller

Counsel for Sellers

Attachments

Attachment A

CAISO Energy Imbalance Market Size Analysis for Puget Sound Energy, Inc.

CAISO ENERGY IMBALANCE MARKET SIZE ANALYSIS

FOR

PUGET SOUND ENERGY, INC.

PREPARED BY
LLOYD REED
REED CONSULTING

JULY 27, 2016

Table of Contents

Section 1 – General Description of the PSE Energy Imbalance Market Size Analysis

1.1 Introduction

Puget Sound Energy (PSE) anticipates that it will initiate operations in the California Independent System Operator's Energy Imbalance Market (CAISO EIM or EIM) on or about October 1, 2016. Currently, the EIM consists of the balancing authority areas (BAAs) operated by the CAISO, Pacificorp (PACE and PACW) and Nevada Energy (NVE). Arizona Public Service (APS) is also planning on joining the EIM and, like PSE, expects to initiate operations on or about October 1, 2016.[1] After PSE and APS join the EIM, the EIM "footprint" will be expanded from its current 4-BAA configuration to a 6-BAA configuration.

In early 2016, PSE retained Reed Consulting to perform a Generation Market Power Analysis in order to determine the extent of PSE's horizontal generation market power in the 6-BAA EIM. This Market Power Analysis (EIM MP Analysis), which was submitted to the Commission on March 9, 2016,[2] indicated that PSE lacks horizontal market power in the combined 6-BAA EIM footprint.[3]

Following its initial review of PSE's EIM MP Analysis, Commission Staff contacted PSE and requested that PSE provide additional information regarding the characteristics of the transmission interconnections between the PSE BAA and the other BAAs participating in the EIM. Staff also opined that it did not have enough information to determine if the PSE BAA might be considered to be a separate sub-market within the overall 6-BAA EIM footprint. In response to Staff's concerns, PSE agreed to perform a supplemental analysis to quantify the size of the energy imbalance market within the PSE BAA. PSE

[1] Portland General Electric has announced its intention to join the CAISO EIM in 2017 and the Idaho Power Company has also expressed an interest in joining the EIM.

[2] Puget Sound Energy, Inc., *et al.*, Notice of Non-Material Change in Status, Docket Nos. ER10-2374-010 *et al.* (filed March 9, 2016).

[3] The EIM MP Analysis utilized the Commission's standard Pivotal Supplier and Wholesale Market Share screen methodologies. Some facets of the PS and WMS screens were, however, slightly modified to reflect the unique characteristics of the EIM.

again retained Reed Consulting to perform the PSE EIM Market Size Analysis (EIM Size Analysis), the results of which are presented in this report.

1.2 Summary of Findings

As is discussed in greater detail later in this report, PSE quantified the expected size of the energy imbalance market within the PSE BAA using two different study methodologies as described below:

EIM Size Study 1

Study 1 quantifies the expected size of the PSE BAA energy imbalance market by analyzing the differences, on a 15-minute measurement interval, between: 1) scheduled versus actual PSE BAA loads, and 2) scheduled versus actual intermittent resource generation. The algebraic sum of these two sets of forecast versus actual deviation quantities represent the amounts of imbalance energy that are needed within the PSE BAA during each 15-minute measurement interval.

The results of Study 1 indicate that the average size of the 15-minute energy imbalance market within the PSE BAA is 43.2 MW. This figure equates to 1.4% of PSE's average on-peak hour BAA Load. Study 1 also indicates that the size of the energy imbalance market in the PSE BAA is less than or equal to 108.5 MW 95% of the time, and that the percentage of the time where the PSE imbalance market is greater than 300 MW is only 0.05%.

Study 1 is described in further detail in Section 3.

EIM Size Study 2

Study 2 quantifies the expected size of the PSE energy imbalance market based upon historical data associated with energy imbalance transactions that took place in CAISO's BAA during the period December 1, 2013 – November 30, 2014. These calculations utilize datasets that were originally incorporated into PSE's

March, 2016 EIM MP Analysis (which were used to quantify the size of the combined 6-BAA energy imbalance market).

The results Study 2 indicate that the average size of the energy imbalance market within the PSE BAA is 85.0 MW, based upon historical EIM transactions that occurred within the CAISO's BAA during the period December 1, 2013 – November 30, 2014. In addition, based upon limited historical EIM transactions that took place within the PACW, PACE and NVE BAAs during the period October 1, 2015 – February 28, 2016, the energy imbalance market within the PSE BAA would be even smaller, with an annual average size of approximately 30.7 MW.

While Study 2 does not utilize PSE-specific transactional data, the results of this study do provide a useful cross-check against the results of Study 1. Study 2 is described in further detail in Section 4.

The combined results of Studies 1 and 2 indicate that the expected size of the energy imbalance market in the PSE BAA is likely to be small relative to the initial 300 MW bi-directional transmission path between the PSE BAA and the EIM. This situation indicates that the PSE BAA is not a separate sub-market within the combined 6-BAA EIM footprint since sufficient non-PSE generation located outside of the PSE BAA will be able to compete with PSE generation in order to meet imbalance energy needs within the PSE BAA.

Section 2 – PSE Transmission Interconnections with the EIM

2.1 PSE EIM Transmission Interconnections

The PSE BAA is not directly interconnected with any of the five other BAAs that will make up the EIM footprint as of October 1, 2016.[4] However, in order to effectuate transactions in the EIM, PSE has agreed to initially dedicate 300 MW of long-term firm transmission rights that it has on the Bonneville Power Administration (BPA) transmission system to indirectly interconnect with the EIM via the Pacificorp West (PACW) BAA.[5] PSE's transmission rights on the BPA system between the PSE BAA and the PACW BAA are bi-directional and will allow PSE to both deliver and receive power to/from the EIM.

PSE's transmission system interconnections with BPA are robust and are very seldom subject to congestion. The PSE BAA interconnects with the BPA BAA at 27 different points and the combined thermal limit of these interconnections is significantly higher than the 4,800 MW OASIS-posted transfer capability between the two systems.[6]

One way to evaluate whether the PSE BAA might be a separate sub-market within the combined 6-BAA EIM footprint is to compare the need for imbalance energy within the PSE BAA against the total transmission import capability into and out of the PSE BAA that will be dedicated for EIM transfers. If the size of the energy imbalance need within the PSE BAA is small relative to the 300 MW firm bi-directional transmission path between the PSE and PACW BAAs, then non-PSE generation located outside of the PSE BAA will be able to compete with PSE generation to meet imbalance energy needs

[4] The other five BAAs that are expected to comprise the EIM footprint along with PSE as of October 1, 2016 are: 1) the CAISO, 2) Pacificorp West, 3) Pacificorp East, 4) NV Energy, and 5) Arizona Public Service.

[5] As PSE gains operational experience in participating in the EIM, PSE may consider increasing or decreasing the initial 300 MW firm EIM transfer amount as conditions warrant.

[6] Additional technical details regarding the nature of PSE's transmission interconnections with BPA and the frequency of congestion across these transmission paths is being provided to the Commission as part of PSE's supplemental EIM filing. *See* Attachment B to this filing.

within the PSE BAA and the PSE BAA would therefore not be a separate sub-market within the EIM footprint.

Section 3 – PSE EIM Size Study 1

3.1 Introduction

Determining the size of the within-hour energy imbalance market within the PSE BAA is, at present, a somewhat challenging task since PSE has not yet commenced binding energy imbalance operations in the EIM (and does not expect to do so until on or about October 1, 2016). A mechanism to estimate the size of the energy imbalance market in the PSE BAA is therefore needed to evaluate potential EIM sub-market issues until such time that sufficient actual operating data can be assembled. Fortunately, although PSE has not yet commenced energy imbalance operations in the EIM, alternate historical data does exist to allow for a quantification of the energy imbalance need within the PSE BAA, as is further described in the following sub-sections.

3.2 EIM Size Study 1 Methodology

The general analytical methodology employed for Study 1 is very similar to, and in many aspects identical to, the methodology previously utilized by PSE in developing its OATT Schedule 13 rate proposal that it submitted to the Commission on June 6, 2011.[7] While Schedule 13 is a capacity-based rate that applies to within-the-hour regulation service, the same conceptual framework can also be applied to analyze the within-the-hour energy imbalance needs of the PSE BAA.

The Study 1 methodology employs a forecast versus actual approach in order to derive energy imbalance quantities on a 15-Minute interval basis.[8] BAA load forecast deviations are computed based upon the difference between the hour-ahead forecasted PSE BAA load and the actual BAA load for that same hour. This calculation is performed for each 15-minute period during the December 1, 2013 – November, 2014 study period. When the actual BAA load during any 15-minute interval is greater than the forecasted load, there is a positive energy imbalance need in order to keep the PSE BAA in load/resource

[7] Puget Sound Energy, Inc., Revisions to Open Access Transmission Tariff, Docket No. ER11-3735-000 (filed June 6, 2011).

[8] Study 1 utilizes a 15-minute interval measurement period since this time period directly matches up with the CAISO EIM's 15-minute energy imbalance market.

balance. Conversely, if the actual load during any 15-minute interval is less than the forecasted load, there is a negative energy imbalance need in order to keep the PSE BAA in load/resource balance.

The same concept applies to intermittent wind generation that is located within the PSE BAA, with a sign reversal incorporated into the calculation process. When the actual BAA wind generation during any 15-minute interval is greater than the forecasted generation, there is a negative energy imbalance need in order to keep the PSE BAA in load/resource balance. Conversely, if the actual wind generation during any 15-minute interval is less than the forecasted load, there is a positive energy imbalance need in order to keep the PSE BAA in load/resource balance.

The overall PSE BAA energy imbalance need during any 15-minute interval is the algebraic sum of the load deviation quantities (measured in MW) and the wind generation deviation quantities (also measured in MW). It is important to note that in many cases, the 15-minute interval load deviations have an opposite sign from the 15-minute interval wind generation deviation; these offsetting impacts act to significantly reduce the overall PSE BAA imbalance energy need as opposed to analyzing loads imbalance needs and wind generation imbalance needs in isolation.[9]

When PSE joins the EIM, its final base schedules will generally be established by 55 minutes (T-55) prior to the start of the operating hour.[10] Deviations from the final base schedule for the operating hour will be settled through the EIM's 15-minute and 5-minute markets. Therefore, quantifying the size of the energy imbalance market within the PSE BAA in Study 1 (prior to it commencing operations in the EIM) by using historical hour-ahead load and generation forecasts as compared to the actual quantities, using a 15-

[9] There is a relatively high level of diversity present between short-term PSE load deviations and short-term wind generation deviations. This is due to the fact that the Wild Horse and Vantage wind plants are 1) located approximately 75 miles from the PSE BAA's load center in the Puget Sound area across a mountain pass, and 2) the prevailing weather patterns at the wind plant sites can be quite different from the weather in the Puget Sound area.

[10] EIM Entity Scheduling Coordinators are allowed to make certain adjustments to their T-55 base schedules up to 40 minutes prior to the start of the operating hour. *See* CAISO Tariff, Section 29.34(f).

minute measurement interval, is very consistent with the EIM energy imbalance settlement process.

3.3 Study 1 Input Datasets

Study 1 uses PSE-specific historical data to compute the energy imbalance need within the PSE BAA across the period December 1, 2013 – November, 2014. This particular 12-month period was chosen for use in EIM Market Size Study 1 since it is the same historical period that was also used in PSE's March, 2016 EIM MP Analysis. Specific datasets used in Study 1 are as follows:

PSE Actual System and BAA loads

PSE maintains records of its System and BAA loads on a 4-second interval basis. PSE personnel aggregated the base 4-second interval data into 1-minute interval data for the study period, and the 1-minute data was provided to Reed Consulting. Reed Consulting subsequently verified and re-aggregated the 1-minute data into 15-minute interval data for use in Study 1. A complete dataset of the 1-minute interval, 15-minute interval, and hourly PSE System loads for the period December 1, 2013 – November, 2014 is contained in Exhibit LCR-1. 1-Minute interval, 15-Minute interval, and hourly BAA loads for the study period is contained in Exhibit LCR-2.

PSE Hour-Ahead System and BAA Load forecasts

Hour-ahead PSE BAA load forecasts for the period December 1, 2013 – November 30, 2014 were derived via the following multi-step process:

Step 1

Day-ahead/prescheduled PSE hourly system load forecasts were provided by PSE personnel to Reed Consulting.

Step 2

Next-hour adjustments to the day-ahead/prescheduled PSE hourly system load forecasts were provided by PSE personnel to Reed Consulting. These hourly adjustments were developed and recorded by PSE's Real-Time traders and were utilized by the traders in establishing final transaction schedules for the next operating hour. In reviewing the original set of next-hour system load adjustments provided by PSE, Reed Consulting noted that there were some limited periods of time where real-time load adjustments were apparently not recorded by the Real-Time Traders.[11] During these periods (which typically lasted between one and 24 hours), the hour-ahead system load forecasts provided to PSE's Real-Time Traders by an external forecasting service were used to establish the next-hour's system load forecast.[12]

Step 3

Hourly total schedules for the PSE Schedule 449 loads,[13] borderline loads, and losses for each hour of the 12-month study period were provided by PSE personnel. These schedules, which averaged approximately 236 MW, represent the forecasted difference between PSE's system load and PSE's BAA load.

Step 4

On all hours for which the PSE Real-Time Traders recorded a next-hour load forecast adjustment, Reed Consulting derived a set of hour-ahead PSE BAA load forecasts (using the source datasets described in Steps 1, 2 and 3) for the 12-month study period using the following formula:

[11] All hourly load adjustment data fields that contained either a blank or a 0 MW reading were treated as missing data points.

[12] The alternate set of system load forecasts from the external service provider was used to establish the hour-ahead load forecasts for approximately 18% of the hours during the 12-month study period.

[13] PSE's Schedule 449 customers acquire power supplies to meet their respective load needs pursuant to a voluntary retail open access tariff. These loads are not included in PSE's system load, however PSE does have the obligation to provide energy imbalance for these loads since they are located within the PSE BAA.

Hour-Ahead PSE BAA Load Forecast = Day-Ahead PSE BAA Load Forecast + Hour-Ahead System Load Adjustment + Total Sched 449/Borderlines/Losses

On all hours for which the PSE Real-Time Traders did not record a next-hour load forecast adjustment, Reed Consulting derived a set of hour-ahead PSE BAA load forecasts (using the source datasets described in Steps 2 and 3) for the 12-month study period using the following formula:

Hour-Ahead PSE BAA Load Forecast = Hour-Ahead PSE System Load Forecast from PSE's External Service Provider + Total Sched 449/Borderlines/Losses

Details regarding the computation of the PSE hour-ahead BAA load forecasts for the 12-month study period are contained in Exhibit LCR-3.

PSE and Third-Party Intermittent Resource Actual Generation

PSE maintains generation records for the 273 MW Wild Horse wind plant (owned by PSE) and the 96 MW Vantage wind plant (owned by Invenergy) on a 4-second interval basis. PSE personnel aggregated the base 4-second interval generation data into 1-minute interval data for the study period, and the 1-minute data was provided to Reed Consulting. Reed Consulting subsequently verified and re-aggregated the 1-minute data into 15-minute interval data for use in Study 1. A complete dataset of 1-minute interval and 15-minute interval Wild Horse generation for the period December 1, 2013 – November, 2014 is contained in Exhibit LCR-4. 1-minute interval and 15-minute interval for the Vantage wind plant for the study period is contained in Exhibit LCR-5.

PSE and Third-Party Intermittent Resource Hour-Ahead Generation Forecasts

Hour-ahead generation forecasts for the Wild Horse and Vantage wind plants were provided by PSE personnel to Reed Consulting. In the case of the Vantage

plant, these forecasts are also the next-hour transmission schedules for the plant.[14] Hour-ahead generation forecasts for the Wild Horse wind plant for the 12-month study period is contained in Exhibit LCR-6 while the hour-ahead generation forecasts for the Vantage wind plant are contained in Exhibit LCR-7.

3.4 Study 1 Output Metrics

The overall size of the PSE energy imbalance market, as measured across the 12-month historical study period, can be quantified using several different metrics. For Study 1, four different summary metrics were derived:

1) Average PSE Imbalance Energy Market Size (MW)

   This metric, expressed in MW, is calculated as the average of the absolute values of all 35,040 15-minute interval total PSE BAA energy imbalance values across the December 1, 2013 – November 30, 2014 study period.

2) Average PSE Imbalance Energy Market Size (Percent of Average On-Peak BAA Load)

   This metric, expressed in percent, is calculated as the Average PSE Imbalance Energy Market Size (MW) divided by PSE's average on-peak hour BAA load as measured across the December 1, 2013 – November 30, 2014 study period. It is noted that this metric for the PSE BAA is directly comparable to the EIM size percentages derived in APS's April, 2016 EIM Market Power Analysis for the CAISO, PACE, PACW and NVE BAAs.[15]

3) 95th Percentile Imbalance Energy Market Size (MW)

   This metric, expressed in MW, quantifies the size of the PSE BAA energy imbalance market at the 95% confidence interval. In other words, the 15-minute

[14] The entire output of the 96 MW Vantage wind plant has been sold to a purchaser located outside of the PSE BAA. However, since the plant is physically located within PSE's BAA, PSE is responsible for providing the imbalance energy required for the plant to meet its scheduled energy delivery obligations.

[15] APS EIM Analysis at p. 40.

interval energy imbalance need of the PSE BAA will be less than or equal to the indicated figure 95% of the time.

4) Outlier Percentage (Percent)

This metric, expressed in percent, indicates the percent of the time during the December 1, 2013 – November 30, 2014 study period when the energy imbalance need of the PSE BAA was greater than 300 MW.

3.5 Determining the Energy Imbalance Need of the PSE BAA

The input datasets previously described in Sub-section 3.3 were utilized to perform the following four step computational process:

Step 1

The hour-ahead PSE BAA load forecasts and the hour-ahead generation forecasts for the Wild Horse and Vantage wind plants previously described in Sub-section 3.3 are so-called "levelized" forecast values; *i.e*. these forecasts consist of a single constant value for the entire hour. However, in WECC, power schedules are ramped on a 20-minute basis between each hour to avoid sudden discontinuities that could occur at the end of one hour and the start of the next hour. In order to incorporate this standard industry practice into Study 1, the hour-ahead levelized forecasts/schedules for PSE's BAA load and the Wild Horse and Vantage wind plants were converted into hour-ahead ramped forecast/schedules. These computations are shown in Exhibit LCR-3 (for the PSE BAA Load), Exhibit LCR-6 (for the Wild Horse plant), and Exhibit LCR-7 (for the Vantage plant).

Step 2

The PSE BAA's energy imbalance need associated with BAA load deviations was computed for each 15-minute interval during the 12-month study period by calculating the difference (in MW) between the ramped hour-ahead BAA load forecast for the interval and the actual PSE BAA load for that same interval.

Details of this computation for all 35,040 15-minutes intervals of the study period are shown in Exhibit LCR-8.

Step 3

The PSE BAA's energy imbalance need associated with wind plant generation deviations was computed for each 15-minute interval during the 12-month study period by calculating the difference (in MW) between the ramped hour-ahead Wild Horse and Vantage plant generation forecasts for the interval and the actual generation at each plant for that same interval. Details of this computation for both the Wild Horse and Vantage plants for all 35,040 15-minutes intervals of the study period are shown in Exhibit LCR-8.

Step 4

The 15-minute energy imbalance needs associated with PSE's BAA load and the two large wind plants located within the PSE BAA were added together for each 15-minute interval in order to determine the BAA's overall energy imbalance need for that interval. This set of 35,040 values represents the size of the energy imbalance market within the PSE BAA, as measured across the historical 12-month study period.[16] Details of these computations are shown in Exhibit LCR-8.

3.6 Study 1 Results

The results of Study 1 are summarized using the output metrics described in Sub-section 3.4 are as follows:

[16] APS's April, 2016 EIM Market Power Analysis utilized this same computational methodology in determining the size of the energy imbalance market in the CAISO, PACE, PACW and NV Energy BAAs. APS's analysis did, however, utilize a different 12-month historical data period than PSE's Study 1.

Table 3.6 – PSE EIM Size Study 1 Summary Results

Metric	Result
Average PSE Imbalance Energy Market Size (MW)	43.2
Average PSE Imbalance Energy Market Size (Percent of Average On-Peak Hour BAA Load)	1.4
95th Percentile Imbalance Energy Market Size (MW)	108.5
Outlier Percentage (Percent)	0.05

As can be seen in Table 3.6, the average size of the of the energy imbalance market within the PSE BAA across the December 1, 2013 – November 30, 2014 study period was 43.2 MW. This figure, which is based upon PSE-specific load and intermittent resource datasets, is significantly smaller than the 85.0 MW figure that is derived in Study 2 using data for the CAISO BAA. Furthermore, the PSE BAA energy imbalance market size as measured as a percentage of average on-peak hour BAA load (1.4%) is very consistent with the figures that APS determined in its EIM Market Power Analysis for the PACE, PACW and NVE BAAs.

The 95% percentile metric indicates that the size of the energy imbalance market in the PSE BAA is less than or equal to 108.5 MW 95% of the time. Most importantly, this figure is significantly lower than the initial 300 MW bi-directional EIM transfer limit into and out of the PSE BAA. In addition, there were only eighteen 15-minute intervals out of a total of 35,040 intervals during the 12-month study period when the need for imbalance energy within the PSE BAA was greater than 300 MW. These results indicate that the initial 300 MW EIM transmission path between the PSE BAA and the PACW BAA would only very rarely be subject to potential congestion.

Taken together, the above results indicate that the PSE BAA is not a separate sub-market within the combined EIM footprint since sufficient non-PSE generation located outside

of the PSE BAA will be able to compete with PSE generation in order to meet imbalance energy needs within the PSE BAA.

Section 4 - PSE EIM Size Study 2

4.1 Introduction

PSE's March, 2016 EIM MP Analysis that was previously submitted to the Commission incorporated a set of computations that estimated the size of the energy imbalance market for the combined 6-BAA EIM footprint for the month of July, 2014.[17] This calculation was based upon historical CAISO scheduling data assembled for the period December 1, 2013 – November, 2014 and involved a two-step process as described below:

Step 1

The size of the energy imbalance market for the CAISO BAA was determined by evaluating the hourly differences between the base schedules established for the next operating hour in the day-ahead market (which are essentially a forecast of net load) and the actual net load that occurred within the CAISO BAA for that hour. These energy imbalances are caused by variations in end-use load and variations in the output of intermittent generating resources such as wind and solar plants as measured relative to the base schedules. For the July, 2014 peak month, the amount of energy imbalance that occurred within the CAISO BAA was equal to 2.61% of the CAISO's average weekday peak BAA load. Across the four seasons used in the Wholesale Market Share screens, the seasonal average amount of energy imbalance within the CAISO BAA ranged between 2.00% and 2.85%.[18]

Step 2

To determine the size of the energy imbalance market across the combined 6-BAA EIM footprint, the percentages derived from Step 1 for the CAISO BAA for the July, 2014 peak month were applied to each individual BAA's loads in order to determine the wholesale market size for the combined 6-BAA EIM.

[17] PSE EIM MP Analysis, Table 5.4.

[18] *See* Exhibit LCR-10 to PSE's EIM MP Analysis for the derivation of the July, 2014 and seasonal CAISO energy imbalance percentages.

The results of the energy imbalance market size calculation for the July, 2014 peak month, as originally detailed in PSE's EIM MP Analysis, are reproduced below in Table 4.1:

Table 4.1

July 2014 Energy Imbalance Market Sizes for the EIM BAAs

EIM Entity	July, 2014 Average Weekday BAA Peak Load (MW)	EIM Wholesale Market Size Percentage	EIM Wholesale Market Size (MW)
CAISO	39,718.1	2.61	1,036.6
PACE/PACW	11,170.0	2.61	291.5
NVE	6,931.0	2.61	180.9
PSE	3,083.6	2.61	80.5
APS	6,337.2	2.61	165.4
Total	67,239.9		**1,754.9**

As can be seen from Table 4.1, the energy imbalance market size for the PSE BAA under July, 2014 peaking conditions was determined to be 80.5 MW.

4.2 Study 2 Computational Methodology and Results

Although the size of the energy imbalance market within the PSE BAA for periods other than the July, 2014 peak month was not determined as part of PSE's EIM MP Analysis, it is relatively straightforward to make this calculation by applying computational Steps 1 and 2 to data already assembled in Exhibits LCR-10 and LCR-11 of the EIM MP Analysis. Applying the seasonal percentages from Step 1 for the CAISO's BAA load to just PSE's BAA loads (or alternatively, multiplying the Step 2 results by the ratio of PSE's average weekday peak BAA load divided by the combined 6-BAA average weekday peak load) yields seasonal estimates of the size of the energy imbalance market within the PSE BAA. The results of these calculations are summarized in Table 4.2:

Table 4.2

Seasonal Energy Imbalance Market Sizes in the PSE BAA

Season	PSE Average Weekday BAA Peak Load (MW)	EIM Wholesale Market Size Percentage	PSE BAA Energy Imbalance Market Size (MW)
Winter	4,004.3	2.84	113.7
Spring	3,153.3	2.85	89.9
Summer	2,984.8	2.43	72.5
Fall	3,186.5	2.00	63.7
Average			**85.0**

The computations described above in Sub-sections 4.1 and 4.2 implicitly assume that the load and intermittent resource variability characteristics of the CAISO's BAA are representative of these same characteristics for the PSE BAA (and for the other 4 BAAs included in the EIM as well). However, since the BAAs that make up the EIM have differing amounts of intermittent generating resources relative to the size of their respective BAA loads, it is likely that the size of the imbalance energy market in each separate BAA (on a percentage of load basis) will vary somewhat. It is also worth observing that, because the CAISO deviations were calculated using day-ahead load forecasts, rather than an hour-ahead forecast as was used in Study 1, Study 2 likely overstates demand for imbalance energy in the EIM. The demand for imbalance energy in the EIM is driven by deviations between balanced hour-ahead BAA resource plans and real-time variability.

4.3 Study 2 – Alternate Computation

In the EIM market power analysis that APS submitted to the Commission in April, 2016,[19] APS computed the size of the energy imbalance market for the four individual BAA's (CAISO, PACE, PACW and NV Energy) that currently comprise the EIM

[19] Arizona Public Service Co., EIM Market Power Analysis, Docket No. ER10-2437-004 (filed April 8, 2016).

footprint.[20] Based upon limited historical data reported by the CAISO, APS determined that the size of the energy imbalance market in the PACE, PACW and NVE BAAs ranged between 0.89% and 1.46% of average on-peak hour BAA load, with an average figure across the 3 BAAs of 0.99%. APS also determined the size of the imbalance market in the CAISO BAA to be 2.85% of average on-peak hour load.[21]

The results of an alternate seasonal energy imbalance market size computations for the PSE BAA that utilize the 0.99% PACW/PACE/NVE average percentage is contained in Table 4.3:

Table 4.3

Seasonal Energy Imbalance Market Sizes in the PSE BAA – Alternate Calculation

Season	PSE Average Weekday On-Peak Hour BAA Load (MW)	EIM Wholesale Market Size Percentage	PSE BAA Energy Imbalance Market Size (MW)
Winter	3,694.6	0.99	36.6
Spring	2,928.5	0.99	29.0
Summer	2,807.4	0.99	27.8
Fall	2,951.2	0.99	29.2
Average			**30.7**

As seen in Table 4.3, applying the 0.99% energy imbalance market size percentage (*i.e.* the average of the PACE, PACW and NVE figures) to PSE's average on-peak hour BAA load yields an average PSE energy imbalance market size of 30.7 MW, which is

[20] APS did not attempt to calculate an energy imbalance market size for the PSE BAA in its April, 2016 EIM Market Power Analysis since that information was not needed by APS in order to complete its EIM Analysis by virtue of the fact that: 1) the PSE BAA is not considered to be an APS Tier-1 market, and 2) APS does not own or control any generating resources located within the PSE BAA.

[21] It should be noted that the PSE EIM MP Analysis and APS's EIM Analysis computed market size percentages in slightly different fashions. The PSE Analysis determined EIM market sizes based on the average of the weekday peak BAA loads while the APS Analysis determined EIM market sizes based on the average of all on-peak hour BAA loads. The two Analyses also utilized different 12-month historical study periods.

significantly *lower* than the 85.0 MW annual average market size previously determined using CAISO's seasonal market size percentages from the PSE MP Analysis. In addition, both figures are well below PSE's 300 MW EIM transmission limit; this situation indicates that sufficient transmission import capacity into the PSE BAA will be available to allow non-PSE affiliated generation to compete with PSE generation to meet the energy imbalance need within the PSE BAA.

Section 5 – Conclusions

5.1 Summary and Conclusions

This PSE EIM Market Size Analysis was performed in order to assess the potential for the PSE BAA to be a separate sub-market within the overall combined 6-BAA geographic footprint of the EIM. This analysis incorporated a recent 12-month historical data period (December 2013 – November 2014) which is the same study period that was incorporated into the PSE EIM Market Power Analysis previously submitted to the Commission on March 9, 2016.

In this Report, PSE discussed and presented the results of two separate analyses, referred to as EIM Size Study 1 and EIM Size Study 2. In Study 1, PSE determined the size of the within-the-hour energy imbalance market in the PSE BAA by utilizing 12 months of PSE-specific historical data regarding the within-the-hour load forecasts errors and wind generation forecast errors that occurred within the PSE BAA. The sum of the load and wind generation forecast errors, which were computed on a 15-minute interval basis, represents the need for imbalance energy within the PSE BAA.

The Study 1 results indicate that average size of the energy imbalance market in the PSE BAA, based upon the actual historical PSE operating data observed across a recent 12-month period, is 43.2 MW. In addition, Study 1 indicates that the size of the energy imbalance market in the PSE BAA is less than or equal to 108.5 MW 95% of the time, and that the percentage of the time where the PSE imbalance market is greater than 300 MW is only 0.05%. These results indicate that 1) sufficient transmission import capacity into the PSE BAA will be available to allow non-PSE affiliated generation to compete with PSE generation to meet the energy imbalance need within the PSE BAA, and 2) that the PSE BAA is not a separate sub-market within the combined 6-BAA EIM footprint.

In Study 2, PSE determined the size of the within-the-hour energy imbalance market in the PSE BAA by: 1) utilizing 12 months of historical data for the size of the imbalance market within the CAISO BAA as was previously incorporated into PSE's March, 2016

EIM Market Power Analysis, and 2) utilizing five months of historical data for the size of the imbalance market within the PACE, PACW and NVE BAAs as was originally derived by APS and presented to the Commission in APS's April, 2016 EIM Market Power Analysis.

The Study 2 results indicate that the annual average size of the energy imbalance market in the PSE BAA, based upon the historical scheduling characteristics observed in the CAISO, PACE, PACW and NVE BAAs ranges between 30.7 MW and 80.5 MW. Both of these figures are significantly below the initial 300 MW EIM transmission limit into and out of the PSE BAA. These results, consistent with the results of Study 1, indicate that: 1) sufficient transmission import capacity into the PSE BAA will be available to allow non-PSE affiliated generation to compete with PSE generation to meet the energy imbalance need within the PSE BAA, and 2) that the PSE BAA is not a separate sub-market within the combined 6-BAA EIM footprint.

Section 6 – List of Exhibits to the PSE Energy Imbalance Market Size Analysis

Exhibit LCR-1	PSE 1-Minute Interval, 15-Minute Interval, and Hourly Actual System Loads for December 1, 2013 – November 30, 2014.
Exhibit LCR-2	PSE 1-Minute Interval, 15-Minute Interval, and Hourly Actual Balancing Authority Area Loads for December 1, 2013 – November 30, 2014.
Exhibit LCR-3	PSE Hour-Ahead Levelized and Ramped BAA Load Forecasts for December 1, 2013 – November 30, 2014.
Exhibit LCR-4	Wild Horse Wind Plant 1-Minute Interval and 15-Minute Interval Actual Generation for December 1, 2013 – November 30, 2014.
Exhibit LCR-5	Vantage Wind Plant 1-Minute Interval and 15-Minute Interval Actual Generation for December 1, 2013 – November 30, 2014.
Exhibit LCR-6	Wild Horse Wind Plant Hour-Ahead Levelized and Ramped Generation Forecasts for December 1, 2013 – November 30, 2014.
Exhibit LCR-7	Vantage Wind Plant Hour-Ahead Levelized and Ramped Generation Forecasts for December 1, 2013 – November 30, 2014.
Exhibit LCR-8	PSE BAA Load, Wild Horse Wind Plant, and Vantage Wind Plant 15-Minute Interval Energy Imbalances and Total PSE BAA 15-Minute Energy Imbalances for December 1, 2013 – November 30, 2014.

Attachment B

Puget Sound Energy, Inc. Curtailment Study Data

CERTIFICATE OF SERVICE

I hereby certify that I have this day caused to be served the foregoing document upon each person designated on the official service lists compiled by the Secretary in in the above-captioned proceedings.

Dated at Washington, D.C. this 27th day of July, 2016.

/s/ Justin P. Moeller

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