

December 22, 2016

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

**Re: California Independent System Operator Corporation
Docket: ER15-2526-_____**
**Independent Assessment by the Department of Market Monitoring
October 2016 Energy Imbalance Market Transition Period Report –
Puget Sound Energy**

Dear Secretary Bose:

The Department of Market Monitoring (DMM) hereby submits its independent assessment on the transition period of Puget Sound Energy during its first six months of participation in the Energy Imbalance Market (EIM) for October 2016. Puget Sound Energy entered the EIM on October 1, 2016.

Please contact the undersigned directly with any questions or concerns regarding the foregoing.

Respectfully submitted,

By: /s/ Eric Hildebrandt

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California ISO

Report on energy imbalance market issues and performance: Puget sound energy

December 22, 2016

Prepared by: Department of Market Monitoring

Executive summary

Pursuant to the Commission's October 29, 2015 Order on the ISO's Energy Imbalance Market (EIM), the ISO filed a report on December 15, 2016 covering the period from October 1 through October 31, 2016 (October 2016 Report) for the Puget Sound Energy area.¹ This report provides a review by the Department of Market Monitoring (DMM) of EIM performance in the Puget Sound Energy area during the period covered in the ISO's October report. Key findings in this report include the following:

- Overall EIM performance went very well during the first month of implementation in the Puget Sound Energy area.
- Settlement prices in Puget Sound Energy differed from ISO prices largely because of congestion on transmission between the ISO and PacifiCorp West, as Puget Sound Energy connects to the ISO indirectly via transmission from PacifiCorp West. Settlement prices in Puget Sound Energy tracked closely to a benchmark of bilateral prices and averaged about \$22/MWh during October. Puget Sound Energy and PacifiCorp West prices (\$21/MWh) were similar because there was little overall congestion between these two areas.
- The percentage of intervals when the energy power balance constraint was relaxed to allow the market software to balance modeled supply and demand was very low, at less than 1 percent of intervals, in the 15-minute and 5-minute markets in October. Because of the low number of power balance constraint relaxations, the price discovery feature, which prevents prices from being set by the \$1,000/MWh penalty price during power balance shortages, had minimal impact on prices.
- Without special price discovery provisions in place, the load bias limiter feature would not have been triggered during any intervals in the 15-minute or 5-minute market in Puget Sound Energy. Therefore, the load bias limiter would have had no effect on prices, had it been in place and not the price discovery mechanism.²
- DMM reviewed the results and conclusions in the ISO's October report and found that they are largely consistent with the results we report in this document.

This report is organized as follows:

- Section 1 provides a description of prices in the market and impacts from the power balance constraint.
- Section 2 provides details on the impact of the load bias limiter.

¹ The ISO's October 2016 Report was filed at FERC on December 15 and posted in the ISO website on December 16, 2016: http://www.caiso.com/Documents/Dec15_2016_Oct2016_EIM_TransitionPeriodInformationalReport-PugetSoundEnergy_ER15-2565.pdf.

² The load bias limiter, also referred to as the load conformance limiter, is a market mechanism that sets power balance constraint penalty prices at the last economic bid dispatched, rather than the power balance constraint penalty parameter if the load adjustment is larger than the power balance constraint relaxation. In the event of a power balance constraint shortages, this causes prices to be set by the last economic instead of the \$1,000/MWh penalty parameter. The outcomes from this mechanism do not impact the market because of the price discovery feature, which is in place for the first six months of new energy imbalance market operation, and sets the price for all power balance constraint relaxations to the last price bid into the market by a unit.

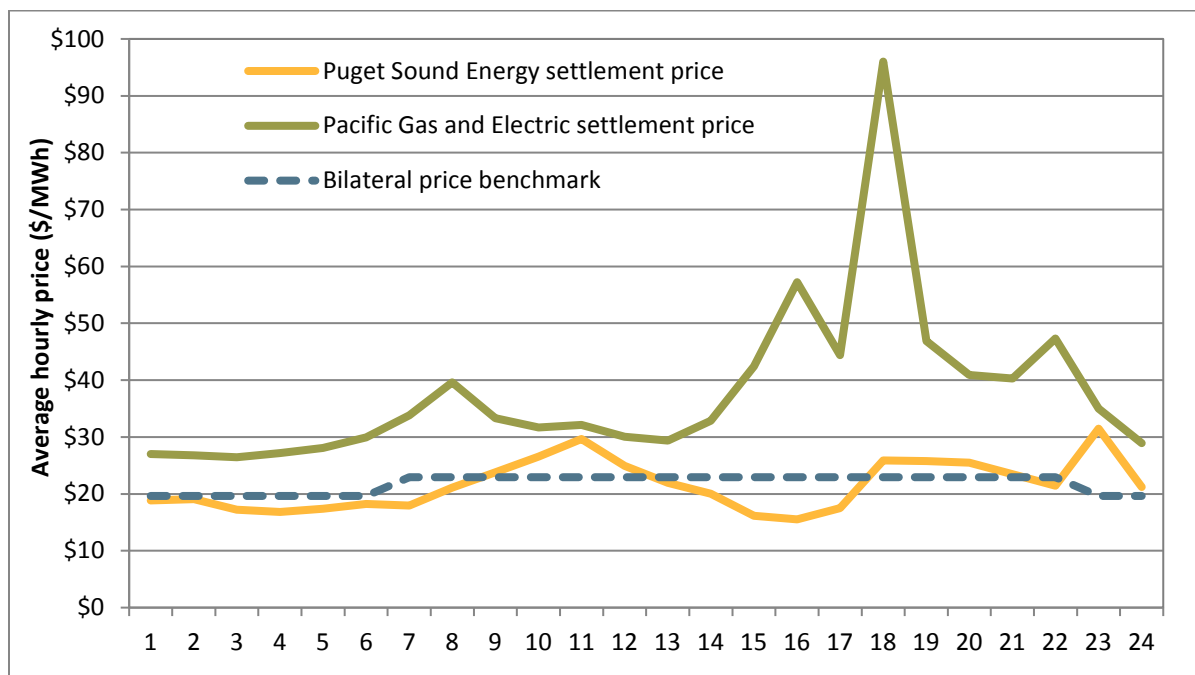
1 Energy imbalance market prices

The load settlement price is an average of 15-minute and 5-minute prices, weighted by the amount of estimated load imbalance in each of those markets.³ The 15-minute market prices are weighted by the imbalance between base load and forecasted load in the 15-minute market, and the 5-minute prices are weighted by the imbalance between forecasted load in the 15-minute market and forecast load in the 5-minute market.

Figure 1.1 shows hourly average settlement prices during October in the Puget Sound Energy and Pacific Gas and Electric (PG&E) areas, as well as the bilateral prices DMM uses as an additional benchmark for energy imbalance market prices.

The bilateral price benchmark is an average of peak and off-peak prices at various trading hubs using day-ahead ICE indices that are representative of an EIM entity’s pricing for settling imbalance prior to EIM implementation. The Puget Sound Energy bilateral price benchmark reflects prices at the Mid-Columbia trading hub.

Figure 1.1 Settlement prices and bilateral price benchmark – Puget Sound Energy



Settlement prices in Puget Sound Energy did not reflect prices in the ISO because of limited transmission between PacifiCorp West and the ISO. This resulted in local resources setting the price in a combined Puget Sound Energy and PacifiCorp West area during many intervals, instead of local prices reflecting system prices. Settlement prices in Puget Sound Energy tracked closely to the bilateral price benchmark

³ Business Practice Manual Configuration Guide: Real-Time Price Pre-calculation, Settlements and Billing, October 29, 2015: https://bpmcm.caiso.com/BPM%20Document%20Library/Settlements%20and%20Billing/Configuration%20Guides/Pre-Calcs/BPM%20-%20CG%20PC%20Real%20Time%20Price_5.13.doc.

and averaged about \$22/MWh during October. PacifiCorp West settlement prices averaged almost the same at about \$21/MWh during the same period.

Figure 1.2 and Figure 1.3 show the average daily frequency of constraint relaxations in the 15-minute and 5-minute markets, respectively, in Puget Sound Energy by week during October.⁴ These figures also show the average weekly prices *with* and *without* the special price discovery mechanism applied to mitigate prices in the two areas.⁵ These figures also include the average bilateral price benchmark for comparison to EIM market prices, depicted by the dashed blue lines.

These figures show that the percentage of intervals when the energy power balance constraint was relaxed was very low in both areas and markets in October. In the 15-minute market and 5-minute market, the power balance constraint was relaxed in less than 0.3 percent of intervals in Puget Sound Energy. As a result, prices with and without price discovery were mostly converged in both real-time markets and areas.

The most significant separation between prices with and without price discovery occurred on October 14 in Puget Sound Energy in the 5-minute market. These infeasibilities were in part driven by congestion on transmission from the ISO.

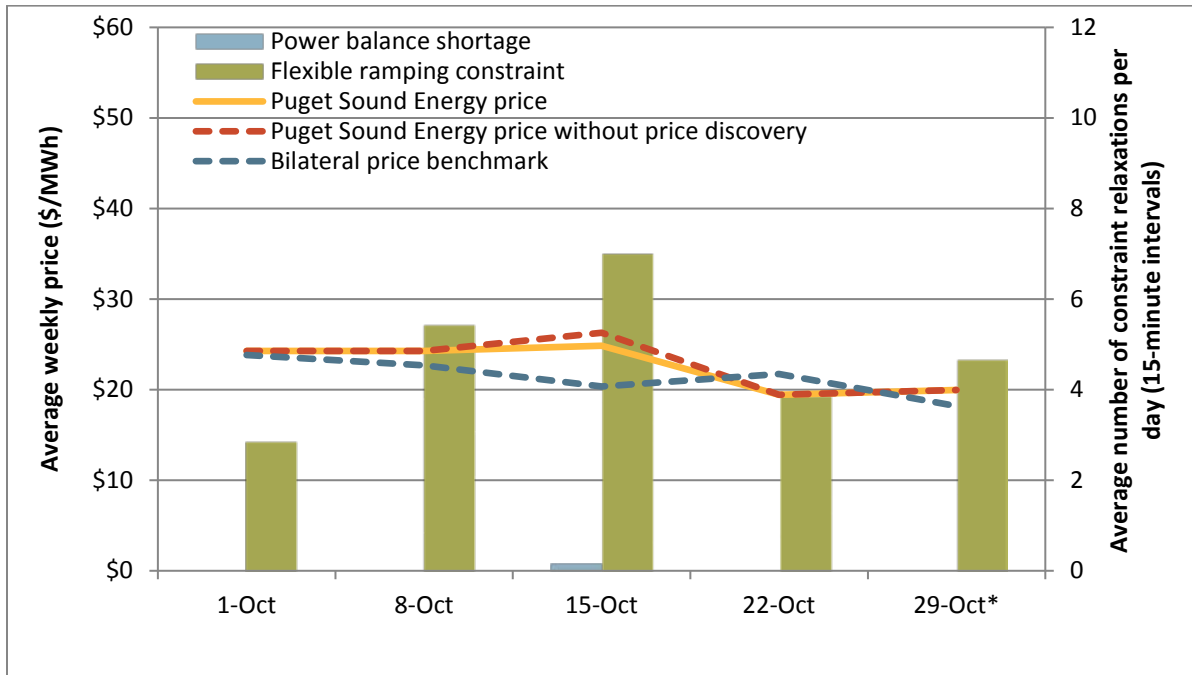
Weekly prices in Puget Sound Energy did not reflect prices in the ISO as closely and tracked near or below the bilateral price benchmark because of less available transmission between the two areas. However, prices in Puget Sound Energy closely tracked prices in PacifiCorp West, as there was little congestion between the two areas.

As shown in these figures, the price discovery mechanism, approved under the Commission's October 29, 2015 Order, had little impact on market prices in Puget Sound Energy in October 2016. This was because of the very low number of power balance relaxations during the month.

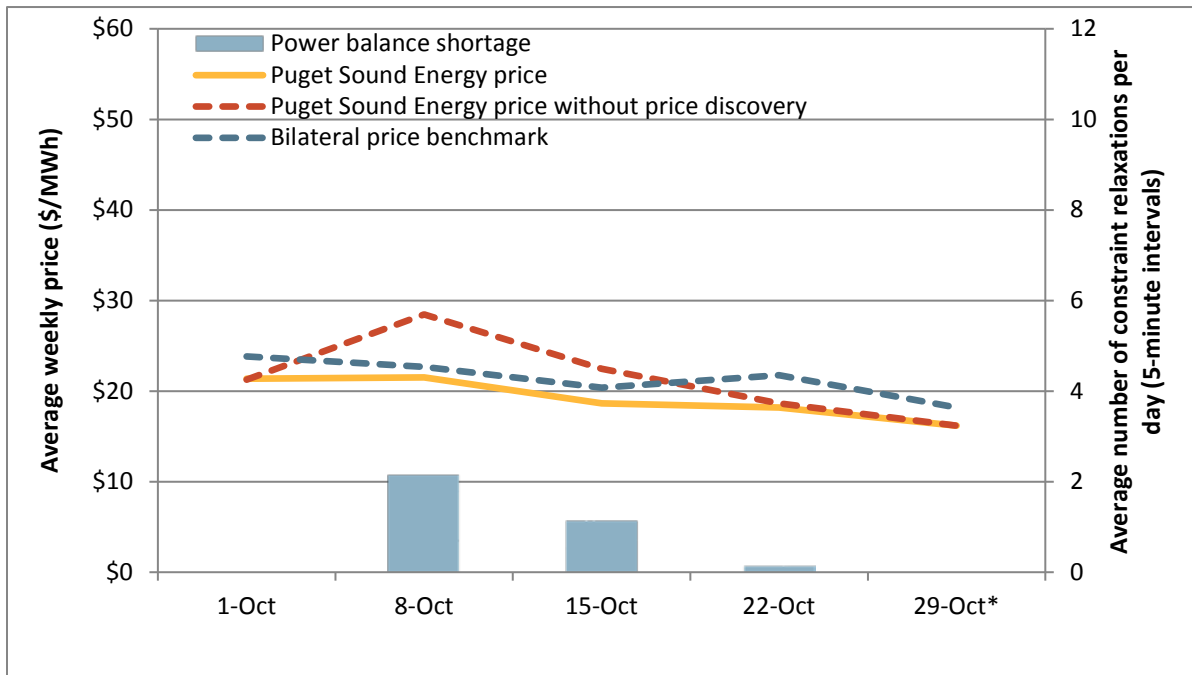
⁴ All figures contain a partial week for the last week shown. The week starting October 29 contains three days.

⁵ A detailed description of the methodology used to calculate these counterfactual prices that would result without price discovery was provided on p. 6 of the April 2, 2015 report on the Energy Imbalance Market from DMM (link below). When estimating prices without price discovery, it is assumed that when the load bias limiter would have been triggered, the resulting price would have been equal to the actual price that resulted with price discovery in effect. DMM has also adjusted its analysis to be consistent with the data in the ISO report.
http://www.caiso.com/Documents/Apr2_2015_DMM_AssessmentPerformance_EIM-Feb13-Mar16_2015_ER15-402.pdf.

**Figure 1.2 Frequency of constraint relaxation and average prices by week
Puget Sound Energy (15-minute market)**



**Figure 1.3 Frequency of constraint relaxation and average prices by week
Puget Sound Energy (5-minute market)**



2 Load bias limiter

When triggered, the load bias limiter would have the same effect as the price discovery feature and cause prices to be set by the last economic bid dispatched rather than the \$1,000/MWh penalty price for energy power balance shortages. A more detailed description of the load bias limiter is included in DMM’s April 2015 report.⁶ The ISO also included a discussion of the load bias limiter in its answer to comments regarding available balancing capacity on November 24, 2015.⁷

The frequency of intervals in which the power balance constraint was relaxed was very low during October in Puget Sound Energy in both real-time markets. Without special price discovery provisions in effect, the load bias limiter feature would not have been triggered during any real-time market interval and would therefore not have any impact on those prices in Puget Sound Energy areas.

Table 2.1 Impact of load bias limiter on EIM prices (October 2016)

	Average proxy price	Average EIM price	EIM price without price discovery	EIM price without price discovery or load bias limiter	Potential impact of load bias limiter	
					Dollars	Percent
<i>Puget Sound Energy</i>						
15-minute market (FMM)	\$21.83	\$22.89	\$23.22	\$23.22	\$0.00	0%
5-minute market (RTD)	\$21.83	\$19.56	\$22.08	\$22.08	\$0.00	0%

⁶ Report on Energy Imbalance Market Issues and Performance, Department of Market Monitoring, April 2, 2015, pp.34-35. http://www.caiso.com/Documents/Apr2_2015_DMM_AssessmentPerformance_EIM-Feb13-Mar16_2015_ER15-402.pdf

⁷ Answer of the California Independent systems Operator Corporation to Comments, November 24, 2015, pp. 13-21. http://www.caiso.com/Documents/Nov24_2015_Answer_Comments_AvailableBalancingCapacity_ER15-861-006.pdf

3 Flexible ramping sufficiency test

The flexible ramping sufficiency test ensures that each balancing area has enough ramping resources over an hour to meet expected ramping needs. The test is designed to ensure an EIM entity has sufficient ramping capacity to meet real-time market requirements without relying on transfers from other EIM balancing areas. This test is performed prior to each operating hour. If an EIM area fails the test, EIM transfers into that area cannot be increased.⁸ In addition, if a power balance or transmission constraint relaxation occurs during any interval within the hour, the price discovery mechanism is triggered pursuant to the ISO tariff.⁹ The area will also fail the flexible ramping sufficiency test for any hour when the capacity test fails. The capacity test is a test designed to ensure that there is sufficient resource capacity available to meet forecasts and net exports for any given hour.¹⁰

Prior to June 2015, the flexible ramping sufficiency test requirement was calculated as the cumulative sum of the flexible ramping requirement for each of the 15-minute intervals during each operating hour. This method was recognized to significantly overestimate the ramping requirements for an EIM entity because the total flexible ramping requirements for the 15-minute intervals within each operating hour are not additive. Therefore, in June 2015 the ISO modified the test to eliminate this cumulative summation so that it instead was based directly on the requirement for each 15-minute interval.

Figure 3.1 shows the percent of intervals in which Puget Sound Energy fails the sufficiency test, relaxes the power balance constraint, or both for the 15-minute and 5-minute markets, respectively. As shown in Figure 3.1, Puget Sound Energy failed the sufficiency test infrequently during the month, during less than 10 total hours, or about 1 percent of all hours. When an EIM area fails the sufficiency test, the effect on EIM transfers into the area can impact the feasibility of the solution. During October, the percent of intervals in which both the sufficiency test failed and the power balance constraint was relaxed was very low, occurring in less than 0.1 percent of 15-minute and 5-minute intervals for Puget Sound Energy.

In November, the ISO implemented the flexible ramping product, replacing the flexible ramping constraint, as a new mechanism to ensure that there is sufficient upward and downward ramping capability available to account for forecasted net load changes and forecast uncertainty. In addition, the ISO introduced a downward ramping sufficiency test to address real-time leaning due to over-supply in EIM. DMM will provide more details on market results from the flexible ramping product in relation to Puget Sound Energy in the upcoming special report for November.

⁸ Business Practice Manual for the Energy Imbalance Market, August 30, 2016, p. 45-52:

https://bpmcm.caiso.com/BPM%20Document%20Library/Energy%20Imbalance%20Market/BPM_for_Energy%20Imbalance%20Market_V6_clean.docx.

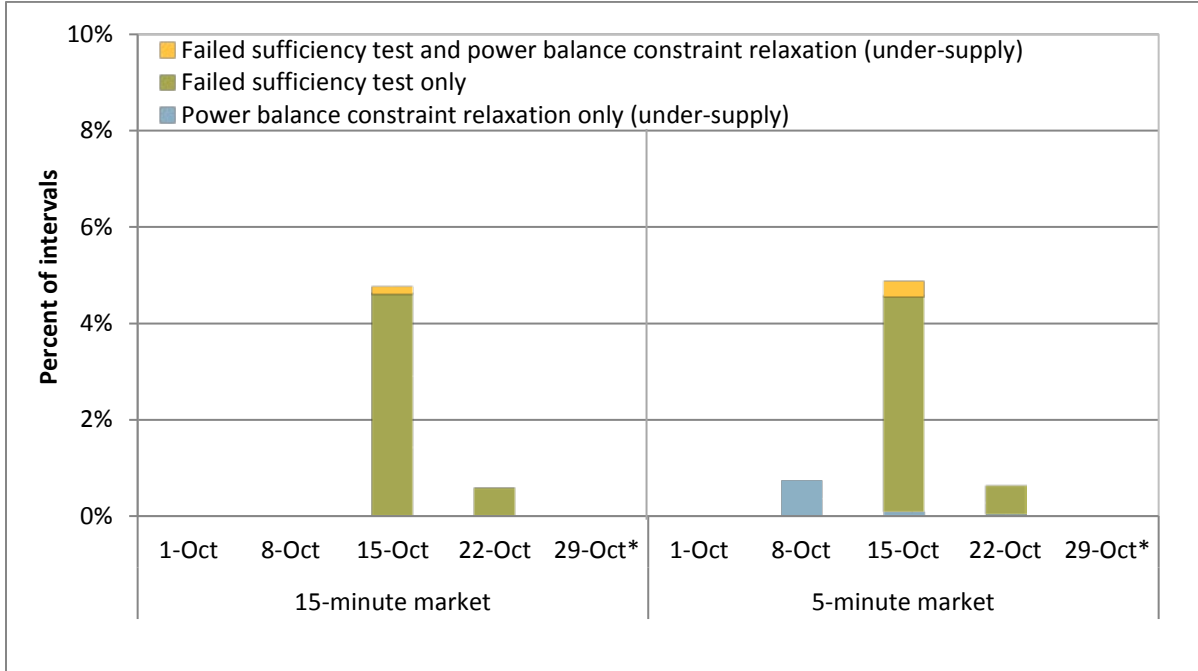
⁹ California Independent System Operator Corporation Fifth Replacement Electronic Tariff, Section 29.27:

http://www.caiso.com/Documents/Section29_EnergyImbalanceMarket_asof_Nov1_2016.pdf.

¹⁰ Business Practice Manual for the Energy Imbalance Market, August 30, 2016, p. 45:

https://bpmcm.caiso.com/BPM%20Document%20Library/Energy%20Imbalance%20Market/BPM_for_Energy%20Imbalance%20Market_V6_clean.docx.

Figure 3.1 Puget Sound Energy flexible ramping sufficiency test results



CERTIFICATE OF SERVICE

I certify that I have served the foregoing document upon the parties listed on the official service list in the captioned proceedings, in accordance with the requirements of Rule 2010 of the Commission's Rules of Practice and Procedure (18 C.F.R. § 385.2010).

Dated at Folsom, California this 22nd day of December, 2016.

/s/ Grace Clark _____

Grace Clark