

January 9, 2018

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

**Re: California Independent System Operator Corporation
Docket: ER15-2565-_____**
**Independent Assessment by the Department of Market Monitoring
November 2017 Energy Imbalance Market Transition Period
Report – Portland General Electric**

Dear Secretary Bose:

The Department of Market Monitoring (DMM) hereby submits its independent assessment on the transition period of Portland General Electric (PGE) during its first six months of participation in the Energy Imbalance Market (EIM) for November 2017. PGE entered the EIM on October 1, 2017, and this will be the last transition period report for PGE.

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: Portland General Electric for November 2017

January 9, 2018

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 19, 2017 covering the period from November 1 through November 30, 2017 (November report) for the Portland General Electric area in the energy imbalance market.¹ This report provides a review by the Department of Market Monitoring (DMM) of energy imbalance market performance in the Portland General Electric area during the period covered in the ISO's November report. Key findings in this report include the following:

- Real-time prices in Portland General Electric differed from ISO prices largely because of congestion on transmission from Portland General Electric and PacifiCorp West to the ISO. Portland General Electric and PacifiCorp West prices were similar during most hours, a result of little real-time congestion between these areas.
- Portland General Electric failed the sufficiency test infrequently during November, during 1 hour in the upward direction and 2 hours in the downward direction.
- In the 15-minute market during November, the power balance constraint was not relaxed. In the 5-minute market, the frequency of valid under-supply and over-supply infeasibilities in Portland General Electric was very low during November, in less than 0.1 percent of intervals. During these intervals, the transition period pricing mechanism set prices at the highest cost supply bid dispatched to meet demand rather than at the penalty parameter.
- Without special transition pricing provisions in place, the load bias limiter would have resolved just one under-supply infeasibility in the 5-minute market. Therefore, the load bias limiter would not have had a significant impact on prices had it been in place and not the transition period pricing mechanism.
- DMM reviewed the results and conclusions in the ISO's November report and found that the results are largely consistent with those reported in this document. However, DMM notes that the ISO's report does not account for the number of over-supply infeasibilities or its impact on prices without transition period provisions. DMM recommends that the ISO include analysis on over-supply infeasibilities in future energy imbalance market reports.

Section 1 of this report provides a description of prices and power balance constraint relaxations, section 2 discusses the load bias limiter, and section 3 discusses the flexible ramping sufficiency test.

¹ The ISO's November 2017 Report was filed at FERC and posted on the ISO website on December 19, 2017, https://www.caiso.com/Documents/Dec19_2017_EIMInformationalReport-TransitionPeriod_PGE_Nov2017_ER15-2565.pdf.

1 Energy imbalance market prices

Figure 1.1 and Figure 1.2 show hourly average 15-minute and 5-minute prices during November in Portland General Electric, PacifiCorp West, and Pacific Gas and Electric (PG&E), as well as the bilateral prices DMM used as an additional benchmark for energy imbalance market prices.

The bilateral price benchmark for Portland General Electric is composed of energy prices at the Mid-Columbia hub published by Powerdex. These are representative of prices used for settling imbalance energy in the Portland General Electric area prior to energy imbalance market implementation.

Prices in Portland General Electric were lower than prices in the ISO in many intervals because of limited transmission from Portland General Electric and PacifiCorp West to the ISO. This resulted in local resources setting the price in a combined Portland General Electric, Puget Sound Energy and PacifiCorp West region during many intervals, instead of prices reflecting the overall system price. In the Portland General Electric area during the month, prices averaged about \$24/MWh and \$23/MWh in the 15-minute and 5-minute market, respectively. During most intervals, real-time prices in Portland General Electric and PacifiCorp West were similar. Significant price separation that did occur between PacifiCorp West and Portland General Electric were mostly during hours when PacifiCorp West failed the upward sufficiency test.

Figure 1.1 Average hourly 15-minute price (November 2017)

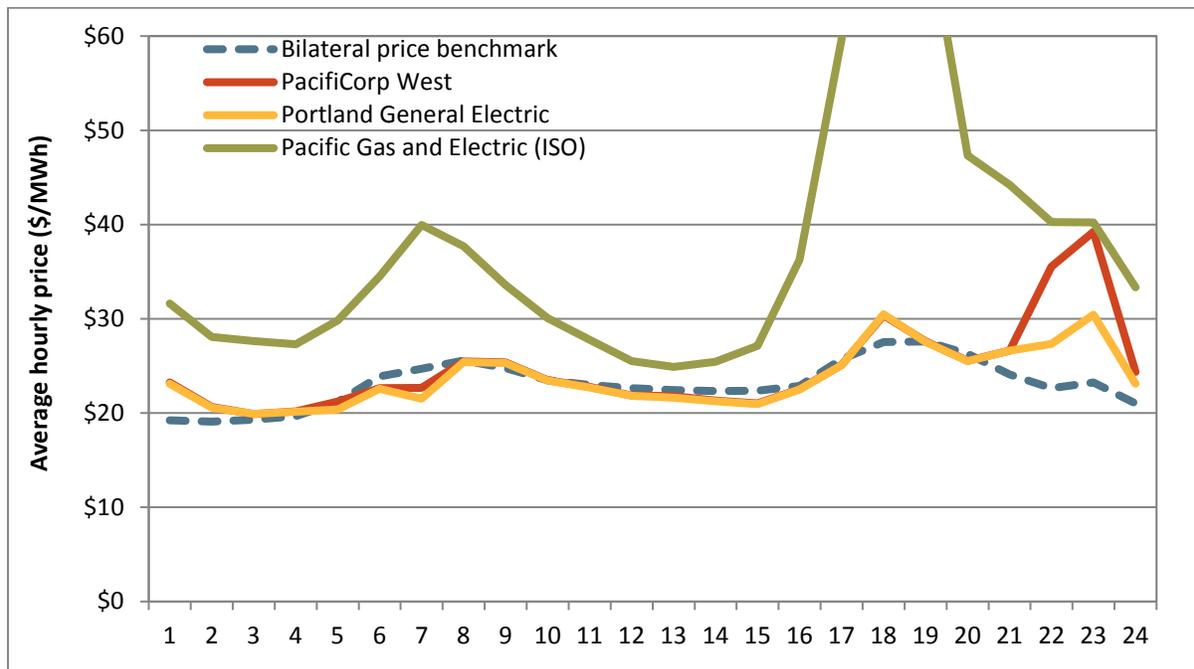
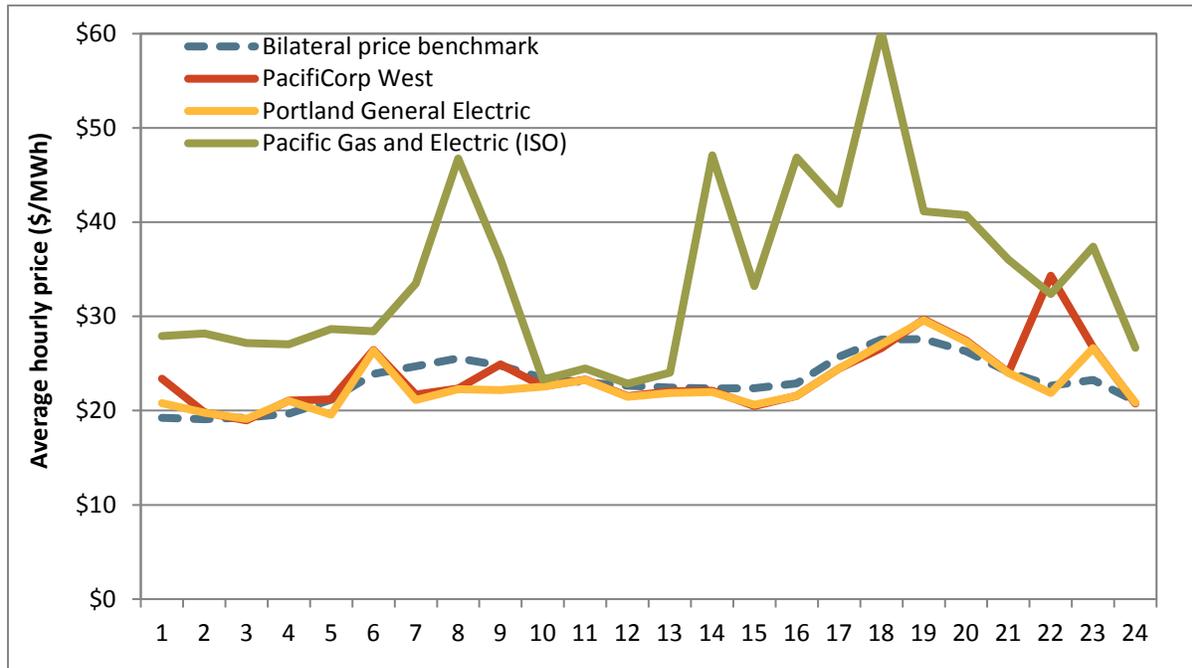


Figure 1.2 Average hourly 5-minute price (November 2017)

All power balance constraint relaxations that occurred in November were subject to the six-month transition period pricing that expires in April 2018. The transition period pricing mechanism sets prices at the highest cost supply bid dispatched to meet demand rather than at the \$1,000/MWh penalty parameter while relaxing the constraint for shortages, or the -\$155/MWh penalty parameter while relaxing the constraint for excess energy.² Power balance constraint relaxations can be grouped in the following categories:

- **Valid under-supply infeasibility** (power balance constraint shortage). These occurred when the power balance constraint was relaxed because load exceeded available generation. The ISO validated that ISO software was working appropriately during these instances.
- **Valid over-supply infeasibility** (power balance constraint excess). These occurred when the power balance constraint was relaxed because generation exceeded load. The ISO validated that ISO software was working appropriately during these instances.
- **Load bias limiter would have resolved infeasibility.** These occurred when a load adjustment entered by Portland General Electric exceeded the amount of the power balance constraint relaxation and in the same direction. During the transition period, the load bias limiter did not change price outcomes because transition period pricing was applied during these intervals instead.

² When transition period pricing provisions are triggered by relaxation of the power balance constraint, any shadow price associated with the flexible ramping product is set to \$0/MWh to allow the market software to use the last economic bid dispatched.

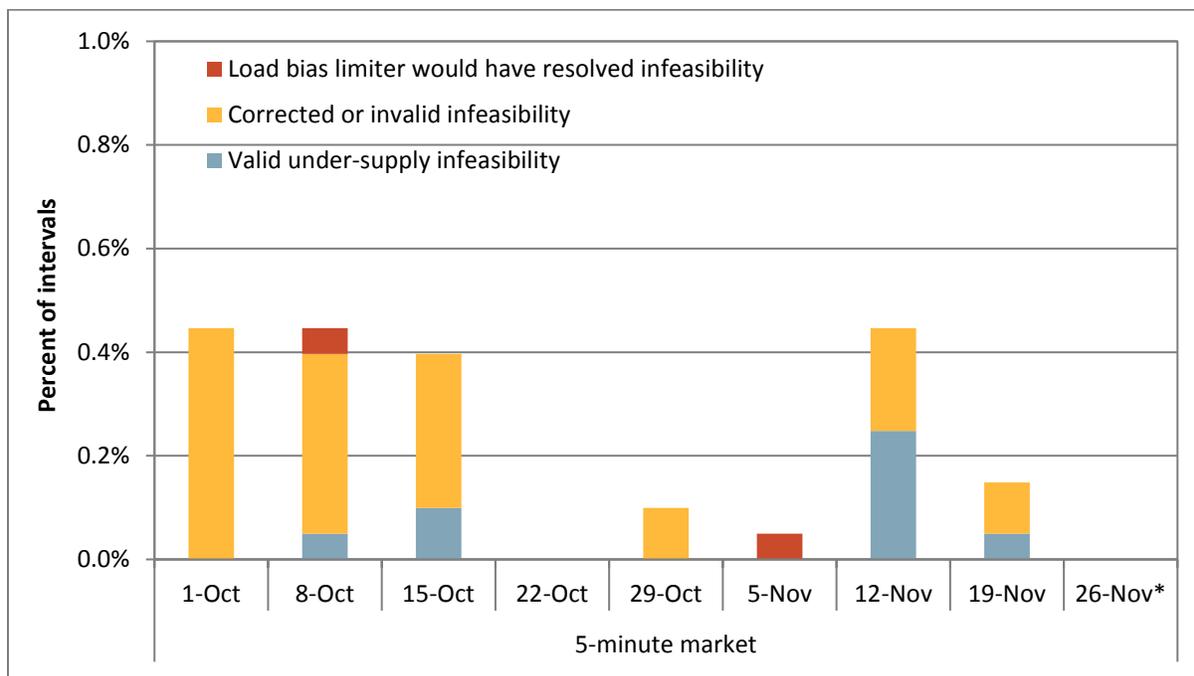
However, in these cases, the load bias limiter would have reduced the operator adjustment in the pricing run to resolve the infeasibility had transition period pricing not been in effect.

- **Correctable infeasibility.** These occurred when the ISO software relaxed the power balance constraint because of either a software error or data error. These required a price correction or would have triggered a price correction if transition period pricing were not active.³

Figure 1.3 and Figure 1.4 show the weekly frequency of under-supply and over-supply infeasibilities, respectively, in the 5-minute market. There were no power balance constraint relaxations for Portland General Electric in the 15-minute market during November. As shown in Figure 1.3, the frequency of valid under-supply infeasibilities in Portland General Electric was very low during November in the 5-minute market, during less than 0.1 percent of intervals.

As shown in Figure 1.4, the occurrence of valid over-supply infeasibilities was also infrequent in the 5-minute market, during less than 0.1 percent of intervals. All of the under-supply infeasibilities during the month occurred on November 27 after failing the downward sufficiency test.

Figure 1.3 Frequency of under-supply power balance infeasibilities by week (5-minute market) Portland General Electric



*Indicates partial week

³ Section 35 of the ISO tariff provides the ISO authority to correct prices if it detects an invalid market solution or issues due to a data input failure, occurrence of hardware or software failure, or a result that is inconsistent with the ISO tariff. During erroneous intervals, the ISO determined that prices resulting under transition period pricing were equivalent to prices that would result from a price correction, so no further price adjustment was appropriate. http://www.caiso.com/Documents/Section35_MarketValidationAndPriceCorrection_May1_2014.pdf.

Figure 1.4 Frequency of over-supply power balance infeasibilities by week (5-minute market) Portland General Electric

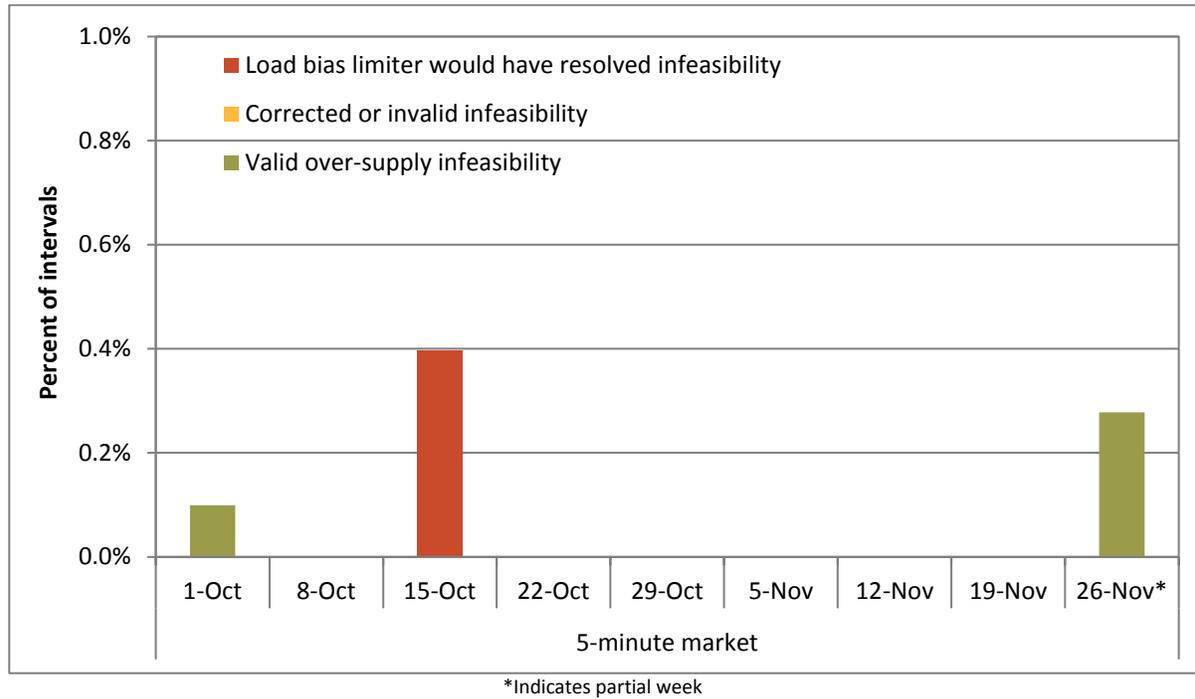


Figure 1.5 and Figure 1.6 show the average weekly prices in the 15-minute market and 5-minute market *with* and *without* the special transition period pricing provisions applied to mitigate prices in Portland General Electric during November.⁴ These figures also include the average bilateral price benchmark for comparison to Portland General Electric prices, depicted by the dashed blue lines.

Because there were no power balance constraint relaxation in the 15-minute market for Portland General Electric during November, prices with and without transition period pricing were identical. In the 5-minute market, these prices were mostly converged and tended to be near the bilateral price benchmark. Transition period pricing decreased average 5-minute market prices by less than \$1/MWh.

⁴ A detailed description of the methodology used to calculate these counterfactual prices that would result without transition period pricing was provided on p. 7 of the January 2017 report for Arizona Public Service from DMM: <https://records.oe.caiso.com/sites/GCA/legal/mm/Records/EIM/FERC%20Report/2017-01%20Arizona/EIM%20Special%20Report%20January%20APS.pdf>.

Figure 1.5 Average prices by week – Portland General Electric (15-minute market)

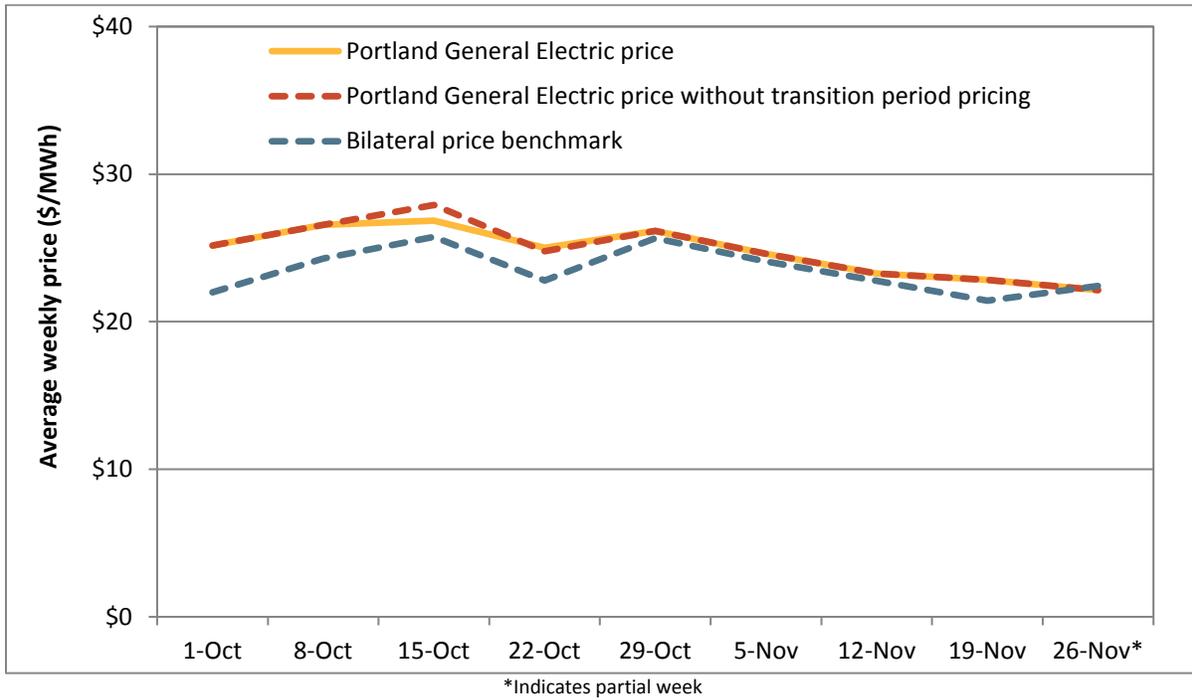
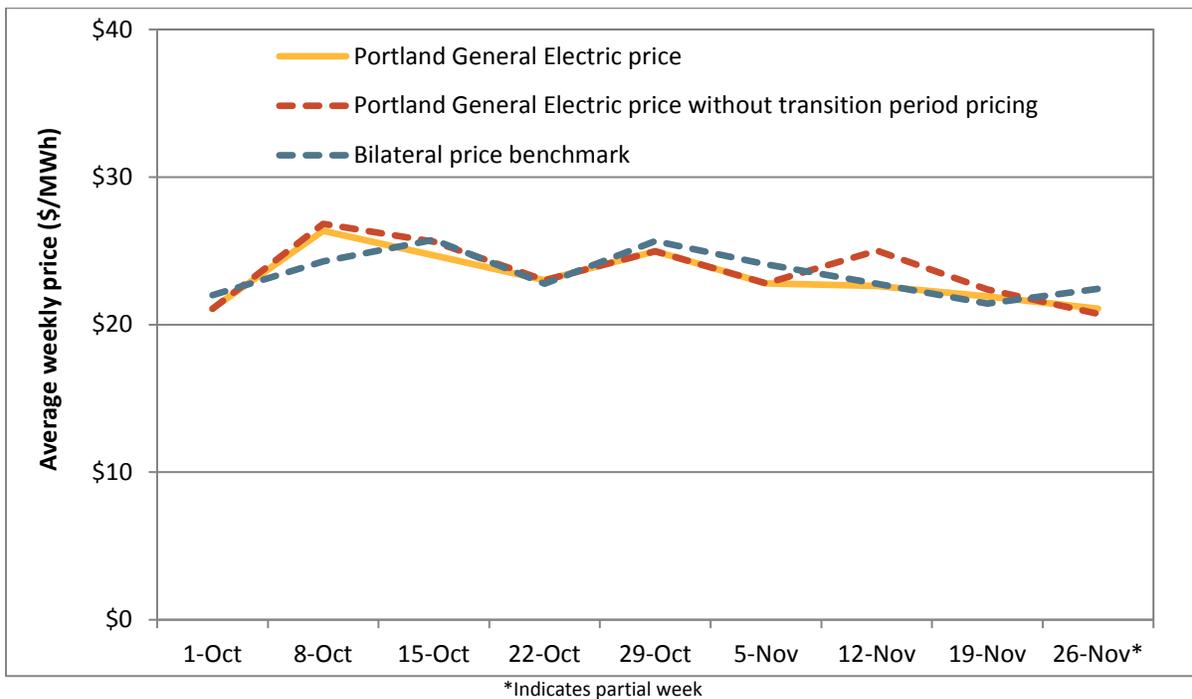


Figure 1.6 Average prices by week – Portland General Electric (5-minute market)



2 Load bias limiter

When the load bias limiter is triggered it has the same effect as the transition period pricing feature and causes prices to be set by the last economic bid dispatched rather than the \$1,000/MWh penalty price for under-supply power balance relaxations or the -\$155/MWh penalty price for over-supply power balance relaxations. A more detailed description of the load bias limiter is included in DMM's April 2015 report.⁵

Table 2.1 shows average 15-minute and 5-minute market prices with transition period pricing as well as counterfactual estimates for prices without transition period pricing and without either transition period pricing or the load bias limiter.

The frequency of intervals in which the power balance constraint was relaxed was low during November in Portland General Electric. Without special transition period pricing provisions in effect, the load bias limiter would have triggered during just one shortage interval in the 5-minute market. As a result, the load bias limiter would have decreased prices slightly, but by only around \$0.11/MWh.

Table 2.1 Impact of load bias limiter on Portland General Electric prices (November 2017)

	Average proxy price	Price with transition period pricing	Estimated price without transition period pricing	Estimated price without transition period pricing or load bias limiter	Potential impact of load bias limiter	
					Dollars	Percent
<i>Portland General Electric</i>						
15-minute market (FMM)	\$23.11	\$23.72	\$23.72	\$23.72	\$0.00	0.0%
5-minute market (RTD)	\$24.56	\$22.80	\$23.42	\$23.53	-\$0.11	-0.5%

⁵ *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.

3 Flexible ramping sufficiency test

The flexible ramping sufficiency test ensures that each balancing area has enough ramping resources over each hour to meet expected upward and downward ramping needs. The test is designed to ensure that each energy imbalance market area has sufficient ramping capacity to meet real-time market requirements without relying on transfers from other balancing areas.

When the energy imbalance market was initially implemented there was an upward ramping sufficiency test. In November 2016, the ISO implemented an additional downward ramping sufficiency test in the market with the introduction of the flexible ramping product, which replaced the flexible ramping constraint. If an area fails the upward sufficiency test, energy imbalance market imports cannot be increased.⁶ Similarly, if an area fails the downward sufficiency test, exports cannot be increased. In addition to the sufficiency test, each area is also subject to a capacity test. If an area fails the capacity test, then the flexible ramping sufficiency test automatically fails as a result.⁷

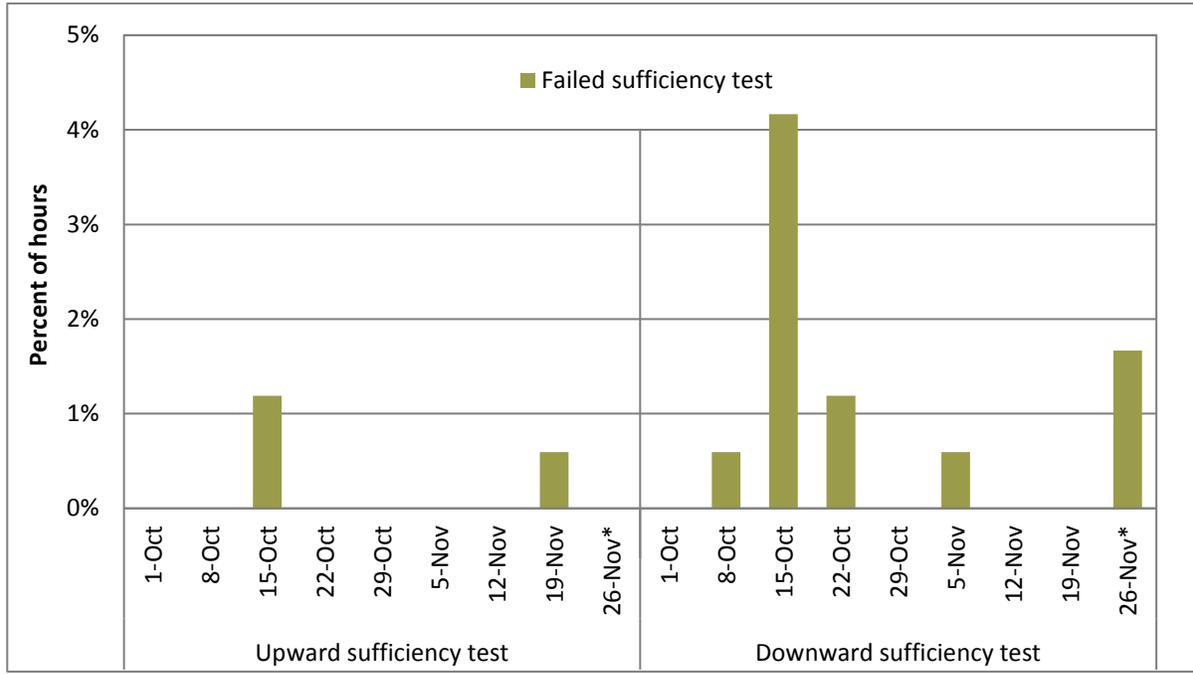
Limiting transfers can impact the frequency of power balance constraint relaxations and, thus, price separation across balancing areas. Constraining transfer capability may also impact the efficiency of the energy imbalance market by limiting transfers into and out of a balancing area that could potentially provide benefits to other balancing areas.

Figure 3.1 shows the frequency that Portland General Electric failed the sufficiency test in the upward or downward direction. As shown in Figure 3.1, Portland General Electric failed the sufficiency test infrequently during the month, during 1 hour in the upward direction and 3 hours in the downward direction, or less than 1 percent of all hours.

⁶ *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.

⁷ *Business Practice Manual for the Energy Imbalance Market*, August 30, 2016, p. 45.

Figure 3.1 Portland General Electric flexible ramping sufficiency test results



*Indicates partial week

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, on this 9th day of January, 2018.

/s/ Grace Clark
Grace Clark