

February 10, 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 No. ER15-2565____
Independent Assessment by the Department of Market Monitoring
December 2015 Energy Imbalance Market Transition Period Report –
NV Energy**

Dear Secretary Bose:

The Department of Market Monitoring hereby submits its independent assessment on the transition period of Nevada Energy during its first six months of participation in the Energy Imbalance Market for December 2015.

Please contact the undersigned with any questions.

Respectfully submitted,

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California ISO

Report on energy imbalance market issues and performance

February 10, 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 February 3, 2016 covering the period from December 1 through December 31, 2015 (December Report) for the NV Energy area.¹ This report provides a review by the Department of Market Monitoring (DMM) of EIM performance in the NV Energy area during the period covered in the ISO's December report. Key findings in this report include the following:

- Overall EIM performance went extremely well during the first month of implementation in the NV Energy area. The volume of available transfers between NV Energy, PacifiCorp East and the ISO increased significantly with the addition of the NV Energy area. The resource sufficiency and flexible ramping sufficiency tests were met in all but two hours in the NV Energy area during December. These factors helped keep supply insufficiencies very low and caused real-time prices to track closely in all these areas.
- NV Energy market prices tracked closely with prices in the SCE area (southern zone of the ISO), with prices for both markets slightly above bilateral trading hub prices during December. Average prices used in settlements, which combine 15-minute market and 5-minute market prices, were slightly less than SCE area prices and were about 4 to 12 percent higher than the various bilateral trading hub prices that DMM uses as an additional benchmark for EIM prices. Prices in the 15-minute market were slightly higher than prices in the 5-minute market, which fell within the representative bilateral hub price range.
- 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 in both markets in December. 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 market prices.
- During December, the percentage of intervals when the flexible ramping constraint was relaxed – but price discovery provisions were not triggered due to relaxation of the energy power balance constraint – was also very small. During these intervals when there is a shortage of flexible ramping capacity, the energy price in the 15-minute market includes the \$60/MWh penalty price for the flexible ramping constraint.² This occurred in only about 1.4 percent of 15-minute intervals during December, driving the monthly average 15-minute price up about 4 percent.
- The flexible ramping constraint bound frequently but was often not relaxed during December. During these periods, the shadow price for the constraint often reflected opportunity costs of cheaper local units in NV Energy providing flexible ramping capacity rather than energy. This result is consistent with efficient and competitive market outcomes given market conditions within the NV Energy area relative to adjacent areas of the ISO.

¹ The ISO's December Report was filed at FERC and posted in the ISO website on February 3, 2016, http://www.caiso.com/Documents/feb3_2016_Dec2015EIMTransitionPeriodReport_NVEnergy_ER15-2565.pdf.

² When price discovery provisions are triggered by relaxation of the energy power balance constraint, the penalty price for the flexible ramping constraint is changed from \$60/MWh to \$0/MWh in the pricing run, so that the shadow price of this constraint is \$0/MWh.

- Without special price discovery provisions in effect, the load bias limiter feature would have been triggered in three of the five intervals when the power balance constraint was relaxed in the 5-minute market in December. This would make hypothetical market prices with the load bias limiter in place just \$.28/MWh (1 percent) lower than what market prices would have been without the load bias limiter or price discovery. Because there were no power balance constraint relaxations in the 15-minute market, the load bias limiter would not have had an impact on those prices.
- When triggered, the load bias limiter would have the same effect as the price discovery feature triggered by power balance constraint shortages. This feature causes prices to be set by the last economic bid dispatched rather than the \$1,000/MWh penalty price for energy power balance shortages.

The remainder of this report is organized as follows:

- Section 1 provides a description of prices in the market and impacts from the power balance and flexible ramping market constraints.
- Section 2 provides highlights information regarding the flexible ramping constraint.
- Section 3 provides details on the impact of the load bias limiter.

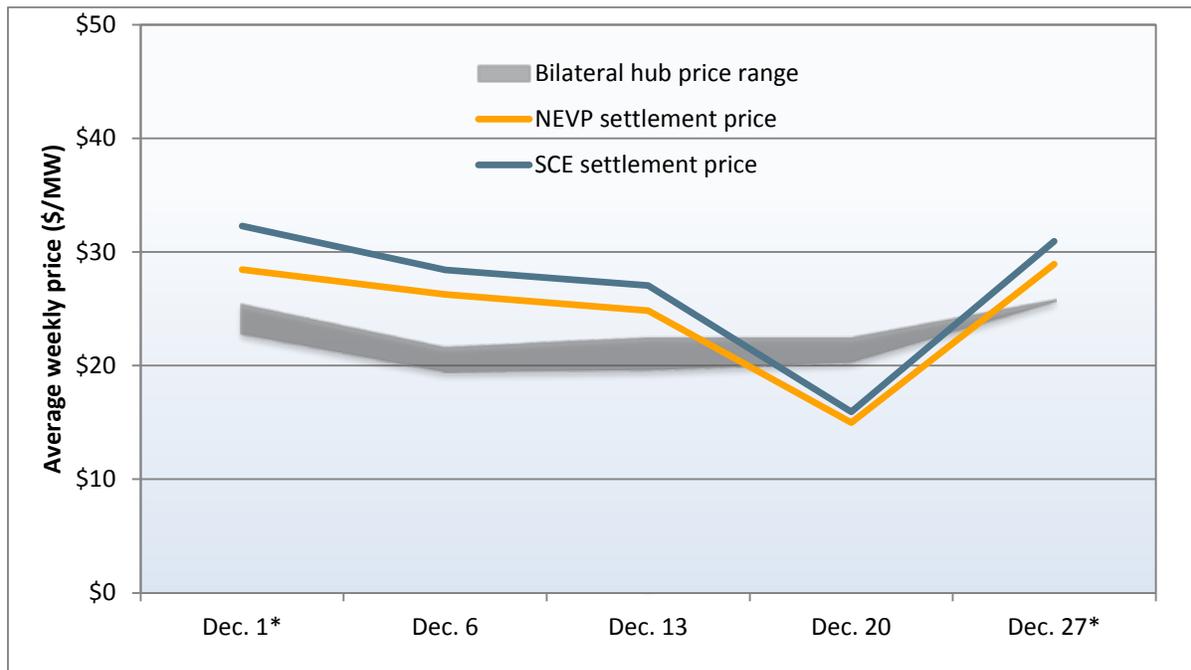
1 Energy imbalance market prices

Figure 1.1 shows weekly average prices used in settlement of loads in NV Energy and SCE area (southern zone of the ISO) prices, along with the range of bilateral trading hub prices DMM uses as an additional benchmark for EIM prices.³

The load settlement price is an average of prices in the 15-minute market and the 5-minute market, weighted by load imbalance in each respective market.⁴ Prices in the 15-minute market are weighted by the imbalance between base loads and load scheduled in the 15-minute market, and the 5-minute prices are weighted by the difference between load scheduled in the 15-minute market and load scheduled in the 5-minute market. The hourly shape and amount of the settlement price curve is most similar to the price curve observed in the 15-minute market. This occurs because the settlement prices are weighted more heavily on prices in the 15-minute market (roughly 80 percent) and less heavily on prices in the 5-minute market (roughly 20 percent).

Figure 1.1 shows that load settlement prices in NV Energy tracked just below load settlement prices in the SCE area, in southern California, during each week of December. The SCE area represents an appropriate area to compare with NV Energy because most of the energy transfer between NV Energy and the ISO occurs via tie points in southern California. Settlement prices in both the NV Energy and SCE areas were also slightly above the range of bilateral trading hub prices during December.

Figure 1.1 Settlement and bilateral trading hub prices – NV Energy



³ All figures include partial weeks for the first and last weeks in December.

⁴ Business Process 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_5.9.doc

The bilateral trading hub price range is calculated as the range between index prices from the ICE and Powerdex indices. For each index, prices are calculated using weighted daily averages of two major western trading hubs (Mead and Mid-Columbia) and include both peak and off-peak prices. The average settlement price for NV Energy was just over \$24/MWh in December, or about 4 to 12 percent above the bilateral trading hub price range for that month.

Figure 1.2 and Figure 1.3 show the average daily frequency of constraint relaxations in the 15-minute and 5-minute markets in NV Energy by week during December, respectively. These figures also show the average weekly prices in NV Energy in the 15-minute and 5-minute markets *with* and *without* the special price discovery mechanism being applied to mitigate prices in NV Energy, respectively. Additionally, these figures also include weekly average ranges of firm bilateral trading hub market prices for comparison to EIM market prices, represented by the grey shaded region.

Figure 1.2 does not include any records for power balance constraint relaxations because the constraint was not relaxed during any interval in the 15-minute market. Figure 1.3 shows that power balance constraint relaxations were very infrequent in the 5-minute market, occurring in five intervals (0.06 percent) during December. These results were very low, particularly when compared to other EIM areas.

Figure 1.2 also shows a low number of relaxations for the flexible ramping requirement in December. It shows that, on average, this constraint needed to be relaxed slightly more than one 15-minute interval each day, or a total of about only 1.4 percent of all intervals. Similar to the power balance constraint, the flexible ramping constraint was not relaxed frequently in NV Energy during December, and was relaxed significantly less frequently than during some recent months in other EIM areas.

Figure 1.2 and Figure 1.3 show that prices with and without price discovery were almost perfectly converged in both the 5-minute and 15-minute markets. This is attributable to the limited number of power balance relaxations during the month, where prices without price discovery in place include the \$1,000/MWh penalty price for relaxing the constraint and prices with price discovery do not.

These figures also show that on average, prices in NV Energy in December tracked closely with representative bilateral trading hub price ranges. Prices in the 15-minute market for the month averaged 5 to 15 percent above the representative bilateral trading hub range, and prices in the 5-minute market, with and without price discovery, were within the range of the representative bilateral trading hub prices.⁵

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 report on the Energy Imbalance Market from DMM (link below). The ISO's June 3 Report notes that the ISO implemented the load bias limiter feature for EIM on March 20, so that data in the ISO's report now excludes intervals since March 20 when the power balance constraint was relaxed in the scheduling run, but this software feature would have been triggered if price discovery was not in effect. Also, 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 NV Energy (15-minute market)

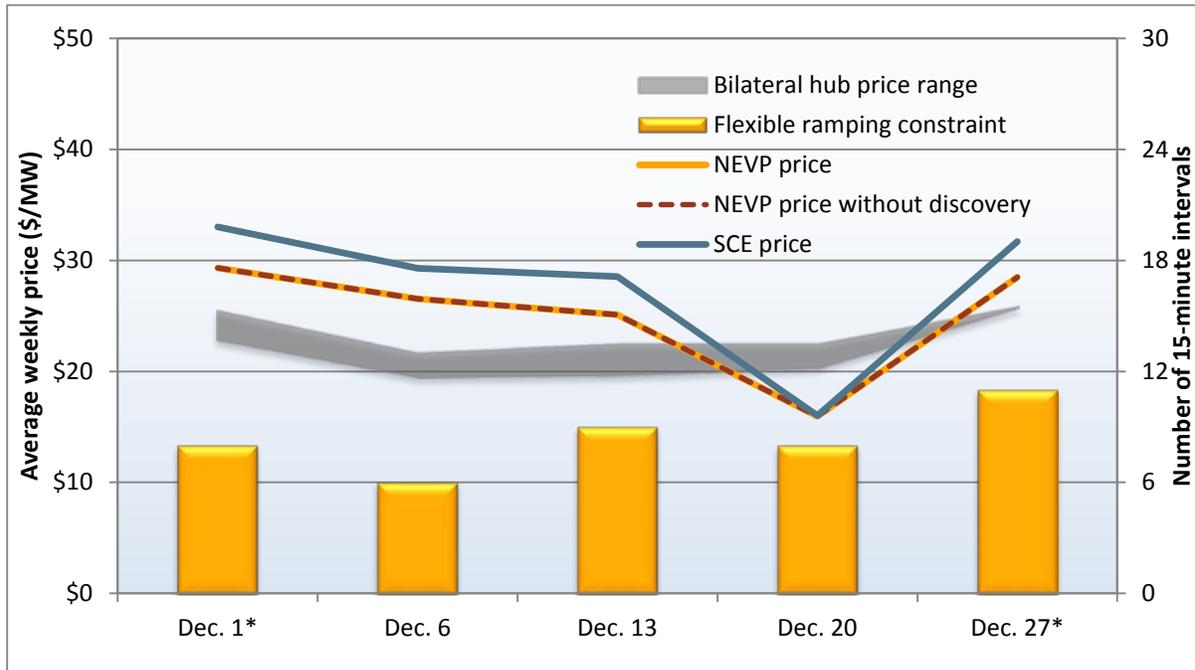
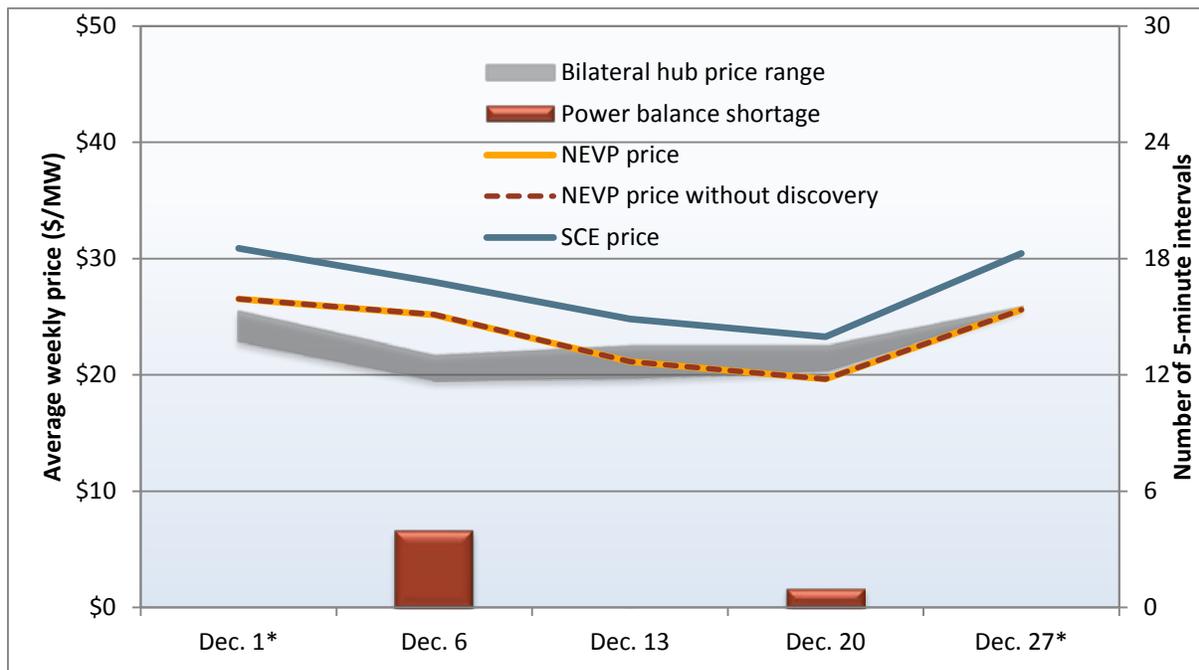


Figure 1.3 Frequency of constraint relaxation and average prices by week NV Energy (5-minute market)



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 the NV Energy area in December. This was because of the very low number of power balance relaxations during the month.

2 Flexible ramping capacity

In DMM’s October report on energy imbalance market issues covering the PacifiCorp areas, we have provided a detailed discussion on the flexible ramping sufficiency test and the flexible ramping constraint.⁶ This section includes analysis and a description of the relationship between the flexible ramping test and the flexible ramping constraint. This section provides a summary of the number of the flexible ramping constraint relaxations in NV Energy.⁷ We do not cover the flexible ramping sufficiency test in detail since there were only two hours in total where the sufficiency test failed in the NV Energy area during December.

Flexible ramping capacity constraint

As shown in Table 2.1, the flexible ramping requirement averaged about 85 MW in the NV Energy area during December. As described in prior reports, flexible ramping constraint requirements are calculated based on historical ramping levels for each 15-minute interval by comparing the preceding 40 intervals.⁸ DMM has expressed concern about this approach since it is based on a very limited sample and tends to result in a very volatile level of requirements. The ISO has addressed this issue placing minimum and maximum bounds of the requirement calculated by this tool, which often set the flexible ramping requirements.

As shown in Table 2.1, the requirement calculated by this tool fell below the minimum level established by the ISO (80 MW) during about 69 percent of intervals, and therefore set the requirement to 80 MW during these intervals. The requirement calculated by the tool exceeded the maximum level established by the ISO (100 MW) during about 24 percent of intervals, the requirement therefore set to 100 MW during these intervals. During only 6 percent of intervals the requirement fell between 80 and 100 MW.

Table 2.1 Flexible ramping constraint requirements for NV Energy

BAA	Month	Requirement (MW)			Percent of intervals		
		Avg	Min	Max	Req = Lower bound	Req = Upper bound	Req = bounds
NV Energy	Dec	85	80	100	69%	24%	94%

⁶ Report on Energy Imbalance Market Issues and Performance, Department of Market Monitoring, December 22, 2015, pp.19-27.

http://www.caiso.com/Documents/Dec28_2015_Department_MarketMonitoringReport_Performance_Issues_EIM_Oct2015_ER15-402.pdf.

⁷ Report on Energy Imbalance Market Issues and Performance, Department of Market Monitoring, December 1, 2015, pp.15-17.

http://www.caiso.com/Documents/Dec1_2015_Department_MarketMonitoringReport_Performance_Issues_EIMfromAug_Sep2015_ER15-402.pdf.

⁸ Q3 2015 Report on Market Issues and Performance, Department of Market Monitoring, November 16, 2015, pp. 34-36.

<http://www.caiso.com/Documents/2015ThirdQuarterReport-MarketIssuesandPerformance-November2015.pdf>.

As shown in Table 2.2, the flexible ramping constraint was relaxed due to a shortage of ramping capacity during only about 1.4 percent of 15-minute intervals during December. This drove the monthly average 15-minute price up about 4 percent.

Table 2.2 also shows that the flexible ramping constraint bound, but was not relaxed, during nearly 75 percent of intervals in December. Because the constraint is not relaxed, the shadow price for the flexible ramping constraint is not set at the \$60/MWh penalty, but a smaller amount. This level of flexible ramping constraint relaxation exceeds levels in the ISO and other energy imbalance market areas and arises because of specific circumstances in the NV Energy area, as described below.

Table 2.2 Flexible ramping constraint requirements and market impacts in NV Energy

	Average flex ramp requirement (MW)	Binding flexible ramping constraint (no shortage)		Relaxed flexible ramping constraint (shortage)	
		% of intervals	Average shadow price	% of intervals	Average shadow price
December	85	73.8%	\$9.41	1.4%	\$60.00

Prevailing system marginal prices, observed across the footprint, frequently set local prices in the NV Energy area during December. This is due to the high amount of transfer capability and limited amount of congestion observed between NV Energy and the ISO. Under these conditions, when flexible ramp requirements were fulfilled by inexpensive units within the NV Energy area, shadow prices for the flexible ramping constraint roughly equaled the difference between the marginal cost of the unit providing flexible ramping capacity and the prevailing system marginal price. This occurred frequently in NV Energy and is not inconsistent with efficient and competitive market outcomes.

3 Load bias limiter

When triggered, the load bias limiter would have the same effect as the price discovery feature by causing 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 2 report.⁹ The ISO included discussion of the load bias limiter in its recent answer to the comments regarding the ISO's response to the Commission's September 24, 2015 letter requesting additional information on the ISO's August 19, 2015 filing to implement its available balancing capacity proposal in the EIM.¹⁰

As highlighted in Section 1, the power balance needed to be relaxed during very few intervals in the NV Energy area during December. The instances where the power balance constraint relaxation did impact prices were confined to the 5-minute market. Figure 3.1 shows that during 5-minute intervals when power balance constraint shortages existed in December, a majority would have also triggered the load bias limiter. Of the five 5-minute intervals in which the power balance constraint was relaxed, three would have been resolved by the load bias limiter.

Because of the infrequency of relaxations, the impact of the load bias limiter and the price discovery mechanism on prices was minimal. Overall the load bias limiter would have lowered prices in the 5-minute market by \$0.28/MWh (1 percent). As there were no power balance constraint relaxations, the load bias limiter would have had no impact in the 15-minute market.

The estimates of EIM prices without price discovery in Section 1 of this report assume that price discovery provisions are not in place, but energy prices would not be set by the \$1,000/MWh penalty price when the power balance constraint was relaxed and the criteria for triggering the load bias limiter were met. This reflects that on March 20 the ISO indicated that the load bias limiter would have been triggered under these criteria, if price discovery provisions were no longer in effect.

⁹ *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.

¹⁰ 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.

**Figure 3.1 Mitigation of power balance relaxation by load bias limiter
NV Energy – 5-minute market**

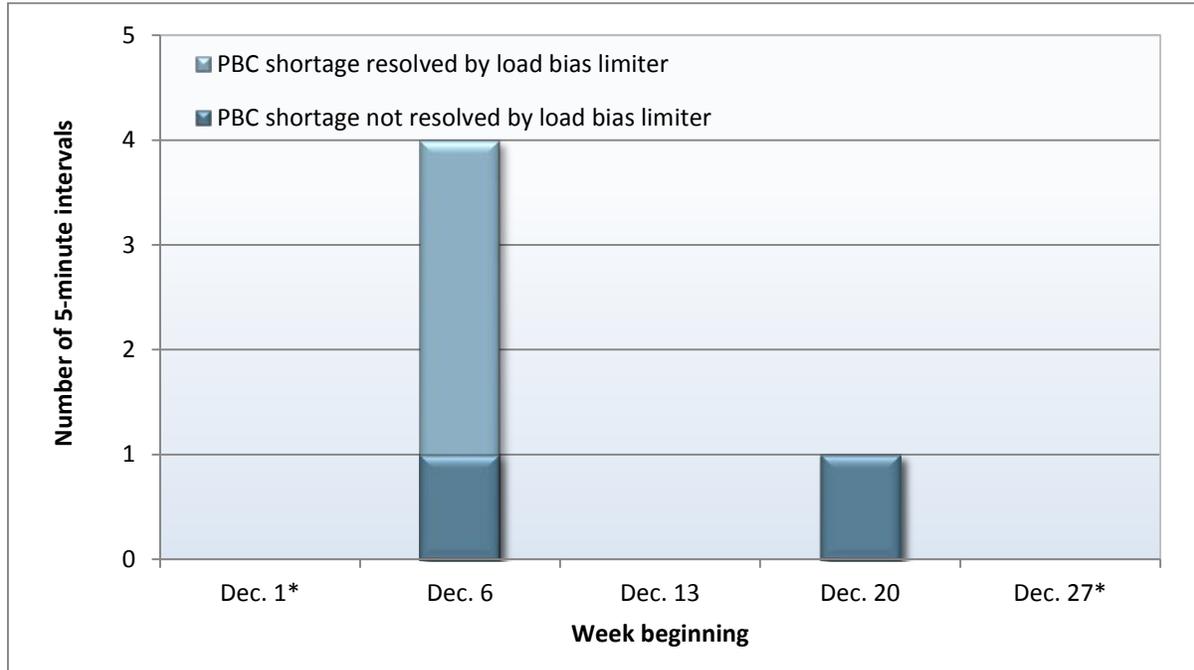


Table 3.1 Impact of load bias limiter on EIM prices (December 2015)

	Representative bilateral trading hub price range		Average EIM price	EIM price without price discovery	EIM price without price discovery or load bias limiter	Potential impact of load bias limiter	
	Low	High				Dollars	Percent
15-minute market (FMM)	\$21.27	\$23.35	\$24.60	\$24.60	\$24.60	\$0.00	0.0%
5-minute market (RTD)	\$21.27	\$23.35	\$23.30	\$23.31	\$23.60	-\$0.28	-1.2%

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 10th day of February, 2016.

Is/ Anna Pascuzzo
Anna Pascuzzo