

September 25, 2015

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. ER15-402____
Independent Assessment – Department of Market Monitoring
Report on Energy Imbalance Market Issues and Performance**

Dear Secretary Bose:

The Department of Market Monitoring hereby submits its independent assessment on the causes and solutions identified by the California Independent System Operator Corporation in its report on the performance of the Energy Imbalance Market for the month of July, 2015.¹

Please contact the undersigned with any questions.

Respectfully submitted,

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¹ The CAISO submits this report pursuant to *California Independent System Operator Corp.*, 149 FERC ¶ 61,194 (2014).

California ISO

Report on energy imbalance market issues and performance

September 25, 2015

Prepared by: Department of Market Monitoring

Executive summary

Pursuant to the Commission's March 16, 2015, Order on the ISO's Energy Imbalance Market (EIM), the ISO filed a report on September 22, 2015 covering the period from July 1-31, 2015 (September 22 Report). This report provides a review by the Department of Market Monitoring (DMM) of EIM performance during the period covered in the ISO's September 22 Report. Key findings include the following:

- Performance of the EIM remained highly efficient and effective during July in both PacifiCorp East and PacifiCorp West. During most intervals, prices in the EIM have continued to be highly competitive and have been set by bids closely reflective of the marginal operating cost of the highest cost resource dispatched to balance loads and generation. However, during a small portion of intervals, energy or flexible ramping constraints have still had to be relaxed for the market software to balance modeled supply and demand.
- In PacifiCorp East, the frequency of intervals in which the power balance constraints have been relaxed in the 15-minute market decreased from about 0.2 percent in June to about 0.1 percent in July. In the 5-minute market, the frequency of power balance constraint relaxation increased from about 1 percent in June to about 1.4 percent in July.
- In PacifiCorp West, the frequency of intervals in which the power balance constraints have been relaxed in the 15-minute market decreased from about 0.4 percent during June to just 1 observation (0.03 percent) in July. In the 5-minute market, the frequency of power balance constraint relaxation decreased from about 1.0 percent in June to about 0.6 percent in July.
- Average prices in the 15-minute and 5-minute markets in both PacifiCorp areas during July that would have resulted even without special price discovery features in effect were slightly below bilateral market price indices for trading points upon which energy imbalance charges in these balancing areas were based prior to EIM.
- In PacifiCorp East, without price discovery provisions in place, EIM prices in the 15-minute market during July would have been about 27 percent lower than these bilateral market price indices, while prices in the 5-minute market would have been about 18 percent lower than bilateral prices.
- In PacifiCorp West, without these price discovery provisions, 15-minute prices during July would have been about 27 percent lower than these bilateral market price indices, while prices in the 5-minute market would have been about 13 percent lower than bilateral prices.
- Bidding in the EIM continues to be highly competitive, with bids for most capacity below or slightly above default energy bids used in market power mitigation. When bids are mitigated due to market power mitigation provisions, these procedures generally result in modest reductions in bid prices.

The ISO's September 22 report includes updated charts and tables, but includes no other substantive changes to the text compared to the ISO's prior EIM reports.

This report is organized as follows: This summary section highlights key findings and trends occurring in July 2015. Section 1 through 3 provide updated charts and tables which have been included in prior reports.

1 Energy imbalance market prices

Figure 1.2 and Figure 1.3 show the average daily frequency of constraint relaxations in the 15-minute market by month in PacifiCorp East and PacifiCorp West, respectively. Figure 1.5 and Figure 1.7 provide a similar summary for the 5-minute market in these two areas. A detailed description of various types of constraint relaxation in these figures has been provided in prior reports.¹

Figure 1.2 and Figure 1.4 show average monthly prices in the 15-minute market *with* and *without* the special price discovery mechanism being applied to mitigate prices in PacifiCorp East and PacifiCorp West, respectively. Figure 1.6 and Figure 1.8 provide the same monthly price summary for the 5-minute market. These figures also include monthly average bilateral market prices for trading points that were used to determine balancing energy charges prior to EIM implementation in PacifiCorp East and PacifiCorp West, respectively. Table 1.1 shows results of this analysis for the month of July.

A detailed description of the methodology used to calculate these counterfactual prices that would result without price discovery has been provided in prior reports.² 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 exclude 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. DMM has also adjusted its analysis to be consistent with the data in the ISO report.³

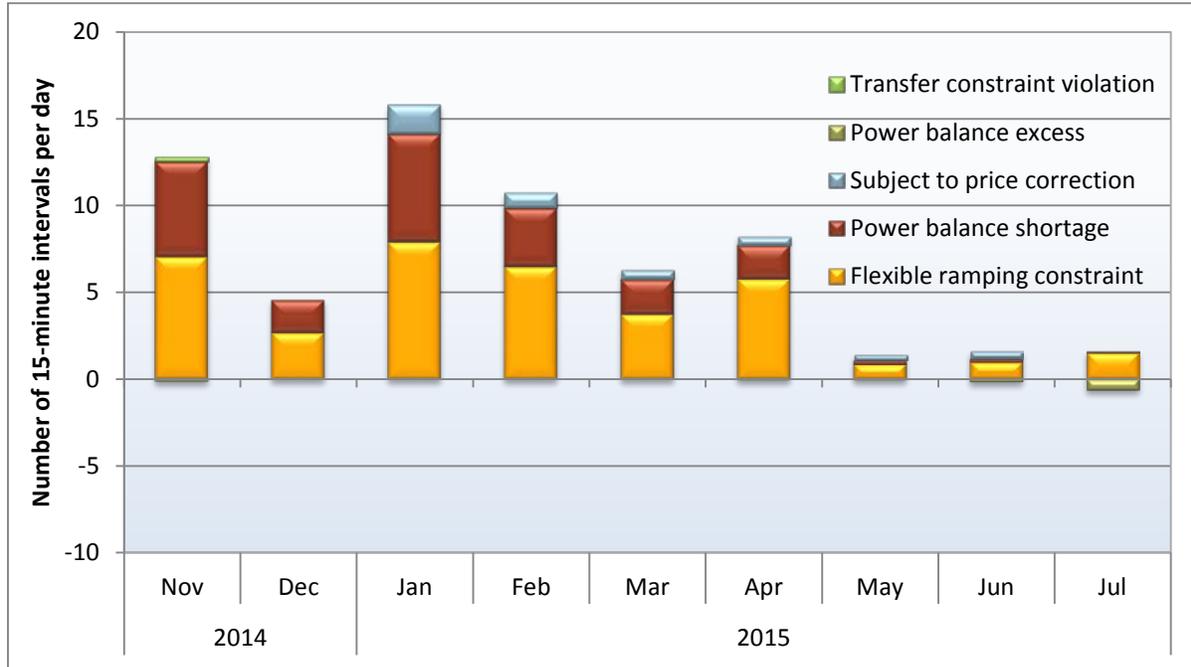
As shown in these figures, the price discovery mechanism approved under the Commission's December 1, 2014 order has effectively mitigated the impact of constraint relaxation on market prices in prior months. However, in July the price discovery mechanism was not triggered frequently and prices without this mechanism would have been very low. As shown in Table 1.1, without price discovery, prices in PacifiCorp East during July would be 27 percent lower in the 15-minute market and 18 percent lower in the 5-minute market than bilateral prices. In PacifiCorp West, prices in July would have been 27 percent lower than bilateral market prices in the 15-minute market and 13 percent lower in the 5-minute markets.

¹ *Report on Energy Imbalance Market Issues and Performance*, Department of Market Monitoring, April 2, 2015, p.5. http://www.caiso.com/Documents/Apr2_2015_DMM_AssessmentPerformance_EIM-Feb13-Mar16_2015_ER15-402.pdf.

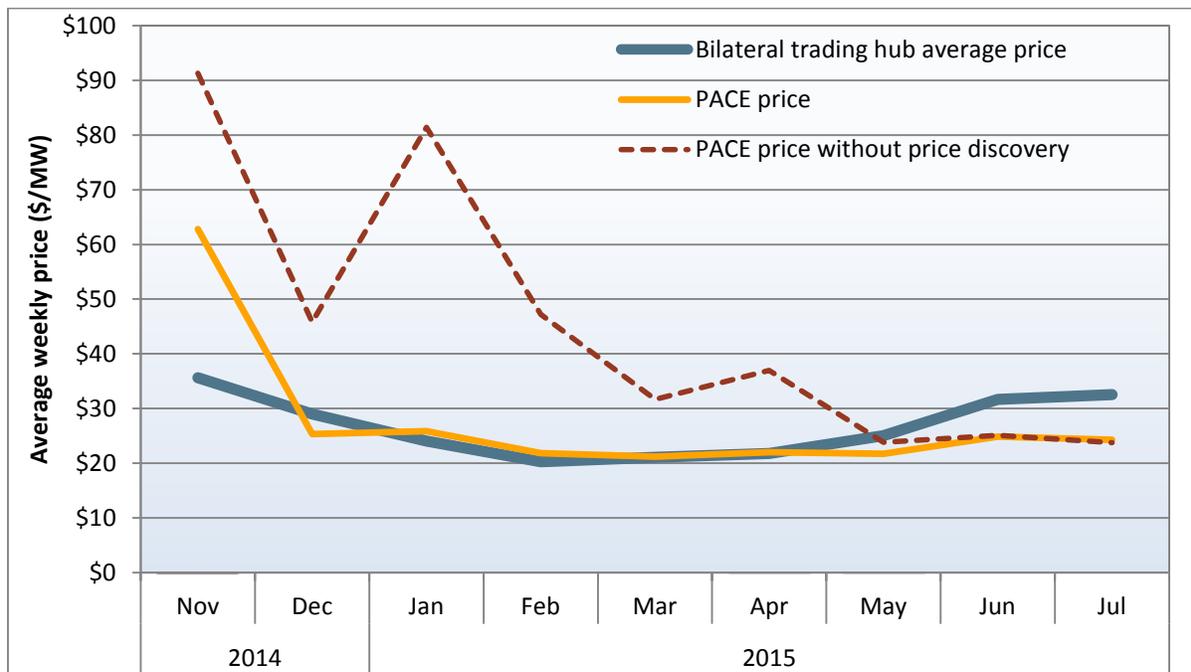
² *Report on Energy Imbalance Market Issues and Performance*, Department of Market Monitoring, April 2, 2015, p.6. http://www.caiso.com/Documents/Apr2_2015_DMM_AssessmentPerformance_EIM-Feb13-Mar16_2015_ER15-402.pdf.

³ As in the ISO report, data on the frequency of constraint relaxation exclude 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 limited would have been triggered, the resulting price would have been equal to the actual price that resulted with price discovery in effect.

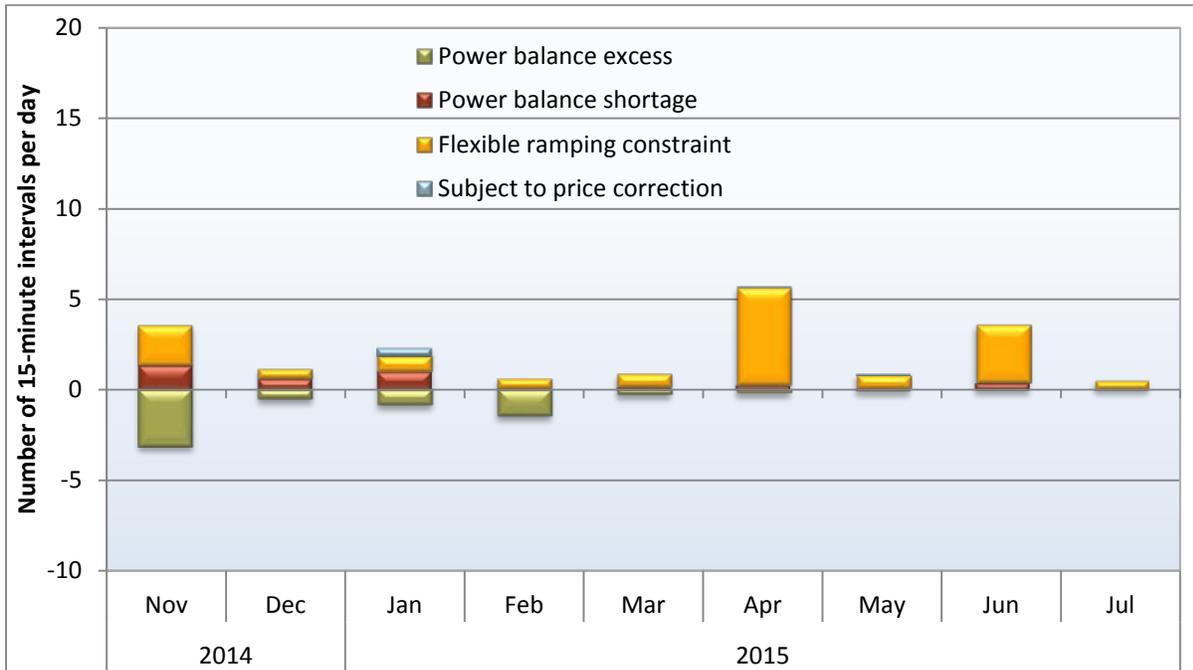
**Figure 1.1 Frequency of constraint relaxation
PacifiCorp East - 15-minute market**



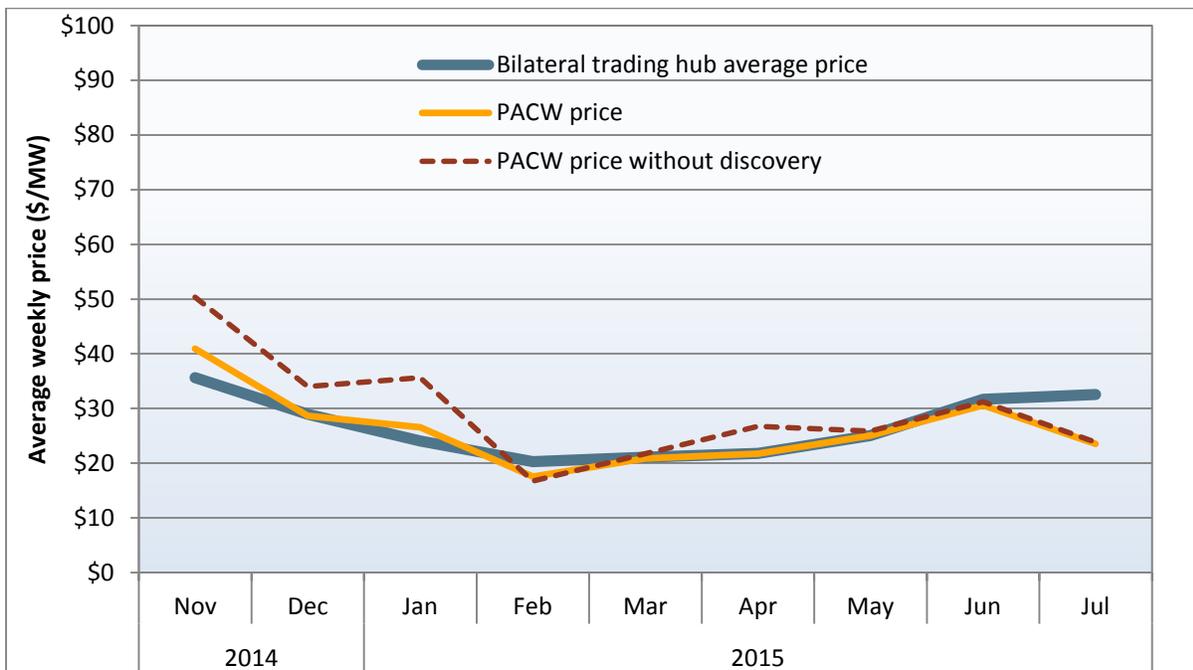
**Figure 1.2 Average daily prices with and without price discovery
PacifiCorp East - 15-minute market**



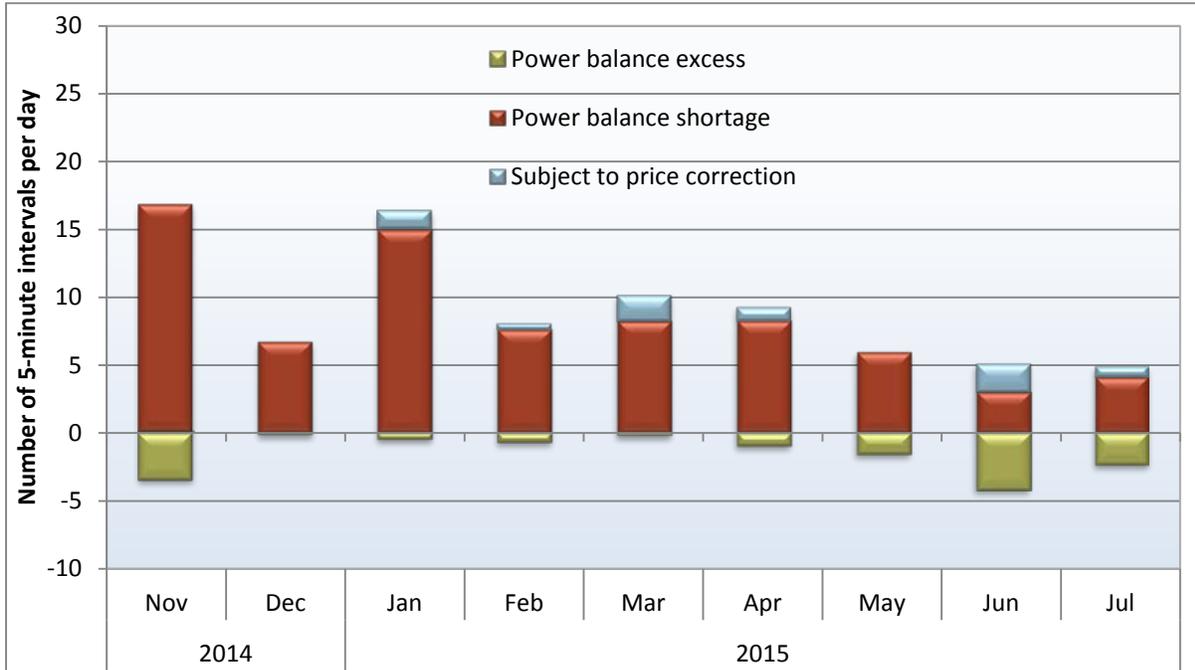
**Figure 1.3 Frequency of constraint relaxation
PacifiCorp West - 15-minute market**



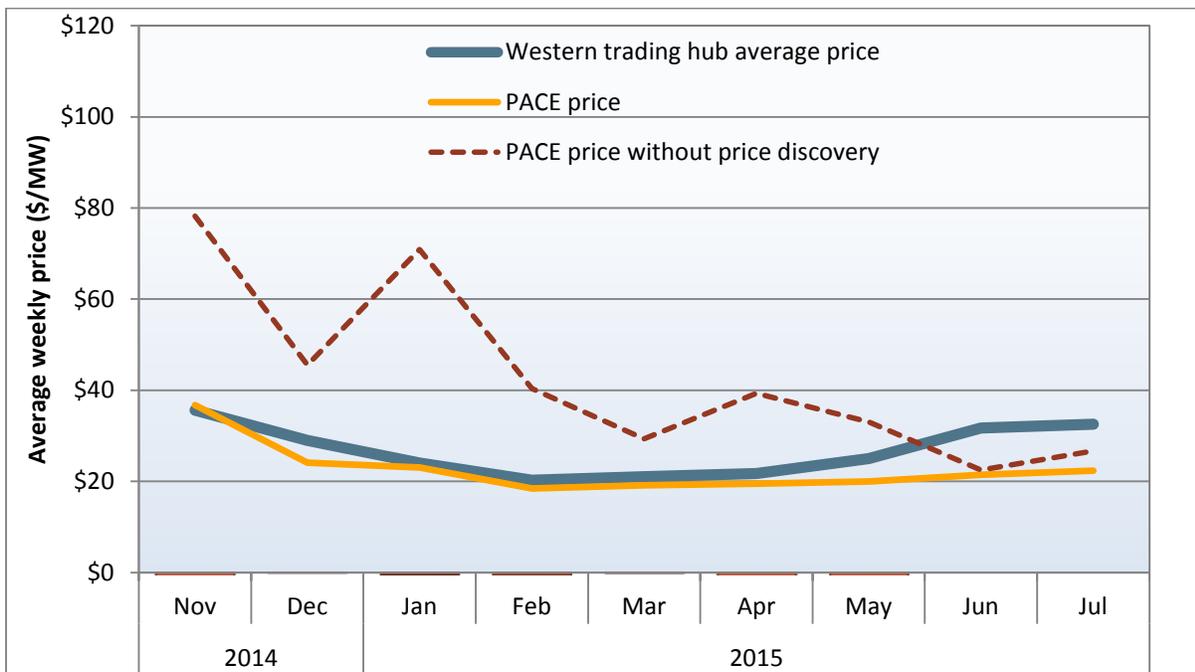
**Figure 1.4 Average daily prices with and without price discovery
PacifiCorp West - 15-minute market**



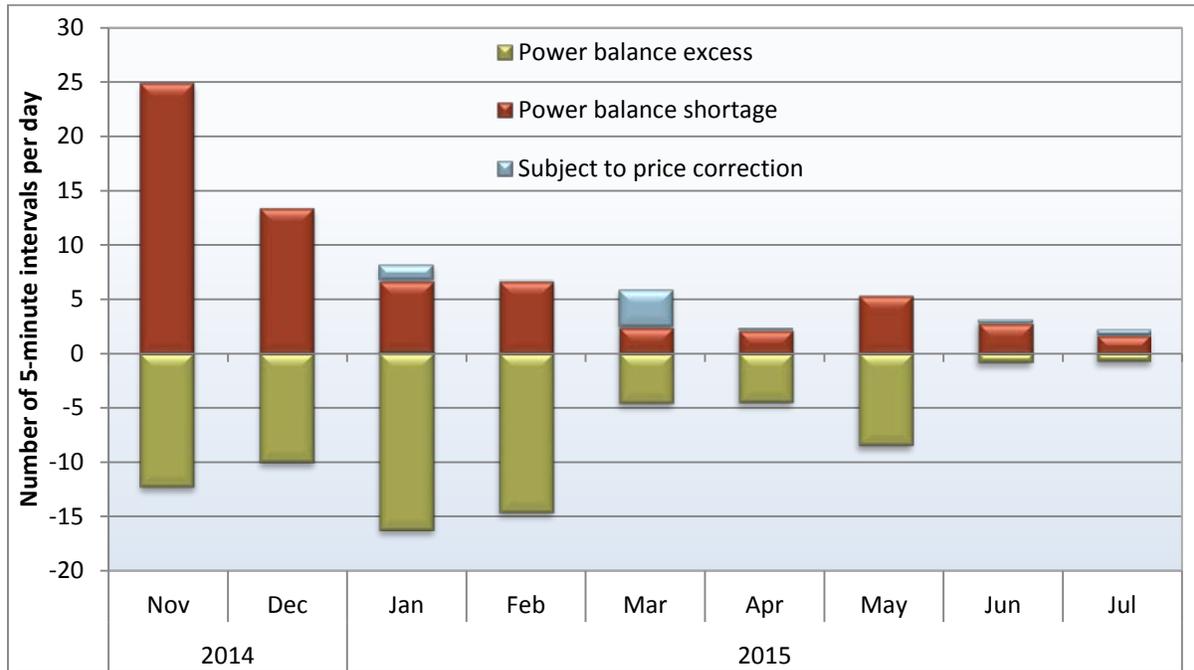
**Figure 1.5 Frequency of constraint relaxation
PacifiCorp East – 5-minute market**



**Figure 1.6 Average daily prices with and without price discovery
PacifiCorp East – 5-minute market**



**Figure 1.7 Frequency of constraint relaxation
PacifiCorp West 5-minute market**



**Figure 1.8 Average daily prices with and without price discovery
PacifiCorp West – 5-minute market**

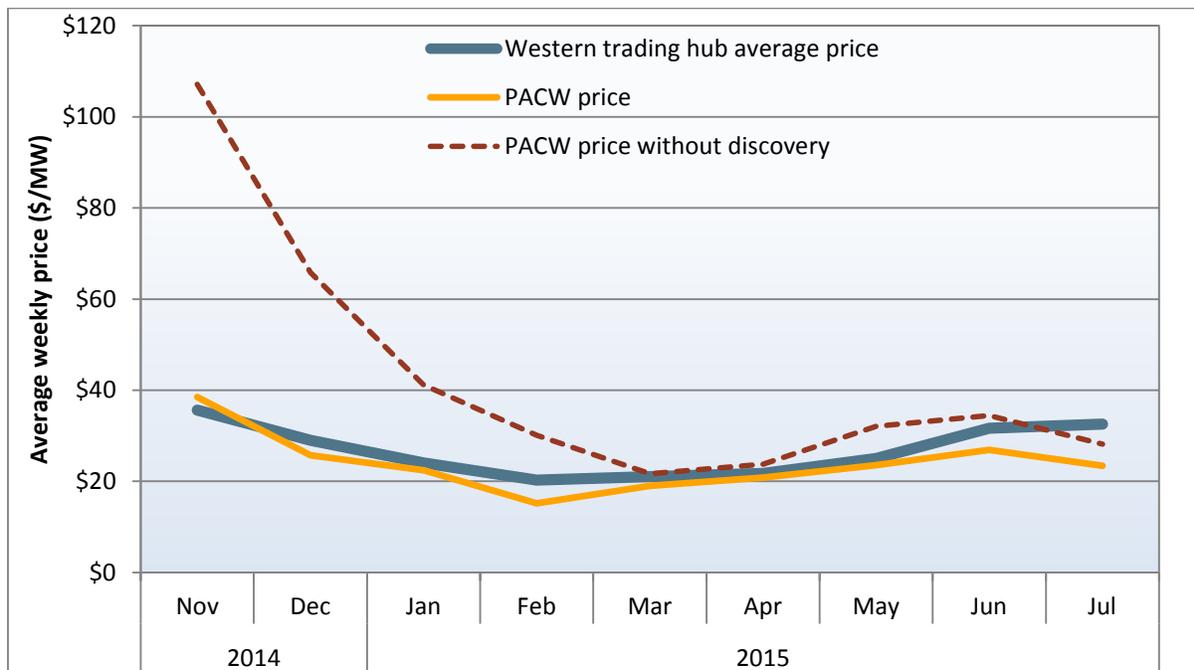


Table 1.1 Average prices in EIM and bilateral markets (July 2015)

	Western trading hub average price	Average EIM price	EIM price without price discovery
<i>PacifiCorp East</i>			
15-minute market (FMM)	\$32.55	\$24.27	\$23.78
5-minute market (RTD)	\$32.55	\$22.39	\$26.70
<i>PacifiCorp West</i>			
15-minute market (FMM)	\$32.55	\$23.51	\$23.81
5-minute market (RTD)	\$32.55	\$23.39	\$28.16

2 Market software constraint relaxation

EIM performance has been driven primarily by the need to periodically relax several key constraints in the EIM market model. This section provides summary information on the frequency of the constraint violations in the EIM by calendar month for each market. Figure 2.1 and Figure 2.2 summarize the percent of intervals in which the power balance and flexible ramping constraints have been relaxed by month in PacifiCorp East and PacifiCorp West, respectively.⁴

As shown in Figure 2.1, in PacifiCorp East the frequency of intervals in which the power balance constraint have been relaxed in the 15-minute market decreased slightly from about 0.2 percent in June to about 0.1 percent in July, while the frequency of power balance constraint relaxation in the 5-minute market increased from about 1 percent to about 1.4 percent of intervals, as shown in Figure 2.3.

As shown in Figure 2.2, in PacifiCorp West the frequency of intervals in which the power balance constraint has been relaxed in the 15-minute market decreased from about 0.4 percent in June to just 1 observation (0.03 percent) in July, while the frequency of power balance constraint relaxation in the 5-minute market (as seen in Figure 2.3) decreased from about 1 percent in June to about 0.6 percent of intervals in July.

As shown in Figure 2.2, in PacifiCorp West the frequency that the flexible ramping constraint was relaxed in the 15-minute market decreased significantly in July, dropping to about 0.5 percent of intervals.

⁴ These charts have changed slightly from previous versions in earlier reports as they now exclude relaxations during intervals where prices were corrected.

Figure 2.1 Frequency of constraint relaxation by month – PacifiCorp East (PACE)

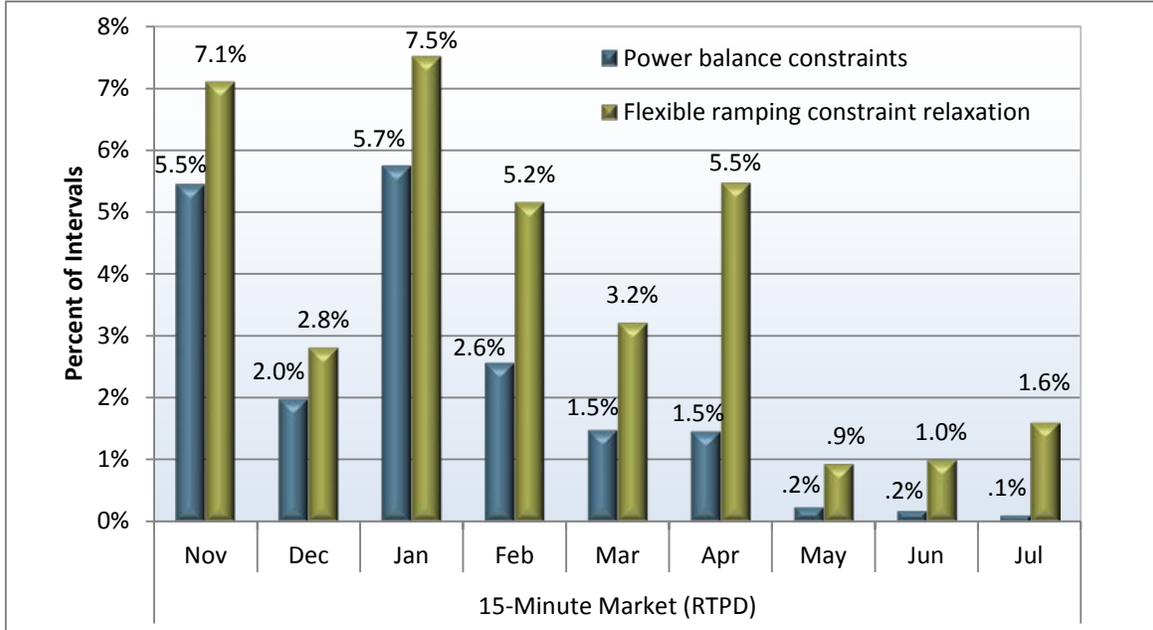
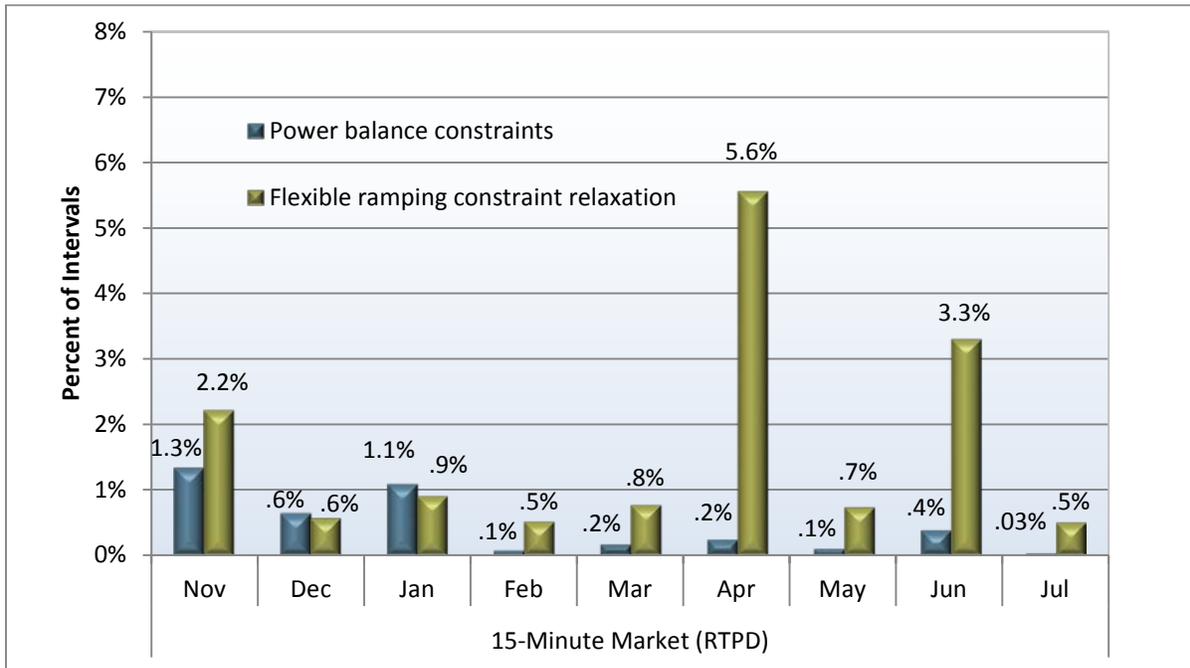
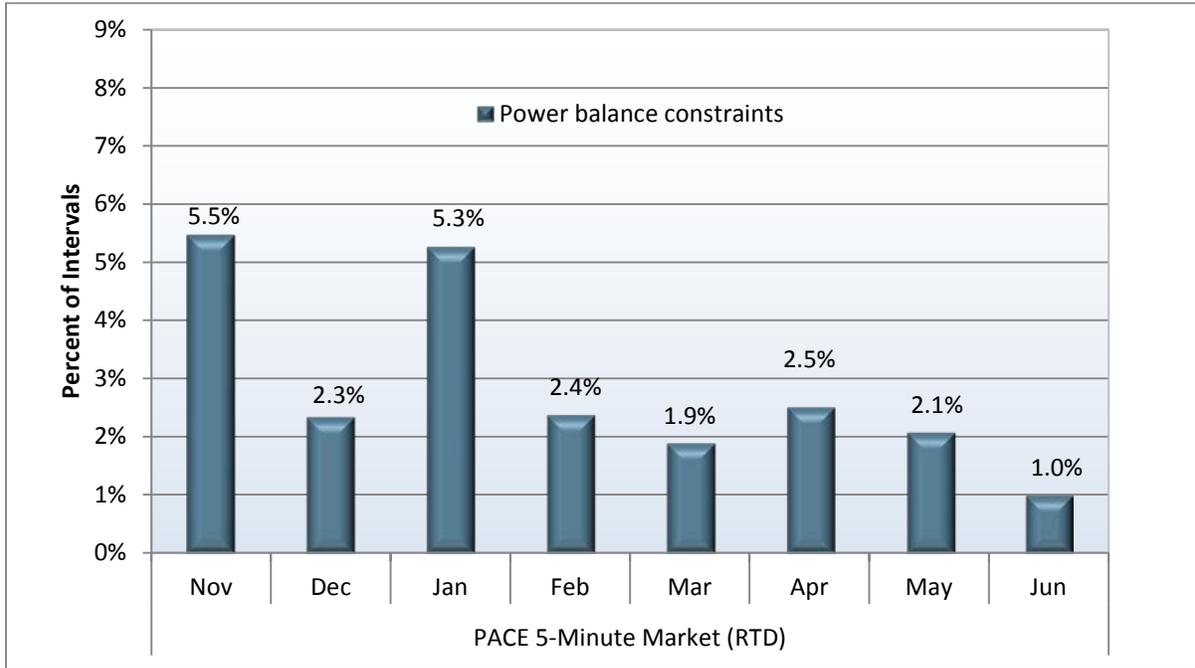


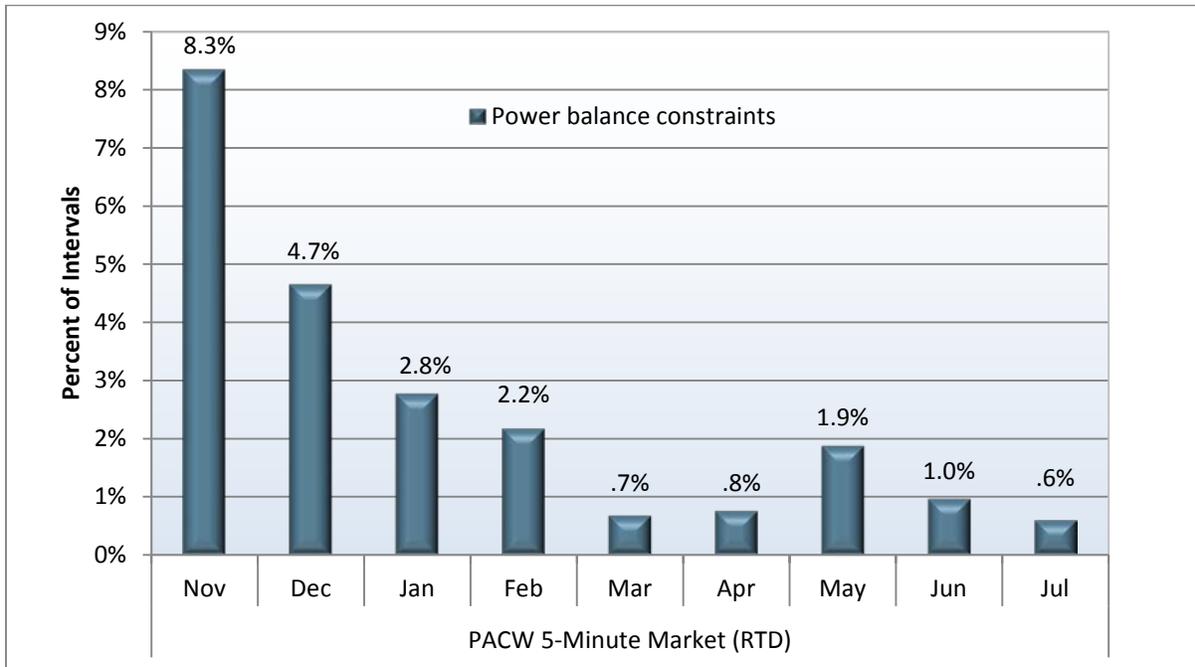
Figure 2.2 Frequency of constraint relaxation by month – PacifiCorp West (PACW)



**Figure 2.3 Frequency of 5-minute market constraint relaxation by month
PacifiCorp East (PACE)**



**Figure 2.4 Frequency of 5-minute market constraint relaxation by month
PacifiCorp West (PACW)**



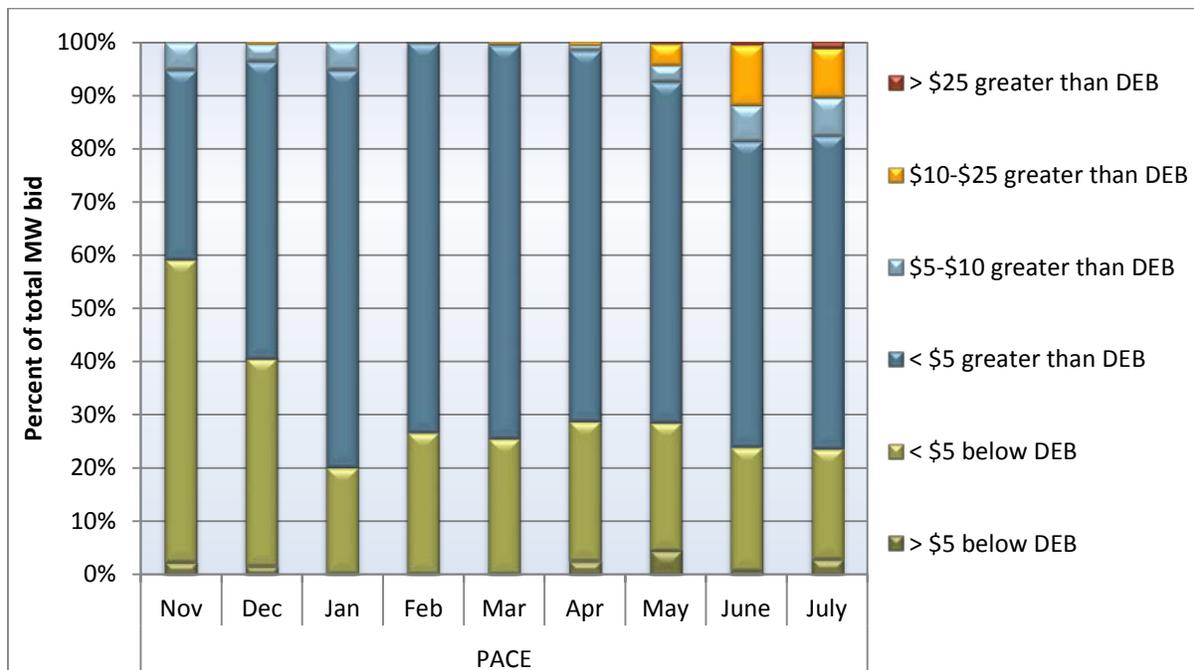
3 Market bidding and mitigation

Bidding in the EIM has been highly competitive, with bids for most capacity below or slightly above default energy bids (DEBs) used in market power mitigation. Thus, when relatively high EIM prices have occurred, these prices reflect penalty prices for software constraints rather than bid prices. In addition, when bids are mitigated due to market power mitigation provisions, these procedures generally result in modest reductions in bid prices.

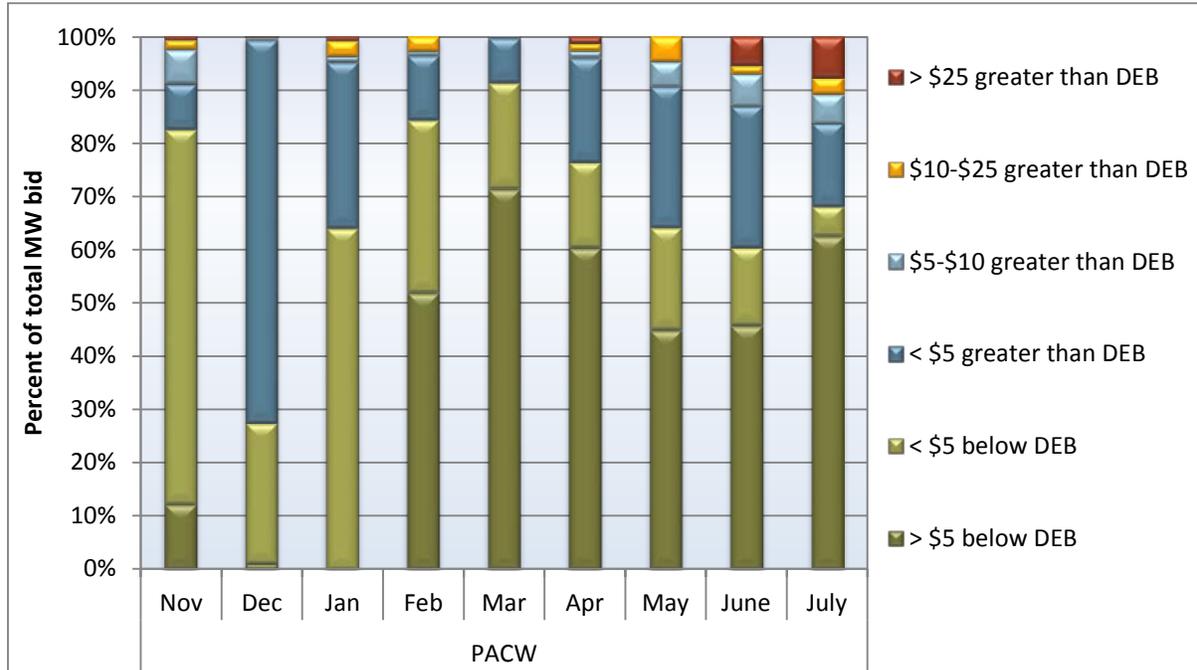
Figure 3.1 summarizes a comparison of bid prices in PacifiCorp East for thermal and hydro units compared to default energy bids used in market power mitigation. Figure 3.2 shows the same information for PacifiCorp West. These default energy bids are based on the marginal operating costs of thermal resources or opportunity cost for hydro resources with limited energy and energy storage capabilities.

Figure 3.1 shows that the bidding pattern in PacifiCorp East in July was similar to June. In PacifiCorp East, there was a continued volume of bids more than \$5/MWh above the default energy bid and a continued volume of bids below the default energy bid. In PacifiCorp West, there was an increase in the volume of bids more than \$25/MWh above and more than \$5/MWh below the default energy bid, as shown in Figure 3.2. Most of the bids more than \$5/MWh below the default energy bid in PacifiCorp West were between \$5 and \$10/MWh below the default energy bid.

**Figure 3.1 Comparison of market bids to default energy bids
PacifiCorp East**



**Figure 3.2 Comparison of market bids to default energy bids
PacifiCorp West**



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 25th day of September, 2015.

Is/ Anna Pascuzzo
Anna Pascuzzo