

May 7, 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 fifth 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 March, 2015.<sup>1</sup>

Please contact the undersigned with any questions.

Respectfully submitted,

**By: /s/ Anna A. McKenna**

Roger E. Collanton

General Counsel

Anna A. McKenna

Assistant General Counsel

John C. Anders

Lead Counsel

California Independent System

Operator Corporation

250 Outcropping Way

Folsom, CA 95630

Tel: (916) 608-7287

Fax: (916) 608-7222

[janders@caiso.com](mailto:janders@caiso.com)

---

<sup>1</sup> 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

May 7, 2015

Department of Market Monitoring



## Executive Summary

---

This report represents the first report by the Department of Market Monitoring (DMM) pursuant to the Commission’s March 16, 2015, Order on the ISO’s Energy Imbalance Market (EIM). The report covers the same period as the ISO’s first report issued pursuant to the Commission’s March 16 Order (March 1-31, 2015).<sup>1</sup> Key findings include the following:

- During most intervals in March, 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 relatively 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.
- The frequency of intervals in which the power balance and flexible ramping constraints have been relaxed dropped notably in PacifiCorp East in both the 15-minute and 5-minute markets again in March, marking the second consecutive month of this downward trend.
- In PacifiCorp West this downward trend continued in the 5-minute market. The frequency these constraints were relaxed in the 15-minute market increased slightly, but remained very low, with the power balance constraint being relaxed only 0.2 percent of 15-minute intervals.
- In PacifiCorp West, without the price discovery provisions currently in effect, average EIM prices in the 15-minute and 5-minute markets during March would have exceeded bilateral market price indices that were used to set prices prior to EIM implementation by only about 6 percent and 11 percent, respectively.
- In PacifiCorp East, without price discovery provisions in place, EIM prices in the 15-minute and 5-minute markets during March would have been about 70 percent higher than these bilateral market price indices.
- With price discovery provisions, EIM prices in both PacifiCorp areas have been kept about equal to the bilateral market price indices that were used to set prices prior to EIM implementation.
- The ISO’s April 24 report indicates that the ISO is prepared to implement a software enhancement known as the *load bias limiter* in the EIM that is currently in place in the ISO real-time market that would mitigate the impacts of inaccurate load biasing in the pricing run.<sup>2</sup> The ISO has indicated it

---

<sup>1</sup> *Energy Imbalance Market Pricing Waiver Report, March 1 – March 31, 2015*, ISO Market Quality and Renewable Integration, April 24, 2015:

[http://www.caiso.com/Documents/Apr24\\_2015\\_March2015\\_EnergyImbalanceMarket\\_PriceWaiverReport\\_ER15-402.pdf](http://www.caiso.com/Documents/Apr24_2015_March2015_EnergyImbalanceMarket_PriceWaiverReport_ER15-402.pdf).

<sup>2</sup> See Remedial Action 9 “Load bias logic correction,” which notes under the column labeled “Actions and Responsibility” that “The CAISO will be implementing software functionality to limit such erroneous load biases, similar to the logic currently used for the CAISO operator bias of load. This feature corrects operator bias of load forecast that are not consistent with system available ramp.” See the ISO’s *Energy Imbalance Market Pricing Waiver Report March 1 – March 31, 2015*, April 24, 2015, pp. 25-26:

[http://www.caiso.com/Documents/Apr24\\_2015\\_March2015\\_EnergyImbalanceMarket\\_PriceWaiverReport\\_ER15-402.pdf](http://www.caiso.com/Documents/Apr24_2015_March2015_EnergyImbalanceMarket_PriceWaiverReport_ER15-402.pdf).

plans to implement this new software feature in the EIM after the price discovery features currently in place expires.

- Analysis in Section 2 of this report indicates this load bias limiter software enhancement could mitigate the impacts of over biasing load in the pricing run during about 30 to 40 percent of all intervals in which the power balance constraint has been relaxed in the scheduling run in March.
- DMM estimates that the load bias limiter would have reduced prices in PacifiCorp East during March by about 11 percent in the 15-minute market and about 20 percent in the 5-minute market. In PacifiCorp West, DMM estimates that this software enhancement would have reduced prices in March by about 3 percent in the 15-minute market and about 7 percent in the 5-minute market.
- Bidding in the EIM continues to be highly competitive, with bids for most capacity slightly below or 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.
- Until late March, the flexible ramping constraint requirement has been set at about 25 to 40 MW for each of the PacifiCorp areas. DMM has recommended that the ISO consider how modifications to the flexible ramping constraint requirement might help increase the amount of supply available on a 15-minute and 5-minute basis in PacifiCorp East. On March 30, the ISO implemented an automated tool that set the flexible ramping constraint requirement at higher levels in the PacifiCorp balancing areas to reflect an estimation of potential ramping levels during different intervals. DMM may provide additional analysis of the impacts of this tool in a subsequent report.
- The ISO's April 24 report included information on the amount of capacity that was available for manual dispatch by PacifiCorp but not available for dispatch by the EIM software. The ISO has provided DMM the data from PacifiCorp used by the ISO in its report. DMM is requesting a more detailed explanation of the information used in the ISO's analysis from PacifiCorp. DMM may provide additional information on this in a future report.

## 1 Background

---

On November 13, 2014, the ISO requested a 90-day waiver of two tariff provisions for establishing the price of energy in the Energy Imbalance Market (EIM) during intervals when, due to a lack of sufficient supply from capacity bid into the market, the ISO's market software must resort to relaxing transmission or system energy balance constraints in order to reach a market solution.<sup>3</sup>

Under these conditions, the waiver would allow prices to be set by a special *price discovery* process designed to let prices reflect the highest cost supply dispatched to meet demand, rather than based on penalty pricing parameters such as the \$1,000/MW price otherwise applied to the amount by which the power balance constraint relaxed. To effectuate this price discovery feature, the ISO has also set the penalty price for the flexible ramping constraint to \$0 in the pricing run of the EIM software. This allows energy prices to be set based on the highest cost supply needed to meet demand when the price discovery mechanism is triggered without any additional impact from the penalty price assigned to the flexible ramping constraint in the scheduling run.<sup>4</sup>

The ISO's November 13 waiver request was submitted as a means of mitigating high prices that the ISO believes resulted from a variety of factors which prevented the market software from producing prices reflective of actual supply and demand conditions. The ISO explained that these high prices are not always indicative of actual physical conditions on the system, and instead reflect factors such as (1) challenges in providing timely and complete data to ensure system visibility under the new procedures, (2) limitations on the resources available to PacifiCorp for use in the EIM, and (3) several forced outages of large EIM participating resources.

On December 1, the Federal Energy Regulatory Commission (FERC) issued an order granting the ISO's petition for waiver of these provisions for 90 days, effective November 14, 2014, as requested.<sup>5</sup> The Commission also directed the ISO to file detailed informational reports at 30-day intervals, providing detailed supporting data demonstrating progress towards identifying and eliminating the problems giving rise to the waiver petition. FERC indicated that these reports should include independent assessments from the Department of Market Monitoring on the causes and the solutions identified by the ISO. The Commission indicated that the first report be filed 30 days from the effective date of the tariff waiver, December 15, 2014.

On March 16, 2015, FERC extended the waiver for an additional 90 days and, in addition, extended the reporting requirements. This represents DMM's first report pursuant to the Commission's March 16 Order. The ISO filed its report pursuant to the March 16 order on April 24. The ISO's report covered market performance through March 2015.

---

<sup>3</sup> [http://www.caiso.com/Documents/Nov13\\_2014\\_PetitionWaiver\\_EIM\\_ER15-402.pdf](http://www.caiso.com/Documents/Nov13_2014_PetitionWaiver_EIM_ER15-402.pdf)

<sup>4</sup> The penalty price for the flexible ramping constraint was \$247/MW until January 14, 2015. As of January 15, 2015, the ISO tariff specifies that the parameter for the flexible ramping constraint will be set to \$60.

<sup>5</sup> [http://www.caiso.com/Documents/Dec1\\_2014\\_OrderGrantingWaiver\\_EIMPricingParameters\\_ER15-402.pdf](http://www.caiso.com/Documents/Dec1_2014_OrderGrantingWaiver_EIMPricingParameters_ER15-402.pdf)



## 2 Energy imbalance market prices

---

During most intervals, prices in the EIM have been 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 relatively small portion of intervals, energy or flexible ramping constraints have had to be relaxed for the market software to balance modeled supply and demand.

Figure 2.1 and Figure 2.3 show the frequency of constraint relaxations in the 15-minute market by day in PacifiCorp East and PacifiCorp West, respectively, from January 1, 2015, through March 31, 2015. As shown in these figures, three different constraints have been relaxed in the 15-minute market:

- Power balance constraint shortages (red bar) occur when the power balance constraint that matches generation and load is relaxed when load exceeds the available generation. The penalty price for power balance relaxation due to energy shortage within EIM balancing authority areas is set at \$1,100/MW in the scheduling run. In the pricing run, the penalty price normally assigned to relaxations of this constraint would be consistent with the offer cap of \$1,000/MW. The pricing parameter when this constraint is relaxed has been set to \$0 in the EIM when the price discovery mechanism has been implemented.
- Power balance constraint excess (green bar) occurs when the power balance constraint that matches generation and load is relaxed because generation exceeds load. The penalty price for excess generation related to the power balance constraint is set at -\$155/MW in the scheduling run and is normally set at the offer floor of -\$150/MW in the pricing run. The pricing parameter when this constraint is relaxed has been set to \$0 in the EIM when the price discovery mechanism has been implemented. The figures show the count of intervals where power balance excess occurred in terms of a negative number, since these violations reduce overall prices.
- The flexible ramping constraint relaxation (yellow bars) occurs when there is insufficient ramping capacity in the 15-minute market to meet the 15-minute flexible ramping capacity requirement. The penalty price for shortages of the flexible ramping constraint would normally be set in the pricing run to \$247/MW prior to January 15, and \$60/MW thereafter. However, the penalty price for the flexible ramping constraint has been set to \$0/MW in the pricing run since the price discovery provisions were implemented in December 2014. This constraint is enforced in the binding 15-minute market but not in the binding 5-minute market.

The light blue bars in Figure 2.1 and Figure 2.3 show the number of intervals when power balance constraint shortages occurred due to reasons that the ISO determined would have triggered price correction even if price discovery provisions were not in place.<sup>6</sup>

---

<sup>6</sup> Section 35.4 of the ISO tariff provides the CAISO authority to correct prices if it detects an invalid market solution or prices due to issues such as data input failure, occurrence of hardware or software failure, or a result that is inconsistent with the ISO tariff.

As noted in the ISO's February 19 report, Figure 16 through Figure 23 of the ISO's report exclude intervals in which the power balance constraint was relaxed due to factors that would have been subject to price correction if price discovery provisions had not been applied (p.44). The ISO determined that prices resulting under price discovery during these intervals were equivalent to prices that would result from price correction, so that no further price adjustment was appropriate.

Figure 2.2 and Figure 2.4 show average daily 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. These figures also provide a comparison of EIM prices to bilateral market price indices that were used to set prices in the PacifiCorp areas prior to EIM implementation.<sup>7</sup> For this analysis, the estimated EIM price without price discovery is calculated as follows:

- When the power balance constraint was relaxed for a shortage of energy, it is assumed prices would be \$1,000/MW minus estimated losses of about 3 percent on average.
- When the EIM transfer constraint was relaxed for a shortage of energy, it is assumed prices would be \$1,000/MW minus estimated losses of about 3 percent on average.
- When only the flexible ramping constraint was relaxed due to a shortage of 15-minute ramping, it is assumed shadow prices for this constraint would be \$247/MW before January 15 and \$60/MW thereafter, and that this shadow price would be reflected in the price for the EIM area.<sup>8</sup>
- When the power balance constraint needed to be relaxed in market software for an excess of energy, it is assumed prices would be -\$150/MW plus estimated losses of about 1 percent.

When relaxations of penalty parameters occurred due to conditions that would trigger price correction, prices were not adjusted (see light blue bars in Figure 2.1 and Figure 2.3). This is because there was an underlying error that caused the price discovery provisions to be triggered. The ISO determined that prices resulting with price discovery during these intervals were equivalent to prices that would result from price correction, so that no further price adjustment was appropriate.

This methodology differs from the estimates of counterfactual price in the ISO's reports in at least one key respect. DMM's analysis estimates prices without application of any special price discovery provisions in EIM. The ISO's analysis only incorporates the effects of price discovery provisions implemented by the ISO following approval of the ISO's November 13 waiver request. Specifically, the ISO analysis reflects that shortly prior to full EIM implementation on November 1, the ISO amended the EIM business practice manual (BPM) so that price discovery was triggered if a constraint was relaxed during an interval when the EIM balancing area failed to pass the flexible ramping requirement test.<sup>9</sup> DMM includes these events in its counterfactual prices without price discovery, while the ISO does not.

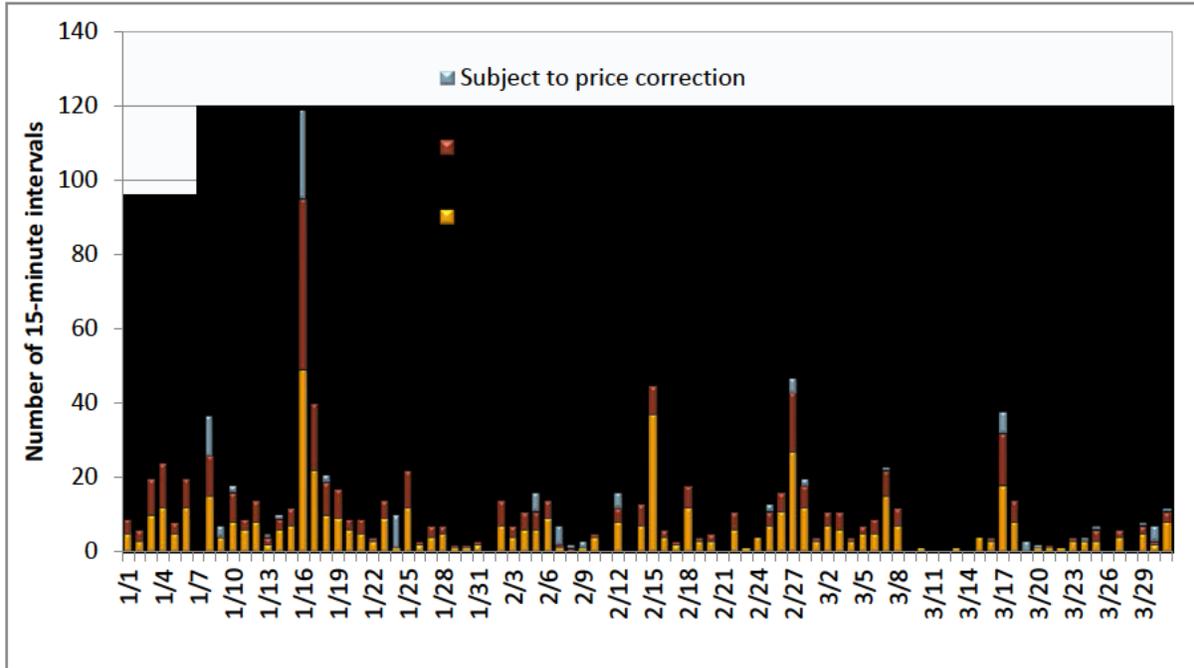
---

<sup>7</sup> The bilateral market index represents a daily average of peak and off-peak prices for four major Western trading hubs representative of the PacifiCorp East and West areas (California Oregon Border, Mid-Columbia, Palo Verde and Four Corners). Prior to EIM implementation, DMM identified this bilateral price index to stakeholders and regulators as a benchmark DMM would use to assess the competitiveness and overall performance of the EIM.

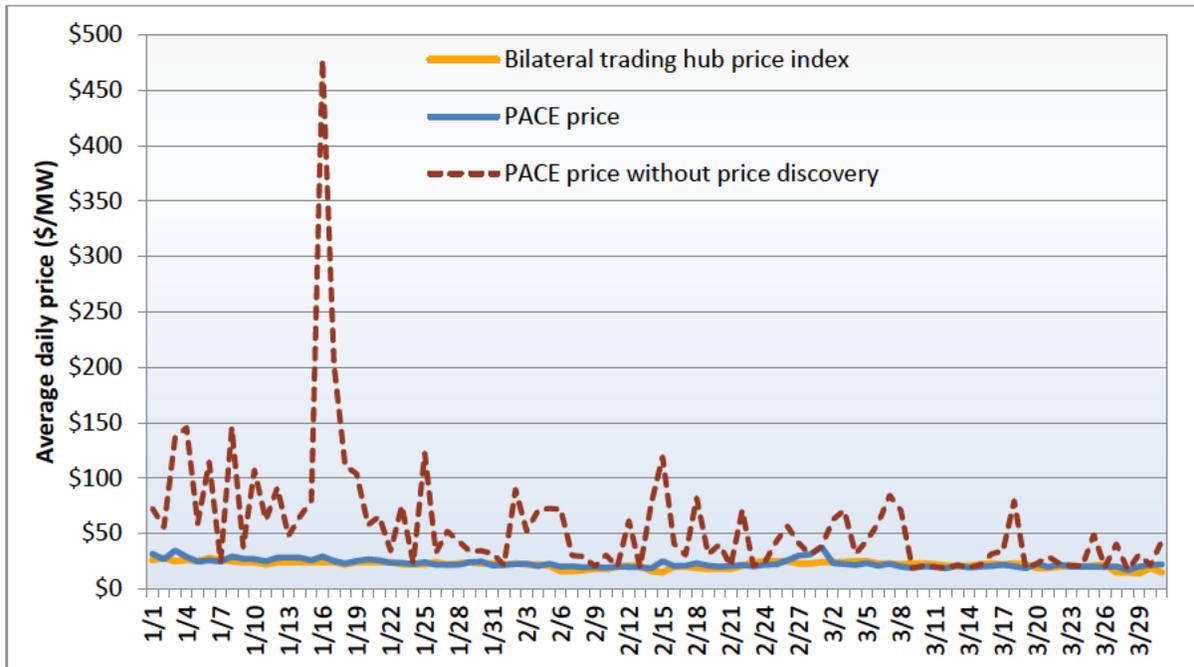
<sup>8</sup> The penalty price associated with procurement shortfalls was set to \$247 before January 15, 2015. Beginning January 15, 2015, the penalty price is now set to \$60. For more information, see: [http://www.caiso.com/Documents/Dec18\\_2014\\_OrderAcceptingFlexibleRampingConstraintParameterAmendment\\_ER15-50.pdf](http://www.caiso.com/Documents/Dec18_2014_OrderAcceptingFlexibleRampingConstraintParameterAmendment_ER15-50.pdf).

<sup>9</sup> See pp. 10-11 of *Energy Imbalance Market Pricing Waiver Report*, December 1 - 31, 2014, January 15, 2015, [http://www.caiso.com/Documents/Jan15\\_2015\\_EnergyImbalanceMarket\\_REPORT\\_ER15-402.pdf](http://www.caiso.com/Documents/Jan15_2015_EnergyImbalanceMarket_REPORT_ER15-402.pdf).

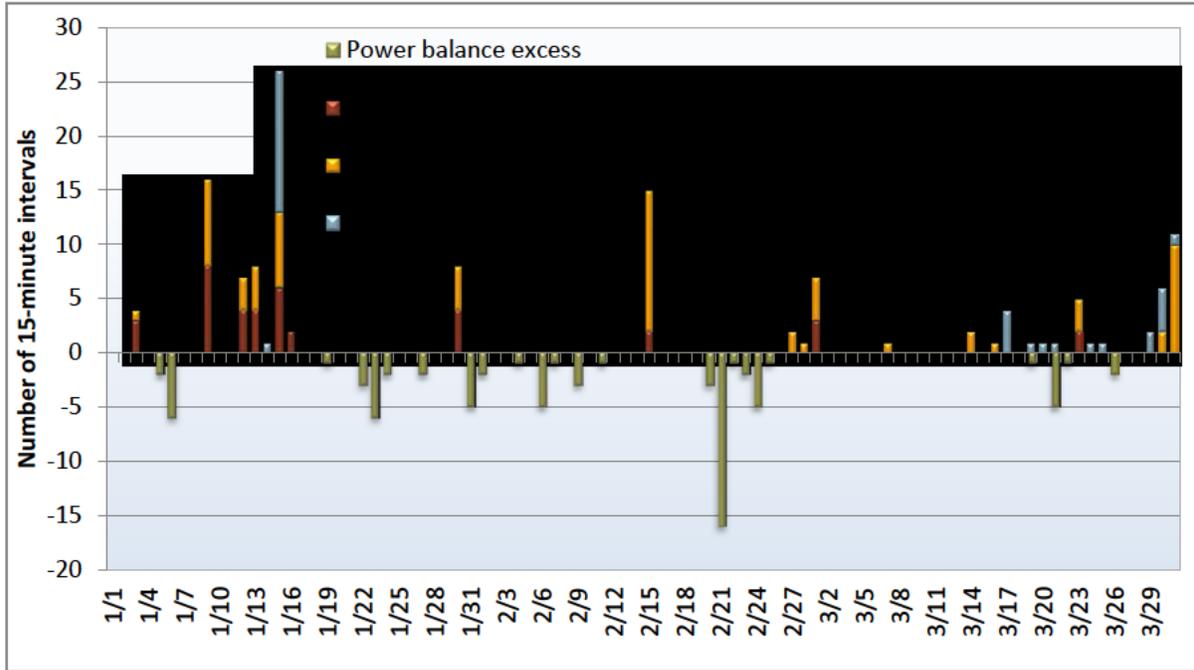
**Figure 2.1 Frequency of constraint relaxation  
PacifiCorp East - 15-minute market**



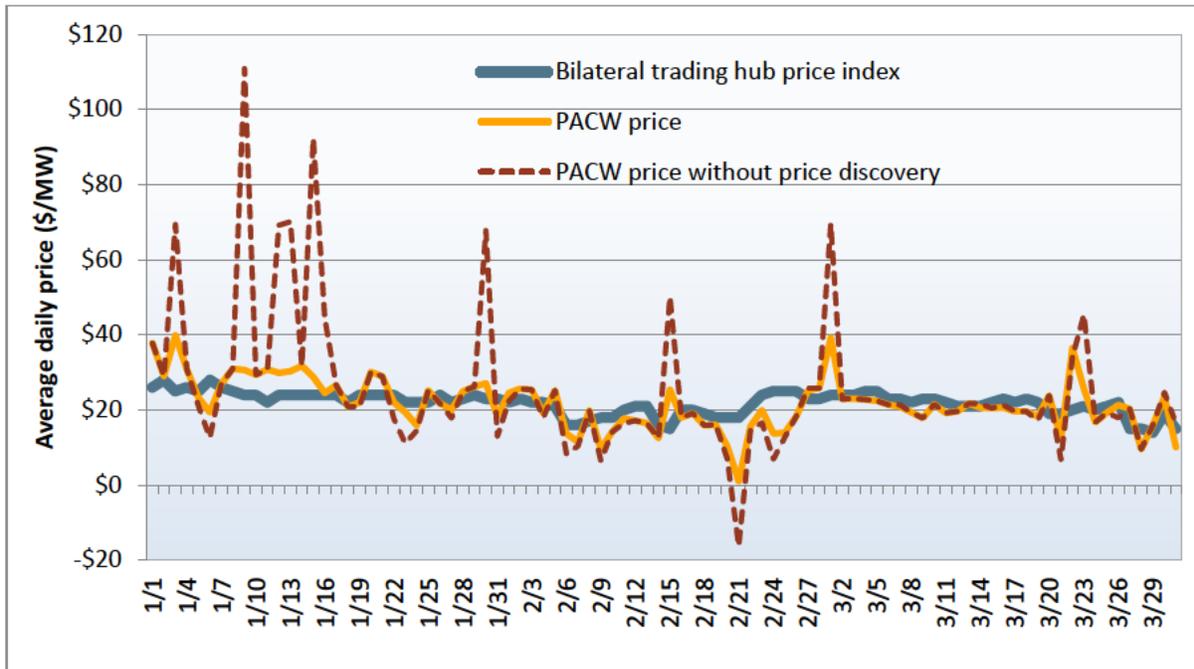
**Figure 2.2 Average daily prices with and without price discovery  
PacifiCorp East - 15-minute market**



**Figure 2.3 Frequency of constraint relaxation  
PacifiCorp West - 15-minute market**



**Figure 2.4 Average daily prices with and without price discovery  
PacifiCorp West - 15-minute market**



As shown in Figure 2.2 and Figure 2.4, without the price discovery provisions being applied in EIM, on days when the power balance or flexible ramping constraints need to be relaxed in more than a few intervals of the 15-minute market, average daily prices would consistently exceed the bilateral market price index reflective of prices for imbalance energy in the PacifiCorp areas prior to EIM. However, with price discovery, EIM prices track very closely with this bilateral price index.

Figure 2.5 and Figure 2.6 provide a weekly summary from the beginning of November 2014 through March 2015 of the frequency of constraint relaxation, average prices with and without price discovery, and bilateral market prices for PacifiCorp East and PacifiCorp West, respectively.

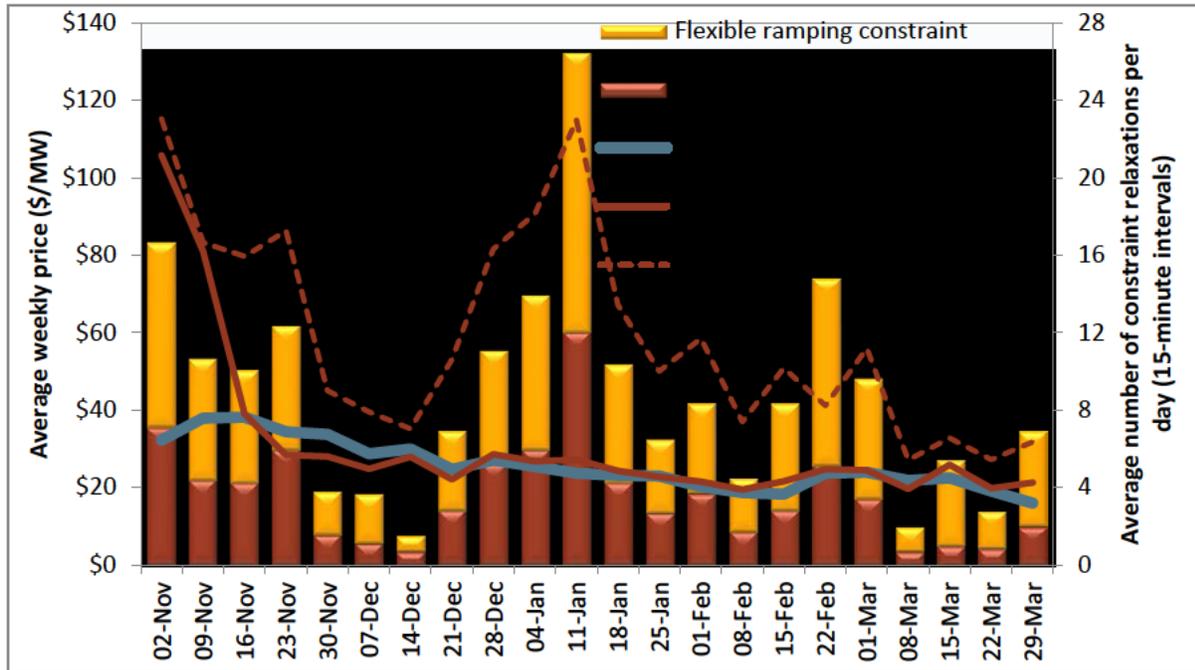
Figure 2.7 and Figure 2.8 provide the same weekly summary for the 5-minute market. As shown in these figures, the need to relax the power balance constraint in the 5-minute market has also remained relatively high, particularly in the PacifiCorp East area, since EIM implementation. This reflects the fact that in the 5-minute market the supply of ramping capacity within PacifiCorp is more constrained than in the 15-minute market.

The higher frequency of power balance constraint relaxations in the 5-minute market also reflects the fact that incremental transfers into PacifiCorp from the ISO in the 5-minute market had been essentially prevented from occurring during almost all intervals until the first week of February. The dynamic transfer constraint (DTC), which constrains the extent to which transfers between PacifiCorp and the ISO scheduled in the 15-minute market can change in the 5-minute market, was set to a limit of less than 0.003 MW during most 5-minute market intervals until early February.

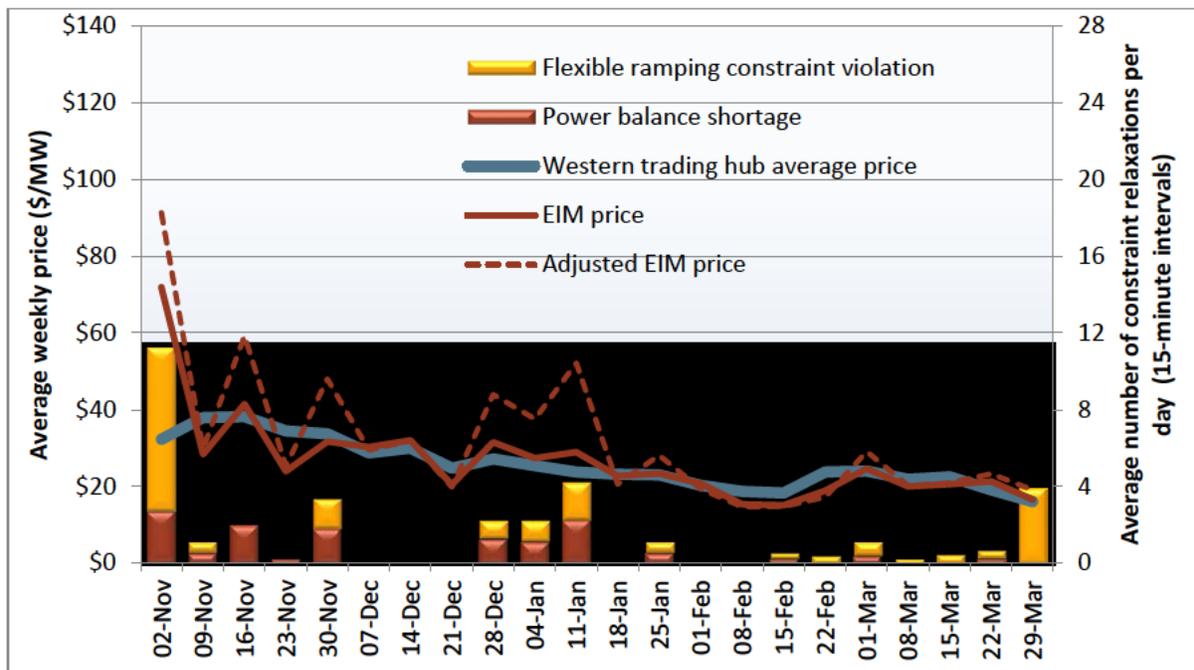
Since early February, the dynamic transfer capability limits now allow 15-minute EIM transfer schedules on COI to be modified by about  $\pm 11$  MW during peak hours and about  $\pm 110$  MW during off-peak hours. This appears to have helped reduce the frequency of power balance relaxations in the 5-minute market in PacifiCorp West since this change was implemented.

As shown in Figure 2.5 through Figure 2.8, the price discovery mechanism approved under the Commission's December 1 order has effectively mitigated the impact of constraint relaxation on market prices.

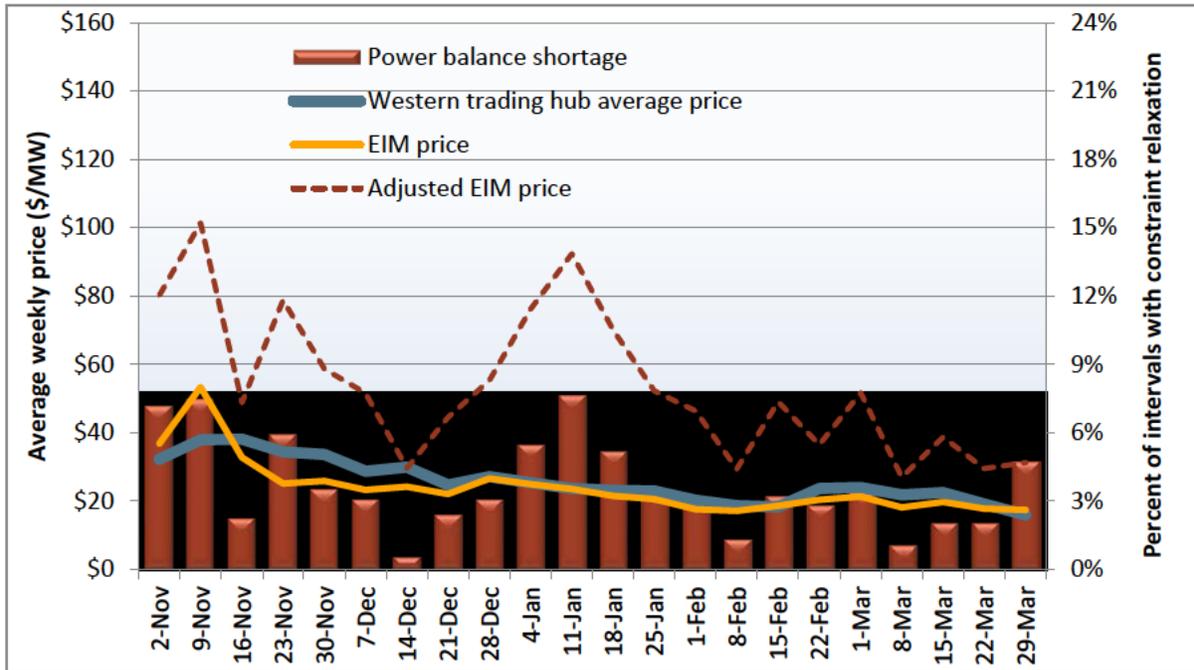
**Figure 2.5 Frequency of constraint relaxation and average prices by week  
PacifiCorp East - 15-minute market**



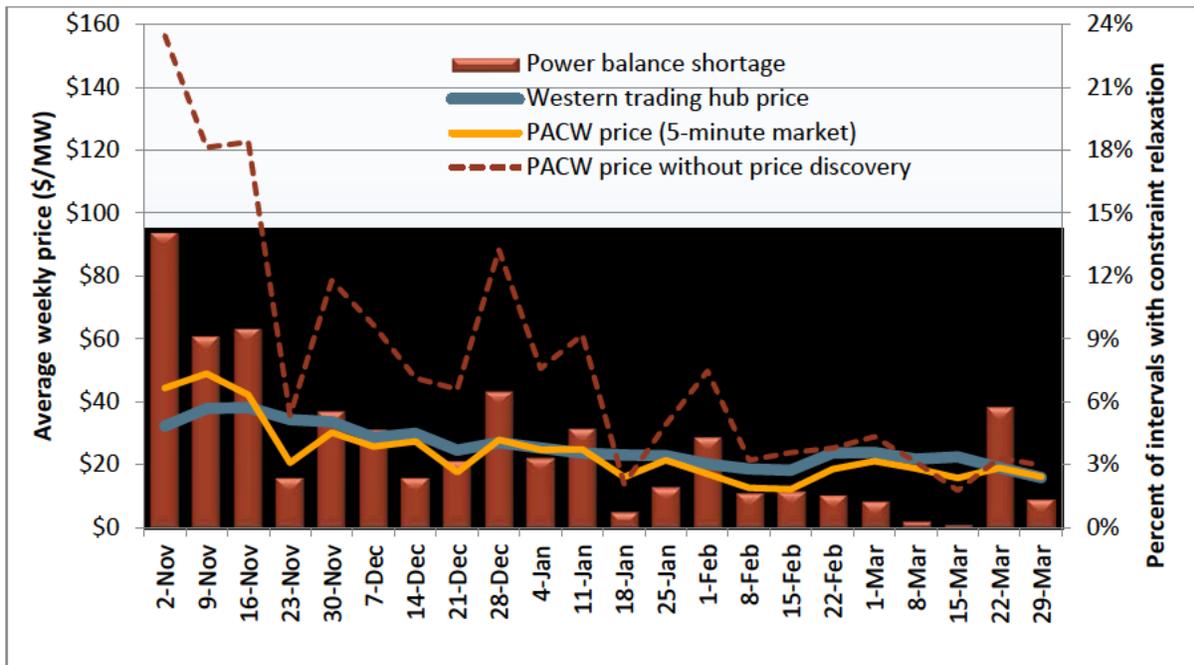
**Figure 2.6 Frequency of constraint relaxation and average prices by week  
PacifiCorp West - 15-minute market**



**Figure 2.7 Frequency of constraint relaxation and average prices by week  
PacifiCorp East - 5-minute market**



**Figure 2.8 Frequency of constraint relaxation and average prices by week  
PacifiCorp West - 5-minute market**



## Load bias limiter

The ISO's April 24 report notes that the ISO is prepared to implement a software enhancement in the EIM that is currently in place in the ISO real-time market that would mitigate the impacts of excessive load biasing in the pricing run.<sup>10</sup>

This software functionality is called the *load bias limiter*. The purpose of this software is to ensure that an excessive load bias entered by the grid operator does not cause the total modeled load to exceed the amount of available ramping capacity available for dispatch by the market software. This feature adjusts the load bias used in the pricing run downward in cases when the load bias entered by the grid operator contributed to a supply insufficiency in the scheduling run.<sup>11</sup> When this feature is triggered between the scheduling and pricing runs, it has the same impact as the current price discovery feature: prices are then set by the highest cost supply dispatched to meet demand.

As described in DMM's 2012 annual report, this feature was expected to have a significant impact on reducing the frequency of price spikes due to power balance constraint relaxation after being implemented in the ISO market in December 2012.<sup>12</sup> Analysis by DMM of EIM results for the month of February indicates that if the load bias limiter was in place instead of the price discovery feature, this software feature would have been triggered during about 50 percent of the intervals when the power balance constraint was relaxed in the scheduling run. Analysis for the month of March shows that the load bias limiter would have been triggered during about 30 to 40 percent of the intervals when the power balance was relaxed in the scheduling run during March. This reduction suggests that use of manual load bias was less frequent or more accurate in March compared to February.

Table 2.1 shows average EIM prices in the 15-minute and 5-minute markets with and without application of price discovery and with and without estimating the effect of the load bias limiter,<sup>13</sup> along with average bilateral market prices. As shown in Table 2.1:

- Application of the price discovery mechanism in March kept average EIM prices in the 15-minute market about the same as bilateral market price indices that were used to set rates in the PacifiCorp area prior to EIM in both PacifiCorp East and PacifiCorp West.
- Average EIM prices in the 5-minute market during March were about 9 percent lower than these bilateral market price indices in both PacifiCorp East and PacifiCorp West regions.

<sup>10</sup> See Remedial Action 9 "Load bias logic correction," which notes under the column labeled "Actions and Responsibility" that "The CAISO will be implementing software functionality to limit such erroneous load biases, similar to the logic currently used for the CAISO operator bias of load. This feature corrects operator bias of load forecast that are not consistent with system available ramp." (April 24, 2015 Report, pp. 25-26): [http://www.caiso.com/Documents/Apr24\\_2015\\_March2015\\_EnergyImbalanceMarket\\_PriceWaiverReport\\_ER15-402.pdf](http://www.caiso.com/Documents/Apr24_2015_March2015_EnergyImbalanceMarket_PriceWaiverReport_ER15-402.pdf).

<sup>11</sup> For instance, assume the grid operator had entered a 100 MW upward load bias for an interval. The load limiter bias adjustment would be triggered if the power balance constraint is relaxed in the scheduling run less than 100 MW during this interval. For instance, if the power balance constraint is relaxed by 70 MW in the scheduling run with the 100 MW upward load bias in effect, the load used in the pricing run is adjusted to reflect only a 30 MW upward load bias. This effectively limits the upward load bias in the pricing run to the amount of supply bids actually available to the market software given ramping and other constraints (100 MW bias – 70 MW relaxation = 30 MW of available supply).

<sup>12</sup> *2012 Annual Report on Market Issues and Performance*, ISO Department of Market Monitoring, April 2013, p. 189. <http://www.caiso.com/Documents/2012AnnualReport-MarketIssue-Performance.pdf>.

<sup>13</sup> If the quantity of the load bias was greater than the quantity of the shortage, we assumed the prevailing EIM price instead of adjusting the prices to account for the shortage without price discovery.

- EIM prices without price discovery would have been about 70 percent higher than the bilateral market price indices in both markets in PacifiCorp East and between 6 and 11 percent higher in PacifiCorp West in the 15-minute and 5-minute markets, respectively.
- In PacifiCorp East, DMM estimates that the load bias limiter would have reduced prices without price discovery by 11 percent in the 15-minute market and about 20 percent in the 5-minute market.
- In PacifiCorp West, DMM estimates that the load bias limiter would have reduced prices without price discovery by about 3 percent in the 15-minute market and about 7 percent in the 5-minute market.
- The impact of the load bias limiter was larger in PacifiCorp East because there were more instances of shortages in that region compared to PacifiCorp West even though the frequency of instances where the limiter would have eliminated the shortage were about the same in both regions.

**Table 2.1 Average prices in EIM and bilateral markets (March 2015)**

	Western trading hub average price	Average EIM price	EIM price without price discovery	EIM price without price discovery and adjusted for load bias limiter	Percent of shortages eliminated by load bias limiter
<b><i>PacifiCorp East</i></b>					
15-minute market (FMM)	\$21.06	\$21.19	\$35.66	\$31.66	30%
5-minute market (RTD)	\$21.06	\$19.13	\$36.53	\$29.31	41%
<b><i>PacifiCorp West</i></b>					
15-minute market (FMM)	\$21.06	\$20.84	\$22.36	\$21.72	40%
5-minute market (RTD)	\$21.06	\$19.01	\$23.36	\$21.64	38%

The ISO has indicated it plans to implement this load bias limiter in the EIM after the price discovery feature currently in place expires. DMM expects this feature will have an impact on reducing the impact of power balance constraint relaxation on prices when implemented in the EIM.

DMM has also provided the ISO with a recommendation on how the load bias limiter feature might be enhanced to better reflect the impact of excessive load bias adjustments on creating power balance shortages. Specifically, DMM has recommended considering the adjustment based on the *change* in load bias from one interval to the next instead of on the *absolute value* of any positive load bias.



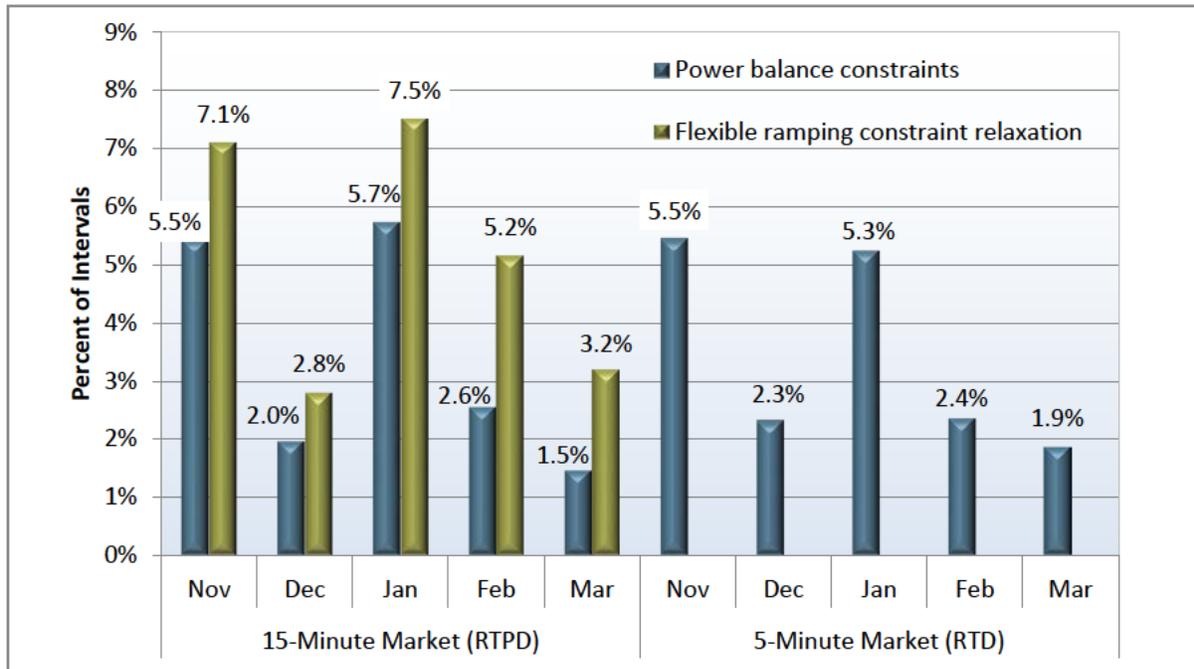
### 3 Market software constraint relaxation

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 3.1 and Figure 3.2 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.<sup>14</sup>

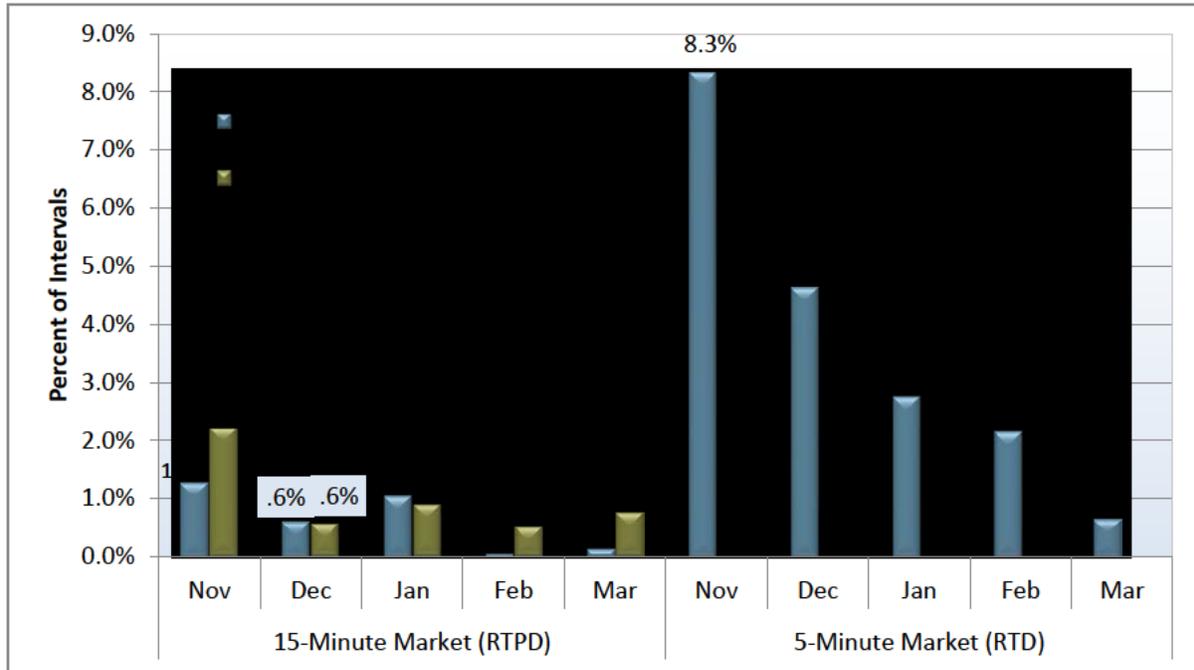
- As shown in Figure 3.1, in PacifiCorp East the frequency of power balance constraint relaxations were the lowest since EIM was implemented in November, at 1.5 percent of intervals in the 15-minute market and just under 2 percent of intervals in the 5-minute market. Flexible ramping constraint relaxations dropped notably from just over 5 percent of intervals in February to just over 3 percent in March.
- As shown in Figure 3.2, the frequency of both power balance constraint and flexible ramping constraint relaxations in PacifiCorp West in the 15-minute market were less than 0.8 percent in March. The power balance constraint was relaxed in about 0.7 percent of intervals in the 5-minute market in PacifiCorp West during March, a decrease from just over 2 percent in February.

**Figure 3.1 Frequency of constraint relaxation by month – PacifiCorp East (PACE)**



<sup>14</sup> These charts have changed slightly from previous versions in earlier reports as they now exclude relaxations during intervals where prices were corrected.

**Figure 3.2 Frequency of constraint relaxation by month – PacifiCorp West (PACW)**



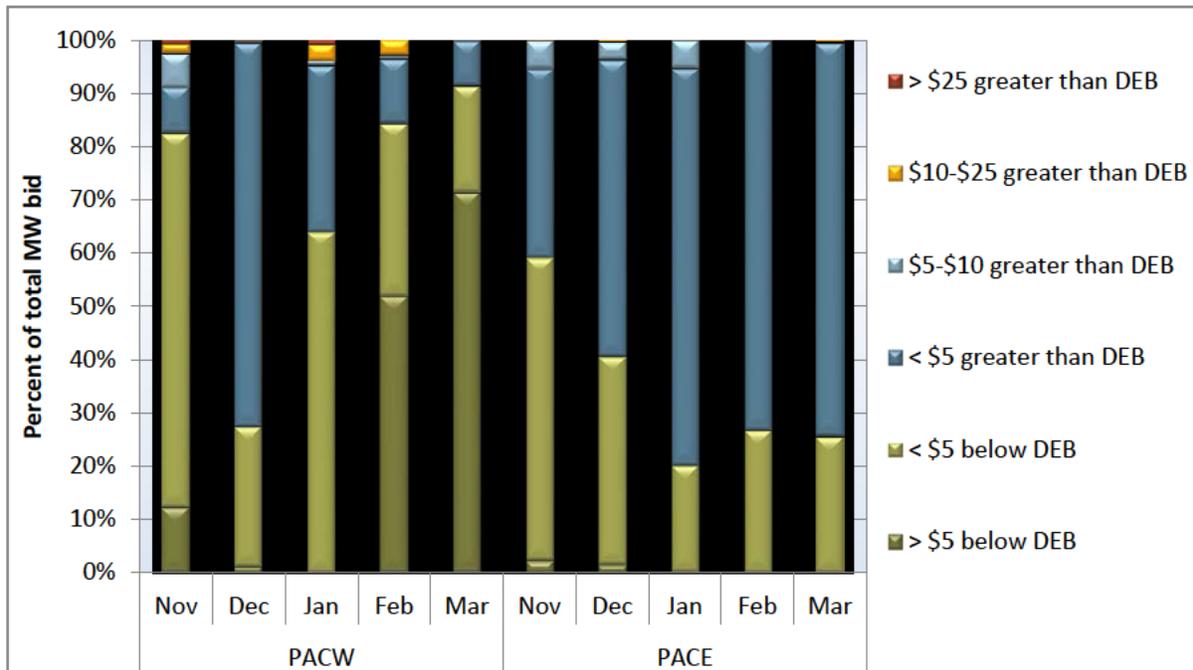
## 4 Market bidding and mitigation

Bidding in the EIM has been highly competitive, with bids for most capacity slightly below or 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 4.1 summarizes a comparison of bid prices in PacifiCorp East and PacifiCorp West for thermal and hydro units compared to default energy bids used in market power mitigation. 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.

The bidding pattern in PacifiCorp East in March was similar to February. However, there was an increase in the volume of bids more than \$5/MWh below the default energy bids in PacifiCorp West. About 95 percent of these bids were between \$5 and \$10/MWh below the default energy bid.

**Figure 4.1 Comparison of market bids to default energy bids**





## 5 Other issues

---

### Flexible ramping constraint

Until late March, the flexible ramping constraint requirement has been set at about 25 to 40 MW for each of the PacifiCorp areas. In our April 2 report, DMM recommended that the ISO consider how modifications to the flexible ramping constraint requirement might help increase the amount of supply available on a 15-minute and 5-minute basis in PacifiCorp East.<sup>15</sup>

On March 30, the ISO implemented an automated tool that set the flexible ramping constraint requirement at higher levels in the PacifiCorp balancing areas to reflect an estimation of potential ramping levels during different intervals. DMM may provide additional analysis of the impacts of this tool in a subsequent report.

### Additional capacity available for manual dispatch

In the ISO's April 24 report, the ISO began reporting information on the amount of capacity that was available for manual dispatch by PacifiCorp but not available for dispatch by the EIM software. This ISO report indicates this analysis represents the:

[D]egree to which the infeasibility was in excess of PacifiCorp's available capacity to balance its system. This measure was determined by calculating the difference between the total amount of reserves carried and the minimum amount of reserves required by NERC.<sup>16</sup>

The ISO has provided DMM the data from PacifiCorp used by the ISO in its report. DMM is requesting a more detailed explanation of the information used in the ISO's analysis from PacifiCorp. DMM may provide additional information on this in a future report.

---

<sup>15</sup> *Report on Energy Imbalance Market Issues and Performance*, Department of Market Monitoring, April 2, 2015, p.2.  
[http://www.caiso.com/Documents/Apr2\\_2015\\_DMM\\_AssessmentPerformance\\_EIM-Feb13-Mar16\\_2015\\_ER15-402.pdf](http://www.caiso.com/Documents/Apr2_2015_DMM_AssessmentPerformance_EIM-Feb13-Mar16_2015_ER15-402.pdf).

<sup>16</sup> *Energy Imbalance Market Pricing Waiver Report March 1 – March 31, 2015*, April 24, 2015, p. 31:  
[http://www.caiso.com/Documents/Apr24\\_2015\\_March2015\\_EnergyImbalanceMarket\\_PriceWaiverReport\\_ER15-402.pdf](http://www.caiso.com/Documents/Apr24_2015_March2015_EnergyImbalanceMarket_PriceWaiverReport_ER15-402.pdf).

## CERTIFICATE OF SERVICE

I hereby 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 7<sup>th</sup> day of May, 2015.

*Anna Pascuzzo*  
Anna Pascuzzo