

Memorandum

To: ISO Board of Governors
From: Eric Hildebrandt, Director, Market Monitoring
Date: January 29, 2015
Re: **Market monitoring report**

This memorandum does not require Board action.

EXECUTIVE SUMMARY

This memo provides analysis of performance of the energy imbalance market by the Department of Market Monitoring.

During the initial implementation of EIM, the amount of capacity available through the market clearing process were restricted in ways that are not reflective of actual economic and operational conditions. This has caused the need to relax ramping and system energy balance constraints in the market software more frequently than expected. The factors contributing to the need for constraint relaxation, and steps being taken to address these issues, have been addressed by the ISO in two reports submitted to FERC.¹

The ISO has implemented *price discovery* measures to mitigate the impact of these constraint relaxation events on market prices. With these measures, prices are based on the highest priced market bid dispatched. Without this special price discovery mechanism, prices could be set based on extremely high penalty prices, such as the \$1,000/MW system price used when the system power balance is relaxed.

The impact of constraint relaxation on market prices has been effectively mitigated by the price discovery mechanism. Average EIM prices since this mechanism was implemented on November 14 have been slightly lower than the bilateral market price

¹ *Energy Imbalance Market Pricing Waiver Report*, December 15, 2014 and January 15, 2015, http://www.caiso.com/Documents/Jan15_2015_EnergyImbalanceMarket_REPORT_ER15-402.pdf

indices that were used to set prices in the PacifiCorp areas prior to EIM implementation. Without these provisions, EIM prices during this period would have been significantly higher than these bilateral market price indices.

ENERGY IMBALANCE MARKET PRICES

During most intervals, the normal EIM process has produced prices that are 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.

As described in the ISO's December 15 and January 15 reports to FERC, there are a number of factors that have prevented the market clearing process from reflecting actual economic and operational conditions in some cases. These include:

- **Lack of timely reporting of outages and manual dispatches.** The market model dispatches the system based on the best information provided to the market system. When information related to unit status is not provided in a timely manner by the EIM entity, this may result in creating false shortages when sufficient supply exists, or signaling over generation conditions when less generation is available than anticipated.
- **Resource scheduling errors and inconsistencies.** Most of the capacity participating in EIM consists of large coal and gas units modeled as multi-stage generating resources with different configurations. Inconsistencies or errors in how these resources are scheduled and bid into the market can cause major discrepancies between information in the market model compared to the intended schedules and bids of EIM participants.
- **Load and resource inaccuracies.** Like the ISO, the EIM entity has the ability to adjust load forecasts to account for differences between actual and modeled supply and demand conditions. This is the major mechanism that can be used to account for fluctuations of wind resources and other sources of uninstructed deviations. To the extent that the EIM entity over or under compensates for these conditions through the use of load adjustments, this can also have major influence on the feasibility of the market solution.

At the start of EIM, when factors such as these lead to relaxation of constraints of the power balance constraint for an EIM area, prices could be set based on the \$1,000/MW penalty price for this constraint used in the pricing run of the market model. After review, the ISO determined that many of these outcomes were inconsistent with actual conditions. Consequently, on November 13, 2014 the ISO filed for and FERC approved special *price discovery* measures to set prices based on the last dispatched bid price rather than penalty prices for various constraints. FERC approved the ISO's filing on December 1 with an effective date of November 14.

As noted above, EIM market performance has been driven by the need to periodically relax several key constraints in the EIM market model, as shown in Figure 1 and Figure 2 on the following page.

- The yellow and red bars provide a weekly summary of the frequency of flexible ramping relaxation and power balance constraints in the 15-minute market in the PacifiCorp East and West areas.
- The red lines show average daily prices in the 15-minute market *with* and *without* the special price discovery mechanism being applied per the ISO filing with FERC.
- The blue lines in these figures show bilateral market price indices that were used to set prices in the PacifiCorp areas prior to EIM implementation.²

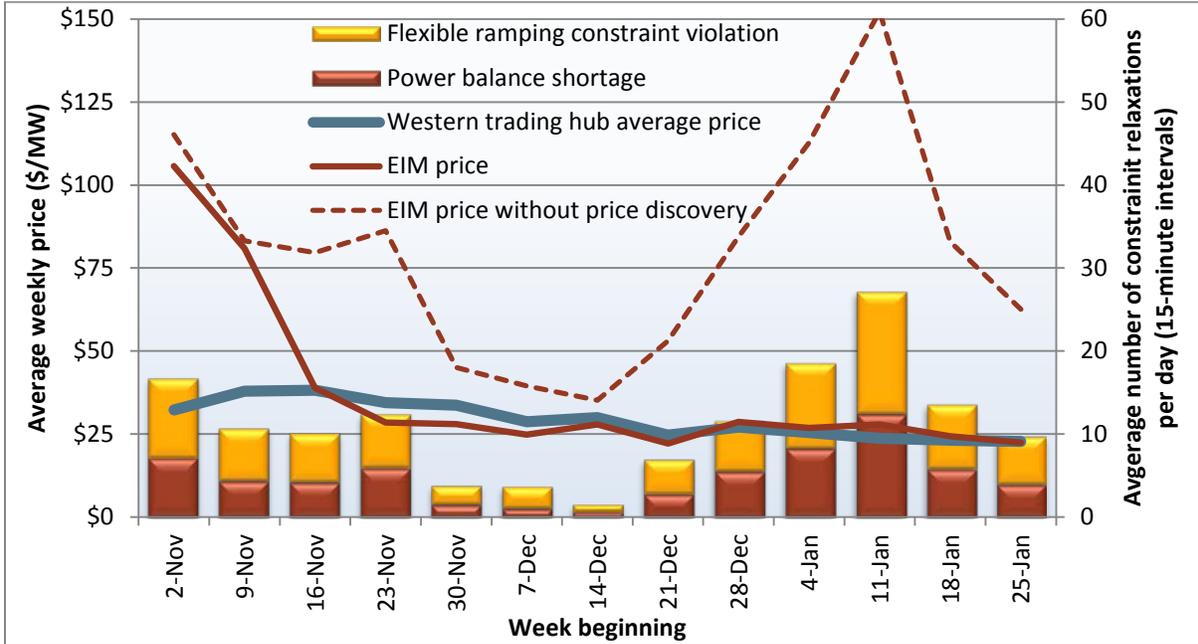
As shown by this analysis:

- The frequency of constraint relaxations in the 15-minute market in PacifiCorp East declined significantly through most of December, before rising in January (see Figure 1).
- The frequency of constraint relaxation in the 15-minute market in PacifiCorp West has been much lower, and also declined significantly through most of December, before rising in January (see Figure 2).
- The factors underlying the trends in constraint relaxation during January will be covered in the ISO's next monthly report to FERC scheduled to be filed in mid-February.
- Without the price discovery provisions being applied in EIM, average weekly 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.

In the 5-minute market, the need to relax the power balance constraint has also remained relatively high in both PacifiCorp East and PacifiCorp West since EIM implementation. This reflects the fact that supply in the 5-minute market is much more constrained, including schedules between EIM balancing areas and the ISO.

² The bilateral market index represents a daily average of peak and off-peak prices for four major Western trading hubs (California Oregon Border, Mid-Columbia, Palo Verde and Four Corners).

**Figure 1. Frequency of constraint relaxation and average prices by week
PacifiCorp East - 15-minute market**



**Figure 2. Frequency of constraint relaxation and average prices by week
PacifiCorp West - 15-minute market**

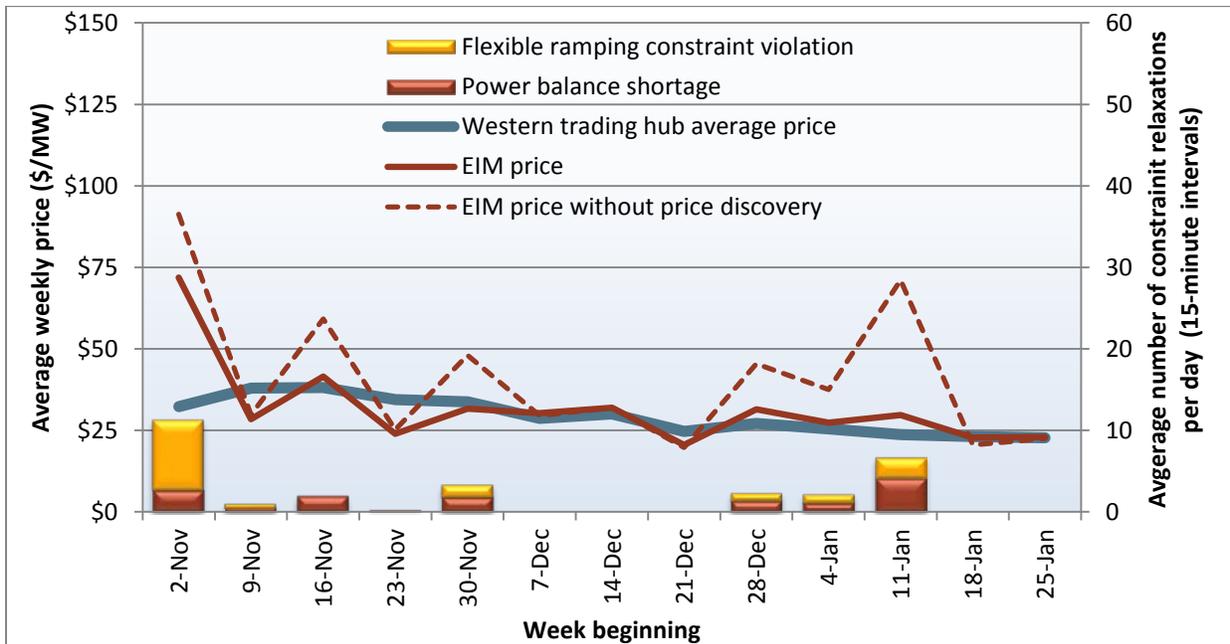


Table 1 below shows average EIM prices in the 15-minute and 5-minute markets with and without application of price discovery, along with average bilateral market prices reflective of prices charged for imbalance energy in the PacifiCorp areas prior to EIM. As shown in Table 1:

- Application of the price discovery mechanism has made average EIM prices in the 15-minute market in PacifiCorp East about 5 percent lower than bilateral market price indices. Prices in PacifiCorp East in the 15-minute market after price discovery have been about equal to these bilateral prices.
- Prices in the 5-minute market since the price discovery mechanism has been in effect have been lower than these bilateral market price indices by about 13 percent in PacifiCorp East and about 10 percent in PacifiCorp West.
- Without the price discovery provisions, prices in PacifiCorp East would be more than double bilateral market price indices in the 15-minute and 5-minute markets.
- In PacifiCorp West, prices without price discovery would be about 32 percent higher than bilateral market prices in the 15-minute market and more than twice as high in the 5-minute market.

**Table 1. Average prices in EIM and bilateral markets
(November 14, 2014 – January 28, 2015)**

	Western trading hub average price	Average EIM price	EIM price without price discovery
<i>PacifiCorp East</i>			
15-minute market	\$28.87	\$27.58	\$75.10
5-minute market	\$28.87	\$25.05	\$62.19
<i>PacifiCorp West</i>			
15-minute market	\$28.87	\$28.95	\$38.09
5-minute market	\$28.87	\$25.89	\$60.88

MARKET POWER MITIGATION

The amount of capacity offered into the EIM appears to be more than sufficient to meet demand during most hours. Analysis by DMM indicates that almost all available capacity from EIM participating resources is being offered into the market, and capacity that is not bid into the market appears to be unavailable due to outages and other unit limitations.

Bidding in the EIM has been highly competitive, with bids for most capacity slightly below or above default energy bids used in market power mitigation. As a result, when bids are mitigated due to market power mitigation provisions, these procedures generally result in modest reductions in bid prices.

Figure 3 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.

In PacifiCorp East, during December about 40 percent of bids have been lower than the default energy bids, with another 55 percent of bids being not more than \$5/MW above default energy bids. Almost all the remaining 5 percent of bids have been no more than \$10/MW above default energy bids.

In PacifiCorp West, during December about 27 percent of bids have been lower than the default energy bids, and almost all of the remaining bids have been no more than \$5/MW above default energy bids.

Figure 3. Comparison of market bids compared to default energy bids

