

Memorandum

To: ISO Board of Governors
From: Eric Hildebrandt, Director, Market Monitoring
Date: January 31, 2013
Re: **Market Monitoring Report**

This memorandum does not require Board action.

EXECUTIVE SUMMARY

This memo provides an update on market performance in the fourth quarter, along with a summary of several key indicators of annual market performance in 2012. Market performance in the fourth quarter was marked by two key trends:

- **System energy price convergence improved.** Average system energy prices in the real-time market (excluding congestion) were close to average prices in the day-ahead market. This trend was driven largely by a decrease in the frequency of extreme real-time price spikes for system energy resulting from short-term limitations in upward capacity.
- **High real-time congestion continued.** Real-time congestion on several major constraints continued to be more frequent and extreme than in the day-ahead market. High real-time congestion was the major cause of about \$60 million in real-time congestion off-set charges incurred in the fourth quarter. Most of the \$15 million in net profits paid to convergence bidders in the fourth quarter also resulted from recurring real-time congestion on a few major constraints.

The Department of Market Monitoring (DMM) is currently preparing its annual report on market performance and will provide a summary of this report at the May Board meeting. Initial results for several components of market performance in 2012 are summarized below.

- **Real-time imbalance off-set costs increased.** Real-time imbalance offset charges totaled just over \$235 million in 2012, representing an increase of about 45 percent compared to 2011. This increase was caused by offset charges associated with higher real-time congestion, which totaled about \$185 million in 2012, compared to about \$28 million in 2011. The ISO has taken several steps to reduce offset costs related to congestion.

- **Bid cost recovery payments fell.** Bid cost recovery totaled about \$104 million in 2012, representing a 20 percent reduction from 2011. This reduction can be attributed to rule modifications implemented by the ISO in 2011 to mitigate bidding practices aimed at inflating bid cost recovery payments.¹ In 2012, about 25 percent of total bid cost recovery payments (or about \$25 million) continued to result from units committed through exceptional dispatches to provide additional on-line capacity to supplement day-ahead market results.
- **Exceptional dispatches for real-time energy increased.** The ISO also issues exceptional dispatches for additional real-time energy to ensure that units operate at specific levels needed for reliability. The volume of real-time energy from this type of exceptional dispatch increased by about 130 percent in 2012. However, this energy from these real-time exceptional dispatches represented less than 0.25 percent of total system energy. Also, the above market cost of this exceptional dispatch energy (in excess of market clearing prices) was only about \$11 million, representing a 7 percent increase from 2011.

In 2013, the ISO is placing a major emphasis on implementation of various process and modeling improvements that may decrease real-time imbalance offset charges and the need for exceptional dispatches. DMM is highly supportive of these efforts, as they target components of the market that may be subject to significant improvement as a result of ISO actions.

QUARTERLY MARKET PERFORMANCE

System energy prices

Average system energy prices in the real-time market (excluding congestion) tracked closely to average prices in the day-ahead market during each month of the fourth quarter (see Figure 1). In the fourth quarter of 2012, differences in the system energy price between day-ahead and real-time markets were less systematic and predictable than in prior months, making it harder for convergence bidders to make consistent revenues from these differences.

The improvement in convergence of system energy prices was caused in large part by a decrease in the frequency of extreme real-time price spikes resulting from short-term limitations in capacity that could be quickly ramped up in the real-time market. As shown in Figure 2, real-time system energy prices above \$250/MW remained about 1 percent of all 5-minute intervals during the fourth quarter. However, the frequency of price spikes above \$750/MWh decreased significantly (see yellow and red bars).

¹ See discussion on pages 61-62 of DMM's 2011 Annual Report.

Figure 1 Average monthly system marginal energy price (all hours)

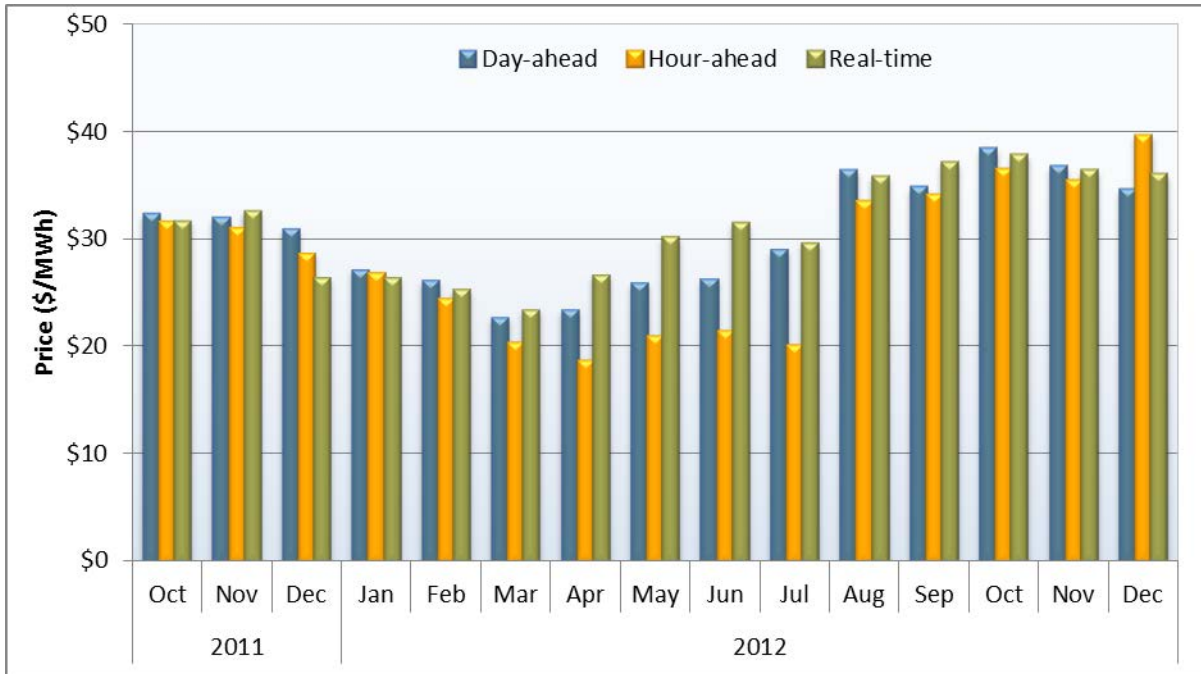
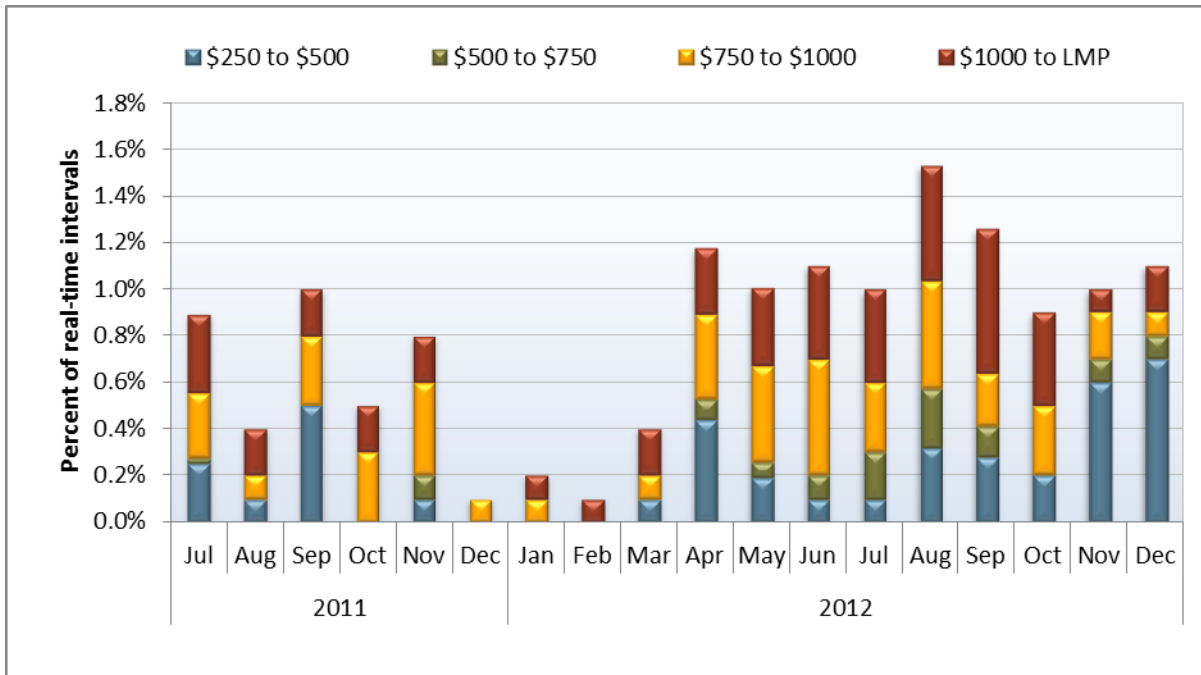


Figure 2 Frequency of real-time price spikes (all LAP areas)



Congestion

While convergence of system average day-ahead and real-time prices improved, differences in congestion between the day-ahead and real-time markets continued to create divergence in day-ahead and real-time locational marginal prices (including congestion). In the fourth quarter, real-time congestion on several major constraints continued to be more frequent and extreme than in the day-ahead market. This represents a continuation of a trend that began in the second quarter of 2012 and continued through the rest of the year.

The price of real-time congestion tends to be much higher than in the day-ahead since market and system conditions represented in the real-time market model are much more constrained. As discussed in DMM's prior quarterly reports, the increase in real-time congestion in 2012 is attributable to a variety of factors.² These factors include the enforcement of additional constraints by the ISO in the real-time market model to increase reliability, as well as downward adjustments in these constraints that are sometimes needed in real-time to account for differences in actual flows compared to flows predicted by the market model.

High real-time congestion was the major cause of about \$60 million in real-time congestion off-set charges incurred in the fourth quarter. Real-time congestion typically increases these offset costs by causing the ISO to collect less revenue from participants with negative deviations from their day-ahead demand and supply schedules than it pays to participants with positive deviations from day-ahead schedules. This real-time revenue imbalance is particularly exacerbated when transmission constraints are de-rated in real-time and congestion occurs.

Recurring real-time congestion on a few major constraints also accounted for most of the \$15 million in net profits paid to convergence bidders in the fourth quarter. DMM estimates that during the fourth quarter about 90 percent of accepted virtual bids were designed to profit from potential differences in day-ahead and real-time congestion. This trend also reflects the improved convergence of day-ahead and real-time prices for system energy (without congestion), which has made it more difficult for participants to profit from differences in these prices.

² For further discussion, please see pages 19, 20 and 25 of DMM's *Q3 2012 Report on Market Issues and Performance*, November 13, 2012, <http://www.caiso.com/Documents/2012ThirdQuarterReport-MarketIssues-Performance-Nov2012.pdf>.

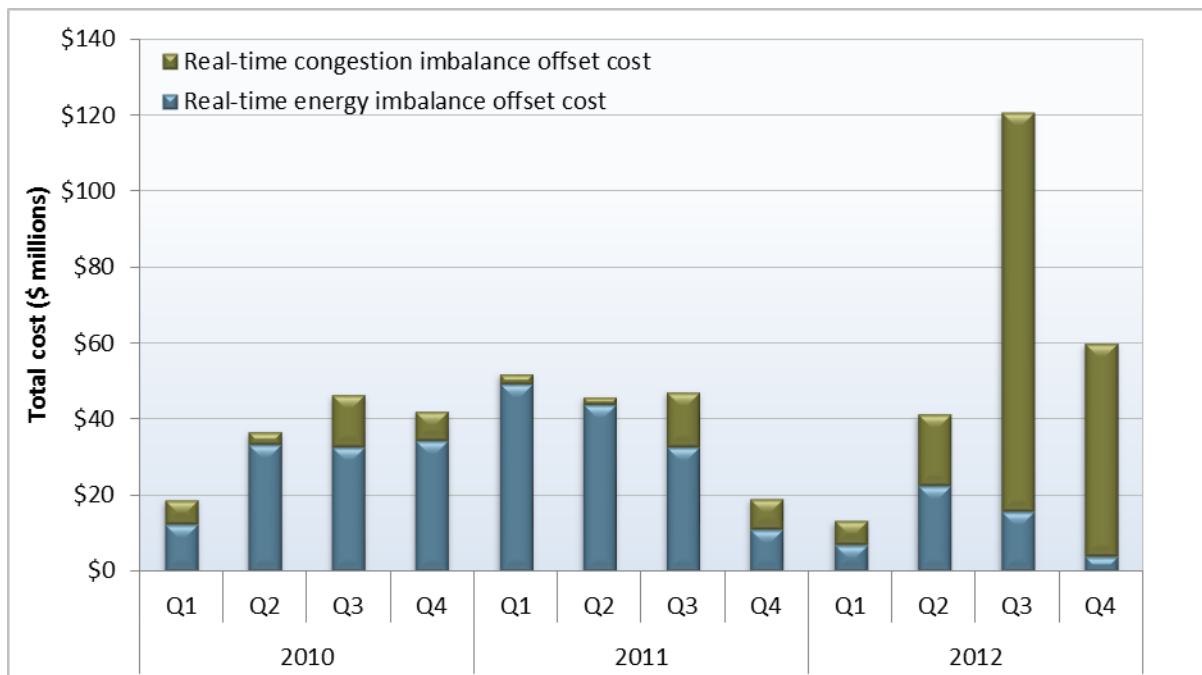
ANNUAL MARKET PERFORMANCE

As noted above, DMM is currently preparing its annual report on market performance and will provide a summary of this report at the May Board meeting. The following section of this memo summarizes initial results for several key components of market performance in 2012.

Real-time offset costs

Total real-time uplifts were about \$235 million in 2012, up about 45 percent from 2011 (see Figure 3). This increase was primarily driven by an increase in real-time congestion imbalance offset costs, which totaled about \$185 million in 2012, compared to about \$28 million in 2011.

Figure 3 Real-time energy and congestion imbalance offset costs



The increase in real-time congestion imbalance offset costs was primarily attributable to systematic congestion differences between the day-ahead and real-time markets. During the third quarter, which accounted for about \$105 million in real-time congestion imbalance costs, systematic reductions in transmission limits between the day-ahead and real-time markets was a key factor contributing to the increase in costs.³ The costs

³ A portion of these costs are offset by collections in the day-ahead market, so that not all of these costs represent net costs to the market.

were further exacerbated as many of these transmission reductions caused local ramping infeasibilities in the real-time market, causing prices at some points within the grid to exceed \$1,000/MWh in many instances.

The ISO has undertaken a series of steps to address the large real-time congestion imbalance costs. These steps include:

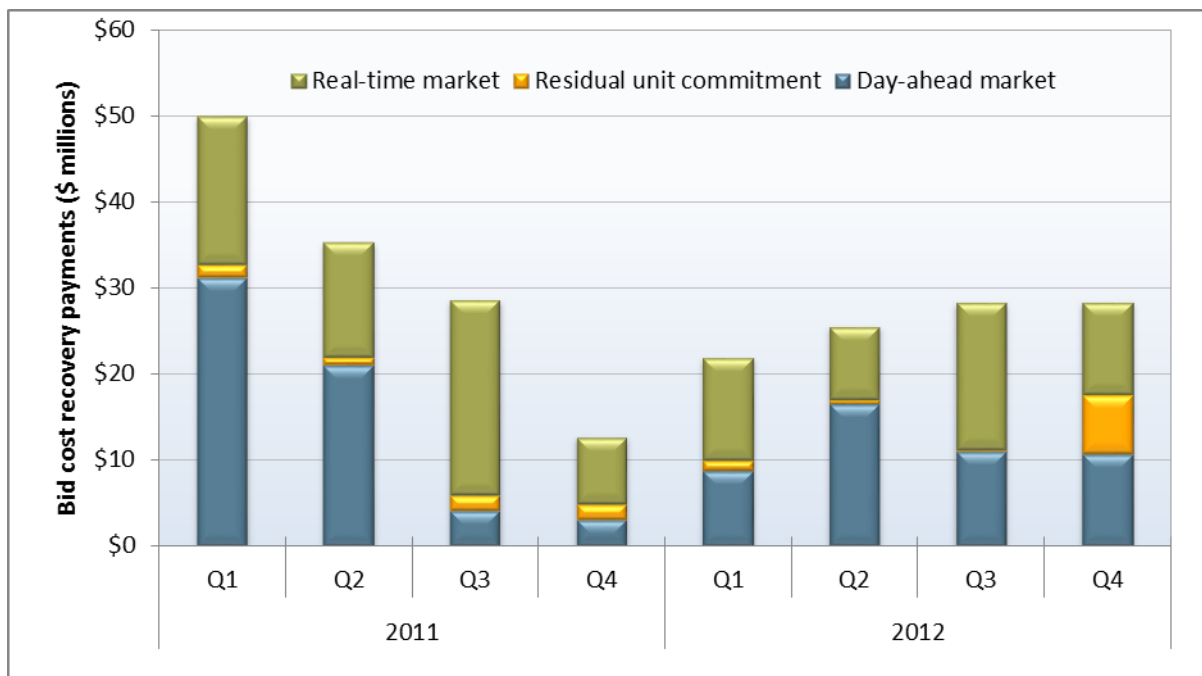
- **Adjusting transmission limits in the day-ahead and hour-ahead markets.** This can better align the scheduling and dispatch of resources that impact flows on transmission constraints with actual real-time conditions on these constraints.
- **Implementing the transmission reliability margin on interties.** This allows the ISO to create a margin of unscheduled capacity on some inter-ties in the hour-ahead market to better allow for management of unscheduled flows in real-time.
- **Enhancing automated modeling adjustments made to account for unscheduled flows.** The ISO has enhanced the automated software feature (known as *compensating injections*) that accounts for unscheduled flows observed on interties in the hour-ahead and real-time processes. These enhancements have improved performance of this feature significantly.
- **Reducing transmission constraint relaxation parameters.** The Board approved revisions to the transmission constraint relaxation parameter in December. These modifications will reduce real-time intervals in which extremely high real-time congestion prices occur even though the congestion management process is resulting in an insignificant reduction in actual power flows on a constraint.

Energy imbalance offset costs decreased in 2012 to \$50 million from about \$137 million in 2011. This category of offset costs has historically been attributable to the tendency for the ISO software to reduce net imports at relatively low prices in the hour-ahead market, and then dispatch additional energy in the 5-minute real-time market at higher prices. Much of the decrease in these offset costs in 2012 can be attributed to the suspension of virtual bidding on interties in December 2011. Virtual bidding on interties increased this category of offset costs by allowing participants to arbitrage persistent differences in hour-ahead and real-time prices.

Bid cost recovery payments

Bid cost recovery payments are designed to ensure that generators receive enough market revenues to cover the cost of all their bids when dispatched by the ISO. Bid cost recovery payments totaled about \$104 million in 2012, down by about 20 percent from 2011 (see Figure 4). This reduction can be attributed to rule modifications implemented by the ISO in 2011 to mitigate bidding practices aimed at inflating bid cost recovery payments.⁴

Figure 4 Bid cost recovery payments



In 2011 and 2012, about 25 percent of total bid cost recovery payments resulted from units committed after the day-ahead market through exceptional dispatches to provide additional on-line capacity to supplement day-ahead market results. When units are committed to run at their minimum operating level through exceptional dispatch after the day-ahead market, but do not earn enough energy revenues to cover their minimum load bids in the real-time market, units are guaranteed to recover their full minimum bid costs through bid cost recovery payments. Under current ISO rules, suppliers can submit minimum load bids each month that can be up to 200 percent of their projected operating costs at minimum operating levels.

⁴ See discussion on pages 61-62 of DMM's 2011 Annual Report.

Exceptional dispatch energy

The ISO also issues exceptional dispatches in the real-time market to ensure that units operate at specific levels needed for reliability. The volume of real-time energy from this type of exceptional dispatch increased by about 130 percent in 2012. However, real-time energy from this type of exceptional dispatch in 2012 (600 GWh) still represented less than 0.25 percent of total system energy.

There are many different reasons driving the need to issue exceptional dispatches for additional real-time energy to supplement the normal economic dispatches issued by the market software. One of the major factors driving exceptional dispatches continues to be the need to ensure that local and system reliability can be restored within 30 minutes in the event of contingencies such as a major transmission or generation outage. To ensure this, the ISO sometimes needs to exceptionally dispatch units to a higher operating level where they could ramp up more quickly in the event of such a contingency.

In 2012, another major driver of the increase in exceptional dispatches for real-time energy was the outage of the San Onofre Nuclear Generating Station (SONGS). In addition, persistent high-priced offers from an individual market participant controlling numerous key generating resources contributed to the increase in real-time exceptional dispatches in 2012.

The *above market* cost of this exceptional dispatch energy (in excess of market clearing prices) was only about \$11 million, representing only a 7 percent increase from 2011. The relatively low above market cost of real-time energy from exceptional dispatches reflects the fact that most of this energy is either bid at prices not far in excess of the market clearing price or was mitigated under the ISO's local market power mitigation rules for exceptional dispatches. Payments for real-time energy from exceptional dispatches made to manage reliability issues relating to any constraint that is not deemed competitive are capped at the maximum of the locational marginal price or a default energy bid reflecting the unit's actual operating cost.