

WESTERN ENERGY IMBALANCE MARKET

Memorandum

To: Western Energy Imbalance Market Governing Body
From: Benjamin F. Hobbs, Chair, ISO Market Surveillance Committee
Date: December 5, 2023
Re: **Briefing on Market Surveillance Committee activities – Oct. 26, 2023 to Dec. 4, 2023**

This memorandum does not require WEIM Governing Body action.

During the time period covered by this report, the Market Surveillance Committee (MSC) of the California ISO held a general session meeting on Nov. 29, 2023.¹ Two topics concerning the functioning of ISO markets were addressed during that meeting.

- **Performance of the congestion revenue rights market**, including the efficiency of the auction market for those rights, the adequacy of congestion revenues to cover the potential payments owed to those rights, and the logic of pro-rata funding of payments to holders of those rights. The ISO is presently in the process of a holistic assessment of these performance dimensions.
- **Flexible ramping product requirements**, emphasizing the performance of statistical methods to project the amount of uncertainty in real-time net load ramps, which is used to define targets for the amounts of product to be procured by the ISO.

A summary of the discussions is given below.

The next MSC general session meeting is scheduled for December 18, 2023.

MSC General Session Meeting, Nov. 29, 2023

Congestion Revenue Rights Market Performance Discussion

This agenda item included a presentation by ISO representative Dr. Guillermo Bautista

¹ www.caiso.com/informed/Pages/BoardCommittees/MarketSurveillanceCommittee/Default.aspx

Alderete, Director of Market Performance and Advanced Analytics. This was followed by a presentation by MSC member Dr. Scott Harvey and comments by Dr. Eric Hildebrandt, Executive Director of the ISO Department of Market Monitoring, along with discussion among the committee members, ISO staff, and attending stakeholders.

Dr. Bautista's presentation included a partial update on the ongoing ISO assessment of the three aspects of the performance of the congestion revenue rights market mentioned above. He started the presentation by describing the definitions of, and differences between, the efficiency of the rights auction and the revenue adequacy of an existing set of congestion revenue rights. He provided extensive data on the types of rights that have been sold, their price distributions, and the magnitudes of indices of the extent of auction inefficiency and revenue inadequacy since the changes that were implemented in 2019 to the rights auctions and payout systems. In terms of revenue adequacy, congestion revenues in the day-ahead ISO markets would have been sufficient to cover 81% of payouts to existing rights over that time period, if the payouts were not subjected to pro-rata funding (termed "natural" revenue adequacy). By definition of the pro-rata system, actual payouts were no more than congestion revenues.

The pro-rata system implemented in 2019 also contributed to a higher level of auction efficiency. Without that pro-rata system, the ratio of revenues to payouts for auctioned rights would have been 49% rather than the actual 65% experienced over that time period (under the strong assumption of no change in auction revenues or the amount or location of rights awarded). Dr. Bautista presented detailed statistics about the "excess" payouts to rights, where "excess" is defined as a positive divergence between payout and the original cost in the auction. For instance, distributions of excess payouts between monthly and seasonal rights were summarized, as were the excess payouts as a function of, first, the identities of the sources and sinks (for instance, originating at generator nodes of the network and sinking at a system sub-load aggregation point) and, second, of the prices paid for the rights in the auction. Details were provided on distributions of rights in terms of the payments they received and the amounts paid to procure them in the auctions. For instance, significant numbers of rights procured at a positive price had negative total quarterly payouts, while some other rights that were procured at a negative price had positive payouts. Information was also provided about arbitrage between seasonal (three month-duration) rights and monthly rights to which they can be converted.

Dr. Bautista provided data that showed that load serving entities are increasingly using the rights auctions to rebalance their portfolios, but their apparent undervaluation of rights contributes to the inefficiency of the rights auctions. Finally, he concluded the presentation with a summary of the additional analyses that the ISO will undertake of the drivers of auction inefficiency and revenue inadequacy.

Stakeholders made a number of comments. One suggested examining the issue of loop flows, while others asked about potential effects of allocated rights and sell-side rights on the

calculations. Dr. Jim Bushnell, MSC member, asked about the effect of load migration from an incumbent utility to a community choice aggregator, and whether those effects might be expected to diminish in the future as less load migrates.

Dr. Hildebrandt was then invited by the MSC Chair to make comments. He first expressed a concern that modelling improvements will be proposed that will be unable to solve the fundamental problem of inconsistencies of the ISO's day-ahead and real-time market models. Dr. Hildebrandt then briefly summarized the Department of Market Monitoring's proposal for a "willing seller"-based auction, in which the supply of congestion revenue rights is provided entirely by market participants and none directly by the ISO. He stated that the Department looks forward to further discussing that proposal and its potential performance.

Dr. Harvey of the MSC then made a presentation in which he summarized the three sets ("tracks") of changes to the rights auctions and payout procedures that were implemented in 2019, and the challenges involved in assessing their individual impact. He nevertheless concluded that it is likely that some improvements in auction efficiency resulted from those changes, based on the observed improvement in the efficiency percentage since implementation.

Some additional observations made by Dr. Harvey, relying in part on analyses carried out by the Department of Market Monitoring at the request of the MSC, include the following:

- It does not seem that acquisition of negatively valued rights by financial entities materially contributed to the magnitude of payouts to financial entities. Instead, large payouts in excess of the prices paid for positively valued rights were more important, indicating that financial entity participation in the auctions is not shifting risk from LSEs to financial entities.
- The level of natural revenue inadequacy appears to be too high to be explained by the impact of transmission outages on the cost of meeting load in the day-ahead market alone. A breakdown by type of market player indicates the natural revenue inadequacy (as a proportion of congestion revenue) is higher for financial entities, but the lower level of inadequacy for various types of load serving entities is still higher than the likely impact of transmission outages on the cost of meeting load.
- Dr. Harvey also offered some possible explanations for the relatively low valuation of CRR payments in ISO auctions. The high rate of natural revenue inadequacy weakens the value of rights as a hedge against locational price differences.
- Dr. Harvey concluded by suggesting several additional analyses to better identify the possible causes of undervaluation by sellers of transmission rights in the auction.

Stakeholders asked follow-up questions about the possible role of risk premiums versus interest in causing auction prices and payouts to diverge, and the role that divergences between auction and day-ahead market shift factors may play in creating the problem. Dr. Bushnell made comments that reiterate observations he has made at previous MSC

meetings about the possibility of imposing a minimum price for rights, and focusing the auction on providing fewer but higher quality rights.

Flexible Ramping Product Requirements Discussion

The second agenda item began with a presentation by Amber Motley, Director of Short Term Forecasting for the ISO on the ISO's method for forecasting ramp product requirements. The presentation included overviews of its performance, challenges, and potential directions for enhancements.

Ms. Motley's presentation began with an overview of performance metrics, including:

- quality of calibration (whether defined downward and upward ramp requirements are close to the targets of 2.5% and 97.5% percentiles, respectively, of net ramp uncertainty),
- informativeness (whether the requirements are responsive to system conditions, and are well calibrated within subsets of hours such as peak conditions),
- average requirements (an index of cost), and
- inter-hour movement (which should reflect changes in actual uncertainty, but not be excessive or difficult to predict, especially for residual supply indices that are used to evaluate balancing area authority adequacy in the ISO spot markets).

Ms. Motley then presented a series of charts comparing the performance of the ISO's former method (based on histograms of net load errors in the recent past) and the new method called MOSAIC recently implemented by the ISO that statistically accounts for dependence on wind, solar, and load conditions and uncertainty. Data presented showed the extent to which realized uncertainty exceeded requirements when such exceedances occurred, along with distributions of the level of requirements. Compared to the histogram approach, MOSAIC seems to result in exceedances that are closer to zero and which avoid very high "misses"; at the same time MOSAIC resulted in about 10% less procurement of upward product and 5% less procurement of downward product. Other aspects of methodology performance addressed by Ms. Motley included performance during weekends versus weekdays, magnitudes of hour-to-hour changes in requirements.

Her presentation then addressed on-going efforts to enhance the performance of the MOSAIC methodology and the transparency of its results. Examples include different size data windows for model calibration, choices of parameters to tune, pooling versus separate treatment of data from weekdays and weekends, and tradeoffs among the performance objectives as estimated by simulation of system performance with past data. Applying the simulation method has identified approaches that improve calibration and at the same time reduce requirements, as compared to a "baseline" (current) method.

In stakeholder discussion, several questions were addressed. One question concerned whether the methodology performed differently in the 15 minute intervals that start and end each hourly interval; this has not yet been assessed. Another question concerned how

rapid changes in the ISO load patterns could affect the quality of estimates based on longer data series, and the roles of “forward” and “backwards” data.

Dr. Harvey of the MSC then made a presentation in which he addressed several concerns in the formulation and calibration of the MOSAIC methodology, especially as applied to upward ramp requirements. Dr. Harvey’s discussion was largely based on analysis in a recent Department of Market Monitoring report.² Examples of topics addressed included:

- the use of the sum of confidence intervals from several variables (wind, solar, load) to characterize uncertainty in net load in the MOSAIC regression (which, unless the variables are highly correlated, will overstate the impact of the individual factors on net load uncertainty in some hours, contributing to inaccurate estimates of uncertainty in the MOSAIC regression.);
- a review of some results from the Department of Market Monitoring analysis of MOSAIC performance, in particular relationships between net load uncertainty and the MOSAIC variable’s summary of solar, wind, and load uncertainty;
- the use of longer look-back times (up to 180 days--in an attempt to lessen statistical uncertainty associated with small sample)--may cause inaccurate estimates of net load uncertainty because many days in the sample will come from a different season and have different sunset and sunrise times, as well as other differences among seasons; and
- application of the MOSAIC model at the pass-group (multiple balancing area authority) level in real-time to determine actual requirements can be challenging if the areas constituting the pass-group change from one resource sufficiency evaluation to the next, as analyzed by the Department of Market Monitoring in its report.
- There was also discussion in the meeting of whether the difference relationships found by the ISO analysis and the DMM analysis might be a result of differences in the relationships between MOSAIC variable uncertainty and net load uncertainty at the pass-group level than at the balancing area authority level. Some of the discussion of the sample used in the MOSAIC regressions during the meeting was unclear. The MSC continues to have discussions with the CAISO and DMM to clarify the number of data points per hour used to estimate upward uncertainty.

Dr. Harvey closed his presentation with a summary of statistical issues associated with the MOSAIC methodology and histogram method it replaced, and some suggestions for how those issues might be resolved by adjusted model reformulations and calibration prot exceed six pages in length.

² <http://www.caiso.com/Documents/Review-of-the-Mosaic-Quantile-Regression-Nov-20-2023.pdf>