



# Memorandum

**To:** ISO Board of Governors and WEIM Governing Body

**From:** Eric Hildebrandt, Executive Director, Market Monitoring

**Date:** May 15, 2024

**Re:** Department of Market Monitoring report

---

*This memorandum does not require ISO Board of Governors or WEIM Governing Body action.*

## EXECUTIVE SUMMARY

This memo summarizes three key recommendations from the Department of Market Monitoring (DMM) by the onset of summer 2024.

- **Limiting transfers into the ISO through the WEIM.** The California ISO has explained that limitations placed on transfers from other WEIM areas during peak net load hours beginning in July 2023 were for reliability reasons. This practice ended in mid-November after implementation of software enhancements that allow ISO operators to better manage self-scheduled exports that decline hour-ahead market curtailments. DMM has recommended that the ISO provide greater transparency on whether this practice may be re-implemented, and if so, under what conditions. If transfer limitations are utilized again, the ISO should carefully manage the use of such limitations and provide more timely transparency to market participants. Since these limitations can decrease overall market efficiency, the ISO should consider any alternatives and weigh the tradeoff between market impacts and the potential reliability benefits of limiting WEIM transfers. Under most system and market conditions, it seems that limiting transfers would not provide significant reliability benefits, but could create negative market impacts.
- **Factoring uncertainty into residual unit commitment requirements.** DMM has questioned the use of the quantile regression model estimates of net load uncertainty between the day-ahead and real-time as the primary basis for determining residual unit commitment (RUC) requirements. In the short term, if the ISO continues to use this approach, the ISO should carefully consider the tradeoff between any gain in reliability and the higher costs associated with the very high levels of RUC that were procured in the summer and fall of 2023. In the longer term, DMM recommends that the ISO develop an approach that directly incorporates the different system conditions and uncertainties that the RUC load adjustment is intended to address. DMM also recommends greater and more timely transparency on the criteria and process for setting RUC requirements.

- **Maximum import bid price (MIBP).** The MIBP is an hourly price calculated by the ISO to determine which days the hard bid cap of \$2,000/MWh is triggered and the maximum prices at which most imports can be offered. The MIBP is based on bilateral hub prices and an hourly shaping factor derived from ISO market prices on a prior high-priced day. The ISO is proposing to expand use of the MIBP to include setting a daily bid cap for energy storage resources that can exceed \$1,000/MWh on days when the \$2,000/MWh hard offer cap is in effect. DMM believes that the MIBP calculation currently used by the ISO does not make sense statistically and is not consistent with the tariff and the intended market design. Given the significant impact this calculation can have on the ISO and WEIM markets, DMM recommends that the ISO address this issue prior to the coming peak summer periods.

This memo provides additional details of these issues and recommendations.

## LIMIT ON TRANSFERS INTO ISO AREA FROM WEIM

### Background

Under very tight market conditions, the amount of available supply, including WEIM transfers into the ISO balancing area, may not be sufficient to meet hour-ahead demand and self-scheduled exports out of the ISO area. In these situations, some low priority self-scheduled exports will not receive hour-ahead market awards. However, many of these exports are scheduled to ultimately sink in WEIM balancing areas, which list bilateral imports as self-scheduled supply in their base schedules. These imports from the ISO area are included in the supply that is considered available to the WEIM in the hour-ahead market.

When bilateral imports into a WEIM area that are sourced from ISO area exports do not receive hour-ahead market awards, the hour-ahead market continues to treat the imports as supply, even though it is supply that the WEIM area will not actually have. This extra supply in the hour-ahead market can allow WEIM transfers from that area into the ISO area, which are ultimately infeasible. In the 5-minute market, when the WEIM area's supply does not include the imports sourced from curtailed exports out of the ISO area, the WEIM area does not have the excess supply to support transfers scheduled into the ISO area. This can cause a large portion of WEIM transfers that had been an important source of ISO area supply in the hour-ahead market to be unavailable in the 5-minute market.

Another reason hour-ahead WEIM transfers into the ISO balancing area may not materialize in the 5-minute market is that the ISO uses a 5-minute market load adjustment that is often thousands of MW less than the hour-ahead market load adjustment. When hour-ahead market WEIM transfers into the ISO area do not materialize in the 5-minute market, this may require the ISO to execute curtailments within the hour to exports that had received hour-ahead market awards or to ISO area load.

Beginning in late July 2023, ISO operators addressed this reliability concern by limiting WEIM transfers into the ISO area in the hour-ahead and 15-minute markets during peak net load hours. By limiting these WEIM transfers, exports supported by potentially infeasible

hour-ahead WEIM transfers would not clear the hour-ahead market. This reduced the risk of the ISO needing to curtail non-firm exports or ISO load within the operating hour. ISO operators did not limit WEIM transfers in the 5-minute market, since additional exports cannot clear in the 5-minute market.

This new practice was implemented on July 26, 2023 to address an immediate reliability concern that developed under tight system conditions. As DMM obtained information on this practice, DMM began assessing its impacts and providing additional market transparency on this issue. DMM has provided a detailed explanation of this practice and related market impacts in numerous recent reports and presentations.<sup>1</sup> As explained in prior reports, this practice has created a significant, systematic modeling difference between the 15-minute and 5-minute markets, which impacted market results in several ways.

- Increased congestion into the ISO area from other WEIM areas in the 15-minute market compared to the 5-minute market.
- Lowering of 15-minute WEIM prices relative to 5-minute prices in the Desert Southwest areas.
- Potentially less efficient resource commitment in the 15-minute market in the Desert Southwest areas.
- Reducing the amount of energy that could be scheduled out of the Desert Southwest through the WEIM in the hour-ahead and 15-minute markets.

DMM has provided examples highlighting the significant impact that this practice has had based on WEIM transfers between balancing areas in the days and hours before and after this limitation was put into effect.<sup>2</sup> Based on comparisons of days and hours with and without the limit, DMM can conclude that the practice has a significant impact in terms of lowering 15-minute prices relative to 5-minute market prices in the Desert Southwest areas. However, DMM does not have sufficient tools and resources to quantify the price, resource commitment, and transfer flow impact during hours when this limitation was in place.<sup>3</sup>

The ISO stopped limiting transfers into the ISO area from the WEIM during peak net load hours in mid-November 2023. The ISO explained the transfer limitations were needed in July and August for reliability reasons, but it is not clear why these transfer limitations

---

<sup>1</sup> The most recent and detailed discussion and analysis of this is in DMM's *Q4 2023 Report on Market Issues and Performance*, pp 74-90. <https://www.caiso.com/Documents/2023-fourth-quarter-report-on-market-issues-and-performance-apr-24-2024.pdf>

<sup>2</sup> See DMM's *Q4 2023 Report on Market Issues and Performance*, pp 83-85 and DMM's *Q3 2023 Report on Market Issues and Performance*, pp 63-69: <https://www.caiso.com/Documents/2023-Third-Quarter-Report-on-Market-Issues-and-Performance-Feb-21-2024.pdf>

<sup>3</sup> For example, DMM cannot re-run a real time market model to quantify the impact of the import limitation on WEIM prices, transfers, and unit commitment in different areas.

continued during the fourth quarter through November 15.<sup>4</sup> The ISO has explained to DMM that it stopped the transfer limitations after implementing enhancements to system software to better address export self-schedules that declined hour-ahead market curtailments.<sup>5</sup> However, it seems to DMM that system conditions that may have necessitated curtailing hourly block exports in the hour-ahead market should have been unlikely by October and November.

### Market participant concerns

Numerous market participants in the Desert Southwest have expressed concern about the impacts that the limitation of transfers into the ISO area from the WEIM have on their balancing areas. As explained above, DMM can conclude that this practice had a significant impact on WEIM transfers and prices, but cannot quantify these impacts.

One of the concerns expressed is that the transfer limitation may create real-time congestion imbalance offset costs for Desert Southwest WEIM entities. Another concern expressed to DMM is that it may prevent the allocation of congestion rent on their transfer constraints in the 15-minute market.

DMM reviewed this issue and concluded that if settlement rules were correctly implemented, the limitation on WEIM transfers in the 15-minute market would not create real-time congestion imbalance offset costs and would not impact the allocation of congestion rent created in the 15-minute market. Limiting 15-minute market transfer capacity would be likely to reduce congestion rent generated by transfer constraints into the ISO area in the 15-minute market. However, congestion rent would still be generated by incremental flows from the Desert Southwest into the ISO area in the 5-minute market.<sup>6</sup> If settlement rules were correctly implemented, this should not create real-time congestion imbalance offset costs.

Desert Southwest entities have noted that positive and negative congestion revenues on WEIM transfer constraints seem to have been erroneously allocated during the time period in which the ISO limited the WEIM transfer constraints into the ISO area. As described in DMM's Q4 2023 report, an implementation error resulted in some

---

<sup>4</sup> For the explanation of why the ISO used the transfer limitation in the third quarter of 2023, see *Summer Market Performance Report for July 2023*, California ISO, September 18, 2023, pp 132-134: <https://www.caiso.com/Documents/Summer-Market-Performance-Report-for-July-2023.pdf>

<sup>5</sup> See the ISO market notice on Automated Dispatch System changes to Partial Acceptance functionality and User Interface implementation on November 15, 2023 at: <https://www.caiso.com/Documents/ads-changes-to-partial-acceptance-functionality-and-user-interface-implementation-111523.html>

<sup>6</sup> See Figures 1.36 and 1.37 on pp 55-56 of DMM's *Q4 2023 Report on Market Issues and Performance*. These figures show positive and negative congestion revenues on WEIM transfer constraints in the 5-minute market over 2023. There did not seem to be a very significant difference in congestion revenue magnitudes between days with the transfer limitation and days without the transfer limitation: <https://www.caiso.com/Documents/2023-fourth-quarter-report-on-market-issues-and-performance-apr-24-2024.pdf>

congestion revenues from WEIM transfer constraints in the 5-minute market to be misallocated between WEIM entities in some intervals from June 26 to December 11, 2023. The ISO has corrected around \$5 million of the incorrect allocation from the November 5 trade date.

DMM has estimated that if this error had impacted all congestion revenues on these constraints in all 5-minute market intervals, the maximum additional congestion revenues that may have been impacted is \$40 million. However, DMM cannot determine how many intervals and what proportion of congestion revenues were impacted by the error.

## Recommendations

The ISO has explained the transfer limitations were needed in July and August for reliability reasons, and that it stopped this practice in mid-November after implementing software enhancements that allow better management of self-scheduled exports that decline hour-ahead market curtailments. DMM recommends that the ISO assess and provide greater transparency on whether this practice may be re-implemented, and if so, under what conditions.

If transfer limitations are utilized, DMM also recommends that the ISO carefully manage the use of such limitations and provide more timely transparency to market participants, given the impacts this has on WEIM transfers and prices in other WEIM balancing areas. Since these limitations can decrease overall market efficiency, the ISO should weigh the tradeoff between these market impacts and the potential reliability benefits of limiting WEIM transfers. Under most conditions, it seems that limiting transfers would not provide significant reliability benefits, but would have negative market impacts.

Finally, DMM also recommends that the ISO work with stakeholders to consider other methods of achieving the intended reliability outcomes without creating the large and systematic modeling differences between the 15-minute and 5-minute markets.

## RESIDUAL UNIT COMMITMENT

### Background

In summer 2023, the ISO began using the *mosaic quantile regression* method to calculate the uncertainty component of the residual unit commitment (RUC) load adjustment. Until December 21, 2023, the ISO set this adjustment based on the 97.5<sup>th</sup> percentile of the regression model estimate of the upward uncertainty between the day-ahead net load forecast and the real-time net load forecast. This resulted in a large increase in RUC requirements and costs.

On December 21, the ISO began using the 50<sup>th</sup> percentile of the quantile regression model estimate of uncertainty, which results in only small adjustments to account for uncertainty

between the day-ahead and real-time net load forecasts.<sup>7</sup> The current procedure by the ISO calls for using the 50<sup>th</sup>, 75<sup>th</sup>, or 97.5<sup>th</sup> percentile of estimated upward uncertainty depending on the assessment of overall system conditions. However, the factors and method for how system conditions will determine which of these three percentiles the ISO will use are not well defined or transparent.

There can be large differences between a RUC adjustment based on the 50<sup>th</sup> percentile and the 97.5<sup>th</sup> percentile. Therefore, the factors and method that the ISO adopts to decide which percentile of day-ahead forecast uncertainty to use on a given day will determine if the RUC load adjustment is very small, moderate, or very large. This indicates that assessments of other system conditions, rather than just the day-ahead forecast uncertainty modeled by the quantile regression, play a large role in determining the different uncertainties that the RUC load adjustment is intended to address. More specific and transparent discussions of how these other system conditions can be factored into procurement requirements could lead to significant improvements in the overall method for determining the RUC load adjustment.

These discussions could also improve the implementation of the extended day-ahead market (EDAM). The demand curve for the imbalance reserve product is an important aspect of the EDAM design. This demand curve is currently designed to be based only on the day-ahead uncertainty forecast from the mosaic quantile regression model. The demand curve will not be taking into consideration how these other system conditions translate to demand for the day-ahead market to procure more or less imbalance reserve capacity. Therefore, discussions and analysis of how assessments of these system conditions should be factored in the RUC requirement could also significantly improve the design of the imbalance reserve demand curve, and reduce the risk that it will overvalue capacity procured in the day-ahead market.

## Recommendations

DMM questions the use of the quantile regression model estimates of net load uncertainty between the day-ahead and real-time markets as the primary basis for determining RUC requirements. In the short term, if the ISO continues to use the quantile regression model, the ISO should carefully consider the tradeoff between any gain in reliability and the higher costs associated with the very high levels of RUC procured in the summer and fall of 2023. In the longer term, DMM recommends that the ISO develop an approach that directly incorporates the different system conditions and uncertainties that the RUC load adjustment is intended to address. DMM also recommends greater and more timely transparency on the criteria and process for setting RUC requirements.

---

<sup>7</sup> Procuring to the 50<sup>th</sup> percentile of uncertainty between the day-ahead forecast and each hour's average real-time forecast would result in sufficient capacity in only half of all hours. Therefore, the uncertainty component of the RUC adjustment would be close to 0 MW. However, the uncertainty measurement is technically between the day-ahead market's hourly net load forecast and the highest of the four 15-minute market forecasts for the hour. With most hours having significant net load ramp up or down, procuring to the 50<sup>th</sup> percentile of uncertainty will usually result in a positive (but relatively low) value.

## MAXIMUM IMPORT BID PRICE

The maximum import bid price (MIBP) is an hourly price calculated by the ISO to determine which days the hard bid cap of \$2,000/MWh is triggered and the maximum prices at which most imports can be offered. The MIBP is based on bilateral trading hub prices and an hourly shaping factor derived from ISO market prices on a prior high-priced day. The ISO is currently proposing to expand use of the MIBP to include setting a daily bid cap for energy storage resources that can exceed \$1,000/MWh on days when the \$2,000/MWh hard offer cap is triggered by a MIBP over \$1,000/MWh.

DMM believes that the MIBP calculation currently used by the ISO does not make sense statistically and is not consistent with the tariff and the intended market design.<sup>8</sup> Given the significant impact this calculation can have on the ISO and WEIM markets, DMM recommends that the ISO address this issue prior to the coming peak summer periods. Additional details this issue is provided in DMM's memo providing comments on Management's proposed changes to rules for bidding over the \$1,000/MWh soft-offer cap.

---

<sup>8</sup> These concerns about the MIBP calculation were first raised by CPUC staff in early 2024 and DMM raised these concerns with the ISO in early February.

