

# Memorandum

**To:** ISO Board of Governors

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

**Date:** December 6, 2023

**Re:** Department of Market Monitoring report

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***This memorandum does not require ISO Board of Governors action.***

## EXECUTIVE SUMMARY

The memo provides a summary of a recent increase in costs associated with residual unit commitment. A key driver of these costs has been upward adjustments in residual unit commitment requirements made by operators. These upward adjustments are now based on estimates of net load uncertainty made with the mosaic quantile regression implemented in February 2023. This new quantile regression model was developed primarily for use in setting demand for the real-time flexible ramping product and requirements used in the Western Energy Imbalance Market (WEIM) resource sufficiency evaluation.

DMM recently released a comprehensive report on the mosaic quantile regression model of net load uncertainty.<sup>1</sup> One recommendation in DMM's report is that the ISO seek to develop improved approaches for incorporating net load uncertainty in different market products and tests. DMM is also recommending that the ISO review and change the recent practice of using estimates of net load uncertainty from the quantile regression model to set operator adjustments to the load forecast used in the day-ahead residual unit commitment process.

## RESIDUAL UNIT COMMITMENT

### Residual unit commitment requirements

The residual unit commitment process runs immediately after the day-ahead market and procures capacity sufficient to bridge the gap between the amount of load cleared in the day-ahead market and the day-ahead forecast load. The purpose of the residual unit commitment market is to ensure that there is sufficient capacity on-line or reserved to meet actual load in real-time.

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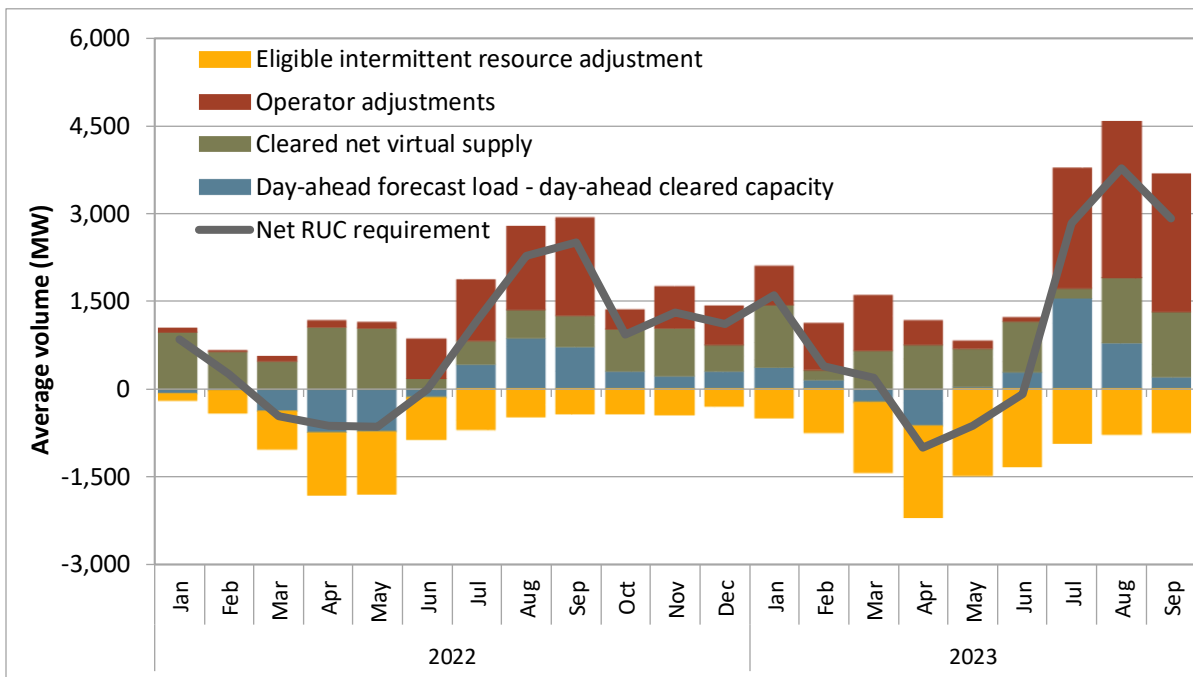
<sup>1</sup> *Review of mosaic quantile regression for estimating net load uncertainty*, Department of Market Monitoring, November 20, 2023. <https://www.caiso.com/Documents/Review-of-the-Mosaic-Quantile-Regression-Nov-20-2023.pdf>

Figure 1 shows average monthly residual unit commitment requirements based on the four different components that are used in setting these requirements. These include:

- the difference between day-ahead forecast load and cleared capacity (shown in blue);
- net virtual supply, or the difference between virtual demand and virtual supply clearing each hour (shown in green);
- a reduction to account for eligible intermittent resources (shown in yellow); and
- operator adjustments made to reflect net load uncertainty between the day-ahead and real-time markets (shown in red).

As shown in Figure 1, total hourly requirements made in the residual unit commitment process increased by about 74 percent in the third quarter of this year compared to the same months in 2022. Most of this increase was due to upward operator adjustments, which increased by about 70 percent in the third quarter of 2023 compared to last year.

**Figure 1. Determinants of residual unit commitment procurement (July - September 2023)**



**Residual unit commitment costs**

Most capacity procured in the residual unit commitment market does not incur any direct costs. Resource adequacy capacity is used to meet most of these requirements and do not receive capacity payments for residual unit commitment. Non-resource adequacy units receive direct capacity payments when used to meet residual unit commitment

requirements, but these make up a small fraction of the total capacity and direct costs are typically low.

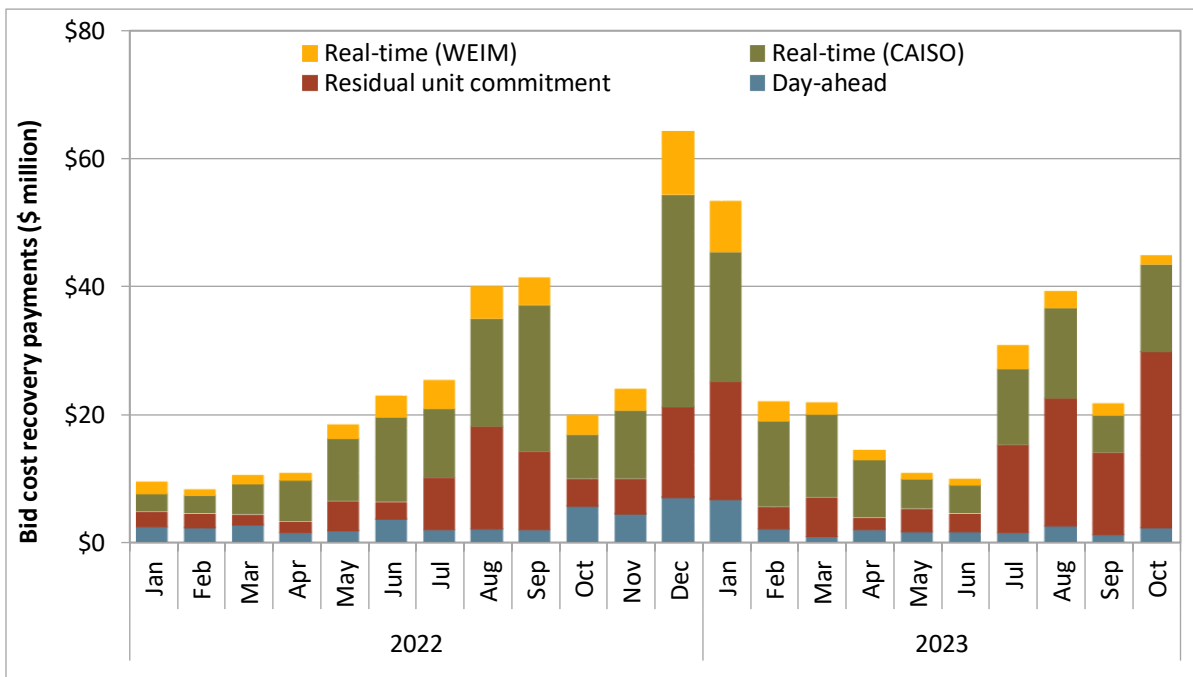
However, all resources committed by the residual unit commitment process receive bid cost recovery payments. These bid cost recovery payments make up the majority of cost associated with this process. Generating units are eligible to receive bid cost recovery payments if total market revenues earned over the course of a day do not cover the sum of all the unit's accepted bids, start-up and minimum load bid costs.

While residual unit commitment capacity must be bid into the real-time market, only a fraction of this capacity is committed to be on-line by the residual unit commitment process. Most of the capacity procured is from units already scheduled to be on-line through the day-ahead market, or from short-start units that do not need to be started up unless they are actually needed in real time.

Bid cost recovery charges associated with residual unit commitment increased from \$36 million in the third quarter of 2022 to \$46 million in the third quarter of 2023 (see Figure 2). October bid cost recovery associated with bid cost recovery was \$27 million, compared to \$4 million in the same month in 2022.

High bid cost recovery payments can indicate inefficient unit commitment or dispatch. High costs in December 2022 and January 2023 were associated with an increase in natural gas prices. High costs in July through October 2023 (which totaled \$73 million), are associated with higher residual unit commitment requirements, driven higher by operator adjustment.

**Figure 2. Monthly bid cost recovery payments**



## **MOSAIC QUANTILE REGRESSION**

### **Residual unit commitment operator adjustments**

The mosaic quantile regression is an estimation technique used to forecast net load uncertainty, adopted for flexible ramping product demand and the Western Energy Imbalance Market (WEIM) resource sufficiency evaluation in February. A recent market performance and planning forum presentation by the ISO explained that the mosaic quantile regression was adapted for use in setting residual unit commitment operator adjustment, starting July 1.<sup>2</sup> This new methodology appears to have resulted in higher requirements and higher costs.

### **Recommendations**

DMM released a comprehensive report on the mosaic quantile regression model of net load uncertainty used in both the flexible ramping product and in the WEIM resource sufficiency evaluation. Key findings of the report include the following:

- the quantile regression model has limited predictive capability for forecasting net load uncertainty;
- results from the quantile regression closely resemble the much simpler histogram model that was previously used, and
- the quantile regression approach should be improved by addressing some technical problems with how the quantile regression model has been implemented.

One recommendation in the report is that the ISO seek to develop improved approaches for incorporating net load uncertainty in different market products and tests. The ISO has adjusted the input data sampling for use in the residual unit commitment regression. DMM recommends reassessing other aspects of this technique as well.

DMM is also recommending the ISO review and change the recent practice of using estimates of net load uncertainty from the quantile regression model to set operator adjustments to the load forecast used in the day-ahead residual unit commitment process.

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<sup>2</sup> California ISO, Market Performance and Planning Forum, March 16, 2023, slides 218-227:  
<http://www.caiso.com/Documents/Presentation-MarketPerformancePlanningForum-Sep27-2023.pdf>