Memorandum

To: WEIM Governing Body and ISO Board of Governors

From: Benjamin F. Hobbs, Chair, Market Surveillance Committee

Date: November 1, 2023

Re: **Briefing on Market Surveillance Committee activities - July 13, 2023 to October 25, 2023**

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

During the time period covered by this report, the Market Surveillance Committee (MSC) of the California ISO held a general session meeting on September 25, 2023.[1] Two ISO initiatives were addressed during that meeting:

- **price formation enhancements**, with an emphasis on scarcity pricing in the day-ahead and real-time markets; and
- **flexible ramping product enhancements** in the real-time markets, especially the performance of the new net load uncertainty forecasting methods and network based-constraints implemented in early 2023.

A summary of the discussions is given below.

Also during this time period, the members of the MSC consulted with ISO and Department of Market Monitoring (DMM) staff to provide informal review and comments on ongoing market initiatives and reports.

The next MSC general session meeting is scheduled for November 29, 2023.

MSC General Session Meeting, Sept. 25, 2023

Scarcity Pricing Discussion

This agenda item began with a presentation by James Friedrich, who is the ISO's Lead Policy Developer, Market Policy Development. He first summarized the five issues to be addressed in the price formation enhancements initiative, including scarcity pricing; balancing

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

area authority-level market power mitigation; inclusion of fast-start unit commitment cost in marginal prices; extending the time horizon for procurement and optimization of flexible ramp product in the ISO's real-time markets; and improving scheduling and pricing outcomes for storage over a multi-interval time horizon in real-time. He stressed that discussions with stakeholders are in the exploratory stage, so the ISO is presenting no concrete proposals at this time. His presentation focused on the broad themes that have emerged in stakeholder working groups on the scarcity pricing issue.

The particular scarcity pricing topics Mr. Friedrich addressed included: **definition of triggers** for applying scarcity pricing; **definition of appropriate price levels** when scarcity pricing is triggered; and **accounting for deployment of strategic reserves and non-market demand response** programs in price formation.

In normal markets, scarcity pricing is "triggered" when supply is short, and instead consumer willingness to pay for a commodity sets the price through the demand curve. In electricity markets, an administrative process is necessary because "demand curves" for energy and ancillary services are in part or largely defined administratively by the ISO through constraint violation parameters or administrative demand curves rather than by consumer bids to buy. The administrative demand may not affect prices when there is actually a risk of scarcity. (Mr. Friedrich pointed out, for instance, that no ancillary service scarcity was triggered in September 2023, despite the stressful conditions that occurred on several days.) This failure to trigger can occur for several reasons, including the following:

- ***There is only limited acquisition of ancillary services in real-time markets***, which restricts the ability of services markets to signal scarcity. For instance, only the California ISO procures in real-time in the Western Energy Imbalance Market (WEIM), and then only if incremental quantities over day-ahead procurement are needed.

- ***Demand curves or penalties often do not gradually increase as the system approaches scarcity conditions***. A review of operating reserve demand curves across US ISOs by MSC Chair Ben Hobbs and colleagues illustrated how some ISOs give "early warning" of scarcity by extending the right tail of their demand curves.[2] The California ISO flexible ramping product gives some such "early warning", but considerably less than other ISOs.

MSC Member Scott Harvey stressed how eastern ISOs have defined a 30-minute reserve product with a demand curve that provides such an early warning and provides a buffer of

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[2] M. Mehrtash, B.F. Hobbs, and E. Ela. "Reserve and energy scarcity pricing in United States power markets: A comparative review of principles and practices." *Renewable and Sustainable Energy Reviews* (2023), https://www.sciencedirect.com/science/article/abs/pii/S1364032123003222

capacity for events that affect net load other than changes in load and variable renewable output.

Turning to the topic of appropriate price levels, Mr. Friedrich suggested several principles to guide pricing. One is that when supply is short, prices should reflect the value of load that might be interrupted and the likelihood of that event. Subsequent discussion pointed out that the relevant cost might instead be the cost to the system of operator actions to prevent loss of load, not the value of lost load itself. This requires estimates of those costs, which may be highly approximate and just as uncertain as the value of lost load and the probabilities of a lost load event. The value of lost load or cost of avoiding loss of load are related to the prices that balancing area authorities are willing to pay to secure supply during stressed conditions; recent experience in the West suggests that at least some areas are willing to pay more than the ISO bid caps/penalty values, which makes it difficult for California to obtain power it needs during stressed conditions.

Inefficiencies can occur from scarcity prices that are set at too low a level. MSC members pointed out that when scarcity prices are low in California, storage may be tempted to discharge during the day (choosing the "bird in the hand" if prices are relatively high then), rather than maintain state-of-charge for possible shortage conditions in the evening, if shortage prices would not be that much higher. However, some stakeholders instead suggest that current scarcity pricing signals in the ISO are sufficient, and emphasis should be placed instead on improving resource adequacy mechanisms instead of pricing.

Closing this agenda item was a discussion on accounting for deployment of non-market demand response and strategic reserves. It was suggested that if those actions are taken in response to anticipated shortages, then a price floor could be activated. Low priority exports could be curtailed as well. But it was also pointed out that due to uncertainty, those actions might be resorted to prematurely, and the efficient price might be less than the defined floor, if scarcity is not as severe as anticipated. Discussion ensued on the need to consider the impact of ISO actions on other systems that, for instance, may be depending on those exports and may or may not be passing scarcity-type prices on to retail industrial customers.

Flexible Ramping Product Enhancements Discussion

The second agenda item included a presentation by ISO representatives Dr. Guillermo Bautista Alderete, Director, Market Performance and Advanced Analytics and Dr. Kun Zhao, Market Engineering Specialist Lead, as well as discussion by MSC members, ISO staff, and stakeholders.

In the first part of the presentation, the results of implementing an enhanced methodology to

calculate ramp uncertainty and product requirements as a function of demand, solar, and wind forecasts were evaluated. The enhanced methodology employed a method called quantile regression which allowed net load ramp uncertainty levels (especially 95% confidence intervals) to be conditioned on those forecasts, instead of the previously utilized approach of defining unconditional histograms of errors based on observed ramps over a previous period. (The quantile method's results are adjusted before defining ramping requirements by subjecting those results to certain defined upper and lower bounds.)

The presentation provided a detailed review of the results of the newer method and found that, as anticipated, the new approach to setting requirements results in more variable requirements. As noted by MSC members, definitive statements about whether requirements are improved depends on whether that additional variability is due to sample error, and requires comparing the performance of the two methods against realized net load ramps. As MSC members pointed out, such comparisons could consider several performance indices, for instance:

- **Quality of calibration:** in particular whether the requirements actually resulted in 2.5% of ramps exceeding the upward ramp requirement, and 2.5% of the ramps being less than the downward ramp requirement.

- **Informativeness:** do the requirements respond to system conditions, with more capacity requirements when there is actually more uncertainty. (This can, for instance, be gauged by assessing conditional quality of calibration under different conditions.) It is possible for instance to have a well-calibrated method that just uses the same unconditional distribution of ramp forecast errors all the time (and so has 5% of the observations in the tails on average), but such a method would not perform well in terms of informativeness.

- **Cost:** which might be gauged by the average amount of the requirement, or by a more sophisticated measure that accounts for ramping product prices. The latter is perhaps less useful at this time because of the low frequency of significant product prices.

Systematic comparisons across a large sample of days have not yet been done, but would be desirable.

The second half of the presentation addressed nodal procurement of flexible ramp product, in particular the performance of the sets of network and WEIM transfer constraints that ensure that activation of flexible ramping capacity would be feasible in both high- and low-net load ramp scenarios. A subset of transmission constraints was implemented in February 2023, and additional constraints in September 2023. The effects of the constraint implementations upon computational time, locations of ramp product procurement, and types of generation providing the product were described in detail. For instance, less upward ramp was procured

in the California ISO area, and more in the PacNW; downward ramp procurement shifted from the Central/Mountain and PacNW regions to the Southwest while California largely retained its share. The fraction of real-time intervals with nonzero product prices remained below 3% in the fifteen minute markets (and actually shrank after February 2023) and well below 1% in the five minute markets. However, the presenters anticipated that higher ramp product prices will be observed as additional categories of network limits are included in the deliverability feasibility constraints.

The presentation included details on calculation of flexible ramp product prices; methods for evaluation of ramping product effectiveness/deliverability; data for February through August 2023 on the reasons why ramping product capacity was not dispatched (economics, resource constraints, and congestion); and ramp product performance during two high-stress days in July 2023. Potential areas for improvement were identified, such as state of charge management for storage. Discussion highlighted that the ramping product focuses on the prediction and management of load and variable renewable ramps, and not other sources of uncertainty in real-time resource availability, including import/export underperformance and outages of thermal generators and transmission. The MSC reiterated the usefulness of a 30-minute reserve product to deal with the latter sources of real-time uncertainty.

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