

# Memorandum

**To:** ISO Board of Governors  
**From:** Eric Hildebrandt, Executive Director, Market Monitoring  
**Date:** December 13, 2019  
**Re:** Department of Market Monitoring update

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***This memorandum does not require Board action.***

## EXECUTIVE SUMMARY

This memo summarizes comments and recommendations relating to the flexible ramping product provided by the Department of Market Monitoring (DMM) in our *Q3 Report on Market Issues and Performance* and in comments submitted in several ongoing stakeholder processes.

ISO operators regularly take significant out-of-market actions in the real-time market to address load and resource uncertainty during the morning and evening ramping hours. These actions -- such as upward load adjustments and exceptional dispatches -- are designed to commit or free up additional fast ramping gas resources that can be used to meet net load and defend against uncertainty in the morning and evening ramping hours. DMM believes these operator actions highlight how the flexible ramping product is not effectively meeting the operational needs that this market feature was designed to address.

One factor limiting the effectiveness of the flexible ramping product is that the market software procures flexible ramping capacity to meet system-level uncertainty requirements, but does not screen to ensure that this capacity is actually accessible on a system-wide basis. Analysis by DMM has shown a significant portion of ramping capacity is procured in the Northwest balancing areas and is unavailable to meet ramping needs in the ISO and other balancing areas due to transmission scheduling limits between balancing areas. The ISO is considering proposals to address this issue by procuring flexible ramping capacity on a more local or nodal level.

A second major limitation of the flexible ramping product is the limited time horizon of the flexible ramping product. The flexible ramping product is currently designed to address net load uncertainty up to only about 15 minutes from the current interval. In addition, flexible capacity that is procured in the 15 minute market is not held back from being dispatched for energy in order to ensure this capacity is available in future intervals. During daily ramping periods, these limitations cause operators to continue to take significant manual actions - such as upward load adjustments and exceptional dispatches - to manage and protect

again net load uncertainty one or hours beyond the 5 to 15 minute time horizon of the current flexible ramping product. These manual actions have increased, rather than decreased, since the flexible ramping product was implemented in November 2016.

DMM has recommended that the ISO initiate work on designing a potential extension of the time horizon of the flexible ramping product as part of current stakeholder initiatives aimed at addressing flexible ramping needs. DMM recommends that this limitation of the flexible ramping product be addressed before the ISO implements a new imbalance reserve product or ramping requirement in the day-ahead market.

## **OPERATOR ACTIONS TO MEET RAMPING NEEDS**

The flexible ramping product is currently designed to address net load uncertainty only 5 to 15 minutes from the current interval. Flexible capacity that is procured in the 15 minute market is not held back from being dispatched for energy in order to ensure this capacity is available in future intervals. Thus, the flexible ramping product is not currently designed to procure and reserve ramping capacity in the real-time market to meet net load uncertainty over the longer time frame, such as one to three hours from the current interval.

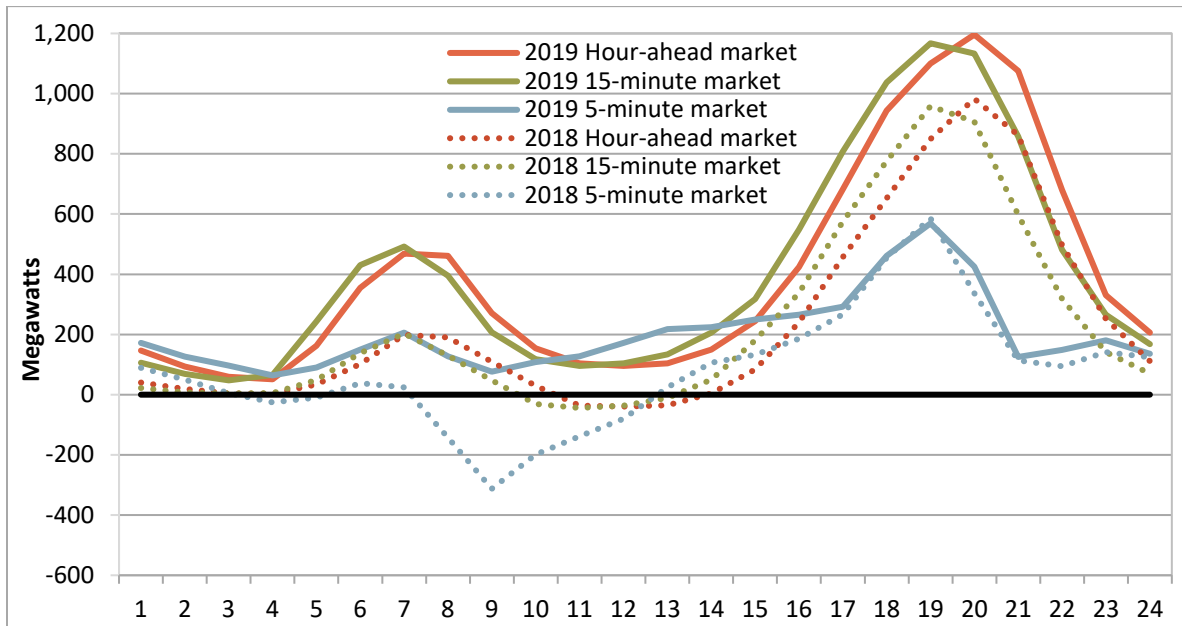
As a result of the limited time horizon of the flexible ramping product, operators regularly take significant out-of-market actions to address the net load uncertainty over this longer multi-hour time horizon in the real-time market. DMM believes that these actions indicate that the flexible ramping product is not meeting actual operational requirements for expected ramping capacity and protecting against uncertainty during the morning and evening ramping hours.

### **Upward load adjustments**

As noted in prior DMM reports, in recent years operators have begun to routinely increase the hour-ahead and 15-minute load forecast upwards during the morning and evening ramping hours. These manual load adjustments are also referred to as *load bias* or *load conformance*. As shown in Figure 1, the magnitude of the upward adjustments in the hour-ahead and 15-minute load forecast now average over 1,000 MW in peak evening ramping hours and have increased in Q3 2019 compared to Q3 last year. As shown in Figure 1, load adjustments made in the 5-minute forecasts are much lower. This reflects the fact that load adjustments are made to increase supply of ramping capacity in future intervals rather than to correct for differences between the net load forecast and actual net loads.

Conversations with ISO operators and analysis of load bias in the hour-ahead scheduling process indicate that a major cause of the upward load bias during ramping hours is the significant uncertainty in the net load forecast over the course of an upcoming hour at the time hour-ahead scheduling process begins. Since the binding run of the hour-ahead scheduling process begins at 67.5 minutes before the start of the trade hour, the net load forecasts used in this run represent net loads that are about 1 to 2 hours (i.e. 67.5 to 127.5 minutes) in the future.

**Figure 1. Average hourly load adjustments (Q3 2018 and 2019)**



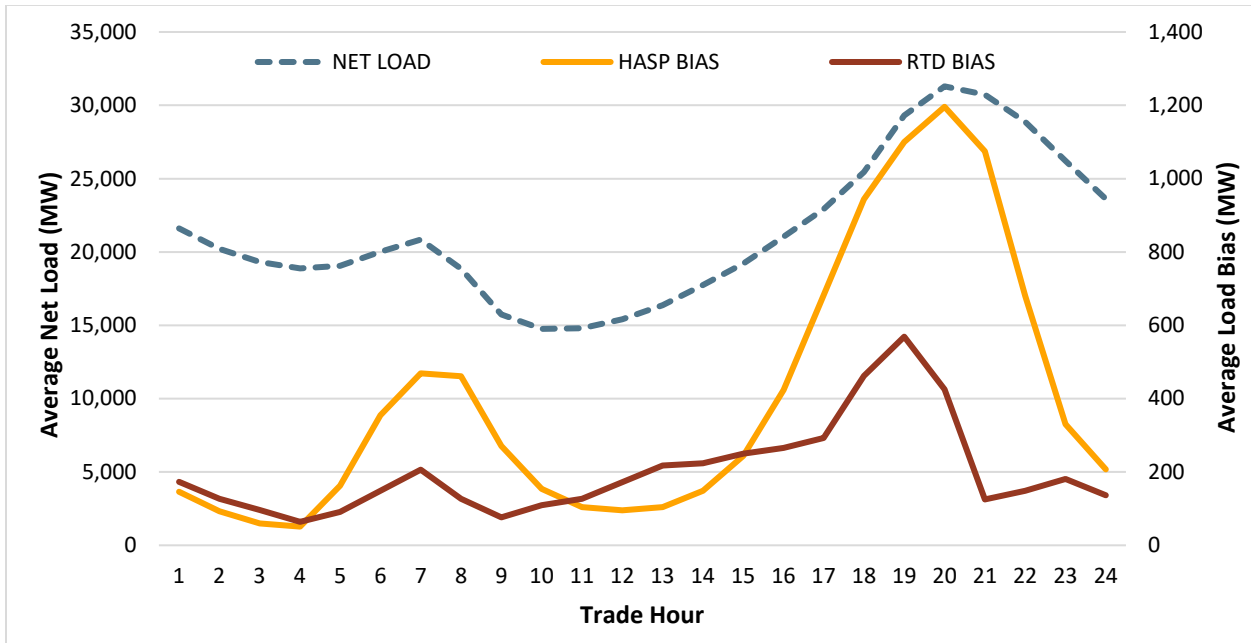
These upward load adjustments have the effect of increasing hourly imports and committing additional capacity within the ISO, so that the amount of 5-minute ramping capacity from gas-fired units is also increased. Since resources do not settle on hour-ahead prices, and there are no prices for ramp capacity beyond 15-minutes, biasing up the hour-ahead load forecast results in the ISO procuring rampable capacity to address net load forecast uncertainty without increasing the prices at which resources are paid for providing that capacity.

DMM's comments on the ISO's issue paper on *Extending the Day-Ahead Market to EIM Entities* provide a more detailed discussion and analysis of how load adjustments being made in the real time market reflect the limitations of the current flexible ramping product design, rather than inaccuracies in the ISO's actual net load forecast.<sup>1</sup> As noted in DMM's comments on that initiative, Figure 2 illustrates the strong correlation between the size of the hour-ahead load bias and the net load ramps in the third quarter of 2019.

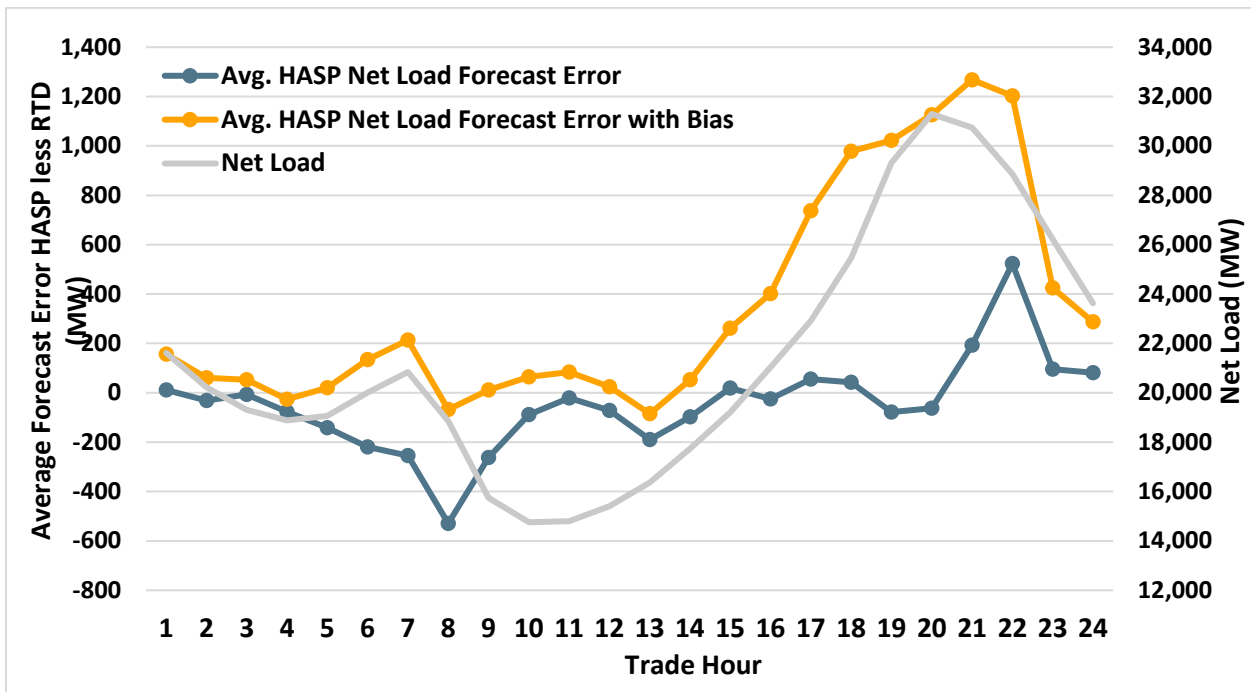
Figure 3 shows that the large hour-ahead load biases appear to be intended to address the significant uncertainty in the net load forecast that exists at the time the hour-ahead run begins 67.5 minutes before the start of the hour. If the hour-ahead load bias were intended to account for actual load forecast errors, we would expect the average hour-ahead net load forecast error *with* the operator load bias (yellow line) to be less than the average hour-ahead net load forecast error *without* the bias (blue line). However, as shown in Figure 3, the average hour-ahead net load forecast error *without* the bias (blue line) is in fact relatively low during most intervals, including most of the evening ramping hours.

<sup>1</sup> <http://www.caiso.com/InitiativeDocuments/DMMComments-ExtendedDay-AheadMarket-IssuePaper.pdf>

**Figure 2. Comparison of average hour-ahead and 5-minute load bias with average hourly net loads (July – September 2019)**



**Figure 3. Average hour-ahead net load forecast errors with and without operator load bias (July – September 2019)**



## Exceptional dispatches

Another out-of-market action frequently taken by ISO operators to address ramping needs and net load uncertainty during the morning and evening ramping hours is to issue exceptional dispatches. During the summer months, many exceptional dispatches are issued to commit and start slower ramping gas units during the evening ramping hours. Before and during the evening ramping hours, exceptional dispatches are also issued to ramp up units to minimum dispatchable levels from which units can ramp up more quickly if needed.

As highlighted in DMM's Q3 2019 report, during summer 2019 ISO operators also began issuing exceptional dispatches instructing slower ramping resources to operate at their maximum resource adequacy capacity during the evening ramping hours.<sup>2</sup> These are referred to as *RA Max* exceptional dispatches by the ISO operators. The objective of these *RA Max* exceptional dispatches is to ensure that slower ramping (and usually higher cost) resources are operating at maximum levels during the peak ramping hours, so that more faster ramping resources will have additional upward ramping capacity to meet net load uncertainty during this period.

As shown in figure 4, the volume of gas fired capacity that was committed and ramped up through exceptional dispatches in summer 2019 was highly correlated with net loads and represented an average of about 400 to 500 MW of energy during the evening ramping hours. The amount of additional upward rampable capacity that was created by these exceptional dispatches would be several times greater than the energy resulting from these exceptional dispatches. As shown in Figure 5, the volume of energy from these exceptional dispatches was much higher on days with peak loads over 37,000 MW.

## FLEXIBLE RAMPING PRODUCT ENHANCEMENTS

### Stranded flexible ramping capacity

One factor limiting the effectiveness of the flexible ramping product is that the market software procures flexible capacity to meet system uncertainty needs, but does not ensure that this capacity is actually accessible on a system-wide basis. Analysis by DMM has shown a significant portion of this ramping capacity is located in Northwest balancing areas and is unavailable to meet ramping needs in the ISO and other balancing areas due to transmission scheduling limits between balancing areas. This is being referred to as a *stranded flexible ramping capacity*.

For example, DMM's Q3 2019 report provides an analysis of a specific 15-minute interval in Q3 during which 822 MW of upward ramping capacity was procured in the Northwest balancing areas (or 69 percent of total system requirements), but none of this capacity could have been exported out of the Northwest to the ISO or other balancing areas in the energy imbalance market.<sup>3</sup>

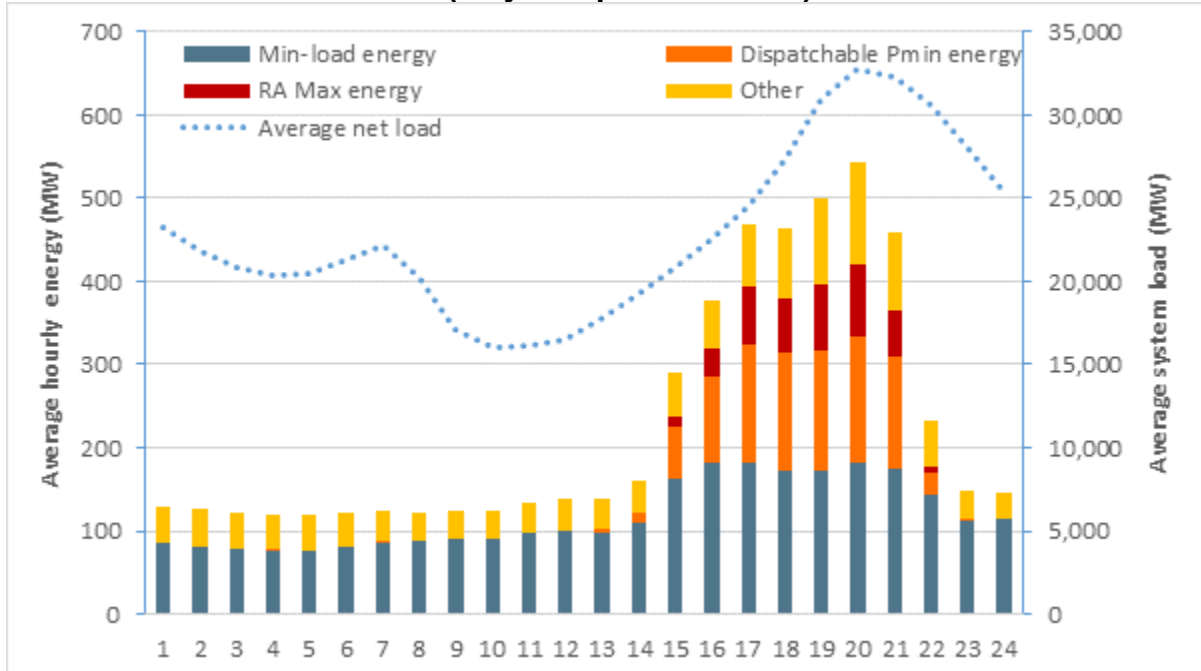
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<sup>2</sup> Q3 Report on Market Issues and Performance, December 5, 2019, pp. 97-99.

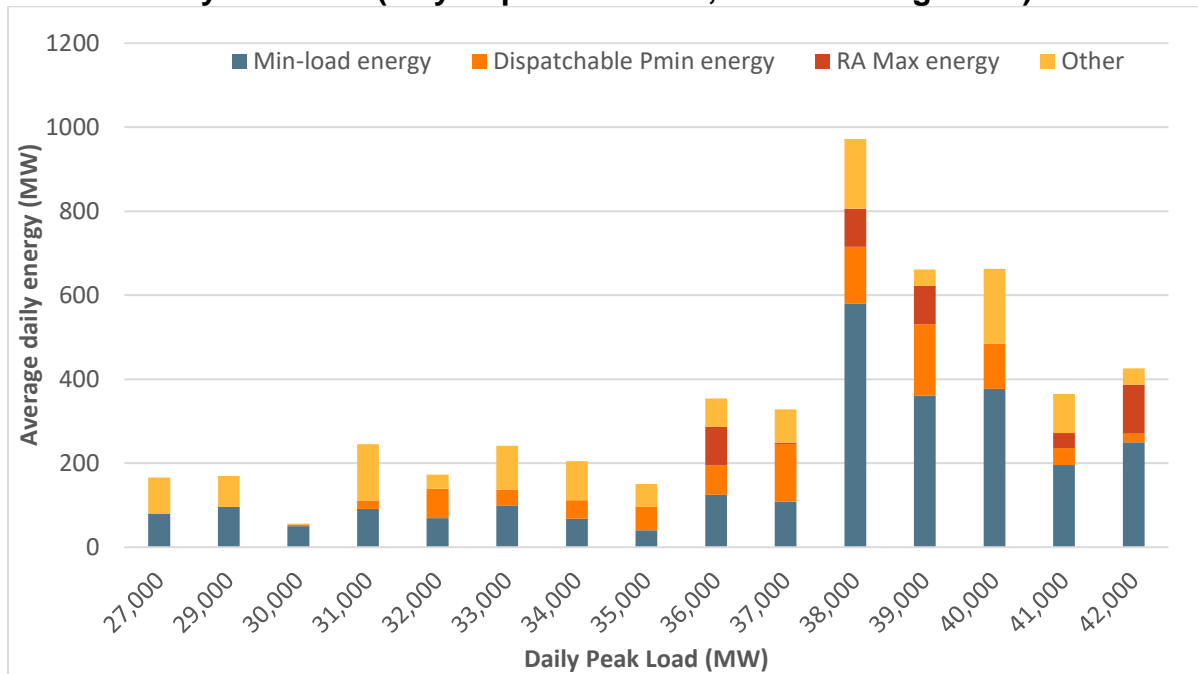
<http://www.caiso.com/Documents/2019ThirdQuarterReportonMarketIssuesandPerformance.pdf>

<sup>3</sup> Q3 Report on Market Issues and Performance, pp. 83-84.

**Figure 4. Average hourly exceptional dispatch of gas-fired resources (July – September 2019)**



**Figure 5. Average exceptional dispatch of gas-fired resources by level of ISO system load (July-September 2019, Hours ending 17-21)**



As noted in DMM's Q3 report, reliance on flexible ramping capacity in low cost areas such as the Northwest that is not actually accessible on a system-wide basis also contributes to very low prices and payments for flexible ramping capacity. For instance, in Q3 2019 the system level demand curve for upward during only about 2 percent of 15-minute intervals.<sup>4</sup> Through the first three quarters of 2019, flexible ramping uncertainty payments to generators in the ISO and energy imbalance market areas have totaled only about \$4.8 million.

### **Flexible ramping product enhancements**

As part of a new initiative on flexible ramping product enhancements, the ISO is considering proposals to address the issue of stranded flexible ramping capacity by procuring flexible ramping capacity on a more local or nodal level which accounts for transmission constraints. DMM supports the ISO's proposed improvements to the flexible ramping product by procuring flexible ramping capacity on a more local or nodal level.

However, as noted in DMM comments in this initiative, DMM is concerned about a second key shortcoming in the flexible product market design that the ISO is not addressing as part of any initiative: the limited time horizon of the flexible ramping product in the real-time market.<sup>5</sup> The ISO has indicated it does not intend to extend the uncertainty horizon of the flexible ramping product beyond the current 5 to 15-minute horizon.

DMM believes that addressing this issue is just as important as addressing the issue of *stranded flexible ramping capacity*. If the uncertainty horizon of the flexible ramping product is not extended, DMM believes it is likely that the ISO will need to continue to rely on out-of-market actions to protect against net load uncertainty in the real-time market.

### **Enhanced day-ahead market**

As part of the enhanced day-ahead market initiative, the ISO is designing the day-ahead market imbalance reserves product to procure ramping capacity to address uncertainty about net loads between the day-ahead and real-time markets. This new imbalance reserve product will increase day-ahead market costs through the direct payments for this new product, as well as through increases to day-ahead market energy prices that will result from procurement of this product.

However, if the ISO does not extend the uncertainty horizon of the flexible ramping product, DMM is concerned that the imbalance reserves procured in the day-ahead market will not provide much benefit in terms of increased ramping capacity in real-time or reduced real-time market costs. If the flexible ramping product uncertainty horizon is not extended, much of the additional ramping capacity procured through the day-ahead market imbalance

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<sup>4</sup> *Q3 Report on Market Issues and Performance*, pp. 79-80.

<sup>5</sup> *Comments on Flexible Ramping Product Refinements: Issue Paper and Straw Proposal*  
Department of Market Monitoring December 5, 2019.

<http://www.caiso.com/InitiativeDocuments/DMMComments-FlexibleRampingProductRefinements-IssuePaper-StrawProposal.pdf>



reserves product will not be held or utilized in the real-time market over the multi-hour time horizon that is needed to effectively mitigate net load uncertainty.

DMM recognizes that designing an extended uncertainty horizon for the flexible ramping product could be a complicated and time consuming endeavor. DMM has been recommending that the ISO start this design process since 2016 and has reiterated its importance in the enhanced day-ahead market initiative.<sup>6</sup> This day-ahead market enhancement is also needed to help support the extended day-ahead market initiative. Thus, DMM continues to recommend that the ISO work on designing an extension of the flexible ramping product uncertainty horizon as part of one of these two current initiatives.

## CONCLUSIONS

The flexible ramping product was implemented in November 2016 as a market mechanism for managing the ISO's increasing need for ramping capacity in the real time market. However, since this product was implemented, ISO operators continue to take significant out-of-market actions -- such as upward load adjustments and exceptional dispatches -- address load and resource uncertainty during the morning and evening ramping hours. These operator actions highlight how the flexible ramping product is not effectively meeting the operational needs that this feature was designed to address.

One factor limiting the effectiveness of the flexible ramping product is that the market software procures flexible capacity to meet system uncertainty needs, but does not ensure that this capacity is actually accessible on a system-wide basis. Accounting for transmission constraints through nodal procurement would significantly improve the effectiveness of procured flexible ramping reserves. As part of a new initiative on flexible ramping product enhancements, the ISO is considering proposals to procure flexible ramping capacity on a more local or nodal level.

A second major limitation of the flexible ramping product is the limited time horizon of the flexible ramping product. The flexible ramping product is currently designed to address net load uncertainty up to only about 15 minutes from the current interval. The flexible ramping product is not currently designed to procure and reserve ramping capacity in the real-time market to meet net load uncertainty over the longer time frame (e.g. 1 to 2 hours) which appears to be driving much of the out-of-market actions being taken by ISO operators to address net load uncertainty in the real-time market. DMM recommends extending the time horizon of the flexible ramping product before the ISO implements a new imbalance reserve product or ramping requirement in the day-ahead market.

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<sup>6</sup> *DMM Comments on Day-Ahead Market Enhancements June 20, 2018 Technical Workshop*, July 24, 2019, p. 1: <http://www.caiso.com/InitiativeDocuments/DMMComments-Day-AheadMarketEnhancementsWorkshop-June20-2019.pdf>.

*DMM Comments on Day-Ahead Market Enhancements August 13, 2019 Working Group*, September 6, 2019, pp. 1-3: <http://www.caiso.com/InitiativeDocuments/DMMCommentsDay-AheadMarketEnhancements-Aug13-Aug19Meetings.pdf>