Comments on Issue Paper on Extending the Day-Ahead Market to EIM Entities

Department of Market Monitoring

November 22, 2019

The Department of Market Monitoring (DMM) appreciates the opportunity to comment on the CAISO's Extending the Day-Ahead Market to EIM Entities (EDAM) issue paper.[1]

Overview

The EDAM issue paper highlights "that imbalance reserves and other aspects of the DAME [day-ahead market enhancements initiative] are also fundamentally important to EDAM."[2] This is because the imbalance reserves CAISO is designing in the DAME initiative will be an important component of the EDAM's day-ahead resource sufficiency evaluation.[3]

CAISO is designing the day-ahead market imbalance reserves product to procure ramping capacity to address uncertainty in the day-ahead market net load forecast. 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 real-time flexible ramping product (RT FRP), DMM is concerned that the imbalance reserves that are procured in the day-ahead market will provide limited benefit in terms of increased ramping capacity in real-time or reduced real-time market costs.[4]

The RT FRP is only designed to address uncertainty in what the actual net load will be five minutes from the current interval. The real-time market is not currently designed to procure ramping capacity to address uncertainty of net load over the longer time frame, such as one to three hours from the current interval. As a result of the very limited uncertainty horizon of the RT FRP, CAISO operators regularly take significant out-of-market actions to address the net load uncertainty over this longer multi-hour time horizon. These actions include routine upward biasing of the hour-ahead and 15-minute load forecast, and exceptional dispatches to commit and begin to ramp up additional gas-fired capacity in advance of the evening ramping hours.

Thus, if the RT FRP uncertainty horizon is not extended, much of the additional ramping capacity procured through the day-ahead market imbalance reserves product may not be held

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[1] *Extending the Day-Ahead Market to EIM Entities Issue Paper,* California ISO, October 10, 2019: http://www.caiso.com/Documents/IssuePaper-ExtendedDayAheadMarket.pdf

[2] EDAM Issue Paper, p. 7.

[3] EDAM Issue Paper, p. 10.

[4] Throughout these comments, we will use the term "uncertainty horizon" to refer to the length of time from the present interval for which RT FRP is designed to procure and hold ramp to address uncertainty in the net load forecast over that length of time.

or utilized in the real-time market over the multi-hour time horizon that is needed to effectively mitigate net load uncertainty. Instead, DMM believes it is likely that CAISO will need to continue to rely on out-of-market actions, such as upward load biasing and exceptional dispatches, to protect against net load uncertainty in the real-time market.

The CAISO plans to start a new real-time flexible ramping product (RT FRP) enhancements initiative to address the deliverability of RT FRP and day-ahead market imbalance reserves. However, the CAISO has indicated it does not intend to extend the RT FRP uncertainty horizon beyond five minutes to address uncertainty in what the actual net load will be further out in time from the current interval.[5]

DMM continues to recommend that the ISO work on designing an extension of the RT FRP uncertainty horizon as part of either the DAME or FRP Enhancements initiatives. The design of the EDAM described in the issue paper increases the importance of extending the RT FRP uncertainty horizon. DMM recognizes that designing an extended uncertainty horizon for RT FRP could be a complicated and time consuming endeavor. DMM has been recommending that the ISO start this complicated design process since 2016 and has reiterated its importance in the DAME initiative.[6] Starting work on this important enhancement to RT FRP early in the EDAM initiative process may allow the ISO to prevent this issue from limiting the value of the imbalance reserves product in the EDAM.

Comments

DMM continues to recommend that the ISO enhance the real-time flexible ramping product to enable the market software to commit and position resources to ramp to address uncertainty in net load forecasts further out in the future.

The real-time market is not currently designed to procure ramping capacity to address uncertainty in what the actual realized net load will be one, two, or several hours from the current interval. The real-time flexible ramping product (RT FRP) is only designed to adequately address uncertainty in what the actual net load will be five minutes from the current interval. Throughout these comments, we will use the term "uncertainty horizon" to refer to the length of time from the present interval for which RT FRP is designed to procure and hold ramp to address uncertainty in the net load forecast over that length of time.

Since shortly after the original RT FRP design passed the Board in 2016, DMM has recommended that the ISO start a new initiative to extend the RT FRP uncertainty horizon, to

[5] Market Surveillance Committee meeting, October 11, 2019.

[6] *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

design locational procurement to reduce stranded FRP, and to procure flexible ramping capability in the day-ahead market.[7]

CAISO is designing the day-ahead market imbalance reserves product to procure ramping capacity to address uncertainty in the day-ahead market net load forecast. The ISO also plans to start a new real-time flexible ramping product enhancements initiative to address the deliverability of RT FRP and day-ahead market imbalance reserves. DMM continues to support CAISO developing design enhancements to address these two important issues.

However, CAISO stated at the October 11, 2019 MSC meeting that it does not currently plan on addressing the third important aspect of DMM's longstanding recommendations for enhancing the flexible ramping product: designing an extension of the RT FRP uncertainty horizon beyond five minutes to address uncertainty in what the actual net load will be further out in time from the current interval. DMM continues to recommend that the ISO work on designing an extension of the RT FRP uncertainty horizon as part of either the DAME or FRP Enhancements initiatives.

Operator interventions indicate the need for extending the RT FRP uncertainty horizon.

Exceptional dispatches for ramping energy

At the October 11, 2019 MSC meeting, the ISO discussed operators exceptionally dispatching slow ramping resources up to their maximum available capacity level in order to free up faster ramping resources to be able to ramp to meet uncertainty in RT net load forecasts. DMM's analysis of recent exceptional dispatches confirms that this is a significant trend.

In the third quarter, a significant amount of exceptional dispatches were issued to commit and ramp up slower ramping gas units during the evening ramping hours. Most of these exceptional dispatches are issued to slow ramping gas generating resources located in the Los Angeles basin. These exceptional dispatches are issued to increase the amount of ramping capacity available to meet the evening net load ramp and to respond to other uncertainties in real-time.

[7] See *2017 Stakeholder Initiative Catalog*, September 15, 2016, Discretionary Initiative 11.6 "Flexible Ramping Product Enhancements", p. 22: http://www.caiso.com/Documents/Draft_2017StakeholderInitiativesCatalog.pdf "The Department of Market Monitoring requests that the ISO support a stakeholder initiative that continues to enhance the design of the flexible ramping product. The flexible ramping product design that was approved in February 2016, procures and prices the appropriate amount of ramping capability to account for the uncertainty in only five minute net load forecasts. There is increasingly greater uncertainty in the net load forecasts for intervals 15 minutes, 30 minutes, and 60 minutes out from a given real-time dispatch interval. The ISO could better facilitate the integration of DERs and VERs and significantly increase the efficiency of its dispatch and pricing signals by designing a flexible ramping product that can procure and price the appropriate amount of ramping capability to account for the uncertainty in net load forecasts over time horizons longer than 5 minutes. Other flexible ramping product design enhancements that could be considered in this initiative include day-ahead procurement of flexible ramping capability, locational procurement and pricing of flexible ramping capability"

Figure 1 shows the average volume of energy from exceptional dispatches to gas-fired resources by hour in the third quarter. As shown in Figure 1,

- The average amount of minimum load energy from gas units committed via exceptional dispatch ranged from 100 MW during off-peak hours up to almost 200 MW in the peak ramping hours (blue bars).
- During the evening ramping hours the ISO often ramps up some slower ramping gas units to their minimum dispatchable levels or *dispatchable PMin*. Energy from these exceptional dispatches averaged about 120 MW over the peak load hours of 17-22 (orange bars).
- Beginning in the third quarter of 2019, the ISO has started to exceptionally dispatch some units to the maximum of their resource adequacy contracts, which is typically at or near the unit's maximum capacity. These exceptional dispatches are referred to as *RA Max* exceptional dispatches by the ISO operators. Energy from these exceptional dispatches averaged about 70 MW over the peak load hours of 17-22 (red bars).
- In the third quarter, energy from other exceptional dispatches averaged about 40 MW during off-peak hours and about 90 MW in the peak ramping hours (yellow bars).

Total energy from exceptional dispatches averaged nearly 100 MW during off-peak hours and about 450 MW in the peak ramping hours. However, the amount of exceptional dispatch energy from gas units is much higher on days with higher peak loads. As shown in Figure 2, on days with peak loads over 37,000 MW, total energy from exceptional dispatches often ranged from over 600 MW to almost 1000 MW on some days.

Figure 1 **Average hourly exceptional dispatch energy by type (July – September 2019)**

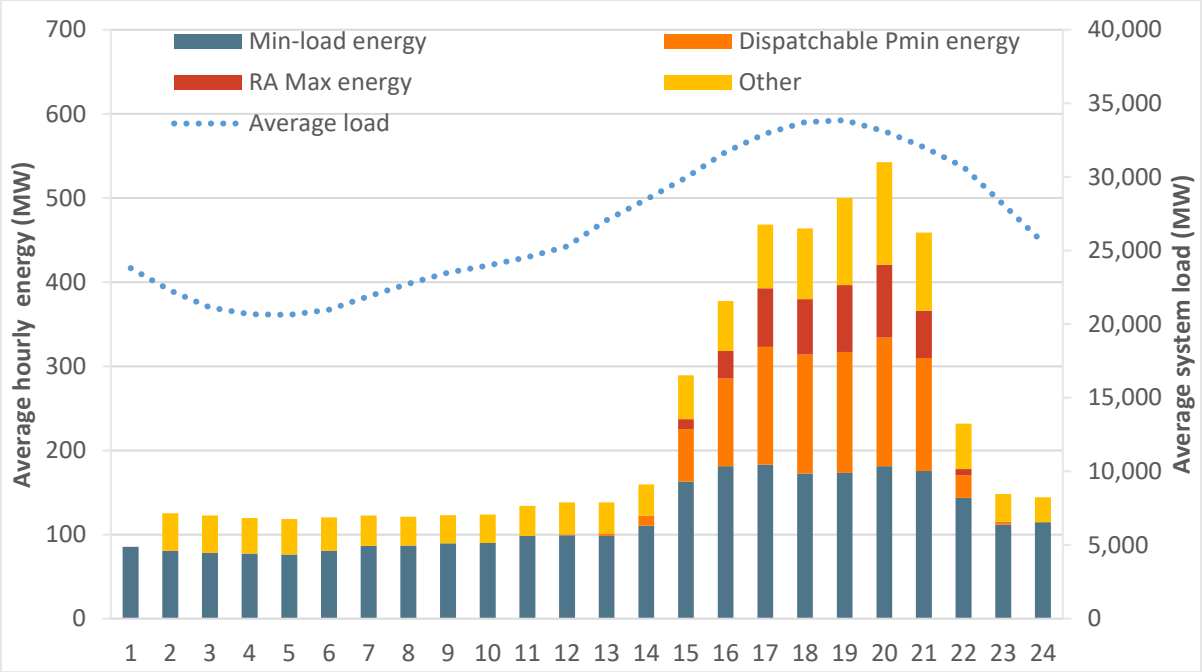
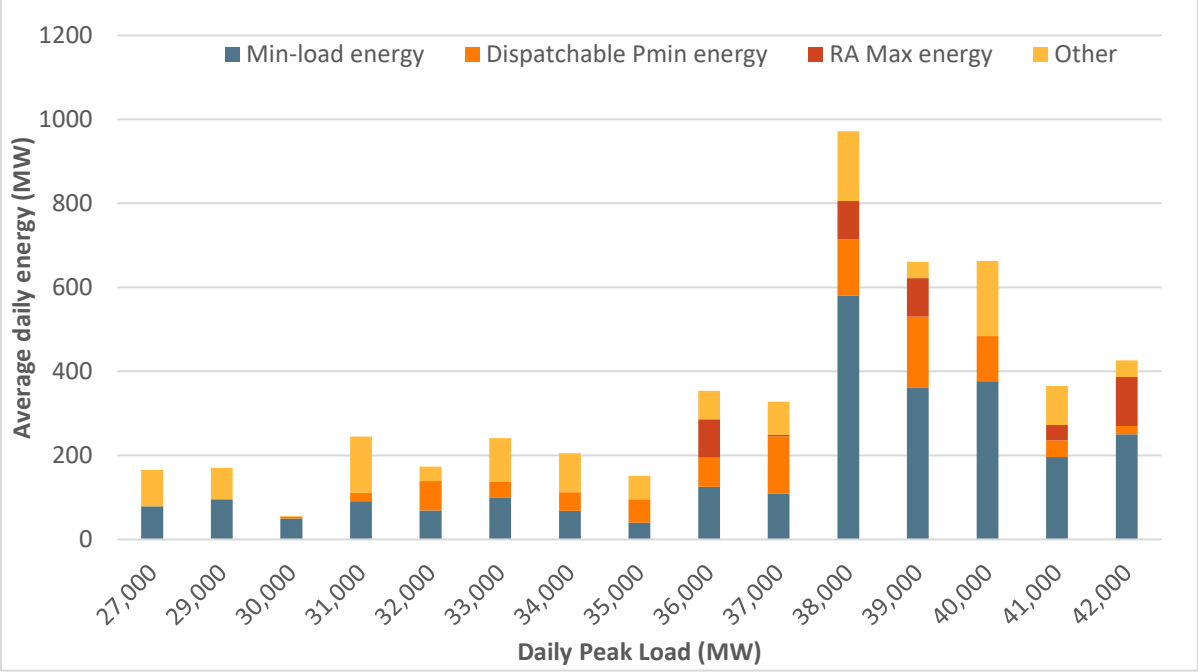


Figure 2 **Average exceptional dispatch energy by peak load amount (July-September 2019, hours ending 17-21)**



The large quantity of exceptional dispatch energy issued to increase the amount of ramping capacity available to meet the evening net load ramp and to respond to other uncertainties in real-time indicate the need for a market design enhancement that would allow the optimization to procure and price this reliability need. Extending the RT FRP uncertainty horizon to address net load uncertainty 1-4 hours from the current interval could resolve much of the need for these operator interventions.

Hour-ahead scheduling process load forecast adjustments

Operators in the ISO can manually modify load forecasts used in the market through a load adjustment. Load adjustments are also sometimes referred to as *load bias* or *load conformance*. Load forecast adjustments are used to account for potential modeling inconsistencies and inaccuracies. Conversations with CAISO operators and analysis of load bias in the hour-ahead scheduling process (HASP) indicate that a major cause of the consistent HASP load bias during ramping hours may be the significant uncertainty in the net load forecast that exists over the course of an upcoming hour at the time the HASP run begins.

The HASP run starts 67.5 minutes before the start of the trade hour. The net load forecasts used in the HASP run are therefore for net loads that will not be realized until 67.5-127.5 minutes in the future. HASP schedules are only binding for hourly intertie blocks, and the HASP prices are not binding for any resources. Biasing the HASP load above the deterministic load forecasts that would otherwise be used for each 15 minute interval in the HASP hour would increase the hourly block interties that get scheduled, freeing up internal resources that can ramp in 15 or 5 minute intervals to be available to address uncertainty in the net load forecast. Biasing the HASP and RTPD load also increases the number of resources that are committed by the market software, which also frees up capacity to ramp to address uncertainty in net load forecasts.

DMM notes that because resources do not settle on HASP prices, biasing up the HASP 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 the ramp capacity.

Figure 3 illustrates the strong correlation between the size of the HASP load bias and the net load ramps in the third quarter of 2019. Operators increase the HASP load forecast bias to levels significantly in excess of the FMM flexible ramp up product requirement during the morning and evening ramps.

Figure 4 shows that the large HASP load biases appear to be intended to address the significant uncertainty in the net load forecast that exists over the course of an upcoming hour at the time the HASP run begins 67.5 minutes before the start of the hour. If the HASP load bias was intended to account for actual load forecast errors, we would expect the average HASP net load forecast error with the operator load bias (yellow line) to be less than the average HASP net load forecast error without the bias (blue line).

Figure 3 Average HASP and RTD load bias, FMM flexible ramping up requirement, and CAISO net load (July – September 2019)

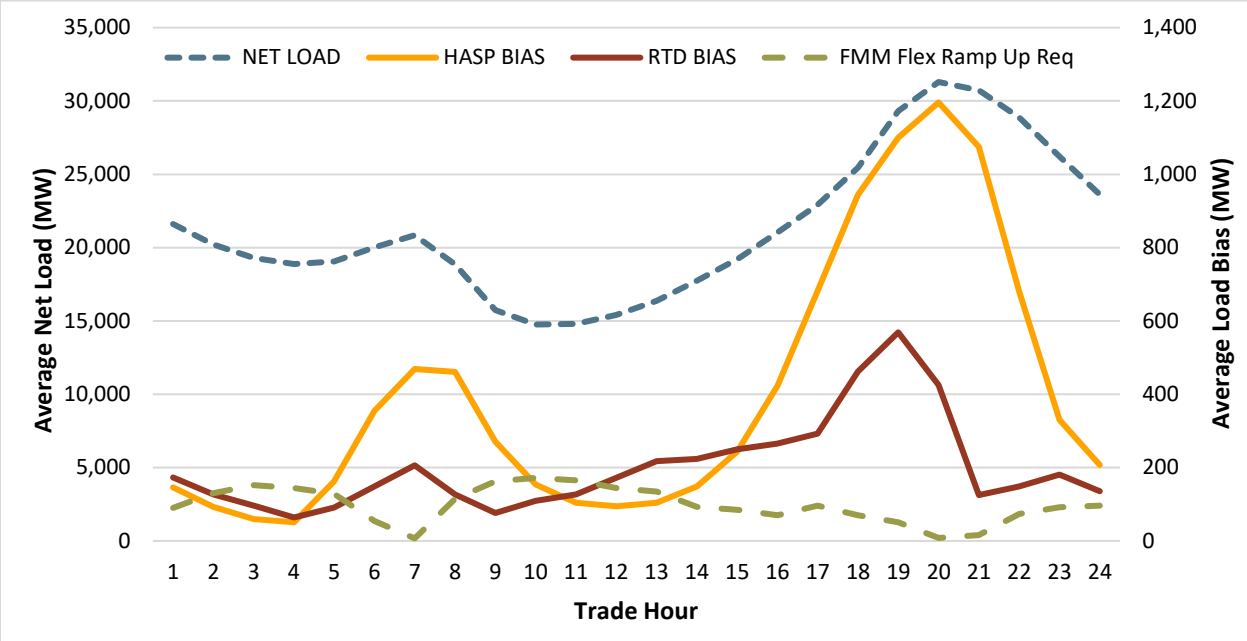
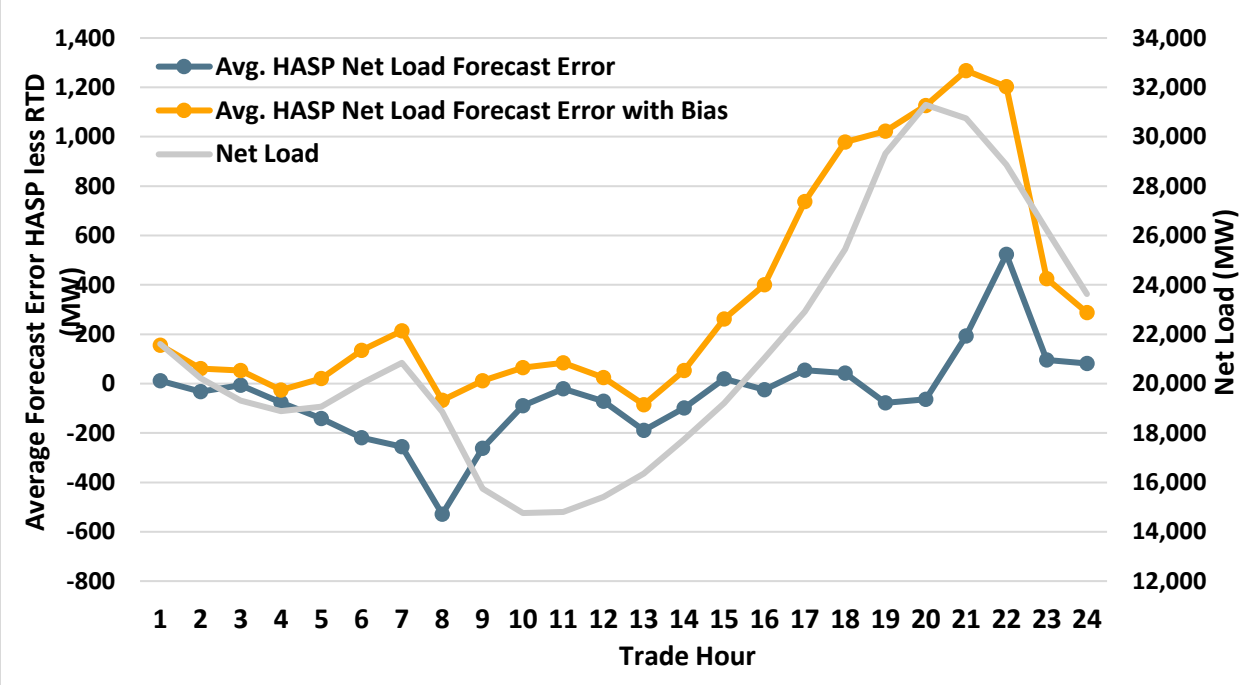


Figure 4 Average HASP net load forecast errors, with and without operator load bias (July – September 2019)



The fact that the HASP load bias consistently increases the load forecast significantly above the 5-minute market load forecast during the ramping hours indicates that operators are using the HASP load bias to procure resources to address the potential for infrequent net load realizations that may be significantly higher than the expected net load at the start of the HASP run.

The consistent operator use of a large HASP load bias to address net load uncertainty 1-2 hours out indicates the need for a market design enhancement that would allow the optimization to procure and price this reliability need. Extending the RT FRP uncertainty horizon to address net load uncertainty 1-2 hours from the current interval could resolve much of the need for these operator interventions.

Efficient imbalance reserve procurement would require CAISO to extend the real-time flexible ramping product uncertainty horizon.

The imbalance reserve product is being designed to get the efficient quantity of dispatchable capacity bidding into real-time markets to address uncertainty in net load between the EDAM market run and real-time market runs. However, a significant portion of that uncertainty still exists between the beginning of each real-time STUC, RTPD, or RTD market run and the final advisory interval considered in the time horizon of each market run. RT FRP is currently designed to commit resources to address net load forecast uncertainty only 30 minutes from the start of each RTPD run. RT FRP is currently designed to dispatch these committed resources to address uncertainty only 5 minutes from the start of each RTD run.

STUC and RTPD have time horizons that look out as much as 4.5 hours in the future. However, the net load forecast used in all intervals of those time horizons are deterministic. They do not incorporate any uncertainty in what the net load forecast may actually be when the most distant advisory interval becomes the present binding interval.

Therefore, STUC and RTPD may decommit non-long-start resources that received imbalance reserve awards in the EDAM if STUC or RTPD determine that those resources are not needed to meet the deterministic net load forecasts used for future intervals. This could happen even if there is still significant uncertainty in what the future net load forecast will actually be, i.e., when operators still need the correct set of resources committed to be able to ramp to meet the range of potential net load forecasts that could still be realized over the STUC or RTPD time horizon.

In order for a non-long-start resource that EDAM counted on to address uncertainty to actually be online and available to address the uncertainty that still exists at the start of real-time market runs, the real-time market must recognize the need for the resource and issue a start-

up instruction with enough lead time to at least cover the resource's start-up time.[8] As a result, the real-time market could lose the ability to use the ramp capacity of imbalance reserve resources to address the uncertainty in net load forecasts that still exists in any time frame less than the resource's start-up time.

For example, at the start of a given RTPD run that looks out 2 hours near the net load peak, significant uncertainty still exists over what the net load forecast will actually be in each of the 15 minute intervals over that 2 hour time horizon. The resources that the RTPD run decides to commit may be sufficient for meeting the deterministic load forecasts used by the optimization in each of the 15 minute intervals over the upcoming 2 hours.

However, all of the uncommitted resources with start-up times greater than 2 hours will be unavailable to address the uncertainty in the net load forecast that may be realized in those upcoming 2 hours. This could be the case even if those resources received imbalance reserve awards in EDAM and had therefore been relied upon by EDAM to bid into real-time to address net load forecast uncertainty. If CAISO does not extend the RT FRP uncertainty horizon, EDAM end users may not realize the benefit of this ramp capacity that they had paid for in the day-ahead market.

Moreover, if the RT FRP uncertainty horizon is not extended, the 5-minute real-time market may often not dispatch resources to output levels that would allow imbalance reserves to be used to address uncertainty in the net load forecast over the upcoming hour. For example, the EDAM may issue day-ahead schedules that ramp slower, higher marginal cost resources up to their maximum output levels in peak net load hours in order to leave the faster ramping capabilities of lower cost resources unloaded and available to serve as imbalance reserves to address uncertainty in the net load forecast.

A higher than expected net load forecast may not begin to materialize in real-time until 60 minutes or less before the actual peak net load time interval. Because the RTD market uses a deterministic net load forecast, RTD may ramp up the faster ramping, less expensive resources to meet the deterministic, expected net load forecast. If the net load forecast increased above that expected level within the hour, the unloaded, slower ramping resources may not be able to ramp quickly enough to meet the actual realized net load.

In this way, if the RT FRP uncertainty horizon is not extended, the real-time market can render the imbalance reserves bought in the EDAM unable to ramp to address much of the uncertainty that the imbalance reserves were procured to be available to address.

Extending the real-time flexible ramping product uncertainty horizon will improve the potential efficiency of EDAM.

[8] If the resource is already online in real-time, the real-time market must recognize the need for the resource for addressing future net load forecast uncertainty and avoid issuing a shutdown instruction with enough lead time to cover the resource's minimum off time plus start-up time.

The EDAM issue paper highlights "that imbalance reserves and other aspects of the DAME [day-ahead market enhancements initiative] are also fundamentally important to EDAM."[9] This is because the imbalance reserves CAISO is designing in the DAME initiative will be an important component of the EDAM's day-ahead resource sufficiency evaluation.

> The day-ahead resource sufficiency evaluation is intended to ensure that each EIM entity and the CAISO have sufficient bid range from participating resources to individually meet their bid-in demand, ancillary services requirement, share of imbalance reserves and their net demand forecast.[10]

The imbalance reserve product that CAISO is developing in the DAME initiative is expected to increase day-ahead market costs through end-user payments for the product as well as through increases to day-ahead market energy prices. However, as explained in the comments above, if the ISO does not extend the RT FRP uncertainty horizon, EDAM end users may not receive much of the benefit from the imbalance reserves that they paid for in the day-ahead market.

The ISO and stakeholders should pay particular attention in the EDAM initiative to how the design will handle EIM areas relying on imbalance reserves from a neighboring EIM area to meet real-time flexibility needs. As the ISO explains in the issue paper,

> Since each balancing authority remains responsible for its reliability requirements, it is necessary to assure the deliverability of imbalance reserves carried in another balancing authority area; otherwise, additional units may need to be committed because the imbalance reserves cannot be relied upon in real-time to meet the reliability needs of the receiving balancing authority area.[11]

As explained above, however, if CAISO does not design an extension to the RT FRP uncertainty horizon, the real-time market may not commit or position resources in the supply area to be able to provide the flexibility purchased as imbalance reserves in the extended day-ahead market.

DMM recognizes that designing an extended uncertainty horizon for RT FRP could be a complicated and time consuming endeavor. DMM has been recommending that the ISO start this complicated design process since 2016 and has reiterated its importance in the DAME initiative.[12] Starting work on this important enhancement to RT FRP early in the EDAM initiative

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[9] EDAM Issue Paper, p. 7.

[10] EDAM Issue Paper, p. 10.

[11] EDAM Issue Paper, p. 8.

[12] *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.

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process may allow the ISO to prevent this issue from limiting the value of the imbalance reserves product in the EDAM.