Comments on Day-Ahead Market Enhancements March 2023 Workshops

Department of Market Monitoring

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Summary

The Department of Market Monitoring (DMM) appreciates the opportunity to comment on the *Day-ahead market enhancements – March 2023 workshops*.[1]

The ISO's initial DAME design proposed utilizing a penalty price greater than the IFM offer cap (i.e. > $1,000/MWh) to procure upward imbalance reserves sufficient to cover 97.5% of net load uncertainty between the day-ahead and 15-minute markets. This valued each MWh of the product, up to that 97.5% uncertainty level, as a requirement that had to be met, without considering the actual economic value of buying imbalance reserves in the IFM. The main justification for placing such a high value on imbalance reserves appears to be that a high level of imbalance reserves may be necessary in the IFM for balancing areas to have confidence in the deliverability of EDAM transfers – and that the additional costs from using an uneconomic penalty price to procure a pre-determined "requirement", or from inflating the demand curve above an accurate valuation, may be justified by the added assurance that sufficient capacity will be available in real-time to support EDAM transfers.

However, DMM believes that procuring a high level of imbalance reserves in the IFM, such as the previously proposed 97.5% requirement, would be inadequate for achieving this goal of ensuring confidence in EDAM transfers, while adding unnecessary costs to the day-ahead market. This inadequacy of the imbalance reserve product should not adversely impact the successful implementation of EDAM because having this product in the IFM is not necessary for EDAM. With or without the imbalance reserve product in the IFM, balancing areas will need to utilize the EDAM net export constraint in order to ensure confidence in EDAM transfers. And use of the constraint will ensure deliverability of EDAM transfers in the absence of any imbalance reserve product in the IFM. If participating balancing areas feel EDAM should determine a real-time must offer obligation in excess of load forecast, it would be more appropriate to incorporate the uncertainty adder into RUC and use RUC to determine this must offer obligation.

DMM appreciates that the ISO has now proposed a downward sloping demand curve for imbalance reserve procurement. However, as the Market Surveillance Committee (MSC) explained at its March 10, 2023 meeting, the proposed demand curve still drastically overstates the actual value of procuring each MWh of imbalance reserve capacity in the IFM. Any

[1] See presentations from meetings on 2-27, 3-7, 3-8, and 3-10-2023 on the ISO's day-ahead market enhancements initiative website at: https://stakeholdercenter.caiso.com/StakeholderInitiatives/Day-ahead-market-enhancements

overvaluing of the demand curve will add unnecessary costs to the day-ahead market while still falling significantly short of a capacity level that could create confidence in the reliability of EDAM transfers or the resulting real-time must offer obligation. Therefore, if the ISO proposes to include an imbalance reserve product in the IFM, DMM recommends that the ISO focus its efforts on determining the actual value of this capacity. The value of day-ahead imbalance reserves, as represented by demand curve prices, would be significantly less than the value of the real-time flexible ramping product. DMM also continues to recommend that the ISO expand the supply counted towards meeting imbalance reserve product demand to capacity that resources can ramp to over several hours, rather than limiting supply to 15-minute capacity.

Comments

The demand curve for an imbalance reserve product in the IFM should be significantly lower than the ISO has proposed

The ISO's initial DAME design proposed procuring imbalance reserve up (IRU) sufficient to cover 97.5% of net load uncertainty between the day-ahead and real-time, with a penalty price greater than the IFM offer cap (i.e. > $1,000/MW). In response to concerns this could overvalue IRU, the ISO is now proposing to procure IRU using a demand curve. However, as noted at the most recent Market Surveillance Committee (MSC) meeting, the ISO's proposed demand curves have had prices far higher than the value of procuring imbalance reserves in the day-ahead market.[2]

The IRU demand curve should represent the value of procuring additional reserves in the IFM relative to not procuring the IRU reserves. To illustrate, consider the flexible ramping product (FRP) demand curve. The FRP demand curve is the marginal value of reduced expected power balance violation costs from procuring additional flexible reserves—*assuming no other options exist* to respond to net load uncertainty from one market interval to the next.[3] If there were other non-FRP capacity available to respond to net load errors, than the value of FRP would be less. The FRP value would be lower because this other capacity could respond to net load outcomes and avoid the potential power balance violation costs even if no FRP were procured. The value of buying an option to respond to uncertainty through an explicit market product decreases as the number of resource options available even without the explicit market product increases.

There are many options, other than IRU procurement, to respond to net load uncertainty in the hours between the day-ahead and real-time markets. Many of these options will be from

[2] *Calibrating the Demand Curve for Imbalance Reserves*, MSC presentation, Jim Bushnell, March 10, 2023: http://www.caiso.com/Documents/Presentation-DAME-IBRDemandCurve-Mar10_2023.pdf

[3] The FRP demand curve calculates the marginal option value of procuring additional flexible reserves. Because the calculation ignores the costs of exercising these options, i.e. ignores the energy dispatch costs, the FRP demand curve itself over estimates this value.

capacity without IFM awards that are bid into the real-time markets. Significant portions of capacity receiving IRU awards are also likely to bid into the real-time markets without an IRU award. The main mechanism for resolving uncertainty between day-ahead and real-time is the real-time market and prices. The potential to profit from real-time market sales gives entities reason to participate in the real-time market even if they do not have a real-time must offer obligation. The residual unit commitment, real-time FRP, and other potential products or actions can provide additional options or better manage existing options. Given the available options, the value of procuring IRU relative to not procuring IRU is likely to be relatively low.

If the ISO proposes a demand curve with prices significantly more than a few dollars per MWh, staff should demonstrate how they calculated the value of the capacity to determine these prices. Setting IRU demand curve prices above the marginal value of the capacity would reduce day-ahead market efficiency because it would result in IRU procurement costs exceeding the actual value of the procured capacity. In addition, as described in following sections of these comments, procuring IRU in the IFM may provide very limited – if any – reliability benefits.

Procuring IRU in the IFM may decrease physical supply and demand clearing IFM and increase reliance on RUC for scheduling physical supply

As also discussed at the March 10 MSC meeting, procuring IRU in IFM based on demand curves that overvalue IRU may decrease physical supply and demand clearing IFM and increase reliance on RUC. When IRU is procured in the IFM along the demand curve, this will drive day-ahead energy prices up relative to real-time prices. This energy price increase would tend to increase virtual supply and decrease physical demand clearing IFM. This virtual supply and any physical load not clearing IFM would increase the amount of capacity scheduled in the RUC process to ensure reliability. The potential for this market dynamic increases with the degree to which IRU is overvalued in the demand curve used in the IFM.

A demand curve that overvalues imbalance reserve product in the IFM would be insufficient for ensuring adequate capacity to support EDAM transfers

Even an extremely overvalued imbalance reserve demand curve in the IFM would not ensure adequately reliable EDAM transfers or real-time must offer obligations. Even a somewhat less overvalued imbalance reserve demand curve would still create inefficient cost increases, as described above. But it is unclear how any overvalued IRU demand curve would enhance EDAM.

The ISO has previously proposed utilizing a penalty price greater than the IFM offer cap (i.e. > $1,000/MW) to procure upward imbalance reserves sufficient to cover 97.5% of net load realizations. DMM has explained in prior comments that even this extreme overvaluation of imbalance reserves in the IFM would leave the real-time must offer obligation determined by

the extended day-ahead market short of standard reliability criteria.[4] If balancing area operators relied on even this extreme overvaluation of imbalance reserves, the EDAM footprint's real-time must offer obligation would still be expected to be insufficient to meet net load in more than one day out of every 50. This level of reliability is almost 2x orders of magnitude lower than standard reliability criteria such as no more than one day of load shed every 3,650 days. As a result, it seems unlikely that procuring day-ahead imbalance reserves at this level would be sufficient to impact decisions operators must make to ensure grid reliability under stressed system conditions.

Moreover, if an EDAM area allows convergence bidding, virtual supply can cause the balancing area to assume responsibility for real-time load curtailment even if the area provided sufficient capacity to cover its obligations in EDAM.[5] This can occur even when uncertainty materializes at a much lower level than the 97.5% threshold if another EDAM balancing area has failed the EDAM resource sufficiency evaluation.

Therefore, as DMM explained in prior comments, EDAM's net export constraint is a critical aspect of the EDAM design that will need to be utilized by EDAM balancing areas in tight system conditions regardless of how much the DAME market design ultimately overvalues an imbalance reserve up product in the IFM.[6] In conditions when EDAM balancing area operators have concern that sufficient capacity may not bid into real-time markets to meet the footprint's reliability needs, areas with sufficient capacity bidding into the EDAM will still need to determine how much excess capacity the areas can make available for EDAM transfers out. These capacity sufficient balancing areas will need to set their net export constraints accordingly.

As a result, overvaluing the imbalance reserve demand curve in the IFM would likely provide no appreciable reliability benefit, but, as explained above, it could result in significant EDAM cost increases.

A real-time must offer obligation for EDAM balancing areas may have very limited impact on operator use of net export constraint

DMM understands that having a mechanism that sets a real-time must offer obligation in excess of each balancing area's day-ahead load forecast could in theory add value to the overall EDAM design. The EDAM resource sufficiency evaluations will incorporate capacity requirements in excess of load forecasts set at a level that EDAM balancing areas have mutually agreed is adequate for demonstrating that no area is trying to lean on EDAM to avoid forward capacity procurement. Having a mechanism within EDAM that creates a total real-time must

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[4] For example, see *Comments on extended day-ahead market straw proposal*, Department of Market Monitoring, June 17, 2022, pp. 4-6: https://www.caiso.com/Documents/DMM-Comments-Extended-Day-Ahead-Market-Straw-Proposal-June-17-2022.pdf

[5] *Comments on extended day-ahead market draft final proposal*, Department of Market Monitoring, November 22, 2022, pp. 5-7: http://www.caiso.com/Documents/DMM-Comments-Extended-Day-Ahead-Market-Draft-Final-Proposal-2022-11-22docx.pdf

[6] *Department of Market Monitoring report to ISO Board of Governors and WEIM Governing Body*, January 25, 2023, pp. 2-4: https://www.caiso.com/Documents/DepartmentofMarketMonitoringReport-Feb2023.pdf

offer obligation for the footprint similar to the sum of the footprint's EDAM RSE requirements may increase balancing area operators' confidence in the amount of capacity across the footprint that will ultimately show up in real-time.

A real-time must offer obligation could increase EDAM efficiency if this increased operator confidence causes operators to increase their net export constraint limits, or even turn off the constraints, in some conditions. Less use of the net export constraint could increase the quantity of mutually beneficial trade between EDAM areas.

However, it is not clear that a real-time must offer obligation set by EDAM would significantly change operators' use of the net export constraint. First, the current EDAM design seems to include no incentives, besides exposure to buying back day-ahead awards at real-time prices, for resources with real-time must offer obligations to participate in the real-time market.[7] Therefore, resources assigned real-time must offer obligations by EDAM have the same incentives to participate in the real-time market as resources without real-time must offer obligations: i.e. exposure to real-time market product prices. As a result, an EDAM balancing area is likely to decide when and how high to set the net export constraint limit based on its assessment of footprint-wide resource availability relative to demand, and the possibility that the footprint might be short. The existence of a real-time must offer obligation determined by EDAM for each balancing area may have little practical impact on how the balancing area's operators set the area's net export constraint.

As described above, if another EDAM balancing area fails the EDAM RSE or if uncertainty materializing above a 97.5% threshold could result in an EDAM footprint capacity shortfall, meeting a balancing area's standard reliability criteria (such as loss of load in less than one day in 10 years) would entail operators limiting net EDAM transfers out to capacity that is safely in excess of the balancing area's needs. So, in tight system conditions, a real-time must offer obligation in excess of load forecast would not be likely to impact a balancing area's use of the net export constraint.

In situations where there is abundant capacity in the EDAM footprint to support the realization of high net loads, DMM questions whether the existence of the real-time must offer obligation assigned through EDAM would impact operators' procedures for using the net export constraint. It seems likely that operators would avoid the extra burden of determining when there is a non-negligible risk of a footprint capacity shortfall. Operators may instead always use the same procedure to set the net export constraint equal to the extra capacity that they think their balancing area can sell. Conversely, operators might not be inclined to use the net export constraint on days when high uncertainty materializing would not create concern for a footprint capacity shortfall. Whether or not the EDAM creates a real-time must offer obligation that might ensure loss of load in less than one day out of every 50 is unlikely to play any role when a

[7] The one potential exception DMM is aware of is for non-source specific imports—the EDAM policy is to exclude the balancing area from the EDAM pool for WEIM RSE if an import with an EDAM schedule does not participate in real-time. However, this penalty is only for the balancing area. The EDAM design does not actually create any incentives for the importer to participate in the real-time market.

balancing area operator makes the determination to not use the net export constraint given that their objective is to manage the grid to reliability levels 2 orders of magnitude greater.

DMM understands that there may be other reasons EDAM balancing areas would want EDAM to select which resources bidding into the EDAM resource sufficiency evaluations have real-time must offer obligations. The next section explains why it would be better to determine the must offer obligation in the physical-only RUC process than in the financial IFM.

If potential EDAM balancing areas think there is sufficient value in EDAM determining real-time must offer obligations, RUC could more effectively achieve this than the IFM

EDAM RSE is intended to represent a capacity requirement level that participating EDAM balancing areas have agreed is sufficient for each balancing area to feel the other balancing areas have brought sufficient capacity to the extended day-ahead market process. DMM understands EDAM balancing areas could view there being significant value in ensuring that the EDAM footprint capacity that gets assigned a real-time must offer obligation meets the standards set by the EDAM RSE. DMM agrees with views expressed by Southern California Edison at the workshops that RUC could accomplish this more effectively than the IFM.[8]

First, as explained above, the IFM is a financial market that allows virtual bids to converge IFM outcomes to expected real-time outcomes. If an uncertainty product in the IFM, such as imbalance reserve, places value on capacity for meeting outcomes that are not expected to occur, virtual bids should profitably displace the physical resources that would be optimally procured in a physical only market. Therefore, the RUC capacity market remains necessary for procuring the physical capacity that will be needed to meet net load in situations when the real-time net load realization differs from the expected outcome that the financial IFM market converged to. By removing the demand for capacity to meet this uncertainty from the IFM and including it instead directly in RUC, the day-ahead market can avoid the inefficiency of paying virtual and other financial awards to displace physical capacity that RUC will ultimately still have to procure.

Next, as DMM explained in prior comments, the EDAM design currently allows load in a balancing area that failed the EDAM RSE to "cure" its capacity deficiency and still be included in the EDAM pool for WEIM RSE simply by economically bidding enough of its demand forecast into the IFM. This aspect of the EDAM design creates the possibility that one EDAM balancing area's capacity shortfall could cause the entire EDAM pool to fail the WEIM RSE. [9] Adding

[8] *DAME Design Issues: Imbalance Reserve*, Southern California Edison, March 7, 2023, pp. 6-7: http://www.caiso.com/InitiativeDocuments/SCEPresentation-Day-AheadMarketEnhancements-Mar7-2023.pdf

[9] *Comments on extended day-ahead market draft final proposal*, Department of Market Monitoring, November 22, 2022, p. 8: https://www.caiso.com/Documents/DMM-Comments-Extended-Day-Ahead-Market-Draft-Final-Proposal-2022-11-22docx.pdf

uncertainty to RUC and using RUC to determine if EDAM can cure a balancing area's EDAM RSE insufficiency would help to mitigate this concern.

An imbalance reserve product in the IFM is not needed to ensure confidence in EDAM transfers

DMM understands that the intent of procuring a large amount of imbalance reserves in the day-ahead market is to ensure that balancing areas have confidence in the deliverability of EDAM transfers. From this perspective, the additional costs from procuring IRU may be justified by the added assurance that sufficient capacity will be available in real-time to support EDAM transfers. DMM disagrees with this reasoning, and believes that imbalance reserves in the IFM are not needed for EDAM's initial implementation to be successful.

The ISO's final EDAM proposal includes the net export constraint. As explained in prior comments, the net export constraint is a critical element of the EDAM design, even if imbalance reserves were procured with the clearly excessive valuations for high levels of uncertainty proposed in earlier ISO papers.[10] The constraint allows each EDAM balancing area to limit its EDAM transfers out to only the capacity that its operators determine is in excess of its own balancing area's reliability requirements.

Before the EDAM runs on any day in which there is uncertainty over there being sufficient real-time capacity to meet the EDAM footprint's net load, each EDAM balancing area's operators can determine how much capacity its area needs given load uncertainty and how much capacity the area will have available. The net export constraint will allow the area's operators to ensure that EDAM transfers do not cause the balancing area to assume responsibility for load curtailments caused by another balancing area with a capacity shortfall. If neither the IFM nor RUC could be relied upon to assign sufficient real-time must offer obligations to generation in other balancing areas, the net export constraint allows an area with sufficient capacity to make its extra capacity available for mutually beneficial trade without jeopardizing its own reliability. As a result, implementing the EDAM proposal without imbalance reserve in the IFM should still allow participating balancing areas with excess capacity to ensure reliability while realizing significant benefits from trade.

The ISO's final EDAM proposal approved by the board in January did not include details of most of the significant elements of a potential imbalance reserve product in the IFM. DMM supported the EDAM proposal despite the potential for the ISO to not complete a reasonable imbalance reserve product design before needing to file its EDAM proposal with FERC. This is

[10] *Department of Market Monitoring report to ISO Board of Governors and WEIM Governing Body*, January 25, 2023, pp. 2-4: https://www.caiso.com/Documents/DepartmentofMarketMonitoringReport-Feb2023.pdf

because DMM does not believe the imbalance reserve product is required for EDAM's initial implementation phase.

The supply that counts as meeting imbalance reserve demand should be significantly increased

The ISO proposes to require imbalance reserves to be deliverable over only fifteen minutes to meet the forecast errors between day-ahead and real-time.

DMM's analysis in past comments demonstrated that the entire forecast error between the day-ahead and real-time market for a given hour or interval would not be realized over only fifteen minutes. Rather, some of the errors are realized thirty minutes, one hour, or longer before the real-time interval. DMM analysis looked at the correlation of hourly errors between cleared day-ahead market net load and fifteen-minute market net load. There was significant correlation between errors in the hours shown and at least the previous three hours. This suggests that portions of the errors for a given hour are realized in previous hours. DMM also analyzed an example day that demonstrated that net load errors are similar across multiple intervals. This analysis showed that restricting all imbalance reserves to being rampable within fifteen minutes is overly restrictive.[11] At its March 10 meeting, members of the Market Surveillance Committee also demonstrated that the entire net load uncertainty between day-ahead and real-time does not materialize over just 15 minutes.[12]

Restricting the supply to 15-minute capacity could significantly inflate the costs of imbalance reserve product procurement above what is necessary to meet the actual demand. Therefore, the ISO should allow hourly block intertie bids, longer start resources, and capacity levels that can be reached over several hours to count as meeting the imbalance reserve demand. It would only be appropriate to limit the imbalance reserve supply to 15-minute capacity if the ISO limits the IFM demand to only the uncertainty that materializes 15 minutes in advance of power flow.

Locational versus zonal procurement

DMM's understanding of the ISO's locational procurement proposal is that it would be flexible in the constraints and contingencies that it modeled in the deployment scenarios in order to prevent its implementation from adversely impacting day-ahead market run performance. This locational design with the enforced constraints limited to only the most important constraints does not seem meaningfully different from what proponents of zonal procurement were envisioning.

DMM agrees with arguments made by members of ISO staff and the market surveillance committee at the workshops that local market power could be exercised even in a design that limited constraints to only those between EDAM balancing areas. Therefore, with an imbalance

[11] *Comments on Day-Market Enhancements Second Revised Straw Proposal*, Department of Market Monitoring, August 18, 2021: http://www.caiso.com/Documents/DMM-Comments-on-Day-Ahead-Market-Enhancements-Revised-Straw-Proposal-Aug-18-2021.pdf

[12] *Normalized net load errors*, MSC Presentation, Ben Hobbs, March 10, 2023: http://www.caiso.com/Documents/Presentation-Normalized-Net-Load-Errors-Mar10-2023.pdf

reserve demand curve on the order of magnitude previously proposed by the ISO, a zonal approach would not avoid the complication of designing and implementing an appropriate mechanism for mitigating the potential exercise of market power. However, with a demand curve that placed an appropriately low value on imbalance reserve procured in the IFM, such as the $5/MWh discussed in the workshops, there may not be a practical need for binding deployment scenario constraints to trigger energy and imbalance reserve bid mitigation.

Therefore, DMM supports proceeding with a locational imbalance reserve procurement design, and encourages the ISO and stakeholders to focus efforts on the more significant issues discussed above:

- the possible overvaluation of any potential demand curve greater than a few dollars per MWh in the IFM;
- limiting supply to less capacity from each resource than can ramp over several hours to meet the uncertainty between day-ahead and real-time, which would be known several hours before power flow; and
- potentially using uncertainty in RUC to determine a real-time must offer obligation that meets the excess capacity standards mutually agreed upon by participating EDAM balancing areas.