Day-Ahead Market Enhancements

Addendum: Imbalance Reserve Demand Curve

April 19, 2023

Imbalance Reserve Demand Curve

Introduction

The market uses penalty prices to establish the priority of different schedules and constraints and to set market prices when schedules or constraints need to be relaxed when there is insufficient supply to satisfy requirements. Previous DAME proposals have suggested various penalty price structures, ranging from demand curves to graduated penalty prices that relax the imbalance reserve requirement as the cost increases, to strict penalty prices that protect the full imbalance reserve requirement at higher costs.

The Draft Revised Final Proposal published on April 6, 2023 proposed for the CAISO BAA a hybrid design for the imbalance reserve requirement, dividing it equally between a demand curve and high penalty prices. This addressed concerns of prioritizing LPT exports over imbalance reserves for the CAISO BAA's net load uncertainty, ensuring more predictable export volumes. The demand curve followed the flexible ramping product's design. The hybrid model was exclusive to the CAISO BAA, as other EDAM BAAs would be subject solely to the imbalance reserve demand curve due to the absence of intertie bidding.

New Proposal

The ISO no longer recommends the hybrid approach for the CAISO BAA. Further evaluation of this approach revealed that it could lead to high prices that exceed the operational benefit of the product. Given the updated RUC proposal that allows the market to signal that exports may not be feasible in real-time, the CAISO BAA's exposure to unpredictable export volumes is reduced. One continued concern is that the cost of curtailing these exports in real-time might be high. CAISO will monitor the situation and make adjustments if necessary after implementation.

In response to stakeholder feedback, the ISO will replace the previous proposal and instead implement an imbalance reserve demand curve for all EDAM BAAs, including the CAISO BAA, and cap the imbalance reserve up and down demand curve values at $55.[1] The calculation of the imbalance reserve demand curve will resemble that of the flexible ramping product demand curve. The principle is that CAISO would calculate demand curves by determining the amount of the imbalance reserve requirement that should be relaxed at different price levels to ensure the cost of imbalance reserve awards does not exceed the expected cost of foregoing them. However, instead of the $1,000/MWh cost used in the flexible ramping product calculation, the avoidance cost of imbalance reserves will be set to $247/MWh, which is the lowest penalty price for violating contingency reserve requirements. Although $247/MWh is the basis for calculating the various segments of the demand curve, no steps of the demand curve will exceed the administrative ceiling of $55/MWh for the imbalance reserve product. Demand curves will be calculated each hour and determined separately for each EDAM entity.

[1] $55/MWh represents a high-percentile replacement cost of spinning reserves, which can be deployed in real-time in response to net load forecast error. This is similar to the approach of Midcontinent Independent System Operator, in which their Ramp Capability Up product demand curve uses a "cost of violation" equivalent to the first step of their spinning reserve demand curve.

Demand Curve

A demand curve represents the relationship between the price of imbalance reserves and the quantity that the market is willing to procure. It shows how the market's willingness to procure imbalance reserves changes with the price, helping to establish an appropriate price level while considering the expected cost of not procuring them.

The imbalance reserve demand curve establishes the price of not fulfilling the imbalance reserve requirement for a given hourly interval. This allows the market to determine whether to meet all or some of the upward and downward uncertainty requirements. The market makes this determination by assessing the trade-off between the cost and the value of an incremental unit of imbalance reserves.

If the imbalance reserve price is lower than the expected cost of not meeting the uncertainty requirement, the market will continue to procure imbalance reserves. Conversely, if the imbalance reserve price is higher than the expected cost of not meeting the uncertainty requirement, no additional imbalance reserves will be procured to cover it.

Implementation and Monitoring

By capping the demand curve values at the default bid price for imbalance reserve mitigation, market participants can gradually gain experience and adapt to the new market design. This approach allows for a smoother transition, reducing the likelihood of unforeseen issues or price spikes that could arise from a more aggressive initial implementation. However, the ISO emphasizes the importance of closely monitoring the DAME/EDAM market to ensure that the demand curve cap does not unintentionally stifle market efficiency or suppress price signals that are essential for maintaining system reliability. As the market matures and more operational experience is gained, it will be crucial to periodically review and adjust the demand curves to better reflect the true value of imbalance reserves and the associated scarcity conditions. This process should involve ongoing collaboration between the ISO, market participants, and other stakeholders to identify potential improvements and to make informed adjustments to market rules and design based on empirical evidence.

Other Considerations

This revised demand curve approach also simplifies the DAME design by decreasing the necessity for local market power mitigation of upward imbalance reserves. Since the $55/MWh administrative cap on imbalance reserves is equivalent to the proposed upward imbalance reserve mitigation price, there is no need to apply local market power mitigation to imbalance reserve bids. However, the ISO plans to develop the local market power mitigation functionality to apply to upward imbalance reserve bids in the DAME implementation, even if the functionality is not immediately employed. This will provide the flexibility for local market power mitigation to be deployed if the future need arises to adjust the imbalance reserve demand curve calculation. This revised approach also means the imbalance reserve offer cap would be reduced from $247/MWh to $55/MWh.

Some additional considerations are listed below:

- The uncertainty requirement used in the demand curve would include the EDAM diversity benefit.

- There would be separate demand curves for imbalance reserve up and down for each hour and for each BAA in the EDAM footprint.
- The EDAM resource sufficiency evaluation (RSE) would not use the imbalance reserve demand curve that will be used in the IFM. Instead, the RSE will penalize any imbalance reserve requirement relaxation at a high penalty price to ensure that all economic imbalance reserve bids are fully used before incurring an imbalance reserve shortfall, which would result in failing the RSE in that direction.