Comments on Storage Design and Modeling
May 28, 2025 Presentation

Department of Market Monitoring

June 11, 2025

Summary

The Department of Market Monitoring (DMM) appreciates the opportunity to comment on the *Storage Design and Modeling* May 28, 2025 working group presentation.[1] These comments reiterate DMM's position on storage bid cost recovery (BCR) issues, mitigation and default energy bids of storage resources, and the proposal to extend usage of dynamic limits to storage resources.

DMM continues to encourage the ISO to address the storage BCR issues as a top priority. Specifically, DMM recommends the ISO address the real-time bidding incentives created by the current BCR design for batteries.

DMM appreciates the ISO's analysis on the mitigation of charging bids for storage resources. DMM continues to recommend the ISO develop a dynamic default energy bid (DEB) for storage resources that can vary by hour. A storage DEB that reflects intraday opportunity costs that vary across the day would support efficient mitigation.

As noted in DMM's last round of comments, DMM conditionally supports extending the use of dynamic limits to storage resources.[2] However, this support is conditional on sufficient ability for DMM and the ISO to monitor and enforce appropriate usage of this functionality, and rules that storage resources would be ineligible for BCR when dynamic limits impact dispatch.

Comments

Storage BCR

DMM continues to encourage the ISO to address storage BCR design as the top priority of this initiative. The current BCR rules remove the exposure to real-time prices for storage resources, which incentivize batteries to submit real-time bids that are inconsistent with their real-time opportunity costs. This creates efficiency, gaming, and reliability concerns. While the ISO developed a tariff amendment to

[1] *Working Group on Outage Management, Uplift & DEB, and SOC Management* presentation, California ISO, May 28, 2025: https://stakeholdercenter.caiso.com/InitiativeDocuments/Presentation-StoradeDesignandModeling-May28-2025.pdf

[2] *Comments on Storage Design and Modeling Issue Paper and Straw Proposal on Outage Management, Nonlinearity, and SOC Clarification,* Department of Market Monitoring, May 23, 2025: https://www.caiso.com/documents/dmm-comments-on-storage-design-and-modeling-issue-paper-and-straw-proposal-on-outage-management-nonlinearity-and-soc-clarification-may-23-2025.pdf

mitigate some gaming concerns, the underlying incentive issues will continue to result in inefficient dispatch of storage resources in the real-time market. [3]

The BCR framework was designed for traditional resources and does not consider attributes of batteries, such as state-of-charge. Therefore, the same situations in which traditional resources should receive BCR will not translate directly to situations where storage resources should receive BCR. DMM recommends redesigning BCR rules to assume no BCR eligibility for batteries and add eligibility only under specific situations where this is deemed appropriate.

DMM does not argue that there are no circumstances in which storage resources should receive BCR. However, these circumstances should be specifically carved out to avoid over-extending BCR to storage resources and distorting their bidding incentives. DMM continues to recommend that the ISO and stakeholders work together to determine situations where BCR is appropriate for storage resources.

DMM reiterates that it is not just gaming concerns that result from the current BCR design, but a lack of incentive for storage resources to bid in such a way that reflects expected real-time intraday opportunity costs and system conditions. When resources are properly incentivized to reflect these costs (including the potential need to buy-back day-ahead schedules at very high prices in the peak net load hours), real-time dispatch instructions should align much more closely with day-ahead schedules and support storage resources being available when most needed in real-time.

DMM continues to recommend the ISO clearly identify where storage BCR is warranted and remove BCR payments for storage in any other scenarios, to ensure that storage resources are properly incentivized to submit bids that accurately reflect actual real-time costs so that the market optimization achieves efficient market outcomes. [4]

Mitigation and the storage DEB

DMM appreciates the ISO's analysis on historical mitigation of charging bids. The ISO's analysis indicates that incremental dispatch (or foregone charging) due to mitigation of charging bids appears minimal across most of the storage resources. [5] These results are similar to the ISO's conclusion during the August 19, 2024 working group that incremental dispatch caused by mitigation on the discharging side

[3] *Tariff Amendment to Prevent Unwarranted Bid Cost Recovery Payments to Storage Resources, and Request for Effective Date on Shortened Notice,* California ISO, November 26, 2024: https://www.caiso.com/documents/nov-26-2024-tariff-amendment-bid-cost-recovery-to-storage-resources-er25-576.pdf

[4] *Comments on Storage Design and Modeling Working Group Session 1,* Department of Market Monitoring, January 8, 2025: https://www.caiso.com/documents/dmm-comments-on-storage-design-and-modeling-working-group-session-dec-11-2024-jan-8-2025.pdf

[5] *Working Group on Outage Management, Uplift & DEB, and SOC Management* presentation, California ISO, May 28, 2025, p 21: https://stakeholdercenter.caiso.com/InitiativeDocuments/Presentation-StoradeDesignandModeling-May28-2025.pdf

was low.[6] DMM also provided analysis supporting this same conclusion as part of this stakeholder process in 2024.[7]

DMM agrees that mitigation does not appear to have historically had a large impact on the dispatch of most storage resources. However, to further understand whether mitigation of charging or discharging bids is causing storage resources to be unavailable in peak hours, DMM recommends the ISO provide more detailed analysis of certain resources on certain days, particularly the units that were frequently mitigated and the days where conditions were tight in the peak hours.

DMM continues to recommend establishing dynamic DEBs that can vary by hour, to reduce the risk of mitigation to values that do not reflect varying real-time intraday opportunity costs. As previously discussed, because the current opportunity cost component of the real-time storage DEB is calculated from day-ahead prices, the real-time DEB only reflects the opportunity cost of a binding financial agreement from the day-ahead, rather than the opportunity cost in the real-time.[8] To dispatch batteries efficiently, bids should reflect the potential opportunity costs of charging or discharging batteries in the real-time market. These costs can change throughout the day, based on the state of the battery and remaining charge and discharge opportunities in future intervals. Therefore, DEBs for batteries used when bid mitigation is triggered need to vary across the day to reflect these dynamic intraday opportunity costs.[9]

DMM continues to recommend the ISO work with stakeholders to develop a method to calculate a real-time intraday opportunity cost for storage that could be incorporated into the storage DEB. Such an approach could result in DEBs that are higher in some hours, but lower in others, and would support more efficient mitigation that aligns with real-time intraday opportunity costs that vary across the day.[10]

Changing BCR rules should not be delayed until changes to DEBs are developed

While DMM continues to recommend that the storage DEB should be enhanced to reflect intraday opportunity costs, the changes to BCR rules recommended by DMM should not be deferred or delayed

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[6] *Storage Bid Cost Recovery and Default Energy Bid Enhancements Stakeholder Meeting,* California ISO, August 19, 2024, pp 29-30: https://stakeholdercenter.caiso.com/InitiativeDocuments/Presentation-Storage-Bid-Cost-Recovery-and-Default-Energy-Bids-Enhancements-Aug-19-2024.pdf

[7] *Comments on Storage Bid Cost Recovery and Default Energy Bid Enhancements Revised Straw Proposal*, Department of Market Monitoring, September 23, 2024: https://www.caiso.com/documents/dmm-comments-on-storage-bid-cost-recovery-and-default-energy-bid-enhancements-revised-straw-proposal-sep-23-2024.pdf

[8] *Comments on Storage Design and Modeling Working Group Session 2 and 3,* Department of Market Monitoring, March 7, 2025: https://www.caiso.com/documents/dmm-comments-on-storage-design-and-modeling-working-group-sessions-2-and-3-mar-07-2025.pdf

[9] *Comments on Storage Bid Cost Recovery and Default Energy Bid Enhancements August 19, 2024 Stakeholder Meeting,* Department of Market Monitoring, August 26, 2024: https://www.caiso.com/documents/comments-on-storage-bid-cost-recovery-and-default-energy-bid-enhancements-august-19-2024-stakeholder-meeting-aug-26-2024.pdf

[10] *Comments on Storage Design and Modeling Working Group Session 2 and 3,* Department of Market Monitoring, March 7, 2025: https://www.caiso.com/documents/dmm-comments-on-storage-design-and-modeling-working-group-sessions-2-and-3-mar-07-2025.pdf

until such enhancements to DEBs are made. In 2024, DMM provided analysis examining whether the efficiency gains of properly incentivizing batteries to submit higher bids in the hours prior to the peak net load hours by removing BCR for battery buy-backs would be undermined by mitigation. The analysis showed that with the current storage DEB, even if batteries bid very high (e.g., $1,000/MWh), mitigation would likely have had minimal impact on dispatch prior to the peak net load hours on critical days.[11]

Extension of dynamic limit functionality to storage resources

DMM continues to support the development of market model improvements that incorporate nonlinearities in storage resource charging and discharging capabilities (i.e., foldback).[12] As previously stated, DMM believes a more appropriate solution would be to include foldback into resource characteristics through Master File, and allow scheduling coordinators to bid based on their state-of-charge (SOC).[13] The ISO indicated these enhancements are not feasible in the short-term and proposed extending the hybrid resource dynamic limit functionality to storage resources as an interim solution.

In the last set of comments, DMM detailed conditional support for this interim solution.[14] To reiterate, DMM would support allowing storage resources to utilize dynamic limits in the short-term if: (1) the ISO tariff clearly specifies acceptable use of dynamic limits for storage resources, (2) the ISO requires new Master File data sufficient for monitoring usage of dynamic limits, and (3) resources would be ineligible for real-time bid cost recovery during hours when dynamic limits impact the resource's dispatch. However, in the long-term, DMM continues to recommend the ISO sunset this feature and develop market functionality to manage operational nonlinearities.

[11] *Storage Bid Cost Recovery and Default Energy Bid Enhancements Stakeholder Meeting,* California ISO, August 19, 2024, pp 29-30: https://stakeholdercenter.caiso.com/InitiativeDocuments/Presentation-Storage-Bid-Cost-Recovery-and-Default-Energy-Bids-Enhancements-Aug-19-2024.pdf

[12] *Comments on Storage Design and Modeling Issue Paper and Straw Proposal on Outage Management, Nonlinearity, and SOC Clarification,* Department of Market Monitoring, May 23, 2025: https://www.caiso.com/documents/dmm-comments-on-storage-design-and-modeling-issue-paper-and-straw-proposal-on-outage-management-nonlinearity-and-soc-clarification-may-23-2025.pdf

[13] *Comments on Storage Design and Modeling Working Group Session 2 and 3,* Department of Market Monitoring, March 7, 2025: https://www.caiso.com/documents/dmm-comments-on-storage-design-and-modeling-working-group-sessions-2-and-3-mar-07-2025.pdf

[14] *Comments on Storage Design and Modeling Issue Paper and Straw Proposal on Outage Management, Nonlinearity, and SOC Clarification,* Department of Market Monitoring, May 23, 2025: https://www.caiso.com/documents/dmm-comments-on-storage-design-and-modeling-issue-paper-and-straw-proposal-on-outage-management-nonlinearity-and-soc-clarification-may-23-2025.pdf