Comments on Storage Design and Modeling
Working Group Presentation on January 22, 2026

Department of Market Monitoring

February 17, 2026

Summary

The Department of Market Monitoring (DMM) appreciates the opportunity to comment on the *Storage Design and Modeling* working group presentation held on January 22, 2026. [1]

DMM supports the ISO addressing storage bid cost recovery (BCR) issues and enhancements to the storage default energy bid (DEB) as top priorities. DMM recommends the ISO prioritize creating a standardized storage DEB option for Western Energy Imbalance Market resources and implementing software changes to allow DEBs to vary hourly, independent of any proposed revisions to storage BCR.

DMM continues to recommend a default of no BCR eligibility for storage resources, with only narrowly defined exceptions where BCR is necessary to promote efficient bidding and market outcomes for storage resources. The ISO should utilize working group discussions to identify the specific scenarios in which storage resources should receive BCR, rather than discussing the appropriateness of multi-settlement markets for storage resources, or reevaluating the separation of day-ahead and real-time BCR calculations as a means of addressing storage-related issues. DMM recommends that for storage and all other resource types, the ISO retain the current BCR design that nets costs and revenues across day-ahead and real-time markets separately. This structure encourages real-time market participation and best incentivizes resources to submit bids that accurately reflect their real-time operating costs.

DMM also supports improvements to storage modeling. However, this should be a lower priority than addressing storage BCR issues and enhancements to the storage DEB. Any work to improve storage modeling should not delay the ISO addressing these higher priority issues. For specific modeling improvements, DMM supports the development of new Master File parameters for state-of-charge to represent resource nonlinearities, and the long-term proposal to develop a new non-generator resource model to bid based on state-of-charge. These improvements require close attention to interrelated policies. However, if implemented correctly, these improvements will allow storage resources to more accurately reflect their economic value and physical constraints.

Comments

DMM continues to recommend BCR eligibility for storage resources only under specific situations where BCR is deemed appropriate and necessary to support market efficiency. DMM does not recommend broad redesign of the entire BCR framework to solve storage BCR issues.

DMM continues to recommend the ISO develop storage BCR rules that allow no eligibility for BCR by default, and only allow eligibility under certain situations where uplift to storage resources is deemed appropriate and necessary to support market efficiency. DMM further recommends the ISO utilize stakeholder workshops to identify the specific scenarios where storage resources should be eligible for BCR, rather than considering broad changes to the BCR framework to address storage-related issues. DMM

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[1] *Storage Design and Modeling: Working Group on Uplift and Default Energy Bid, Outage Management, and State-of-Charge Management* presentation, California ISO, January 22, 2026:
https://stakeholdercenter.caiso.com/InitiativeDocuments/Presentation-Storage-Design-Modeling-Jan-22-2026.pdf

believes it is more productive for the working group to focus on developing solutions that allow for storage resources to receive BCR in appropriate situations, rather than discussing possible changes to the existing BCR paradigm that separates day-ahead and real-time costs and revenues. This general design functions effectively for both storage resources and conventional generators.

DMM recommends the ISO continue to separate day-ahead and real-time BCR calculations and consider other solutions to solve the storage BCR issues

DMM does not believe that changing the BCR calculation to net costs and revenues across day-ahead and real-time markets together would resolve the issue of BCR distorting storage bidding behavior. The ISO began netting day-ahead and real-time BCR separately in 2014 to address the fact that suppliers were not properly incentivized to submit bids in the real-time market that reflected their actual marginal operating costs.[2,3] When costs and revenues were netted together across markets, suppliers saw limited benefit in participating in the real-time market compared to the financial risks.[4] This created potential incentives for suppliers to submit bids solely aimed at preserving their day-ahead schedules, rather than submitting bids that reflected their real-time marginal costs. Separating bid cost recovery calculations across markets eliminated this issue. DMM recommends the ISO establish BCR rules for storage resources that incentivize real-time market participation using bids that reflect real-time marginal costs.

DMM continues to recommend creating a BCR framework for storage resources that incentivizes efficient real-time bidding

DMM maintains that the real-time market is most efficient when all resources, including storage, are incentivized to submit bids that reflect real-time conditions and operating costs. Under the current BCR design, storage resources are not exposed to real-time prices they must pay when buying back a day-ahead schedule due to insufficient state-of-charge (SOC). Therefore, the current BCR paradigm removes incentives for storage resources to reflect real-time costs in bids and fails to incentivize storage resources to bid efficiently in the real-time market. Netting day-ahead and real-time BCR together does not solve this issue, as it would potentially further remove exposure to real-time prices by creating an incentive for storage resources to submit bids aimed at preserving their day-ahead schedule regardless of real-time conditions. While day-ahead schedules are based on an optimization of the entire 24-hour timeframe, it is still important for all resources, including storage, to bid in a manner that allows the market to re-dispatch them efficiently in real-time based on real-time costs and conditions.

There are instances where it would be economic for storage resources to buy back day-ahead schedules in some intervals in order to increase their real-time dispatch in others. This is the case when the benefits of those incremental dispatches exceed the cost of the buybacks. However, because the current BCR paradigm provides uplift to storage resources that uneconomically buy back day-ahead schedules due to insufficient SOC, battery operators are not exposed to the real-time price of those day-ahead buybacks and are therefore not incentivized to submit efficient real-time bids in earlier hours that reflect expectations of later hour real-time prices. However, netting day-ahead and real-time markets together could simply shift the distortion—instead of being indifferent to real-time conditions during hours of day-ahead schedules, storage resources may be actively incentivized to preserve those schedules even when real-time conditions

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[2] *2014 Annual Report on Market Issues and Performance,* Department of Market Monitoring, June 2015, p 67: https://www.caiso.com/Documents/2014AnnualReport_MarketIssues_Performance.pdf

[3] *Draft Final Proposal - Renewable Integration: Market and Product Review Phase 1,* California ISO, November 4, 2011: https://www.caiso.com/documents/draftfinalproposal-renewableintegrationmarket-productreviewphase1.pdf

[4] *ISO Board of Governors Memorandum,* Eric Hildebrandt, Director, Market Monitoring, December 8, 2011: https://www.caiso.com/documents/department_marketmonitoringupdatedec2011.pdf

warrant a different dispatch. Storage resources should be incentivized to bid in such a way that takes into account the costs of not providing their day-ahead schedules, as well as the potential revenues that could be gained by different schedules in real-time.

To incentivize bidding behavior that reflects real-time conditions, storage resources must be exposed to the cost of day-ahead buybacks (under most circumstances) and be properly incentivized to participate in the real-time market rather than solely preserving day-ahead schedules. The current BCR paradigm fails to expose storage resources to real-time prices by providing uplift uneconomic buybacks due to insufficient SOC. However, netting day-ahead and real-time together could further remove exposure to real-time prices by incentivizing resources to bid in such a way to preserve day-ahead schedules regardless of real-time conditions. DMM believes the solution to storage BCR issues should ensure storage resources are incentivized to accurately reflect their real-time costs in their real-time bids, which neither the current BCR paradigm nor netting markets together in the BCR calculation accomplish.

DMM supports improvements to storage modeling, but as a lower priority than addressing storage BCR issues and enhancing the storage default energy bid

The storage design and modeling initiative seeks to address a wide range of topics, including storage BCR, default energy bid enhancements, OMS improvements, and various enhancements to storage resource modeling. As discussed in these comments, DMM supports many of the ISO's proposed enhancements and other changes proposed in the storage design and modeling initiative. However, we emphasize that many of these proposed changes are time consuming to both develop and implement. The ISO and stakeholders have limited resources and bandwidth which may require allocating resources toward the highest priority items. DMM continues to recommend the ISO place top priority on implementing software changes allowing storage DEBs to vary hourly, and development of a standardized storage default energy bid for storage resources. Pursuit of changes to the modeling of storage resources should only be undertaken to the extent they do not delay these higher priority items and other more detailed enhancements to the storage BCR design that may be appropriate.

DMM supports incorporation of storage nonlinearities in the market model; inaccessible charging and discharging capacity should be subject to RAAIM

In December 2025, the ISO proposed to improve modeling of storage nonlinearities by clarifying that storage resources "should only reflect the range unaffected by foldback [in the] Min/Max Continuous Energy Limit in the ISO's Master File."[5] In the subsequent stakeholder meeting, the ISO decided to hold off on the proposed clarification in the storage design and modeling stakeholder process to require resources to limit their SOC range to obviate foldback.[6] However, in the interim the ISO proposed in the California Public Utilities Commission resource adequacy proceeding to update the qualifying capacity calculation

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[5] *Storage Design and Modeling: Working Group on Outage Management, Uplift & DEB, and Mixed-Fuel & Distribution-Level Resources* presentation, California ISO, December 4, 2025: https://stakeholdercenter.caiso.com/InitiativeDocuments/Presentation-Storage-Design-and-Modeling-Dec-4-2025.pdf

[6] *Storage Design and Modeling: Working Group on Uplift and Default Energy Bid, Outage Management, and State-of-Charge Management* presentation, California ISO, January 22, 2026: https://stakeholdercenter.caiso.com/InitiativeDocuments/Presentation-Storage-Design-Modeling-Jan-22-2026.pdf

methodology to reflect nonlinearities, as proposed in the December 2025 stakeholder meeting. [7] DMM previously supported this proposed change in the storage design and modeling initiative, but supports the shift to make this a policy change in the qualifying capacity calculation versus a clarification in the storage design and modeling stakeholder process. Additionally, DMM continues to support the short-term rule that all power limitations should be reflected in OMS and subject to the resource adequacy availability incentive mechanism (RAAIM). [8]

In the January stakeholder meeting, the ISO proposed a solution to modeling storage resource nonlinearities in the SOC extremes using improvements to Master File, and accompanying modifications to the market model. The proposed solution to modeling nonlinearity uses additional Master File parameters that will scale the charging and discharging capabilities of the resource linearly with SOC. The solution creates an envelope of the operational range for storage resources to ensure feasible dispatches, allowing for full access to the stored energy of the resource.

DMM has long recommended improvements to Master File and storage resource modeling, and supports this improvement to modeling nonlinearities. [9] Further, DMM has cautioned that any changes to storage capacity modeling need to contemplate the interrelated policies around resource adequacy and RAAIM. Any power output limitation on resource adequacy capacity, even if modeled in Master File, should still be subject to RAAIM. The ISO has indicated that RAAIM will be addressed in the Resource Adequacy Program and Modeling Design (RAMPD) initiative. [10] DMM will continue to be an active stakeholder in that process.

Biddable SOC functionality would improve the market model for storage

The ISO is contemplating development of a new non-generator resource (NGR) model for storage resources to allow better representation of their operational and economic characteristics. [11] DMM continues to support the ISO's development of a new energy storage model that considers variation in cost and operational characteristics by SOC. [12] DMM views this model as a significant improvement in the ability of storage resources to accurately reflect costs and resource limitations applicable to a particular market interval. However, development and implementation of such a model is likely to be time consuming and resource intensive. DMM continues to highlight the importance of working toward such modeling improvements only to the extent it does not delay work on more urgent issues such as the storage BCR

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[7] *Comments of the California Independent System Operator Corporation on Order Instituting Rulemaking,* California ISO, CPUC R.25.10.003, November 4, 2025: https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M586/K273/586273752.PDF

[8] *Comments on Storage Design and Modeling Working Group Presentation on November 12, 2025,* Department of Market Monitoring, November 26, 2025: https://www.caiso.com/documents/dmm-comments-on-storage-design-and-modeling-nov-12-2025-working-group-presentation-nov-26-2025.pdf

[9] *Ibid.*

[10] *Storage Design and Modeling: Working Group on Uplift and Default Energy Bid Working Group on Uplift & DEB, Outage Management, and State-of-Charge Management* presentation*,* California ISO, January 22, 2026: https://stakeholdercenter.caiso.com/InitiativeDocuments/Presentation-Storage-Design-Modeling-Jan-22-2026.pdf

[11] *Ibid.*

[12] *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

issues and default energy bid enhancements referenced earlier in these comments. Addressing these issues first should be the top priority of the ISO, and these issues should receive priority access due to limited resources.

The current model for energy bidding requires storage resources to bid a price-quantity pair based on opportunity costs of an assumed SOC for current and future intervals. Because real-time bids cannot be updated after the bid submission deadline 75 minutes before the operating hour, submitted energy bids remain static even if dispatch changes SOC before the operating hour. This creates potential misalignment between bid assumptions and actual conditions at dispatch. Allowing bids to be submitted in relation to SOC rather than power output would address this timing issue by enabling the market model to translate SOC-based bids into standard price-quantity pairs that more accurately reflect marginal costs at dispatch, given the resource's SOC. This enhancement would help storage resources avoid issues such as foldback and other SOC related constraints, and improve bid accuracy in representing intraday marginal costs. DMM continues to highlight it will be important that the translation of SOC-based bids to price-quantity bid curves represent marginal costs, not average costs, to ensure consistent price formation across all resource types in the market. [13, 14]

DMM requests the ISO give careful consideration to the translation of SOC-based bids to the standard price-quantity pair, and provide clear detail on how this will be accomplished in a manner that results in a monotonic non-decreasing bid curve. Assuming the translations of the SOC-based bids can represent marginal costs, and maintain monotonicity, DMM recommends close attention be paid to local market power mitigation (LMPM), particularly in the real-time dispatch (RTD) market. Supposing bids for SOC are translated to a standard bid curve and price-quantity pairs, the LMPM runs will need to modify mitigation as SOC changes. However, in RTD, a bid could be mitigated in an advisory interval and flow through to the binding RTD interval. With the SOC changing between advisory and binding intervals, so could the bid curve. A more appropriate mitigated bid in this instance would consider the mitigated SOC bid applicable to the SOC at the start of that interval, rather than the previous advisory intervals. This would ensure that the market clearing solution in the binding interval accurately reflects the cost of the mitigated energy storage resource at the SOC in that interval of binding schedules, but would require significant changes to the RTD LMPM process. [15, 16]

Finally, DMM asks the ISO to consider interrelated policies in the context of this model and the translation of SOC-based bids to price-quantity pairs. Specifically, DMM requests the ISO work through examples of the bid mapping, and demonstrate how these mappings will work for all of the market products, i.e., ancillary services, flex ramp, BCR, and new products introduced by the day-ahead market enhancements (DAME). An example of where this could be of concern is an ancillary service award that has a probability of being

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[13] *Ibid.*

[14] *Comments on Energy Storage Enhancements Revised Straw Proposal*, Department of Market Monitoring, April 7, 2022: https://www.caiso.com/documents/dmm-comments-on-energy-storage-enhancements-revised-straw-proposal-apr-7-2022.pdf

[15] *Ibid.*

[16] *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

dispatched and thus changing the SOC of a resource, and the energy bid price, with the change in SOC. DMM also recognizes there will be overlap with resource adequacy policy, and will be an active stakeholder in the RAMPD policy process in the development of this new NGR model. [17]

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[17] *Ibid.*