

Comments on Storage Design and Modeling: Revised Straw Proposal on Default Energy Bids

Department of Market Monitoring

October 9, 2026

Summary

The Department of Market Monitoring (DMM) appreciates the opportunity to comment on the *Storage Design and Modeling: Revised Straw Proposal on Default Energy Bids* issued September 17, 2026.¹ While DMM still has concerns with some features of the storage default energy bid (DEB), DMM appreciates the ISO's modifications to the original straw proposal and commends the ISO for providing empirical analysis demonstrating the potential impacts of the different DEB proposals. DMM supports the two revisions to the storage DEB proposed in the revised straw proposal. The ISO's analysis highlights the improved ability of both DMM's proposal and the ISO's revised proposal to estimate storage opportunity costs during peak hours relative to the ISO's original straw proposal.

First, the ISO proposes retaining a price-based opportunity cost multiplier of 1.1 rather than increasing it to 1.4 as proposed in the straw proposal. DMM supports this change because this multiplier applies throughout the day, and using 1.4 would substantially overestimate the marginal costs of storage resources during peak hours.

Second, the ISO proposes incorporating DMM's recommended time-of-day multiplier design, which decreases to a lower multiplier value at the later of the hour of the Nth highest day-ahead locational marginal price (LMP) or hour-ending 18. DMM supports this approach as it ensures that the time-of-day multiplier does not decrease to its lower value too early or too late.

DMM continues to recommend a time-of-day multiplier design that accommodates values less than 1 where appropriate to accurately reflect lower opportunity costs during the highest-priced hours at the end of the operating day. While DMM acknowledges that opportunity costs may reflect expected prices beyond the current day, this does not imply that DEBs during the peak hours need to be as high as peak-hour prices. Rather, DEBs in peak hours should reflect future charging and discharging opportunities following peak hours and into the next morning. DMM and ISO analysis have shown the average DEB values resulting from a 0.8 time-of-day multiplier are generally consistent with or exceed the value of those future opportunities.

The revised straw proposal also references a price-scaling adjustment that will adjust the prices used to calculate DEBs when there are large differences between those prices and prices in the final market run. DMM recommends that the ISO propose specific scalar calculations and provide updated analysis of the potential real-time DEB formulations previously analyzed.

DMM supports the ISO's proposed interim hybrid resource DEB design. DMM continues to support the "greater of" approach and does not identify any material issues with the proposed 30 percent minimum share requirement. DMM continues to place high priority on the development of a DEB for hybrid resources to facilitate local market power mitigation, and recommends the ISO prioritize further enhancements following the implementation of this near-term solution.

¹ *Storage Design and Modeling: Revised Straw Proposal on Default Energy Bids*, California ISO, September 17, 2026: <https://stakeholdercenter.caiso.com/InitiativeDocuments/Second-Straw-Proposal-Uplift-Default-Energy-Bids-and-State-of-Charge-Management-Topic-Group-Storage-Design-and-Modeling-Sep-17-2026.pdf>

Comments

Storage DEB

Retaining the opportunity cost multiplier value of 1.1 is more appropriate than increasing it to 1.4

DMM raised concerns that the ISO's proposal to increase the price-based opportunity cost multiplier from 1.1 to 1.4 would greatly overestimate the marginal cost of battery resources during the highest-priced hours.^{2,3} The price-based multiplier was included in the original storage DEB formulation in order to provide additional headroom above the estimated highest opportunity cost of the day. Under the revised straw proposal, the opportunity cost multiplier remains at 1.1 and additional headroom is provided through the introduction of both the price adjustment scalar and the time-of-day multiplier.

The ISO provided analysis similar to DMM's that compares the average DEB values under the ISO's original straw proposal, the ISO's revised straw proposal, and DMM's proposal, along with the hourly average real-time pre-dispatch (RTPD) locational marginal prices (LMPs). This analysis highlights the extent to which the ISO's original straw proposal overestimated storage opportunity costs throughout the day, particularly during peak hours when local market power concerns are the greatest.

DMM appreciates the ISO's analysis demonstrating that retaining a 1.1 opportunity cost multiplier, rather than increasing it to 1.4, substantially reduces the overestimation of DEB values observed during peak hours. While DMM continues to believe that time-of-day multipliers and the price adjustment scalars may make the opportunity cost multiplier unnecessary, DMM supports the ISO's proposal not to increase the multiplier to 1.4 and DMM does not oppose retaining the multiplier value of 1.1.

The time-of-day multiplier design should allow values less than 1 where needed to accurately reflect varying intraday opportunity costs

DMM continues to recommend a time-of-day multiplier that reflects both the higher opportunity costs in hours prior to the highest-priced hours and the lower opportunity costs during those hours. The proposal to limit the multiplier range from 1 to 1.4 addresses concerns about the DEB underestimating costs during the pre-peak hours, but does not address the longstanding issue that current storage DEBs may significantly overestimate marginal costs during peak hours, the very periods when local market power concerns are the greatest. Therefore, DMM continues to recommend a time-of-day multiplier that can take on a value less than 1 during peak hours.

The ISO stated that the time-of-day multiplier could not be less than 1 because it must capture the value of opportunities that extend beyond the current trade date and into the following day. DMM agrees with the ISO's statement that opportunity costs are not limited to hours within the same trade date. However, DMM does not agree that this implies that the time-of-day multiplier should not be set less than 1.

The DEB in the evening peak hours should estimate the opportunity costs associated with future discharging and charging opportunities over the remaining hours of the current day and the early

² *Comments on Storage Design and Modeling: Straw Proposal on Default Energy Bids, Uplift, and State-of-Charge Management*, Department of Market Monitoring, August 5, 2026: <https://www.caiso.com/documents/dmm-comments-on-storage-design-and-modeling-straw-proposal-on-default-energy-bids-uplift-and-state-of-charge-management-aug-05-2026.pdf>

³ *Supplemental Comments on Storage Design and Modeling: Straw Proposal on Default Energy Bids, Uplift, and State-of-Charge Management*, Department of Market Monitoring, August 17, 2026: <https://www.caiso.com/documents/dmm-supplemental-comments-on-the-storage-design-and-modeling-jul-15-2026-working-group-presentation-aug-17-2026.pdf>

morning hours of the following day. A reasonable approximation of these opportunity costs should be closely aligned with prices during the hours in which those future charging and discharging opportunities exist.

The following figure compares the average DMM DEB during peak hours, using a 0.8 time-of-day multiplier, to the average RTPD LMP across the entire day. The figure is reproduced from the ISO's revised straw proposal, with DMM adding a horizontal reference (green dashed) line representing the lower DEB value under DMM's proposal during peak hours to allow for comparison with average RTPD LMPs.

Figure 1 Comparison of DMM's average proposed DEB values over peak hours and average RTPD LMPs

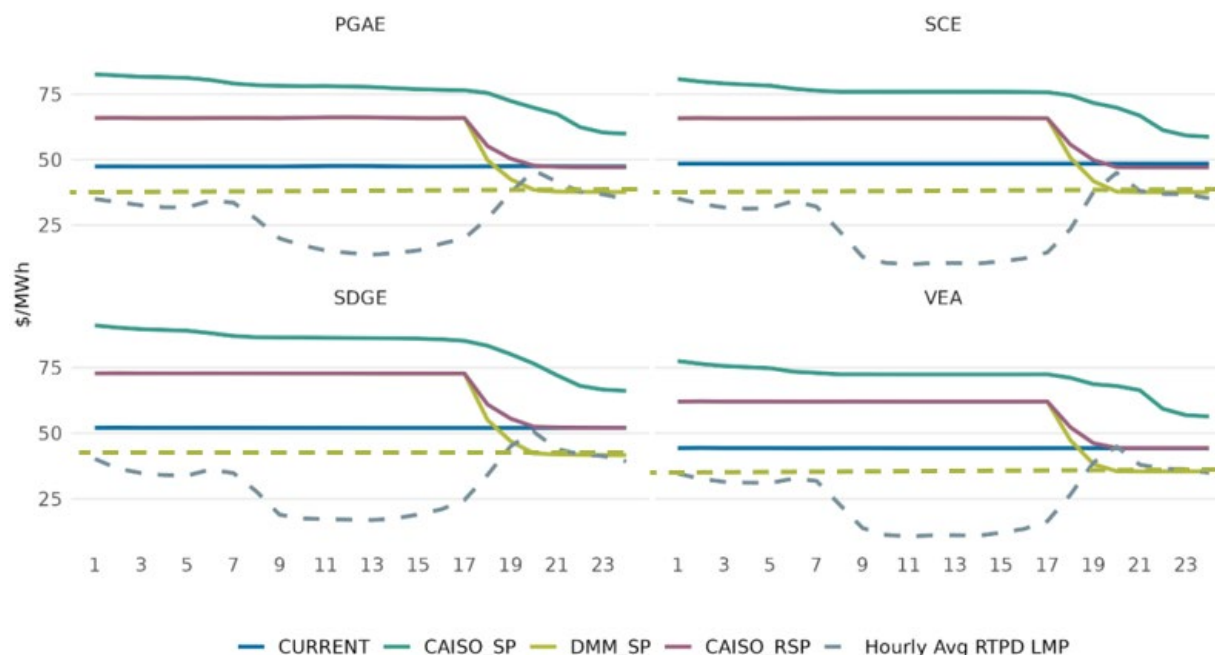


Figure 1 shows that the lower DEB values produced under DMM's proposed 0.8 multiplier are broadly consistent with prices during the hours following the evening peak and during the morning peak (e.g., hours-ending 1 to 6), while also exceeding average prices during the morning ramp hours. The alignment between the DMM DEB and average prices during the late evening and morning peak hours indicates that the DMM DEB very accurately reflects the value of future discharge opportunities. The fact that the DMM DEB is higher than morning ramp hours indicates it may even overestimate the opportunity cost of recharging in advance of the morning peak.

Together, these observations demonstrate that a DEB with a time-of-day multiplier that decreases to 0.8 during peak hours can appropriately reflect opportunity costs following the evening peak and into the next morning. Moreover, any real-time upward adjustment scalar adopted by the ISO would further increase these DEB values and provide additional headroom.

DEB design should balance providing sufficient headroom for efficient dispatch while still effectively mitigating local market power

DMM acknowledges that there may be instances where storage resources are mitigated to DEB values that could result in inefficient dispatch. No DEB will be a perfect approximation of marginal cost in every circumstance. However, the potential for outlier situations does not justify a DEB that significantly

overstates marginal cost in the great majority of instances, to the point that it is no longer capable of mitigating market power.

Under the current bid cost recovery rules (BCR), storage resources are eligible to receive real-time uplift payments when they must buy back day-ahead schedules at a loss due to insufficient state-of-charge.⁴ While DMM continues to recommend that BCR rules limit the circumstances in which storage resources receive real-time uplift for buying back day-ahead schedules due to insufficient state-of-charge, DMM previously identified buy backs due to mitigation as a potential consideration for a carve-out in future bid cost recovery designs.⁵

The day-ahead storage DEB should include the time-of-day multiplier to better reflect intraday opportunity costs and promote day-ahead and real-time market convergence

DMM also recommends the ISO incorporate the time-of-day multiplier into the day-ahead storage DEB as well. The ISO has argued that the time-of-day component of the DEB multiplier may not be as necessary in the day-ahead optimization because it considers the full 24-hour time horizon. In earlier comments, DMM has described in detail the importance of explicitly including an estimate of intraday opportunity cost in the day-ahead storage DEB, even in the context of 24-hour optimization.⁶ The ISO reintroduced an opportunity cost component in the day-ahead storage DEB in 2022, and DMM recommended to the CAISO at that time further refinements to consider a more precise estimate of hourly opportunity cost that can reflect changing opportunity costs throughout the operating day.

Additionally, incorporating the time-of-day multiplier into the day-ahead storage DEB would promote convergence between the day-ahead and real-time markets. DMM further notes that the ISO's decision not to include a time-of-day multiplier in the day-ahead DEB should not constrain the design of the real-time time-of-day multiplier or preclude the use of multiplier values below 1 during peak hours.

The ISO should provide analysis using their proposed methodology for scaling up DEBs to reflect differences in day-ahead and real-time prices

The ISO is proposing to incorporate a scaling process for both day-ahead and real-time storage DEBs to account for significant discrepancies between the prices across different market runs. DMM continues to support this concept and recommends that the ISO propose a specific methodology for calculating the adjustment scalar to allow stakeholders to review.

DMM also recommends that the ISO conduct analysis on the real-time storage DEB after incorporating the proposed adjustment scalar, similar to that included in the revised straw proposal comparing DMM's proposed DEB formulation and the ISO's revised proposal. Such analysis would allow stakeholders to

⁴ A stakeholder in the September 22 meeting noted that their resource did not receive BCR after buying back a day-ahead schedule at a loss due to insufficient state-of-charge resulting from earlier discharge due to mitigation. DMM notes that while storage resources are generally eligible for BCR in this circumstance, there are exceptions. For example, resources are not eligible for bid cost recovery when using the end-of-hour state-of-charge parameter or when constrained by the ancillary services state-of-charge constraint.

⁵ *Comments on Storage Design and Modeling Updated Discussion and Issue Paper on Uplift and Default Energy Bid*, Department of Market Monitoring, January 8, 2026: <https://www.caiso.com/documents/dmm-comments-on-storage-design-and-modeling-updated-discussion-and-issue-paper-on-uplift-and-default-energy-bid-jan-8-2026.pdf>

⁶ *Comments on Energy Storage Enhancements Second Revised Straw Proposal*, Section III: Addendum to revise day-ahead DEB for energy storage resources, Department of Market Monitoring, August 4, 2022: <https://www.caiso.com/documents/dmm-comments-energy-storage-enhancements-second-revised-straw-proposal-aug-4-2022.pdf>

better understand how the adjustment scalar interacts with the other DEB components and affects DEB values throughout the day, and how those values compare to the average RTPD LMPs across the day.

The inclusion of the gas floor in the storage DEB is not warranted as it does not directly relate to the marginal cost of storage resources

DMM continues to oppose the inclusion of the gas floor in the storage DEB calculation because it is not related to the marginal costs of storage resources. DMM does not agree that storage DEBs need to incorporate the gas floor because the gas floor is included in the hydro DEB, and DMM does not agree that DEBs should not be used to establish a preferred relative position of resources in the bid stack. DEBs should be designed to estimate the marginal costs of individual resources, with the appropriate bid stack position following based on cost.

Storage DEBs rely on locational marginal prices (LMPs) or default aggregation point (DGAP) values that are much more representative of real-time prices than the day-ahead index prices used in hydro DEBs. In addition, the ISO proposes several upward adjustments to storage DEBs, including the real-time adjustment scalar. DMM recommends the ISO propose a real-time adjustment scalar that more accurately provides protection against underestimating real-time prices than relying on the gas floor component that may inappropriately set storage DEB values during periods of elevated gas prices even if gas resources are not setting electricity prices.

The ISO indicates that the gas floor is impactful in less than 10 percent of resource-days and, according to the ISO, is most frequently the binding component on days when electricity prices are particularly low (e.g., due to congestion) rather than when gas prices are exceptionally high. While this finding may partially reflect gas price trends during the period examined, DMM does not understand why it is necessary for the gas floor to set storage DEBs during these intervals. The ISO argues that the gas floor would only be material in circumstances where it is material for both hydro and storage resources. However, DMM does not understand why storage DEBs should reflect the estimated cost of electricity generated by gas resources when actual electricity prices—and therefore the opportunity costs of storage resources—are lower.

DMM continues to believe that the appropriateness of a gas floor should be evaluated based on the design and objectives of the storage DEB itself, rather than its utilization in the hydro DEB. If an additional justification for including the gas floor is to increase the real-time DEB on days with same-day gas price spikes (as a proxy for real-time LMP increases compared to day-ahead), this may be duplicative in the presence of the ISO's proposed but yet-to-be-detailed real-time price scalar meant to serve this purpose. Even if the gas floor affects only a limited number of intervals, DMM continues to believe that storage DEBs should be based on estimates of storage opportunity costs rather than the estimated costs of another generating technology.

Hybrid resource DEB

DMM supports the "greater of" approach to establish an interim hybrid resource DEB

Hybrid resources currently do not have a DEB and therefore are not subject to local market power mitigation. DMM continues to place a high priority on developing a hybrid resource DEB to facilitate local market power mitigation for these resources. DMM continues to support the ISO's proposed "greater of" approach, which is similar to DMM's recommendation to develop a near-term hybrid resource DEB by calculating the maximum of the DEBs applicable to each generation component within the hybrid resource. DMM supports implementing a practical near-term solution that can appropriately subject hybrid resources to local market power mitigation while more comprehensive enhancements are developed.

As part of the "greater of" approach, the ISO proposes a 30 percent minimum share requirement, under which a technology must account for at least 30 percent of a hybrid resource's total capacity for that technology's DEB to be considered in the "greater of" calculation. DMM does not object to the proposed 30 percent threshold and appreciates the ISO's efforts to address concerns that, without such a threshold, the resulting hybrid DEB could significantly exceed the marginal costs of the large majority of a hybrid resource's generation capacity. While this proposal represents a reasonable near-term solution, DMM continues to recommend additional hybrid DEB enhancements that more accurately reflect the costs and operational characteristics of hybrid resources as integrated systems composed of multiplier generation technologies.

Questions and comments

DMM welcomes questions, comments, and discussion directly from stakeholders on all market issues. If you have any questions about this initiative or any other issue, please feel free to contact DMM in any of the following ways:

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