Submit comments on Nov 12 Hybrid Meeting, Working Group Session 10: Uplift and Default Energy Bids (DEB), State-of-Charge Management, and Mixed-Fuel and Distribution-Level Resources

Initiative: Storage design and modeling

1. Please provide a summary of your organization's general comments on the materials shared and subsequent discussion during the Nov 12 meeting.

The California Energy Storage Alliance (CESA) appreciates the opportunity to comment on the November 12 hybrid meeting. CESA applauds the CAISO for holding a hybrid in-person meeting. While there was limited attendance by stakeholders, those that attended benefited from the interpersonal interactions with other concerned stakeholders and CAISO staff.

Although there were numerous interesting presentations at the meeting, in order for the discussions to meaningfully advance the Storage Design and Modeling initiative, CESA requests that CAISO clearly outline before the presentations are given how they are expected to address the core analytical questions and move stakeholders toward a decision point and an implementable market design solution.

In summary, CAISO should implement a nonlinearity modeling solution in Fall 2026 release and consider this improvement essential for EDAM. The stakeholder process needs to discuss implementation details developed by CAISO. Any RA capacity accreditation concerns should be clarified at the CPUC and not impact operations.

Lastly, CAISO should withdraw the BPM Proposed Revision Request (PRR) clarifying that distribution-level charging constraints fall under the 'ambient due to fuel insufficiency' nature of work. It was inappropriate for CAISO to move forward with a PRR given the limited discussion on the topic in the last working group.

2. Provide your organization's comments regarding the initiative's overview and schedule.

CESA is concerned with the pace of this initiative and the inability to issue a proposal to implement longer-term solutions requested by stakeholders. Also, it is unclear how these comments can be incorporated into the December 4th meeting and subsequent issue paper & straw proposal planned for mid-December.

3. Provide your organization's comments regarding the update on nonlinearity.

CESA does not support CAISO's proposal. CAISO continues to conflate its operational and market model issues with resource planning process for capacity accreditation from local regulatory authorities. The CAISO must develop a market-based solution to enable the full operational capability of storage, including the foldback region, to be available to system operators.

This issue has been raised for over eight years since ESDER 2 Draft Final Proposal. CAISO erroneously concluded that foldback would not be an operational concern. Since there have been larger scale storage coming online in 2020 and later years, storage operators have raised that foldback impacts maximum output (Pmax) and minimum output (Pmin) as storage nears 0% state-of-charge (SOC) and 100% SOC respectively. CAISO should implement a modeling solution in Fall 2026 release and consider this improvement essential for EDAM. The stakeholder process needs to discuss implementation details developed by CAISO. Any RA capacity accreditation concerns should be clarified at the CPUC and not impact operations.

CAISO's proposal to address storage non-linearity is simply to redefine its "minimum continuous energy limit" Master File field to align with minimum resource adequacy (RA) qualification rules. This conflates CAISO's distinct operational concerns (like deviation risk) with the details of the CPUC's RA planning framework. In effect, CAISO's proposal has the potential to remove up to a TWh of energy out of its market and dispatch control per year, presenting concerning reliability and economic implications. To the extent that resources can produce power in hours beyond their minimum RA duration requirements, they must be allowed to do so. Generally, the RA program is not structured, and should not be construed to be structured, to disincentivize or discourage RA resources from offering more energy capability to the CAISO than its minimum RA qualifications.

CAISO's core issue regarding storage non-linearity, or foldback, revolves around an apparent attempt to reconcile the dispatch of lithium-ion battery energy storage systems within both operational requirements and the CPUC's qualifying capacity (QC) methodology. This reconciliation is a inappropriate. RA programs often accredit resources at values less than their full capability, reflecting an average contribution to reliability. This is to ensure that load-serving entities procure more resources to meet overall reliability objectives, not to limit these resources' participation in the market. For instance, CAISO sees many solar resources with a net qualifying capacity ("NQC") value of 10.1 MW in November, but that does not mean that those resources should be limited to produce 0.1 MW if they are physically capable of producing more power.

CAISO proposes to limit the MWh value represented in the "minimum continuous energy limit" and "maximum continuous energy limit" Master File fields to only the MWh that is not affected by foldback. The result of this misguided proposal is that the market optimization will not access otherwise available energy within a storage resource's foldback region. By engineering the market optimization to steer clear of the foldback region, CAISO is deliberately restricting the maximum operational use of the asset. This change would force the asset's dispatch to be limited to the simplified QC definition, which requires the resource to discharge at its QC level for four or more uninterrupted hours at an energy capability that is lower than its maximum performance. CESA believes this approach would effectively be CAISO-sanctioned physical withholding of available energy. Any physical MWh capability, even in the foldback region, should remain accessible to the system, especially during an emergency. CAISO's medicine is worse than the disease because it artificially restricts the amount of energy that could be available to system operators.

For storage resources located in non-CAISO Western Energy Imbalance Market (WEIM) areas that are relied on to support their resource sufficiency evaluation (RSE) or their ancillary service needs this would unfairly shift a California centric decision to remove energy from the market onto entities externally comfortable with the reduced charging or discharge capability in this region.

Furthermore, CAISO's supporting data does not demonstrate that the proposal is justified or that foldback energy is insignificant. CAISO analysis, which CAISO interprets as showing that most assets already represent only the range unaffected by foldback, fails to distinguish whether resources were actually discharged within their foldback regions. For instance, the data shows resources discharged to 0.1% SOC, but not whether those same resources were (or were not) actually discharged through their foldback regions to reach the 0.1% SOC. Therefore, this data cannot conclusively show the potential magnitude of the affected energy.

Reliability risks outweigh any claimed administrative simplicity, and CAISO must preserve access to physical energy. Even if CAISO anticipates that its proposal would not result in the loss of a material amount of available energy, the potential impact on reliability must be prioritized above all else. During a system emergency, which would a system operator choose: shed load or discharge foldback energy? The answer is clearly the latter, meaning that the full available energy—including that in the foldback region—must not be withheld from the market optimization.

Similar questions exist for when a non-CAISO WEIM entity would need that energy at the adjusted Pmax or Pmin levels to be used to pass its RSE where the WEIM participants should be able to choose whether storage's available energy affected by foldback can be used to support its RSE. If a storage resource is not providing RA to a CPUC jurisdictional load serving entity, how should the resource's maximum and minimum continuous energy limits be set in Master File? It is unclear to CESA why CAISO, as a market operator, would seek to limit the capabilities of storage resources artificially.

In addition, FERC found it unjust and unreasonable for CAISO to consider adding market values into Master File for parameters such as ramp rate even while the physical capability would be available for exceptional dispatches in its Commitment Cost Enhancements Phase 3 filing. It is unlikely that FERC would agree it is just and reasonable to *require* storage to physically withhold their maximum performance in physical parameters. CAISO cannot require a storage resource to register less than its maximum performance to be registered for a given parameter through a Business Practice Manual change.

In summary, CAISO should implement a nonlinearity modeling solution in Fall 2026 release and consider this improvement essential for EDAM. The stakeholder process needs to discuss implementation details developed by CAISO. Any RA capacity accreditation concerns should be clarified at the CPUC and not impact operations.

4. Provide your organization's comments regarding the presentation offered by REV Renewables.

CESA supports accurate modeling of the foldback region in the market. This issue has been raised by multiple storage stakeholders in this effort. Based on the discussions/presentations to date, there may be a variety of simplifying market solutions that CESA is open to. It is essential that CAISO produce a timeline for all parties to understand which solutions could be implemented on what timeline.

REV Renewables' proposal offers a constructive starting point for addressing foldback-region operations, and CAISO's technology group is well-positioned to build on this foundation by assessing implementation feasibility and identifying potential enhancements. For example, while the concept is directionally sound, the level of SOC at which a storage resource enters the foldback

region is dynamic, suggesting that an hourly bid-based value may be more practical than a static Master File entry.

Vistra previously presented similar proposals early on in this effort that aligned with Rev Renewables proposal presented at the November workshop indicating shared interest among storage to pursue similar types of solutions. Vistra also suggested CAISO's technology group should assess whether a simplified implementation could be taken to allow the market to recognize foldback impacts in near term.

The REV Renewable and Vistra proposals should be evaluated by CAISO's technology group to assess the implementation feasibility and identify improvements. For example, the level of SOC where a storage resource enters the foldback regions is dynamic. Thus, it may be better to implement this operational constraint through an hourly bid component or dynamic limit tool rather than in Master File. Also, the CAISO could use this hourly value to assess if RAAIM penalties would apply. For example, assume that the minimum SOC to meet the resource's RA showing is 10 MWh. If the storage resource submitted 14 MWh as the point it enters foldback for a given hour, then the storage resource would be subject to RAAIM. Lastly, if CAISO determined that implementing a liner curve from the start of the foldback region is not implementable or does not meet the dispatch needs of operators, the CAISO could consider establishing a predetermined derate of the Pmax, for example cap dispatch at 10% of PMax when operating in the foldback region.

CESA recommends CAISO focus on how to implement a modeling approach for nonlinearity within the market optimization versus continuing to discuss interim measures because nonlinearity isn't modeled. We look forward to CAISO bringing forward a proposal that can be implemented in Fall 2026 that allows the market to see the derated MW discharge capability and rerated (increased) MW charge capability without outage cards.

In summary, CAISO should implement a modeling solution in Fall 2026 release and consider this improvement essential for EDAM. The stakeholder process needs to discuss implementation details developed by CAISO. Any RA capacity accreditation concerns should be clarified at the CPUC and not impact operations.

5. Provide your organization's comments regarding the guiding principles related to the Uplift & Default Energy Bid (DEB) topic group.

CESA supports developing a storage make-whole payment design that differentiates between a shortfall caused by the CAISO market and a shortfall caused by bidding behavior inconsistent with system conditions.

CESA supports changes to the storage DEB to enable storage resources across the entire market footprint to reflect intertemporal opportunity costs in bids.

6. Provide your organization's comments regarding the responses on Day-Ahead Uplift and Initial State-of-Charge (SOC) as part of the Uplift & Default Energy Bid (DEB) topic group.

The CAISO committed to performing a holistic review of the uplift storage resources need to be made whole for CAISO driven market outcomes, and to date this effort has fallen short of that commitment. To progress the conversation, CESA recommends CAISO focus on starting that holistic review with a focus on real-time market. CESA recommends developing a real-time make-whole design for storage. As CAISO has shown, day-ahead BCR is very low for storage resources. This data supports focusing on real-time issues. Yet, CAISO continues to focus on the day-ahead

market. After developing a real-time make-whole payment design, the initiative should then focus on changes to the day-ahead market that will support and align with the real-time make-whole payment design. Given the upcoming Day Ahead Market Enhancements (DAME) changes it is also premature to propose a day-ahead uplift policy until sufficient experience is gained under the DAME enhancements to identify whether Imbalance Reserves and the new envelope equations may lead to more frequency in the day-ahead market requiring uplift.

7. Provide your organization's comments regarding Real-Time Uplift and Proposed Approaches as part of the Uplift & Default Energy Bid (DEB) topic group.

CESA supports continued development by CAISO of the real-time make-whole conceptual framework. Since the conceptual framework determines if a storage resource is bidding consistent with real-time conditions based upon the real-time DEB, an inaccurate real-time DEB will result in higher make-whole payments. CESA does not believe an hourly DEB is necessary. Rather, if CAISO identifies that system conditions during the net load peak will be higher than planned for in the day-ahead market, the storage DEB should be increased and applied to all hours though the net load peak. The reference level change request process could also be explored for making changes intra-day.

8. Provide your organization's comments regarding the notion of establishing a form of System SOC target or constraint, including your perspective on how the SOC target should be established and the relationship this target or constraint would have with market products.

CESA is weary of having a system SOC target or constraint. As part of CESA's conceptual framework, CESA recommended the CAISO publish information regarding system SOC to better inform market participants of changes between day-ahead SOC expectations and actual real-time SOC. This will enable storage resources to better reflect real-time conditions in their energy bids.

9. Provide your organization's comments regarding the potential modifications to the storage DEB to enable the representation of real-time conditions and ease its use across different geographies.

See previous response.

10. Provide your organization's comments regarding the presentation offered by Pacific Gas & Electric (PG&E).

CESA appreciated PG&E's presentation. The PG&E presentation was an excellent example of the type of discussion that should occur as part of the CAISO's annual policy initiative roadmap process. What is the collective stakeholder vision of the CAISO market design evolution? However, it is unclear how CAISO expected the PG&E presentation to move forward resolution of issues being discussed in the Storage Design and Modeling initiative.

11. Provide your organization's comments regarding the presentation offered by Vistra, including the discussion questions included in their materials.

CESA appreciated Vistra's presentation. While CESA advocates for a holistic review of the current constraint modeling of storage in CAISO markets, it is unclear how CAISO expected the Vistra presentation to move forward resolution of issues being discussed in the Storage Design and Modeling initiative. CESA does note that Vistra highlighted the importance of CAISO meeting its

commitment to CESA to provide documentation of the constraints enforced on storage resources dispatch and SOC calculation in the IFM, RUC, STUC, FMM, and RTD.

CESA agrees with the general notion raised that when the market enforces SOC management constraints that lead to uneconomic results, storage should be eligible for real-time uplift. As CESA noted in our comments on working group session 8, the CAISO implemented the ancillary services (AS) SOC constraint based on a policy decision to maintain AS awards "at any cost." We understood Vistra's presentation to be to try to ask whether there should be an alternative to this policy decision to explore whether an alternative to provide more control to storage scheduling coordinators in exchange for eliminating uplift could be considered. As we put in our previous comments, since CAISO is making a policy decision to maintain AS at any cost it is appropriate to make storage whole for this choice. While CESA prefers maintaining uplift with the changes we have proposed, we do agree that if uplift is eliminated or significantly limited then revisiting the policy decision to maintain AS at any cost is needed and that the ability to reflect opportunity costs in energy bids must be ensured.

12. Provide your organization's comments regarding the presentation offered by Cong Chen Ph.D., Assistant Professor, Thayer School of Engineering, Dartmouth College.

No comments.

13. Provide your organization's comments regarding the update provided regarding the high sustainable limit (to ease the development of comments, please note that a more detailed review of the proposed guidance is included in the materials presented September 29, 2025).
https://stakeholdercenter.caiso.com/InitiativeDocuments/Presentation-Storage-Design-and-Modeling-Sep-29-2025.pdf

In general, CESA supports reasonable requests by CAISO to enhance telemetry and other resource information that will improve the CAISO dispatch of resources. During this and previous working groups, CAISO mentioned that the iHSL proposal would apply to all solar resources.

CESA is appreciative that CAISO engaged the Large Solar Association (LSA) to ensure their participation in this initiative. However, CESA is unclear why this topic was presented again but without additional information on the request CAISO has of solar resources.

14. Provide your organization's comments regarding the update and materials on outage reporting for distribution-level resources. This topic will be discussed during the next stakeholder meeting (scheduled for Dec. 4)

CESA does not support using a nature of work that is not exempt from the resource adequacy availability incentive mechanism (RAAIM) for WDAT storage resources subject to distribution charging constraints. CESA supports including the charging restrictions placed on WDAT storage resources in the Master File. If these operational constraints were modeled in the optimization, there would be no exposure to RAAIM penalties. Until the operational constraints are modeled, WDAT storage resources should continue to use an outage nature of work that is exempt from RAAIM penalties.

First, it is illogical to subject storage resources to RAAIM penalties if the CAISO's ultimate goal is to introduce new Master File parameters to adequately reflect distribution-level charging restrictions in

the market optimization. The CAISO is unjustified in applying a RAAIM penalty for a near-term solution when – once the operational characteristic is included in the market model – there would be no outage subject to a RAAIM penalty.

Second, if the CAISO has issues with the calculation of qualifying capacity (QC) developed by the CPUC, CAISO should engage in a CPUC process and not inappropriately apply RAAIM penalties the purpose of which is NOT to validate QC calculations.

CAISO attempted to justify its position by arguing that WDAT storage resources made this decision by not choosing Firm charging service. This was not a viable choice for resources interconnecting with SCE. SCE requires that resources fund all upgrades to resolve all N-1 contingencies, which is an unreasonable expectation of a project developer. In addition, the static charging tables are intended to be an interim solution put in place until SCE can deploy a sub-transmission level constraint management system (CMS). SCE currently estimates that this system will be completed in Q2 of 2027. CESA notes that the CAISO's security constrained economic dispatch (SCED) enforces N-1 contingencies in the market and does not penalize storage resource not dispatched to charge because a constraint is binding. This further justifies using a RAAIM exempt nature of work during this interim period.

CESA opposes using the "ambient due to fuel insufficiency" nature of work. The CAISO proposal is discriminatory against distribution interconnected resources for the following reasons:

1. Grid-scale resources are commonly dispatched lower than their full capability to respect N-1 constraints in the security constrained economic dispatched and not penalized by RAAIM. Distribution interconnected storage resources respect N-1 limitations by following the charging restrictions established by the PTO.
2. The Off Grid Charging Indicator (OGCI) is a CAISO SIBR parameter that, when enabled, prevents grid-charging and ancillary service awards. This is used to prevent charging storage resources when co-located with solar. When the sun is not shining, the storage resource cannot be charged. Since this constraint (contractual limitation, not physical) is modeled in the market, there is no need for the storage resource to enter an outage. The storage resource is not subject to RAAIM even though it cannot charge in certain hours.

The appropriate solution for distribution charging restrictions is to model this resource's charging constraint in the market. In the interim, outage cards should be used which are RAAIM exempt to communicate the charging limitation and ensure feasible dispatch instructions result from the market optimization.

CAISO should withdraw the BPM Proposed Revision Request (PRR) clarifying that distribution-level charging constraints fall under the 'ambient due to fuel insufficiency' nature of work. It was inappropriate for CAISO to move forward with a PRR given the limited discussion on the topic in the last working group. In fact, the PRR notification was made November 25 which is conveniently the day prior to the Storage Design and Modeling working group comments due date.

15. Provide your organization's comments regarding the materials and upcoming discussion on the co-located variable energy resource Follow DOT topic. This topic will be discussed during the next stakeholder meeting (scheduled for Dec. 4).

CESA looks forward to having additional discussions on December 4th. The current follow DOT instruction is overly restrictive when ancillary services are awarded to co-located resources.

Allocating upward headroom below the ACC pro rata by VER resource dispatch seems a reasonable starting point.

16. Provide your organization's comments regarding the upcoming discussion on mixed-fuel ancillary services. This topic will be discussed during the next stakeholder meeting (scheduled for Dec. 4).

No comment.

17. Please provide any additional comments, feedback, or examples in the Nov 12 stakeholder meeting. You may upload examples or data using the Attachments field below.

No additional comments.