



Submit comment on Energy storage enhancements - straw proposal

Initiative: Energy storage enhancements

1. Please provide a summary of your organization's general comments on the straw proposal presentation for this initiative:

The California Energy Storage Alliance (CESA) appreciates the opportunity to provide feedback on the California Independent System Operator's (CAISO or ISO) Energy Storage Enhancements (ESE) Straw Proposal. CESA recognizes the leadership of the ISO in addressing potential improvements to the modeling, treatment and optimization of storage assets. With approximately 4 GW of grid-connected storage expected by the beginning of 2022, CESA supports the CAISO's foresight to enable storage assets to substantially contribute to advance decarbonization while maintaining reliability by absorbing excess renewable energy for later use, reducing reliance on emitting local resources, and meeting ramping needs, among other use cases and benefits.

In this context, while CESA welcomes several of the ISO's proposals for storage assets, we recommend these should not be limited solely to a novel participation pathway, but are, to the extent possible, applied to the current non-generator resource (NGR) model as well. CESA also recognizes that the ISO's intent to create a state-of-charge exceptional dispatch (SOC ED) instruction that accounts for energy market opportunity costs is a step in the right direction, yet it continues to underestimate the impacts such a directive would have on the economics of storage assets. Moreover, regarding co-located resources, CESA appreciates the ISO consideration of ITC rules within this initiative and welcomes the additional optionality the electable pathway described in the Straw Proposal would offer to resource owners and scheduling coordinators (SCs). As such, CESA's comments can be summarized as follows:

- **The CAISO should recognize that all storage resources, not just a subset of technologies, experience variations in their marginal costs relative to SOC**
 - New participation model is welcome but may create a disadvantage relative to NGR model
 - Both the NGR and the energy storage resource (ESR) models should offer the same level of granularity for the submission of bids, include representation of transition times, cycling limits and variable charge/discharge rates in the Masterfile
 - CAISO's intent to minimize changes to the NGR model is reasonable, CAISO staff should develop a path to use the lessons learned from ESR to apply to NGR
- **CAISO's proposal to compensate for holding state of charge is a step in the right direction, but fails to capture full market conditions**
 - Improving on the modeling of opportunity costs is urgent given the vast amount of storage expected to come online
 - *Ad minimum*, the CAISO should consider dispatch up to 24 hours past the SOC ED instruction to calculate opportunity costs
- **Increased optionality for co-located resources seeking the ITC is welcome**

- **CESA is concerned with the lack of substantial proposals to address challenges related to multi-interval optimization (MIO) despite robust discussion with Market Surveillance Committee (MSC)**
 - *Ad minimum*, the Bid Cost Recovery (BCR) mechanism should be revised to cover MIO until underlying issues with dispatch outside of resource bid curves are resolved

2. Provide your organization’s comments on the proposed energy storage resource model, as described in the straw proposal:

In the Straw Proposal, the ISO proposes the creation of a new storage participation pathway, the ESR model. The CAISO notes that this model would be available to storage assets in addition to the NGR model, which is currently used by most storage assets interconnected to the CAISO grid. CAISO staff notes that this model would address limitations of the NGR model that have been highlighted by the storage community in the last years; namely, the need to represent the impact state-of-charge (SOC) has on the marginal costs of storage assets.¹ In response to said feedback, the ISO proposes an ESR model in which storage asserts would be able to submit bids in terms on incremental SOC instead of traditional bids submitted in terms of incremental power output. This model would be operationalized by requiring assets to submit two sets of bid curves, one for charging and one for discharging, each with up to 10 bid segments.² In addition to this functionality, the ESR model would allow storage to:

- Indicate variable charging and discharging rates to represent the fact that these can degrade at both the high and low ends of SOC.³
- Enforce a minimum transition period, in minutes, to represent the time it would take a storage asset to go from charging to discharging, and vice versa.⁴

Importantly, CAISO states in the Straw Proposal that the development of this new model may obviate the need for some of the possible improvements to the NGR model, and requests comments on whether the ESR model would be attractive and if assets would prefer one model over the other.⁵

While CESA welcomes the innovative approach the ISO is considering to better incorporate energy storage assets to its markets, it is not readily obvious why some of the improvements the ESR model has over the NGR model cannot be readily applied to the latter. CESA understands that modifications to the fundamental bidding structure of the NGR model should be approached with caution as this is the current pathway most energy storage assets are set to use in the coming years. Nevertheless, to avoid creating disadvantages for NGR resources relative to ESR, the ISO should consider, *ad minimum*, the following modifications for the NGR model:

- Both NGR and ESR should allow bid curves with the same number of bid segments.
- Both NGR and ESR should include representation of transition times, cycling limits, and variable charge/discharge rates in the Masterfile.
 - As noted by the ISO, transition times would be 0 minutes for most storage assets participating under the NGR model; as such, this would be a clerical addition in most cases.
 - Reflecting cycling limits in the Masterfile for NGR resources is necessary and it is aligned with current resource adequacy (RA) reform discussions.

¹ Straw Proposal, at 7.

² *Ibid.*

³ Straw Proposal, at 9.

⁴ *Ibid.*

⁵ Straw Proposal, at 8.

- Representation of variable charge and discharge rates should be considered for NGR to minimize the likelihood of unfeasible dispatch instructions that may hinder system reliability.

If the ISO does not apply these changes for both participation pathways, CESA considers there would be clear advantages for ESR resources as they would be better positioned to represent their marginal costs and ensure unfeasible dispatch instructions are minimized. Finally, CESA requests that, if the ISO continues development of the ESR model, it should lay out a strategy to incorporate lessons learned from the ESR model to the NGR model. In essence, CESA does not agree with the ISO's statement that developing a new participation pathway obviates the need to improve upon the NGR model.

3. Provide your organization's comments on the proposed reliability enhancements for storage resources, as described in the straw proposal:

In the Straw Proposal, the ISO lays out a number of proposals set to enhance the reliability of storage operations. In this section, CESA focuses on the proposal to establish an SOC ED instruction. The ISO notes that developing this ED instruction is necessary as, today, the ISO is unable to instruct a storage asset to reach and hold an SOC.⁶ In essence, this proposal seeks to replace the minimum SOC (MSOC) requirement which the ISO introduced in 2021 by creating a new type of ED and compensating energy storage resources for it through a calculation of lost energy revenues.⁷

Regarding compensation, the ISO proposes that resources issued ED to hold SOC will be compensated at the difference between the prevailing price during the exceptional dispatch and the reference interval discharge price.⁸ The ISO notes that the reference interval discharge price will be the period when the storage resource discharges to sell energy, and that this period will have a time limitation.⁹ As such, if the ISO issues an ED to a storage resource to hold SOC for an hour, and prevailing prices at that resource's location are \$100/MWh, and the resource sells energy later in the day, after the exceptional dispatch, for \$80/MWh, the ISO will compensate the resource for the \$20/MWh, or the difference between prices during the exceptional dispatch and reference interval dispatch.¹⁰

CESA considers that the CAISO's proposal is a step in the right direction as it recognizes that energy storage resource economics are severely affected by directives to retain SOC. While addressing potential revenue loss from the energy market is essential, CAISO's proposal to compensate for holding state of charge fails to capture full market conditions. The ISO notes that re-running and generating new prices when a storage resource was prevented from discharging due to the exceptional dispatch to hold state of charge would be computationally difficult and burdensome for the ISO. As such, the Straw Proposal notes this is not something staff is willing to explore at this time.¹¹ CESA considers this hesitance seems to ignore the relevance and frequency of these analyses.

Improving on the modeling of opportunity costs for storage is urgent given the vast amount of storage expected to come online in the next decade. Planning processes across the State signal that as

⁶ Straw Proposal, at 11.

⁷ Straw Proposal, at 12.

⁸ Straw Proposal, at 13.

⁹ *Ibid.*

¹⁰ *Ibid.*

¹¹ Straw Proposal, at 12.

much as 14 GW of incremental energy storage assets will be needed by 2032, as such, the ISO must commence preparing its optimization and compensation algorithms for a system in which storage, not fossil-fueled assets, are the primary providers of capacity. Moreover, this significant volume of energy storage will most likely erode some of the challenges of retaining SOC for the peak-net peak period. This in turn is likely to mitigate the need for SOC ED instructions for system needs. As such, it can be assumed that these types of EDs will not be as frequent as to make it impossible for the CAISO to evaluate counterfactual prices for settlement. In contrast to system needs, it is more likely that SOC ED instructions would be issued to ensure sufficiency and reliability in local areas with limited transmission and/or generation assets. In these circumstances, by definition, there are few market participants. As a result of this lack of competitors, the issuance of an SOC ED could materially affect market conditions; thus, re-estimating prices would be essential to properly compensate the storage asset. Hence, CESA requests the ISO reevaluates and refines this proposal considering that the burden of these analyses may (1) not be as frequent, and (2) be essential in the context of local reliability areas.

CESA recognizes that some of the modifications enlisted above may require significant effort on part of the ISO. While the ISO considers pathways to better reflect opportunity costs related to the SOC ED, CESA requests that, *ad minimum*, the CAISO modifies this proposal so that settlement for SOC ED considers dispatch up to 24 hours past the SOC ED instruction in its calculating of opportunity costs. This modification is essential as resources might be instructed to hold SOC during the peak period for the purposes of meeting net peak needs. If this is the case, the ISO would be amiss if it only considered the actions of the storage asset in the last couple of hours of the day as reference price points. The economics of storage resources do not restart at midnight, as such, the arbitrary time limit proposed by the ISO should be revised.

4. Provide your organization's comments on the proposed co-located enhancements, as described in the straw proposal:

In the Straw Proposal, the ISO proposes to implement a new electable co-located model to ease compliance with the federal Investment Tax Credit (ITC). Under this model:

- Storage would not dispatched above co-located renewable schedule
- Storage may deviate down to match solar, when less than forecast
 - Deviations will be subject to imbalance energy charges
- Storage would submit outage cards to signal when it has been depleted and has no ability to charge

Overall, CESA welcomes the increased optionality offered by the ISO through this electable model. CESA considers the application of this alternative model will better enable the ISO to obtain insights regarding the economics and participation of both hybrid and co-located assets.

5. Provide your organization's comments on the proposed EIM classification for this initiative, as described in the straw proposal:

CESA offers no comments at this time.

6. Provide your organization's additional comments on the Straw Proposal:

CESA is concerned with the ISO's omission of MIO topics within the Straw Proposal. As noted in prior comments by CESA and other stakeholder, MIO often produces real-time dispatch instructions

that are not aligned with the bid curves for storage resources under the NGR model. These instructions can and have occurred in periods with significant reliability risk. This occurs due to the fact that the MIO estimates market conditions several intervals in the future, known as the advisory intervals, to generate dispatch signals for resources in the immediately following interval, known as the binding interval. While CESA understands that this type of functionality is needed to optimize real-time dispatch, this tool does not adequately represent storage resources that can ramp up and down instantaneously. In this context, the MIO might overlook awards in prior market runs, basing dispatch on expectations for future prices. This, in turn, frequently creates adverse outcomes for storage resources, impacting both system reliability and the economics of these assets.

CESA greatly appreciated the discussions on MIO that have taken place with the MSC. In light of those conversations, CESA requests the ISO seriously contemplates improvements for the MIO as it applies to storage. CESA considers that, *ad minimum*, the Bid Cost Recovery (BCR) mechanism should be revised to cover MIO until underlying issues with dispatch outside of resource bid curves are resolved. CESA welcomes discussion on how the BCR formulation for storage can be improved in this regard; whether it is through revising the BCR calculus itself or the time period used for its calculation. CESA welcomes the opportunity to further collaborate with the ISO and other stakeholders on this issue.