



Comments on Issue Paper

Initiative: Energy storage enhancements

Comment period

May 06, 2021, 08:00 am - May 19, 2021, 05:00 pm

Submitting organizations

California Energy Storage Alliance

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Submitted on 05/19/2021, 04:46 pm

Contact

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1. Please provide a summary of your organization's general comments on the issue paper, including reprioritization (if any) of the proposed issues in scope:

The California Energy Storage Alliance (CESA) recognizes the leadership of the CAISO with regard to revising market design elements that currently overlook the specific operational characteristics of energy storage assets. As the ISO notes within the Issue Paper, energy storage is set to be a key resource type to meet our peak net loads, particularly considering California's energy and climate targets.^[1] Thus, addressing issues related to energy storage participation is timely and necessary in order to fully integrate these resources into the market, leverage the flexibility of these assets to maintain grid reliability, support an efficient marketplace that delivers savings to ratepayers, and maximize their use to achieve the State's clean energy goals.^[2]

The present effort is the result of several months of active engagement between ISO staff and the energy storage stakeholder community within the Resource Adequacy (RA) Enhancements Initiative. In RA Enhancements, ISO staff proposed a means to ensure RA energy storage assets with a Day-Ahead (DA) schedule would have sufficient state-of-charge (SOC) to meet said schedule: the minimum state-of-charge (MSOC) requirement. In said initiative, energy storage stakeholders noted a series of necessary improvements to the CAISO's treatment of storage assets that could, jointly, minimize the need for a tool akin to the MSOC and ensure proper compensation of opportunity costs in the case the MSOC was applied.^[3] In response, ISO staff recommended adopting an MSOC requirement designed to be applied only in critical days (*i.e.* those with a residual unit commitment (RUC) process unfeasibility), paired with a two-year sunset clause. Notably, the adopted MSOC proposal does not include a means to compensate energy storage assets for potentially forgone revenues resultant from its application. In the RA Enhancements Phase 1 Final Proposal, the ISO noted that a stakeholder initiative would be launched to identify a successor mechanism to the MSOC, and address other issues identified by storage stakeholders.

As a result of its procedural background, the Energy Storage Enhancements Initiative encompasses a wide array of issues: some of them are related to energy storage participation broadly, while others are directly related to the replacement of the MSOC. While CESA generally agrees with the issues put forth by the ISO within the Issue Paper, the establishment of a form of prioritization is necessary to ensure timely and actionable outcomes.

CESA supports prioritizing elements of the CAISO's market design that, due to their formulation, currently hinder the economic dispatch and utilization of storage assets; namely, the multi-interval optimization (MIO) tool, the application of "spread bidding" and bid-cost recovery (BCR) to energy storage, and the ability to represent marginal costs related to cycling and SOC. Revising these elements can ensure energy storage is dispatched feasibly and economically, and that all the services rendered by it are properly compensated. Moreover, the revision of these elements could influence the scope and formulation of any MSOC successor. Once these elements are considered, CESA recommends assessing potential replacements for the MSOC requirement, which include the extension of the Real-Time (RT) market's optimization horizon, the establishment of an energy shifting product, or the creation of a biddable stored energy product. As such, CESA proposes dividing this initiative into two phases: Phases 1 and 2. CESA's prioritization proposal is summarized in the following procedural calendar and justified in the answers for Questions 2-5.

Phase 1: Energy Storage Management, Operation, and Compensation (targeting December 2021 Board of Governors meeting)

- Reflection of SOC and cycling within marginal costs
- Revision of the MIO tool
- Spread bidding revision
- Revision of the BCR mechanism
- Revision of variable charging rates
- Revisions to exceptional dispatch

Phase 2: Ensuring State-of-Charge (targeting Q1 2022 Board of Governors meeting)

- Understanding the challenges of extending the RT market's optimization horizon
- Scoping the energy shifting product

[1] See Issue Paper at 10.

[2] See Issue Paper, at 3.

[3] See CESA, "Comments of the California Energy Storage Alliance on the RA Enhancements Initiative Phase 1 Draft Final Proposal."

2. Provide your organization's comments on whether to include issues related to representing marginal costs as a scope item for this initiative (including whether to include modifying the Multi-Interval Optimization (MIO) and Spread bidding, and modifying the cost recovery rules for storage):

CESA strongly supports the inclusion of issues considered as "related to representing marginal costs". This collection of issues, which include spread bidding, modifying the MIO tool and revising the BCR mechanism in addition to improving the representation of marginal costs, could be better

understood as market elements that require modifications to properly utilize storage assets available to the ISO. As such, addressing these issues will have a substantial effect on the ability of asset owners to properly manage their resource, and of the ISO to maximize their utilization. In this context, CESA deems these topics should have the highest priority. In the following paragraphs, CESA elaborates on the urgency to address each of the topics contained within this section and shares some preliminary solutions for the ISO to consider.

Spread bidding: The ISO must fundamentally revise its RT market structure to properly represent the bid curves submitted by asset operators. Currently, the ISO's RT market captures the bid curves supplied by storage operators and oftentimes dispatches them according to the implied spread between charge and discharge bids. CESA notes that this method carries potential risks as some resources might receive uneconomic instructions regardless of the expected spread. Moreover, this limits the owner's management of their asset and introduces substantial financial and contractual risks, both key components to secure financing. Consider a storage asset that has a revenue obligation to discharge every time prices hit a particular threshold; this cannot be guaranteed given the current spread bidding practice. This practice, in turn, increases the likelihood RA-providing resources participating in the RT market would find themselves unable to comply with DA schedules, the precise situation the ISO has sought to minimize with the MSOC. Hence, CESA urges the ISO to reform the RT market optimization tools to act based on specific bid points and not expected spreads.

The Multi-Interval Optimization (MIO) Tool: The current MIO tool does not adequately process the bid curves submitted by storage assets. This is due to the tool's focus on conventional resources. This focus can result in high power charge commands when the storage asset is reaching full SOC, consecutive charging commands despite the asset being at 100% SOC, and discharge directives despite the resource having a discharge schedule just ahead of the MIO horizon, among other operational issues. As a result, the MIO software's operation can lead to undesired discharge in intervals prior to the evening peak, potentially causing reliability concerns similar to the ones the ISO sought to mitigate with the MSOC. In order to address the limitations of MIO, CESA supports the proposals made by LS Power within the RA Enhancements Initiative. LS Power offered two solutions for this issue: (1) link real-time dispatch (RTD) instructions directly to the binding interval and not the advisory intervals; or, (2) reduce the number of advisory intervals for NGRs from 13 to two or three. CESA agrees with these recommendations as resource owners already face strong incentives to align their behavior with reliability-driven outcomes (i.e. abide to their DA schedules given the penalties associated with them).

The Bid-Cost Recovery (BCR) Mechanism: Currently, BCR is calculated using settled cost and revenue values from the DA and RT markets. These values are netted across the day (24 hours) for the RT market. This mechanism is incapable of identifying circumstances when a storage asset would "fall short" on its revenue requirements since, compounded with the practice of spread bidding, the netting of the BCR over a 24 hour period would invariably result in no need for compensation. Given this limitation, energy storage stakeholders have proposed to the ISO to either net costs and revenues for BCR over a charge/discharge cycle (e.g. 8-9 hours for a 4-hour battery) or netting all costs to charge the resource with the revenue from discharging to ensure the bid spread for the resource is covered. *Prima facie*, CESA considers the latter solution would be the most adequate to properly compensate all types of energy storage assets, regardless of their duration.

Reflection of SOC and cycling within marginal costs: CESA appreciates the ISO's consideration of means to improve the reflection of several costs incurred by energy storage resources. In the Issue Paper, the ISO notes that several storage stakeholders have advocated for a modification that would allow them to alter their bids based on their resource's SOC. CESA, within the RA Enhancements Initiative, proposed to adapt the policy adopted by the Electric Reliability Council of

Texas (ERCOT) which allows storage to update its bid curves at every five-minute interval, rather than submitting bid curves for all five-minute intervals for the following hour. CESA recognizes the ISO's consideration of this proposal; however, given the urgency to address this issue and that the ISO notes this does not represent a feasible near-term solution, CESA favors evaluating the proposal to allow storage assets to submit multiple RT market bid curves that are dependent on SOC. Regarding the issue of cycling, CESA considers this could be incorporated in the same fashion: resources willing to cycle more than once could submit a series of bids curves dependent on SOC and the current cycle. In addition, CESA recommends that CAISO explore adding the reporting of CAISO's modeled SOC value for NGR battery assets. This would enable asset operators to understand the energy budget CASIO believes an asset will have.

3. Provide your organization's comments on whether to include a tool to ensure state of charge topic as a scope item for this initiative and early preference for a solution to this issue:

As noted in CESA's responses to Question 1, CESA appreciates the ISO's commitment to timely find a successor for the MSOC requirement. Given the ISO's intention to revise market elements that conflict with the operational nature of energy storage resources, the revision of these elements could influence the scope and formulation of any MSOC successor. As such, CESA recommends that the ISO assess potential MSOC replacements once revisions to other market elements are considered. Within the Issue Paper, the ISO puts forth four alternatives to ensuring SOC: the extension of the Real-Time (RT) market's optimization horizon, the establishment of an energy shifting product, or the creation of a biddable stored energy product.

Within the Issue Paper, the ISO notes that the first potential solution, extending the RT market, is not technologically feasible. While CESA respects the ISO's conclusions, more clarity regarding the costs and challenges of expanding the RT optimization horizon would enable stakeholders to better evaluate this proposal and provide substantive feedback on if and when the ISO should pursue this option. In light of the complexities linked with extending the RT optimization horizon and the need to replace the MSOC requirement, CESA recommends the ISO focus its attention on the second proposed solution: creating an energy shifting product.

In the RA Enhancements Initiative, CESA advocated for the creation of an energy shifting product as it would directly address the issue that ISO has tried to solve with its MSOC: incenting storage assets to engage in daily diurnal energy arbitrage.^[1] This product could complement market signals sent by energy and ancillary services pricing to incent shifting behavior while properly compensating storage assets for the services they render. CESA supports this potential policy direction, as its effects could ease storage development, not just operation, and would welcome further engagement around the design of this product. In particular:

How could it affect existing market products (energy and ancillary services)?

How could it support co-optimization across products and time horizons?

How could it create efficiencies for the market and economic value for ratepayers?

It is also worth noting that the CAISO's Day-Ahead Market Enhancements (DAME) considers new market products and other modifications that could potentially affect the development of an energy shifting product. As such, CESA requests the ISO considers the merits of evaluating the development of this product within or in parallel of the DAME initiative, in order to minimize divergent

policy development and enhance the synergies across proposed solutions. In addition, CESA recommends that CAISO explore adding regulation throughput considerations to its SOC management. This could enable CAISO to consider the impact of regulation dispatches on schedule feasibility.

Currently, the CPUC estimates that around 11 GW of energy storage will be needed by 2030 in order to meet California's ambitious energy goals. Given the growth of energy storage is directly related to the State's commitment to decarbonization, the ISO has the opportunity to clearly define a product that could further facilitate the market integration of storage resources set to provide daily solar energy shifting. As such, the establishment of an energy shifting product could both ease the ISO's concerns regarding ensuring SOC and facilitate the development and contracting of resources that will be certainly required to maintain reliability and achieve California's energy and environmental goals.

[\[1\]](#) See CESA, "Comments of the California Energy Storage Alliance on the RA Enhancements Initiative Phase 1 Draft Final Proposal."

4. Provide your organization's comments on whether to include variable charging rates as a scope item for this initiative:

CESA supports the inclusion of the variable charging rates issue within the scope of this Initiative. As noted in our response to Question 2, currently, the ISO may issue dispatch instructions that direct a battery storage resource to aggressively charge in periods where the SOC is nearing 100%. These instructions are often unfeasible since some storage technologies like lithium-ion, alike most electrochemical storage technologies, have diminishing charge acceptance rates. In essence, one can think of the charge rate as a function with an inverse relationship with the SOC. Given this physical consideration, the ISO is correct in including this issue in the scope.

In order to address this challenge, the ISO asks stakeholders if options currently available on the resource's side could be used. CESA considers this could be resolved by allowing resources to communicate a charging rate curve by SOC as part of the Masterfile. This would allow resources to communicate the fact that its charging rate varies depending on the SOC range it is at.

5. Provide your organization's comments on whether to include exceptional dispatch as a scope item for this initiative:

CESA appreciates the ISO's consideration of exceptional dispatch within the Issue Paper. As noted by the ISO there are two potential types of exceptional dispatch that merit revision with regards to their application for energy storage. First, the case when an asset is exceptionally dispatched at 0 MW, essentially retaining SOC. CESA considers that compensation for opportunity costs under this scenario is warranted.

The second case describes a situation in which operators specifically procure SOC rather than a target MW amount. While CESA can appreciate the potential for this case, the development of an

energy shifting product could substantially decrease the need for such a form of exceptional dispatch (ED). Hence, CESA recommends the ISO focus this initiative's efforts on developing an ED compensation framework that properly characterizes the opportunity costs forgone by storage asset that has been directed to hold SOC.

6. Provide any additional comments on the issue paper, or any additional scope items your organization feels should be included for this initiative. You may upload examples and data using the "attachments" field below:

CESA notes that the grid-scale storage resources being deployed onto the CAISO grid also include long duration and emerging technologies beyond lithium-ion batteries. As the ISO considers how to best integrate storage resources through this initiative and others, it should ensure that market changes consider the impact to all types of storage resources.