



Submit comment on Issue paper and working group discussion

Initiative: Energy storage enhancements

1. Please provide a summary of your organization's general comments on the working group presentations and the scope of issues for this initiative:

The California Energy Storage Alliance (CESA) appreciated the opportunity to present at the stakeholder meeting on July 26, 2021, along with a number of other presenters. With over 1.8 GW of grid-connected storage expected by September 2021, CESA continues to support the importance of this initiative to make the enhancements needed for energy storage participation in a market designed for conventional assets. Storage is poised 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. Importantly, CESA stresses that any method to preserve state-of-charge (SOC) to meet system needs must:

- Be a market-driven solution dependent on prices
- Properly compensate storage resources for their SOC and opportunity costs
- Balance the need for certainty with the need for fast and flexible capacity

Having presented at the July 26, 2021 workshop and reviewing other stakeholders' presentations, CESA summarizes our comments as follows:

- Energy storage should be able to represent variable charging rates in the Masterfile and be allowed to submit multiple real-time bid curves that are dependent on SOC and cycle.
- CESA supports proposals to dispatch and compensate storage resources in accordance with their bid curves, including in calculating bid cost recovery (BCR) compensation.
- CESA favors investigation into ways to fully capture the demand for energy in market prices ahead of implementation of an additional market product.
- If there is no feasible way to fully capture the demand for energy in market prices, CESA favors the development of a Biddable Energy Shift Product to replace the minimum state of charge (MSOC) requirement; as details are developed and Summer 2021 operational data is reviewed, CESA supports a priority focus on Phase 1 market enhancements regarding multi-interval optimization (MIO), BCR, and exceptional dispatch (ED).

2. Provide your organization's comments on the presentations provided by stakeholders at the working group:

Marginal costs and variable charging rates

Marginal costs are affected by multiple factors (cycling, charging costs) – many of which have been explored to some degree in other initiatives, such as ESDER 4 and the Variable O&M Review

Initiatives. However, the current market bidding functionality does not allow batteries to precisely reflect cycling costs, even if additional cycling could be economic to meet reliability needs. At the workshop, CESA thus recommended that energy storage be allowed to submit multiple real-time bid curves that are dependent on SOC and cycle, in lieu of a proposal that would allow storage to update its bid curves at every five-minute interval, which the ISO explained in its Issue Paper as being infeasible in the near term.

In addition, CESA supports the various recommendations by GDS, LS Power, and Vistra to have storage operators have the ability to represent their marginal operating costs as a function of SOC, whereas the ISO currently requires a constant rate of charge in the Masterfile. As presented by storage operators, battery storage resources have variable charging rates that depend on the SOC range, particularly as the resource approaches 100% SOC. As a physical characteristic that the ISO has historically considered in a resource's bidding parameters, this represents a reasonable and near-term fix to enable more efficient market participation of battery storage resources and avoid less efficient outcomes such as oversizing energy storage resources to be able to represent a constant charge rate.

Multi-interval optimization (MIO) and spread bidding

As highlighted in examples presented by LS Power, CESA agrees that the ISO must fundamentally revise its RT market structure to properly represent the bid curves submitted by asset operators in order to mitigate risks of uneconomic dispatches due to the expected spread, informed by future advisory prices. 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. Resources with day-ahead obligations would carry the additional loss of an undelivered day-ahead award in the same example. In order to address the limitations of MIO, CESA supports recommendations to: (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.

Considering MIO and spread bidding are linked in many ways, CESA believes that these issues and solutions should be addressed in tandem. While some stakeholders have expressed concern with applying different rules or processes for storage as compared to other resource types, the unique characteristics of energy storage as an arbitraging resource as opposed to a pure load or pure generation resource warrants such different considerations.

Bid cost recovery (BCR)

Opportunity costs are essential as storage is energy-limited. However, currently, BCR is calculated using settled cost and revenue values from the DA and RT markets and netted across the day (24 hours) for the RT market, often leading to no need for compensation to be determined. As presented by LS Power, CESA recommends that BCR be calculated based on NGR settlements had they been dispatched on actual bids and binding prices, undoing financial damage caused by MIO. A fix to BCR by netting all costs to charge the resource with the revenue from discharging would also address many of the issues with ED and the MSOC, which as currently constructed do not compensate in-market storage resources with the lost opportunity costs of being held to a specific charge or held back for ED purposes. Compensation via BCR is needed for losses incurred due to the MIO, ED, or MSOC relative to if dispatch had been determined by bids and on binding interval prices. As such, fixing BCR, along with other elements of the ISO's current optimization and usage of energy storage assets, should be a priority of this initiative.

Exceptional dispatch (ED)

In addition to the various improvements to more efficiently operationalize ED for energy storage resources (e.g., reflecting physical limits, accounting for manual processes), CESA agrees with LS Power on the importance and need for storage resources subject to ED to be made whole with compensation for their lost opportunity costs in line with their day-ahead schedules. This modification of ED rules would need to be aligned with the updated formulation of BCR for storage assets. In the meantime, the ISO should continue to collect data and publicly report on the instances and conditions during which ED is triggered for storage resources to inform this initiative and solutions developed herein.

Hybrid and co-located resources

WPTF discussed how hybrid resources are currently limited in their range for regulation, which is only limited to the battery storage component, not the full range that includes both the storage and generation range. Due to current market models turning market participants toward sub-optimal practices to control grid charging for ITC and property tax exemption compliance, LSA and SEIA proposed that bids should be allowed to be structured so that the storage resource ID charging schedules and dispatch are lower than VER resource ID production. CESA generally agrees with these concerns and adds that developers need clarification on how MSOC successors would interact with hybrid and co-located storage, particularly as it relates to the aforementioned concerns around charging from the grid.

Long-duration energy storage

WPTF and SDG&E recommended that long-duration storage and hydrogen storage technologies should be considered within this initiative since many of them have lower roundtrip efficiency and require additional bidding parameters (e.g., transition times, startup times, multiple ramp rates) and have multiple uses in the case of the latter. CESA agrees that this initiative should consider various market enhancements that provide clarity on market participation parameters for these resources, which have been directed for procurement by the CPUC.

Biddable Energy Shift Product, Biddable Stored Energy Product, and SOC Firming AS Product

Under a potential Biddable Energy Shift Product, CESA proposed that the ISO procure energy in the day-ahead market from the storage fleet at a specific bid price. This product would internalize the opportunity cost of storage retaining SOC for later periods. After storage clears for this product, a requirement would be imposed in real-time to prevent discharging below a certain shifting amount. The daily quantity purchased by the ISO could be based on the potential shortfall identified within the RUC analysis. CESA explained that this option is promising since it aligns with developments in the RA framework, is tradeable, eases contracting, provides assurances regarding the behavior of storage, and does not inhibit co-optimization of other services in RTD. By contrast, the Biddable Stored Energy Product could be developed as a real-time market product would have a constraint in both markets imposed on the energy storage resource based on the needed SOC inferred by the ISO. The requirement would specify a total amount of SOC in MWh based on bids for the SOC. While this option is workable, it may be more complex as it would require owners to internalize their opportunity cost in a higher number of bids. Moreover, this solution might require the inclusion of deliverability considerations to align with other ancillary services.

As explained in our presentation, among the two products, CESA favors the development of a Biddable Energy Shift Product to replace the MSOC. It is less complex and potentially addresses some of the ISO's concerns that led to their development and implementation of the MSOC in the first place. CESA sees some advantages for the Biddable Energy Shift Product in allowing owners to internalize their opportunity costs in hourly bids that would be seen as self-schedules by the ISO, not affecting co-optimization of other services in RTD, and providing advanced assurances regarding the

behavior of storage. CESA considers this product definition also minimizes the risks associated with paired storage assets, be it in a hybrid or co-located configuration, charging from the grid despite their intention to claim the ITC.

Whichever MSOC replacement that the CAISO deems necessary, CESA recommends that it should be tradeable in the Day-Ahead and Real-Time markets. This would ensure having market flexibility and efficiency in the current economic dispatch model, thus avoiding any undue financial burden on ratepayers.

At the same time, CESA recommends that the ISO prioritize the Phase 1 market enhancements on MIO, BCR, and ED because the MSOC is in place over the next two years, such that continued discussion and development of the details of any additional product can be targeted for mid-2022 to timely replace the MSOC before the sunset of the interim MSOC measure. CESA looks forward to collaborating with the ISO on whether and how a Biddable Energy Shift Product would affect existing market products (energy and ancillary services), be co-optimized across products and time horizons, maintain flexibility for storage operations, and interact with RA requirements and obligations. Furthermore, with several months of operational data on the use of the MSOC requirement along with Phase 1 enhancements to be considered, the ISO, CESA, and other stakeholders will have a better understanding of the magnitude and frequency of the critical reliability concerns of storage SOC, dispatch, and real-time market operations. This data may reveal whether additional products are necessary.

Finally, CESA appreciated PG&E's presentation on its proposed SOC Firming AS Product. At this time, CESA has no position on this product and looks forward to further detail on the mechanics of this proposal.

3. Provide any additional comments on the working group, 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:

As expressed in previous comments, CESA reiterates our recommendations to divide this initiative into two phases, summarized below:

- 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

In sum, CESA again recommends that the ISO assess potential MSOC replacements once revisions to other market elements are considered. It is important to focus on the immediate term on the day-to-day operational enhancements for energy storage resources given the volume of storage projects that are already online or are coming online in the next few months.