California ISO

Stakeholder Comments Template

Energy Storage and Distributed Energy Resources (ESDER) Phase 4

This template has been created for submission of stakeholder comments on the Revised Straw Proposal for ESDER Phase 4*.* The paper, stakeholder meeting presentation, and all information related to this initiative is located on the initiative webpage.

Upon completion of this template, please submit it to initiativecomments@caiso.com. Submissions are requested by close of business **November 12, 2019.**

Submitted by	Organization	Date Submitted
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Please provide your organization's general comments on the following issues and answers to specific requests.

San Diego Gas & Electric (SDG&E) appreciates the opportunity to comment on and support the general direction of CAISO's ESDER 4 Revised Straw Proposal. SDG&E offers the following comments on the revised straw proposal.

1. **End-of hour state-of-charge proposal**

SDG&E is generally supportive of the end-of-hour state-of-charge proposal. The scheduling coordinators will enter a minimum and maximum range to ensure that a certain amount of a capacity is available at the end of the hour in the real time market. This additional operating parameter will allow scheduling coordinators to have greater control of the energy storage resource in the real-time market and better inform their bidding strategy in the day-ahead market. This will better ensure alignment with end-of-day state-of-charge and the following day's day-ahead schedule to ensure feasible market scheduling and dispatch. The end-of-hour max and min should also better ensure that the resource can meet its service award obligations and that the CAISO can economically dispatch the resource, while also staying within a satisfactory state-of-charge range.

2. **Discussion of end-of-day state-of-charge**

3. **Market power mitigation for storage resources**

3.2 Modeling Default Energy Bids (DEB)

More practical experience with storage resources in the market may be needed in order to develop a fully fungible and functional default energy bid (DEB) that will reasonably approximate energy storage operating costs for most resource types. Trying to quantify a universal marginal cost for the purpose of establishing a DEB for all storage resources will be challenging even for illustrative purposes. DEB is important from a market power standpoint, but energy storage resources are still very limited from an overall capacity standpoint and competes with a large amount of dispatchable conventional generation. Therefore, energy storage resources are unlikely, as a practical matter, to have the theoretic ability to exert undue market power for quite some time.

DEBs may be especially premature since there are relatively few energy storage devices interconnected and participating in the CAISO markets. There are even fewer instances where these resources are being awarded energy bids. Most energy storage today is participating in the ancillary market in the form of regulation services (as displayed by Figure 5). Furthermore, the age of the resource, average ramping speeds, amount of deep cycling the battery performs and average state of charge will all lead to diverse degradation profiles and there is not a lot of practical evidence to model what such degradation will look like. In addition, round-trip efficiency losses can worsen over time and most likely in a nonlinear fashion. Lithium-ion batteries have varying chemistries, which could also result in dissimilar degradation profiles. In addition, developers account for battery cell degradation in different ways. Sometimes developers choose to oversize the battery to guarantee a certain amount of capacity throughout the life of the asset, while others may prefer to augment the battery cells at a future date in order to maintain the full qualifying capacity rating. These strategies could largely impact the degradation profiles of these energy storage resources and the subsequent marginal cost profile.

3.2 Assessing Cycling - Costs for Depth of Discharge Model

As a separate matter, lithium-ion battery degradation should not only model the depth of discharge (when the state-of-charge decreases) but also factor-in assumptions surrounding charging. For instance, charging the storage resource above 80% state-of-charge levels can also worsen the degradation profile of a lithium-ion battery which will worsen the storage resource’s performance over time. It appears from the DEB formula that only the total depth of discharged was modeled and accounted for in the formula. For the DEB formula to hold-up in practice, it would have to account for the two-way cycling of the batteries to truly escalate and monitor the marginal costs associated with both charging and discharging. Figure 6 only accounts for discharging, but charging the battery should account for similar variable degradation patterns. For example, charging from 40% to 60% would incur less total marginal costs then charging from 80% to 100%.

4. **Variable output demand response**

5. **Parameters to reflect demand response operational characteristics**

6. **Removing consideration of non-24x7 settlement of behind the meter resources under DER aggregation model**

7. Additional comments

Please offer any other feedback your organization would like to provide from the topics discussed during the working group meeting.