



California ISO

# **Energy Storage Enhancements**

Second Revised Straw Proposal  
Addendum

July 18, 2022

Market & Infrastructure Policy

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## 1 Storage Default Energy Bid

The ISO developed the default energy bid for storage resources in the energy storage and distributed energy resources (ESDER) initiative.<sup>1</sup> The default energy bid was discussed at great length with stakeholders and the market surveillance committee during public meetings and written materials posted to the initiative website.

The ISO proposed a default energy bid for storage resources that would accomplish three key principles. First, values for default energy bids should incorporate estimates of energy prices paid by storage resources to procure energy. Second, values should incorporate wear and tear due to the storage resource cycling to provide energy to the grid. This principle is most similar to those in place for traditional gas resources. Third, the ISO proposed that these values also incorporate an opportunity cost to avoid discharging the resource prior to the profit maximizing periods of the day. This aspect of the default energy bid captures that storage resources have a limited duration of discharge capability.

While the ISO was developing the formulation for the default energy bids, one suggestion for improvement, made by the market surveillance committee, was that a term in the day-ahead default energy bid to account for opportunity costs was unnecessary. The idea was that if a storage resource was dispatched by the day-ahead market, because the market considers all 24 hours when optimizing, it will automatically select the hours with the highest prices. This logic is valid in scenarios when a scheduling coordinator for a storage resource is bidding the same cost through all 24 hours and those costs match the default energy bid of the resource.

In light of this feedback and deep discussion with stakeholders the ISO proposed the following default energy bids in the energy storage and distributed energy resource initiative:

$$DA \text{ Storage } DEB = (MAX(E n_{\delta/\eta}, 0) + \rho) * 1.1$$

$$RT \text{ Storage } DEB = Max[(MAX(E n_{\delta/\eta}, 0) + \rho), OC_{\delta}] * 1.1$$

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<sup>1</sup> Energy storage and distributed energy resource initiative webpage:

<https://stakeholdercenter.caiso.com/StakeholderInitiatives/Energy-storage-and-distributed-energy-resources>.

Where:

- $E_n$ : Estimated cost for resource to buy energy
- $\delta$ : Energy duration
- $\eta$ : Round-trip efficiency
- $\rho$ : Variable cost
- OC: Opportunity Cost

These default energy bids were approved by FERC and introduced into the ISO market, alongside market power mitigation for storage, with the Fall 2021 software release. The ISO and market participants have now had time to observe actual performance of these formulas in the market.

### **Operational Experience**

A specific case was flagged and brought to the attention of the ISO by a storage scheduling coordinator, where the day-ahead dispatch schedule did not meet the third principle outlined by the ISO for storage default energy bids. Despite the scheduling coordinator bidding at a consistent price throughout the day, the resource was scheduled to discharge during the late afternoon hours and not during the highest priced hours in the evening. This happened because bids were higher than the default energy bids and market power mitigation triggered during the earlier hours of the day and not the later hours of the day. In this case, the market optimization chose to schedule the resources for discharge energy during periods when the resource appeared less expensive because of the mitigated bids.

A unique aspect of the storage default energy bid, is that it is computed from outputs of the market power mitigation pass of the day-ahead market, which are unknown to scheduling coordinators when they are submitting bids. This could lead to situations where storage resources are dispatched in a similar manner to the case outlined above.

In response to this operational feedback the ISO agrees that the outcome for this particular day is contrary to the principle expectations for how market power mitigation should be applied to storage resources. The ISO also acknowledges that even though this case was only for a specific day, this could be a routine occurrence under typical bidding circumstances. In light of these observations, the ISO proposes that the default energy bids be updated, so that the day-ahead formulation includes an opportunity cost. This will result in the same formulation for default energy bids for storage resources in the day-ahead and real-time markets. Specifically, the ISO proposes updating the existing formulations to the following equations:

$$DA \text{ Storage DEB} = \text{Max}[(\text{MAX}(En_{\delta/\eta}, 0) + \rho), OC_{\delta}] * 1.1$$

$$RT \text{ Storage DEB} = \text{Max}[(\text{MAX}(En_{\delta/\eta}, 0) + \rho), OC_{\delta}] * 1.1$$

Where:

- En*: Estimated cost for resource to buy energy
- δ*: Energy duration
- η*: Round-trip efficiency
- ρ*: Variable cost
- OC: Opportunity Cost

These proposed formulations should ensure that storage resources will be dispatched during the highest priced hours in the day-ahead market, in accordance with the principles initially outlined by the ISO.

## 2 Next Steps

The ISO proposes to include this change as a component of the scope in the energy storage enhancements initiative. This will allow the ISO time to socialize this proposal with stakeholders, request Board of Governors approval with other storage related topics, and address necessary changes to the tariff outlining how these calculations are carried out.

In light of these changes being posted to the initiative website after posting the second revised straw proposal and after the public meeting to discuss that proposal, the ISO is extending the deadline for comments by an additional week. Comments are now due on July 27, 2022 and may include feedback on the aspects of the proposal included in this addendum.