



California ISO

Energy Storage Enhancements – Energy Storage Model and Market Power Mitigation

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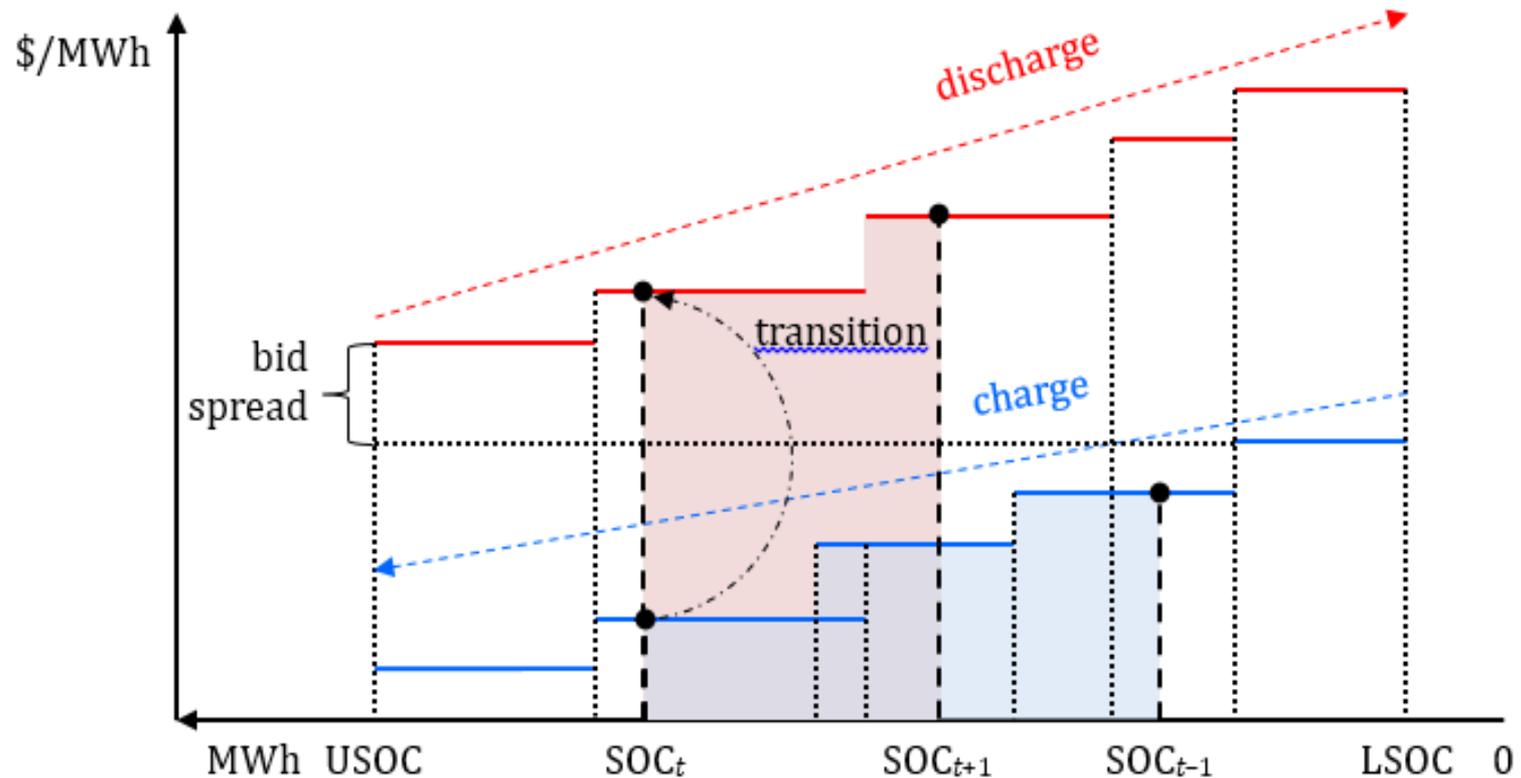
General Session

February 11, 2022

The ISO is proposing a new model for use by storage resources to participate in the market

- The ISO is developing a framework for a new energy storage resource model
- Energy storage resources will submit bids to the ISO in (MWh, Price) pairs, instead of (MW, price) pairs
 - Allows scheduling coordinators to place a monetary value on incremental state of charge
- Model also allows storage resources several other features
 - Resources may specify a time to transition to/from charging/discharging
 - Allows for reduced Pmax and Pmin values at high or low state of charge
- The ISO is not planning to retire or make any changes to the NGR model

The energy storage resource model will require bids for charging and discharging energy over the operation range



Similar to non-generator resources, energy storage resources will be subject to market power mitigation

- Non-generator resources are subject to market power mitigation, where default energy bids include:
 - Incremental cost to cycle the resource
 - Estimated cost to purchase energy
 - (RT) Opportunity cost for discharging energy
- The ISO proposes that energy storage resources also be subject to market power mitigation
 - Use the same underlying information as the NGR default energy bid
 - Incorporate a new 'sloped' concept to the default energy bid

The ISO proposes calculating a sloped default energy bid for the discharge bids for energy storage resources

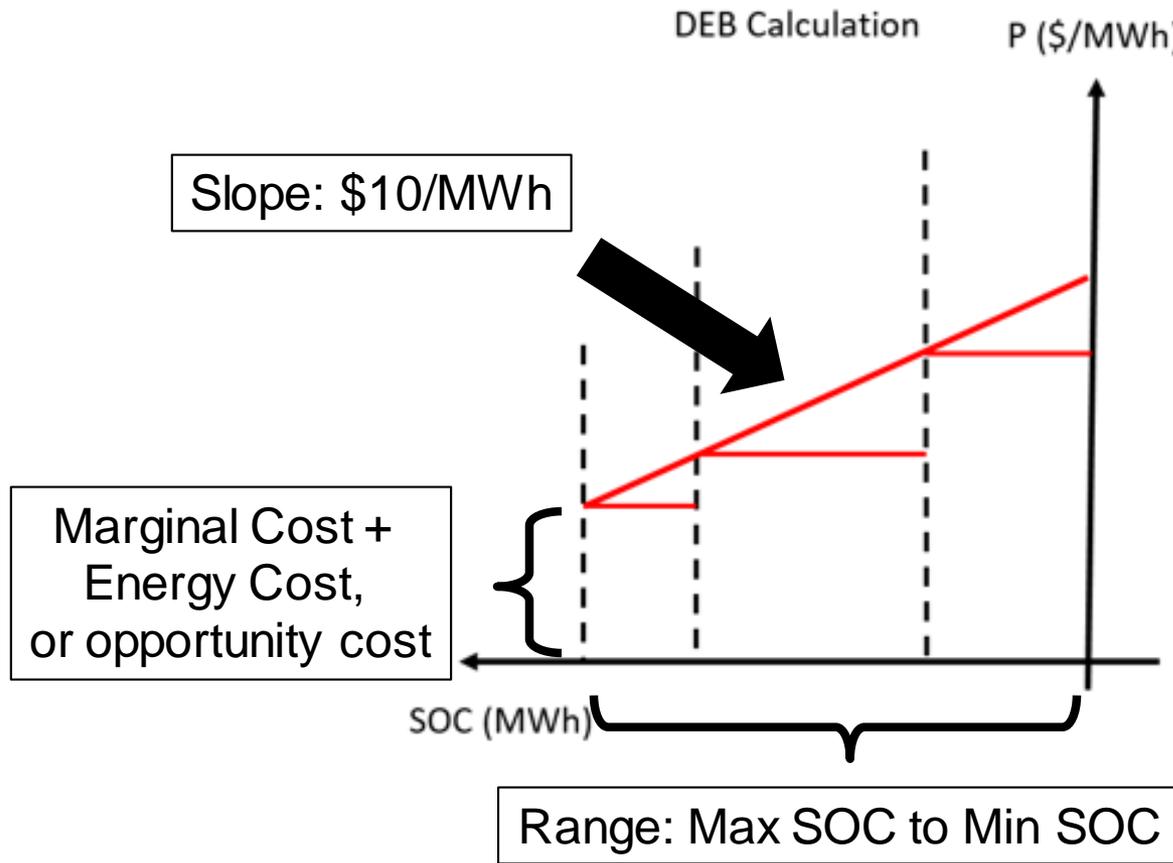
- Use cost information from the resource to determine the lower bound of the default energy bid for discharging energy
 - Cost to buy energy + marginal cycling cost, or opportunity cost
- Determine slope by using the average of the highest priced hours corresponding to the duration of the storage resource
 - The ISO will use the highest 4 hours of LMPs to determine the slope of the default energy bid for a four hour duration storage resource

Example:

Highest continuous prices: \$60/MWh, \$70/MWh, \$80/MWh, \$100/MWh

- Slope = $(\$100/\text{MWh} - \$60/\text{MWh}) / 4 \text{ hour} = \$10/\text{MWh}$

The default energy bid curve will be sloped, allowing



- 1) Red diagonal line: Sloped curve to inform default energy bids
- 2) Black vertical lines: Bid segments for resource
- 3) Red horizontal lines: Default energy bids