



California ISO

# Energy Storage Enhancements Straw Proposal

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# Agenda

Time	Item	Speaker
1:00-1:10	Introductions and Stakeholder Process	James Bishara
1:10-2:10	Alternate Storage Model	George Angelidis
2:10-3:00	Reliability Enhancements	Gabe, James Lynn
3:00-3:45	Co-Located Enhancements	Gabe Murtaugh
3:45-4:00	Next Steps	James Bishara

# ISO Policy Initiative Stakeholder Process

## PROPOSAL DEVELOPMENT

Issue paper and working groups

↳ Straw proposal

Draft final proposal

Draft business requirement specification

Draft tariff and business practice manual revisions

Final proposal

## DECISION

ISO Board

EIM Governing Body

Tariff filing

FERC

## IMPLEMENTATION

Business practice manual

Training

Market simulation

Go Live



Stakeholder input

We are here

# Energy Storage Enhancements Timeline

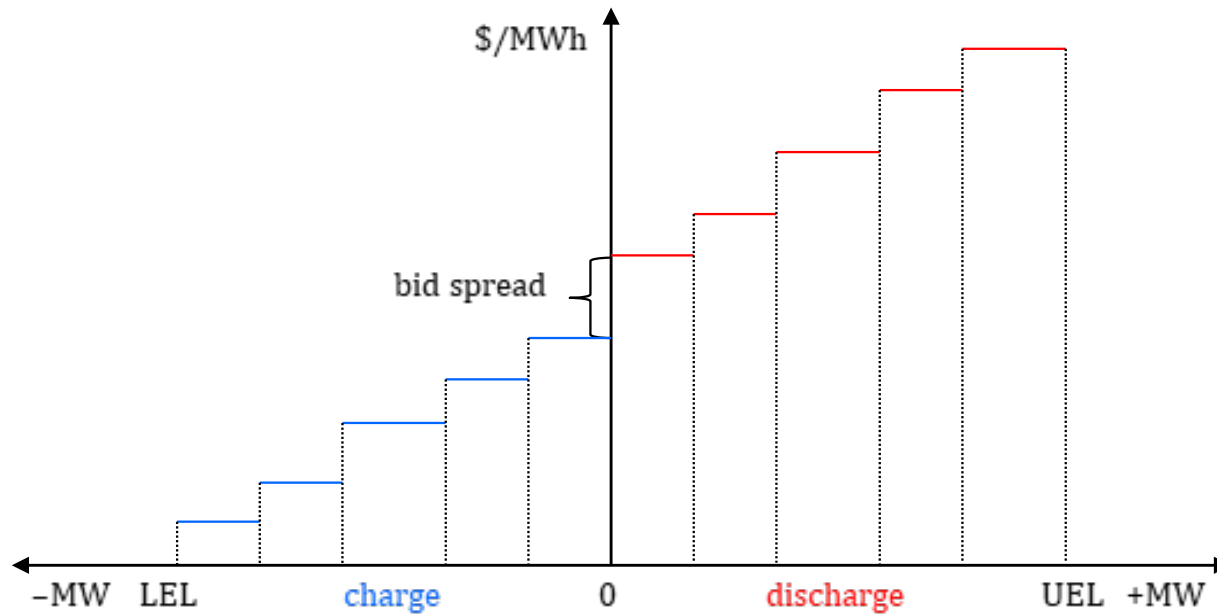
Thurs 10/28:	ISO's Storage Forum
Thurs 12/9:	Post Straw Proposal
Tues 12/14:	Stakeholder Meeting
Wed 1/12:	Comments Due
Q3 2022:	Board of Governors Meeting

# ALTERNATIVE STORAGE MODEL

# Existing Non-Generator Resource (NGR) model

- Limited Energy Storage Resource (LESR)
  - Used for energy storage resource participation
  - Support for charging (round-trip) efficiency
  - Support for State of Charge (SOC) constraints
  - Regulation Energy Management (REM)
- Dispatchable Demand Response (DDR)
  - Used for demand response participation
- Generic Non-Generator Resource (GNG)
  - Used for generic algebraic injections
    - Overlapping Resource Aggregation (ORA)
    - Dynamic exports at inter-tie Scheduling Points

# Existing LESR model energy bid



# Limitations of existing LESR model

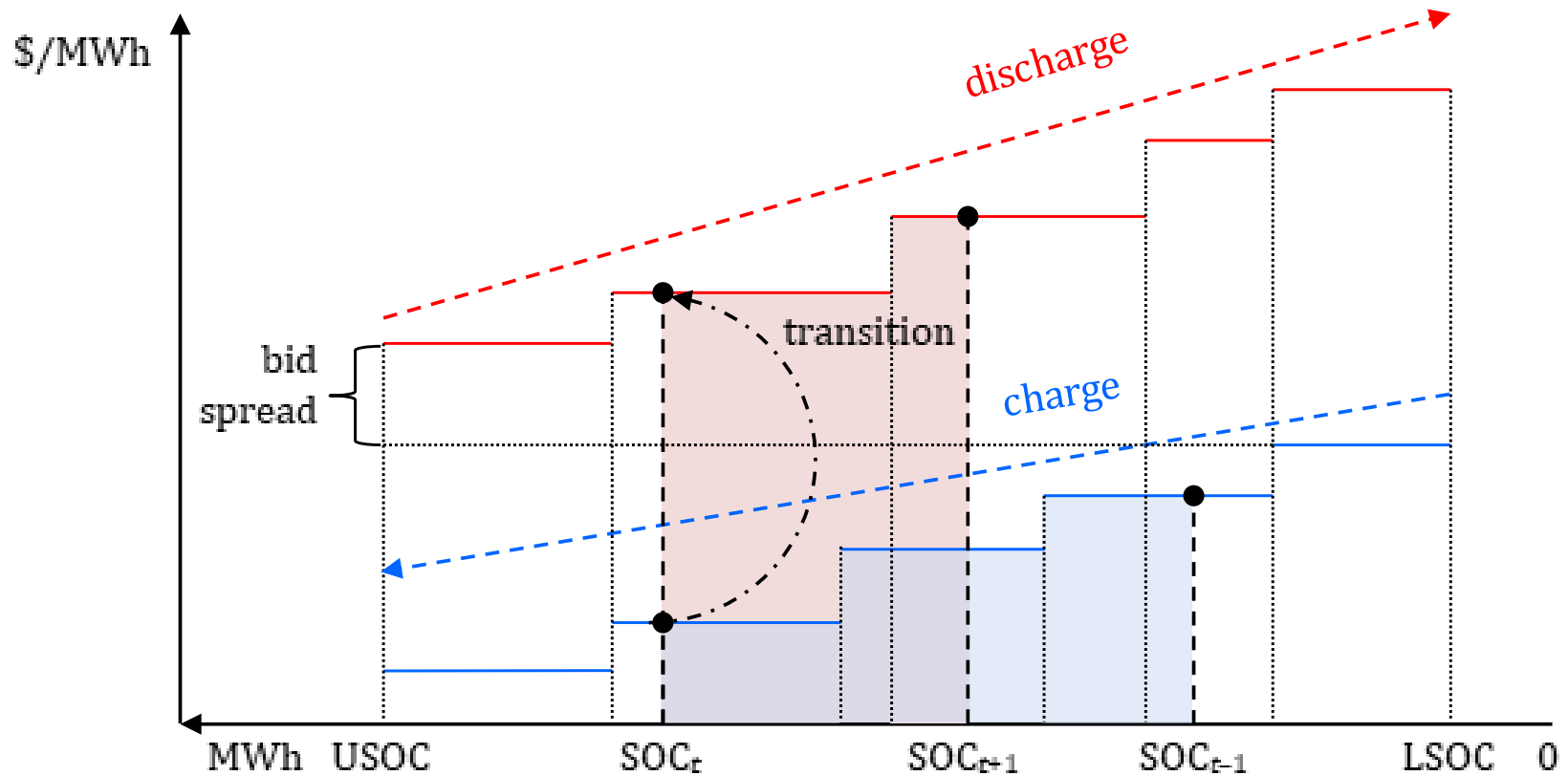
- Incremental energy bids do not reflect operating cost that depends on the SOC
  - Operating cost can be higher near SOC high/low limits
- Operating range depends on the SOC
  - Upper/lower capacity limits can be lower/higher near SOC low/high limits
- Ramp rate depends on the SOC
  - Rate of discharge/charge is reduced near SOC high/low limits
- Continuous linear operation without transition constraints or cost



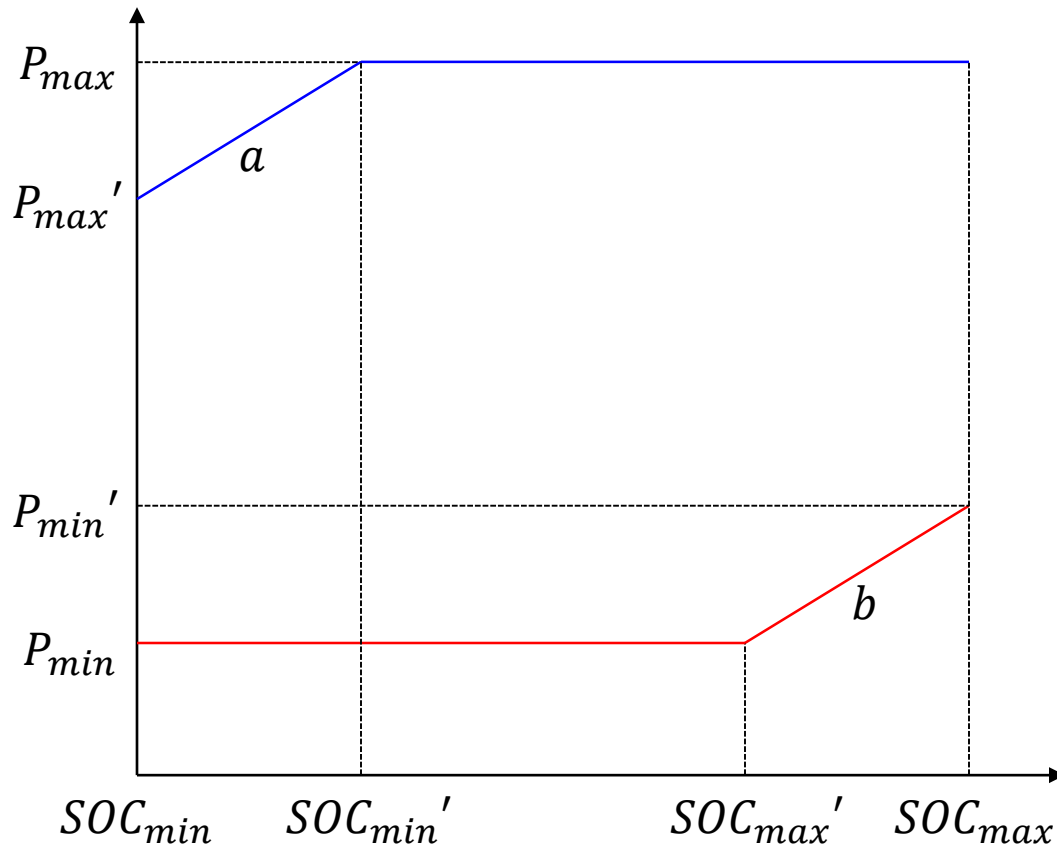
# New proposed alternative Energy Storage Resource (ESR) model

- Incremental energy bids depend on the SOC
  - Separate hourly bids for charging and discharging
- Upper/lower capacity limits depend on the SOC
  - Registered piece-wise linear functions in Master File
- Ramp rate depends on the SOC
  - Registered step function in Master File
- Can support charge-discharge transition constraints and cost
  - Daily transition bid costs for changing operating mode
  - Registered transition times and daily transition limit
  - Transition cost included in Bid Cost Recovery (BCR)

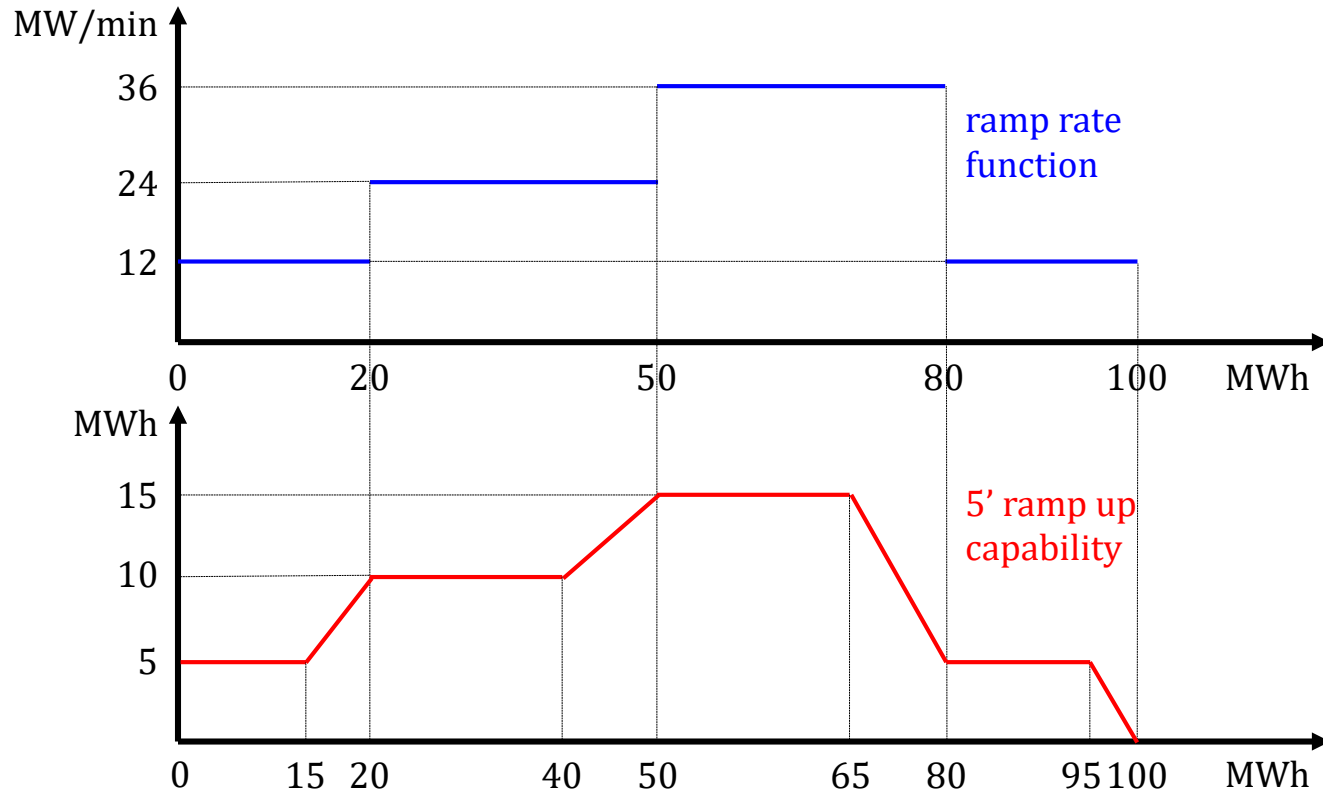
# New proposed ESR model energy bids



# New proposed ESR model dynamic capacity limits



# New proposed ESR model dynamic ramp rate



# RELIABILITY ENHANCEMENTS

## The ISO may propose to change the current rules for storage providing ancillary services

- Operators noted storage resources can run out of SOC, resulting in an inability to provide ancillary services
  - Storage schedules with ancillary services may be/become infeasible
- ISO may propose that storage resources must have an energy bid with an accompanying range of dispatch to provide ancillary services
- E.g. A +/- 100 MW storage resource, when awarded 100 MW of regulation up, will be required to also bid 100 MW of charging range, i.e. -100 MW to 0 MW
  - This will allow the ISO market software to optimally charge the storage resource if state of charge runs low

# The ISO is expanding the exceptional dispatch authority to include holding state of charge

- Traditional exceptional dispatch for generation is to move to a specific MW target
  - Compensation is at the higher of prevailing prices or bids
- Operators may desire to exceptionally dispatch storage to charge and then have them hold that state of charge
  - E.g. This could be for use later (expected high loads) or it could be to stand-by in the event a contingency occurs in a local area
- ISO will develop a new form of exceptional dispatch to handle this explicitly
  - Storage resources may either be exceptionally dispatched to a specific MW target or to hold a specific state of charge, but not both
  - Compensation for an exceptional dispatch to hold a specific state of charge will be compensated differently than traditional exceptional dispatches

## Exceptional dispatch to hold state of charge will be compensated at the opportunity cost

- Stakeholders raised concerns about requiring a storage resources to hold state of charge
  - Preventing discharge for a certain period of time precludes storage from participating in markets and earning revenues there
- ISO proposes an opportunity cost based payment for storage resources that are exceptionally dispatched to hold state of charge
  - I.e. If an ED holds state of charge for 2 hours in the day-ahead market when prices are \$60/MWh and \$100/MWh and sells energy after the exceptional dispatch at \$80/MWh, the ISO will offer compensation of an additional \$20/MWh to that resource
  - I.e. If an ED holds state of charge for 1 hour in the real-time market and prices are steady at \$50/MWh, but spike for one interval to \$100/MWh, and the resource later sells energy at \$60/MWh the ISO will compensate the resource for the one missed interval at \$40/MWh



The ISO will compensate storage, when exceptionally dispatched to hold state of charge, at a reference price

- The ISO will use existing locational marginal price profiles and actual schedules for when storage resources discharge energy to determine reference prices
  - The ISO will not ‘re-optimize’ the market with new generating patterns
- Additional compensation will be awarded based on prices while the resource was issued exceptional dispatch to hold state of charge and reference prices

## The ISO proposes enhancements to internal tools for use to ensure local reliability

- ISO local studies show how storage could be used in the planning horizon for local areas to meet reliability needs
  - Specify total amount of (4-hour) storage that can be in one local area
  - Includes requirements for charging energy and transmission capabilities
- In the operations timeframe the ISO ensures that gas resources are available for dispatch when contingencies might occur
  - This could mean starting resources in anticipation of a contingency
- Storage resources may be used to mitigate contingencies as well as gas resources
  - Storage is always on-line, but may not be economic to charge and hold state of charge
- ISO will enhance internal tools to weigh trade-offs between starting gas resources and charging storage

# CO-LOCATED ENHANCEMENTS

## Additional options for co-located resources that may have rules in place to prevent 'grid charging'

- ITC and property taxes resulted in developers striking contracts with LSEs that strictly prohibit charging more than the energy coming off of on-site renewables
  - Contracts that restrict operation of any resource limits the ISO's ability to manage the grid because full resource capability is not available
  - ISO supports contracts that include costs for certain actions, but that do not explicitly restrict resource operation
  - ISO is concerned that ITC rules do not incentivize the right behavior
- ISO realizes that rules for operating some resources may have been struck years ago, and may need some incremental accommodations

# The ISO proposes enhancements to the co-located model

- Co-located resources may elect an operating mode that will prevent on-site storage from receiving dispatch instructions in excess of co-located renewable output
  - Resources must show documentation to the ISO to qualify for this operating mode
- The ISO will allow storage resources to deviate down in certain circumstances
  - If a storage resource elects this operating mode, solar is not curtailed, and solar is less than forecast, then a storage resource may deviate down from dispatch instructions equal to the difference between the solar forecast and actual output
  - Storage resources that deviate will not receive unique settlement treatment and will still be subject to uninstructed deviation charges

# The ISO proposes enhancements to the co-located model

- Dispatch for storage may not always be less than output from the co-located resources
  - Storage resources may receive dispatch instructions to charge when there is economic curtailment of renewable resources
  - Storage resources **will** be required to follow dispatch instructions in these instances

# Stakeholders requested additional functionality for pseudo tie resources

- Today pseudo tie resources must show transmission capacity for full rating of resource
  - The ISO received requests for new treatment for co-located resources
- ISO proposes to allow co-located resources with transmission less than sum of  $P_{max}$  values to qualify for pseudo tied resource modeling
  - Resources must be located in the same balancing authority area
  - Aggregate capability constraint would limit combined dispatch to the resources to a value less than or equal to transmission to the ISO

# NEXT STEPS



# Next Steps

- All related information for the Energy Storage Enhancements initiative is available at:  
<https://stakeholdercenter.caiso.com/StakeholderInitiatives/Energy-storage-enhancements>
- Please submit stakeholder written comments on today's discussion and the storage enhancements issue paper by **January 12, 2021**, through the ISO's commenting tool
  - The commenting tool is located on the Stakeholder Initiatives landing page (click on the “commenting tool” icon):  
<https://stakeholdercenter.caiso.com/StakeholderInitiatives>