



California ISO

Energy Storage Enhancements Second Revised Straw Proposal

July 7, 2022

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Agenda

Time	Item	Speaker
9:00-9:10	Introductions and Stakeholder Process	Brenda Corona
9:10-9:15	Changes from the RSP	Gabe Murtaugh
9:15-9:35	Reliability – AS, Operational Experience	Ali Miremadi
9:35-9:55	Reliability – Ancillary Service	Gabe Murtaugh
9:55-10:10	Reliability – Local Areas	Gabe Murtaugh
10:10-10:30	Reliability – Exceptional Dispatch	Gabe Murtaugh
10:30-11:00	Co-Located Model	Gabe Murtaugh
11:10-12:00	Next Steps	Brenda Corona

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

Thur 6/30:	Post Second Revised Straw Proposal
Thur 7/7:	Stakeholder Meeting
Wed 7/20:	Comments Due
Aug:	Draft Final Proposal/Meeting
Sept:	Final Proposal/Meeting
Oct 2022:	Board of Governors Meeting

In response to stakeholder feedback the ISO moved aspects of storage modeling to a new initiative

Storage Modeling – New energy storage resource model and changes to existing non-generator resource model

- ISO will run a concurrent initiative to address modeling enhancements and potential new models
- Will likely kick off soon, with workshops

Ancillary Services changes for reliability

- Formally proposes updates to the state of charge formula
- Reduces requirements for storage providing ancillary services
- Additional analysis on storage providing regulation

Compensation for EDs to hold state of charge

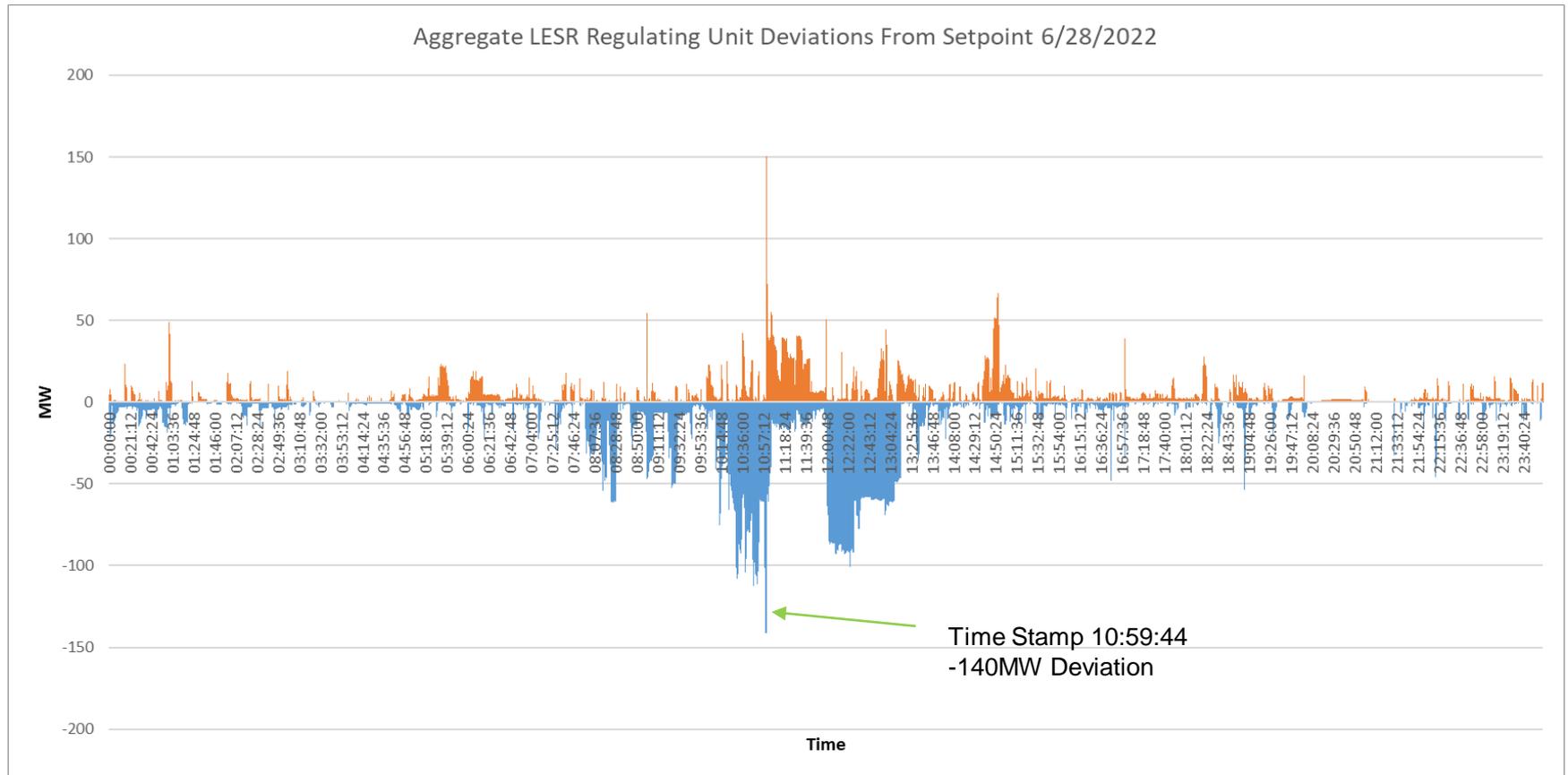
- Consider LMPs in counterfactual dispatches
- Consider time horizon to the end of the day

Co-located model

- Restrictions on using the alternate co-located model were dropped

OPERATIONAL EXPERIENCE: STORAGE WITH AS AWARDS

Some storage deviate significantly from ISO instructions while providing regulating services



Storage resources deviated considerably more than other resource types from AGC setpoint instructions

- Storage was awarded more than 600 MW of reg down
- 92% of total storage deviation attributed to 5 units

	Reg Award (MW)	Deviation (MW)	Deviation (%)
Storage_1	20	-47	235%
Storage_2	31	-35	113%
Storage_3	70	-29	41%
Storage_4	41	-10	24%
Storage_5	54	-9	17%
Other_1	43	-4	10%
Other_2	182	-1	1%
Other_3	81	0	0%
Other_4	25	-3	10%

ANCILLARY SERVICES

Expected state of charge differ from actual state of charge for resources providing ancillary services

- The ISO continues to note differences between day-ahead awards and real-time ability to provide regulating services
 - The markets do not account for state of charge when storage resources are awarded regulation up or regulation down
 - In real-time the ISO continues to observe instances when storage resources are unable to provide ancillary services because of state of charge concerns
- The ISO proposes to address both of these challenges in this policy

The ISO will consider regulation awards in the state of charge calculation

- Today the formula that governs state of charge is:

$$SOC_{i,t} = SOC_{i,t-1} - \left(P_{i,t}^{(+)} + \eta_i P_{i,t}^{(-)} \right)$$

- The ISO proposes to update the formula as follows:

$$SOC_{i,t} = SOC_{i,t-1} - \left(P_{i,t}^{(+)} + \eta_i P_{i,t}^{(-)} + \mu_1 RU_{i,t} - \mu_2 \eta_i RD_{i,t} \right)$$

$SOC_{i,t}$	State of charge for resource i at time t
$P_{i,t}^0$	Dis/Charge (-/+) instruction for resource i at time t
η_i	Round trip efficiency for resource i
$RU_{i,t}$	Regulation up awarded to resource i at time t
$RD_{i,t}$	Regulation down awarded to resource i at time t
μ	Multiplier

- Preliminary analysis shows $\mu_1=.08$ and $\mu_2=.19$

The ISO proposes to change the current rules for storage resources 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 become infeasible
- ISO proposes that upward/downward ancillary services awards have accompanying energy bids
 - Storage resources are required to have energy bids in the opposite direction of ancillary service awards, at **50%** of the award

EXAMPLE: A ± 12 MW storage resource

- Award: 12 MW regulation up (i.e., regulation will discharge the resource)
 - Must bid a 6 MW (0 MW to -6 MW) range of charging energy
- Award: 12 MW regulation down (i.e., regulation will charge the resource)
 - Must bid a 6 MW (0 MW to +6 MW) of discharging energy
- Award: 8 MW of regulation up and 8 MW of regulation down
 - Must bid 4 MW of charging and discharging energy (-12 MW to 12 MW)

LOCAL RELIABILITY

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 so that trade-offs for retaining storage resources are priced in the market

Simple Example of Local Tools

- Suppose a local area has three potential hours in the evening with needs to support local loads

Hour	Local Need
17	50 MW
18	50 MW
19	50 MW

- A gas resource may need to be committed to support this need for the three hour period
- A storage resource could also be available to provide energy during these three hours
 - This would require having 150 MWh of state of charge

EXCEPTIONAL DISPATCH

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 locational price or bid
- Operators may desire to exceptionally dispatch storage to charge and then have them hold that state of charge
 - 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

The ISO enhanced the proposal for the compensation methodology for exceptional dispatches to hold SOC

- The ISO proposes to run two very simple counterfactuals to determine payment to storage resources:
 1. Profit maximizing energy schedule without ED
 2. Profit maximizing energy schedule with ED
- Counterfactuals will be based on actual prices realized at the location of the resource
 - Stakeholders requested that there should be no counterfactual dispatch if prices are less than discharge bids
- The timeframe used to construct counterfactuals will run through the end of the operating day

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 storage 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 full participation of storage resources
- ISO realizes that rules for operating storage resources may require some new accommodations

The ISO proposes enhancements to the co-located model for resources with these arrangements

- Co-located resources may elect to use an optional tool that will prevent on-site storage from receiving dispatch instructions in excess of co-located renewable output
- Any storage resource may elect this option
- There is no time limits for participation with this option
- Resources are still required to follow exceptional dispatch and operator instructions

The ISO will allow these storage resources to observe contractual limitations

- The market model will prevent these storage resources from receiving a dispatch instruction to charge above output from renewable components
- Storage resources may deviate down when dispatch instructions are above actual renewable output
 - ISO is not responsible for ensuring that actual output levels between co-located storage and solar are aligned, this likely must be done through facility level controls
 - Storage cannot deviate beyond the difference between actual and forecast renewable output
 - Storage resources that deviate will not receive unique settlement treatment and will still be subject to uninstructed deviation charges
 - There will be no additional ISO settlement measures between the co-located resources

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 Pmax 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 **July 27, 2022**, 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>



- The ISO is pleased to be hosting the Stakeholder Symposium in-person at the Safe Credit Union Convention Center in downtown Sacramento on Nov. 9 – 10, 2022
- Registration now on the Stakeholder Symposium page at: <https://californiaiso.swoogo.com/2022StakeholderSymposium>
- Please direct questions to symposiumreg@caiso.com