



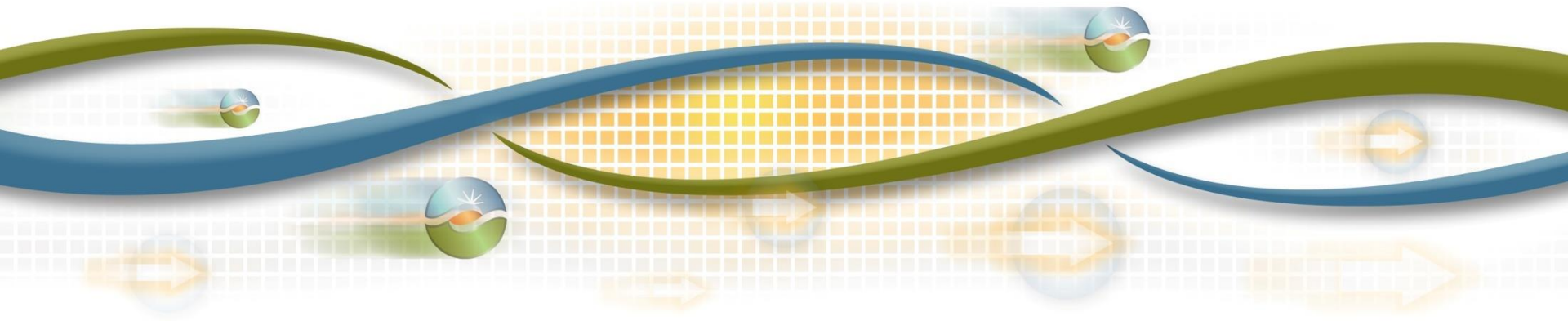
# Energy Storage and Distributed Energy Resources Phase 2 (“ESDER 2”)

## *Draft Final Proposal*

Stakeholder Conference Call

June 15, 2017

1:00 p.m. – 4:00 p.m. (Pacific Time)

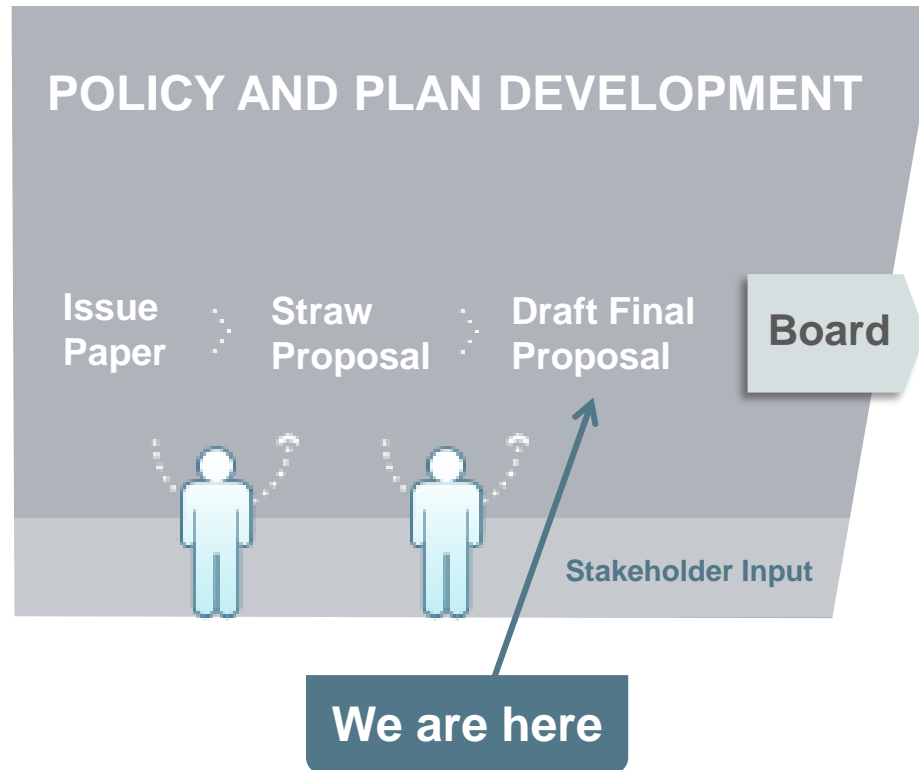


# Agenda

Time	Item	Speaker
1:00-1:10	Stakeholder Process and Schedule	James Bishara
1:10-1:15	Changes from Previous Proposal	Jill Powers
1:15-1:45	Baseline Working Group BAWG Final Proposal and Examples Review	SCE, Cherish Balgos
1:45-2:15	Explanation of posted material and walkthrough of example(s)	Working Group Representatives
2:15-2:35	Distinguishing between Charging Energy and Station Power	Bill Weaver
2:35-2:50	Net Benefits Test for Demand Response	Eric Kim
2:50-3:10	Increase Load Consumption as Demand Response Enhancement	John Goodin
3:10-3:30	Non-Generating Resource Enhancements	Peter Klauer
3:30-3:45	Multiple-Use Applications	Lorenzo Kristov
3:45-3:55	ESDER Phase 3	Eric Kim
3:55-4:00	Next Steps	James Bishara

# STAKEHOLDER PROCESS AND SCHEDULE

# ISO Policy Initiative Stakeholder Process



# ESDER 2 Stakeholder Process Schedule

Milestone	Date	Activity
Third Revised Straw Proposal	April 17	Post ESDER 2 third revised straw proposal
	May 4	Hold stakeholder conference call
	May 18	Stakeholder written comments due
Draft Final Proposal	June 8	Post ESDER 2 draft final proposal
	June 15	Hold stakeholder meeting or conference call
	June 23	Stakeholder written comments due
Presentation to EIM Governing Body	July 13	Present ESDER 2 proposal at Energy Imbalance Market Governing Body meeting
Presentation to Board for Approval	July 26-27	Present ESDER proposal for approval at CAISO Board meeting
ESDER 3 Issue Paper	September 29	Post ESDER 3 issue paper

# CHANGES FROM PREVIOUS PROPOSAL

# Third Revised Straw Proposal Changes Reflected in Draft Final Proposal

1. Responded to stakeholder comments and updated topic status
2. Finalized proposals on topics recommended for July 26-27 Board meeting
  - a) Updated Baseline Analysis Working Group (“BAWG) proposal on alternative baselines demand response (“DR”) enhancement
  - b) Updated proposal on distinguishing between charging energy and station power
  - c) Provided further detail for the proposal introduced in third revised straw proposal to changing how the threshold price for DR, determined by net benefits test, to account for Energy Imbalance Market (“EIM”) participant bidding
3. Identified potential initiative topics to be addressed in ESDER 3
  - a) Development, if feasible, of a load consumption and regulation participation DR enhancement
  - b) Further understanding of Non-generating resources (“NGR”) limitations as explicit costs and developing enhancements to reflect them
  - c) Address issues identified in Track 2 of the CPUC’s energy storage proceeding on multiple-use applications (“MUA”)

# Scope Breakout - ESDER 2 and ESDER 3

2017							
Apr	May	Jun	Jul	Aug	Sep	Oct	Nov

## Demand Response Enhancements

1. Increase Load Consumption
2. Alternative Baselines
3. Net Benefits Test for EIM

## 4. Station Power

## Non-Generator Resource Enhancements

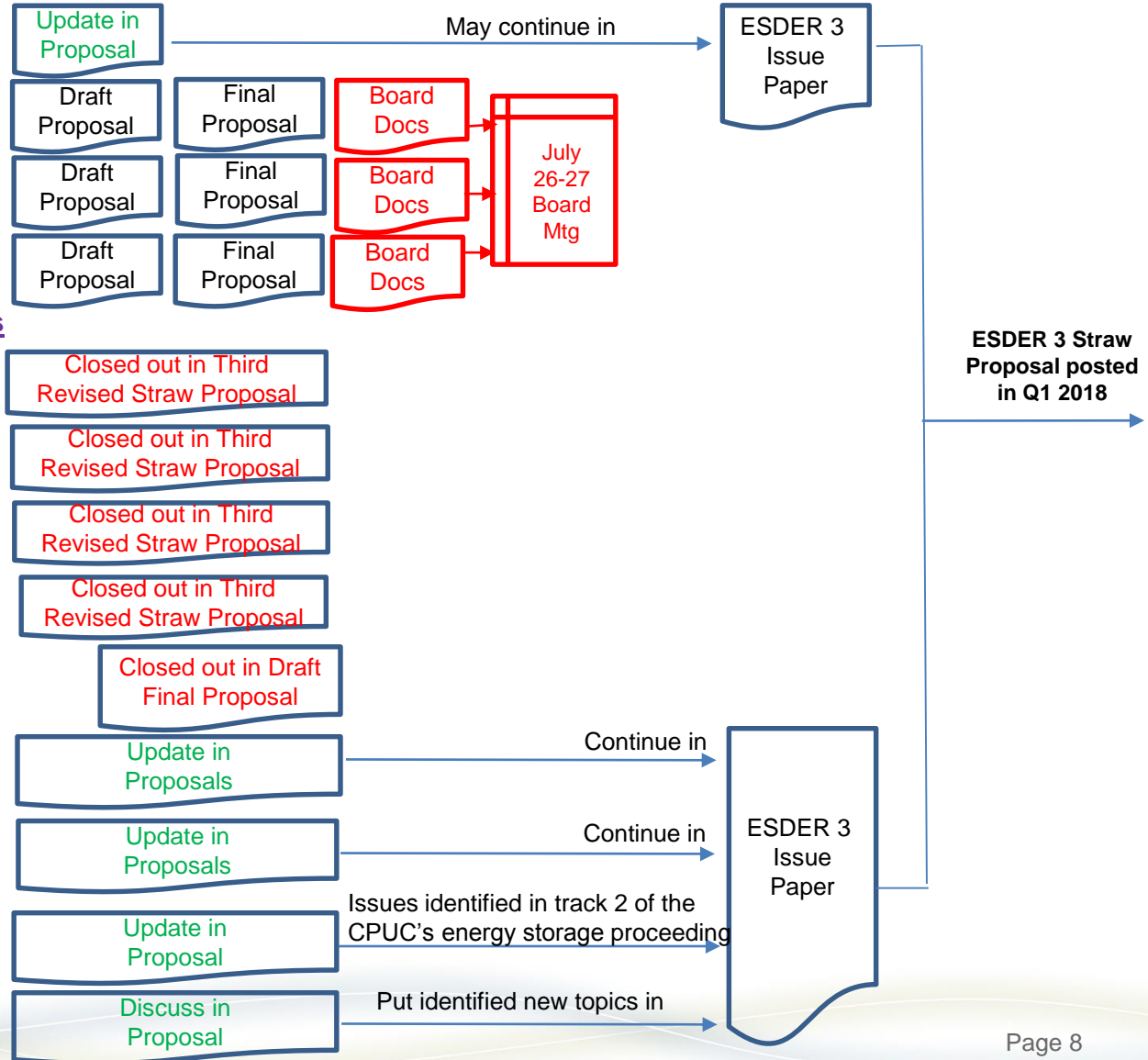
5. Model Physical MW Limits based on Time of Day
6. Model Physical MW Limits based on Depth of Cycling
7. Model Reduced MW Throughput
8. a) Model Annual Charge and Discharge Limitations  
b) Model Daily Cumulative MWh Charge and Discharge Limits based on Bid Parameters

## 9. Reflecting Costs and Modeling of Physical Limitations

10. Define Rules for Storage Modeled as NGR to Qualify as ULR

## 11. Multiple-Use Applications

## 12. ESDER 3 Topics





# ALTERNATIVE BASELINES TO ENHANCE DEMAND RESPONSE

## BAWG analyzed hundreds of different baselines within three types of classes

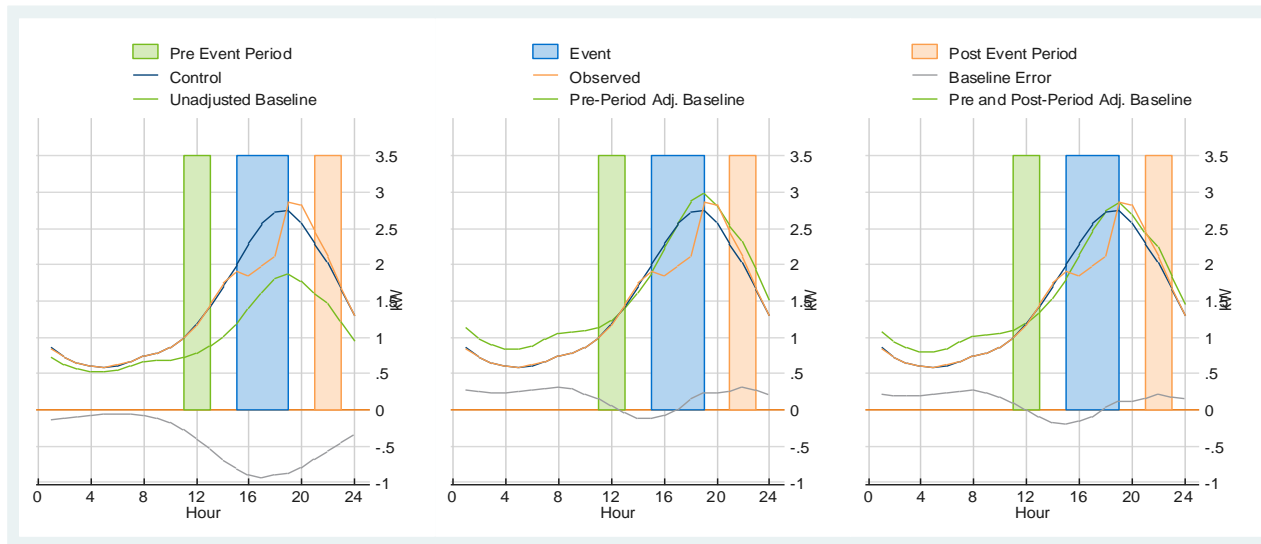
- 1. Control Groups** – Establishes baseline of load patterns during curtailment event using non-dispatched customers with similar profiles
- 2. Day Matching** – Estimates what electricity use would have been in absence of DR dispatch, using electricity use data on non-event but similar days
- 3. Weather Matching** – Estimates what electricity use would have been in absence of dispatch during non-event days with most similar weather conditions

# Baseline Performance Analysis Review

- Randomized control groups with a large sample size (200-400 participants) were more than twice as precise as day or weather matching baselines
- Day or weather matching baselines provides alternative for Demand Response Providers (“DRPs”) that do not have proposed minimum size of 150 participants

# BAWG analyzed and proposed the use of pre- and post-event adjusted baselines

- All of the recommended baselines have an adjustment period that includes two pre-event and two post-event hours (4 hours total), each with a two hour buffer from the event



# Recommended Baselines with Proposal Updates

Customer Segment	Weekday	Baselines Recommended	Adjustment Caps
Residential	Weekday	Control group	+/- 40%
		4 day weather matching using maximum temperature	+/- 40%
		Highest 5/10 day matching	+/- 40%
	Weekend	Control group	+/- 40%
		4 day weather matching using maximum temperature	+/- 40%
		Highest 3/5 weighted day matching	+/- 40%
Non-residential	Weekday	Control Group	+/- 40%
		4 day weather matching using maximum temperature	+/- 40%
		10/10 day matching	+/- 20%
	Weekend	Control group	+/- 40%
		4 day weather matching using maximum temperature	+/- 40%
		4 eligible days immediately prior (4/4)	+/-20%

- Separately posted spreadsheet workbooks embedded in the proposal
- Included requirement to zero out calculated demand reductions if they are negative (i.e., load increases)
- Clarification on use of proposed baselines when resource is an aggregate of both Residential and Non-Residential customers
- Defining Residential and Non-Residential customers

# BAWG Final Proposal and Spreadsheet Examples are Posted on the ESDER2 Page



ABOUT US PARTICIPATE STAY INFORMED PLANNING MARKET & OPERATIONS RULES ISO EN ESPAÑOL

- About Us
- Participate
- Stay Informed
  - Board and Committees
  - Stakeholder Processes
    - Completed and Closed
    - Stakeholder Initiatives
  - Release Planning
  - Clean, Green Grid
  - Managing Oversupply
  - Regional Collaboration
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  - Regional Energy Market
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Home > Stay Informed > Stakeholder Processes > Energy Storage and Distributed Energy Resources Phase 2

## Energy storage and distributed energy resources phase 2

Phase 2 builds upon the work accomplished in Phase 1 by exploring additional enhancements and topics relevant to market participation of storage and distributed energy resources.

### Initiative status

*Policy development:* In progress

+ Energy storage and distributed energy resources phase 2 - relevant market notices

### Current meeting

- Web conference - draft final proposal - Jun 15, 2017

- [Draft Final Proposal - Energy Storage and Distributed Energy Resources Phase 2](#) 6/09/2017 13:24
- [2017 Baseline Accuracy Work Group Final Proposal \(Nexant\)](#) 6/08/2017 15:13
- [Example - Day Match Workbook](#) 6/09/2017 13:24
- [Example - Randomization Validation Template](#) 6/09/2017 13:24
- [Example - Weather Match Workbook](#) 6/09/2017 13:24
- [NOAA Station to Zip Mapping](#) 6/09/2017 13:24
- [Stata Code to Validate Equivalence](#) 6/09/2017 13:24

# The final proposal includes BAWG agreement to a method for deriving SQMD in intervals of five minutes

- New Customer Load Baseline methodology (CLB) calculations will utilize the current methodology to derive 5-minute interval results
  - An hourly baseline is pro-rated to create a 5-minute baseline from which the 5-minute interval load, measured during the event, is subtracted
- Current requirements for load data interval size used in developing the CLB will not change
  - Hourly interval when participating in day ahead only
  - A 15-minute interval maximum when participating in real time or ancillary services (non-spinning and spinning reserve)

CLB calculations, including the current 10 in 10, performed and submitted by the DRP or its SC provides greater flexibility in using alternative baselines

- SQMD submitted will represent the pre-calculated Demand Response Energy Measurement for an event and will, therefore, be submitted for the Event Day only.
  - Submittal of pre-event load SQMD, 45 days required for the 10 in 10 CBL, would no longer be necessary
- Accelerates the retirement of the ISO's legacy Demand Response System
  - Settlement quality meter data SQMD submission will utilize the ISO's Market Results Interface Settlements (MRIS) system consistent with all other resources



# A three-step process to ensure accurate development and submission of SQMD will be implemented

- **Baseline Registration**

The CAISO will collect all registered baseline calculations, required information and justification for each DR resources. The monitoring and auditing processes will utilize the registered information.

- **Monitor**

The CAISO will review and monitor SQMD with references to bids and event days of all DR participants.

- **Audit**

Using available auditing provisions, the CAISO will audit DR resources to ensure the accurate development and submission of SQMD.

# DISTINGUISHING BETWEEN CHARGING ENERGY AND STATION POWER

# Distinguishing between energy used to charge a storage device and energy used to supply station power.

	RETAIL	WHOLESALE
Existing station power definition	Onsite consumption/Aux. load	Pumping load
	Start-up	Blackstart
	Office consumption	Synchronous condensers

+

	RETAIL	WHOLESALE
CPUC decision In R.15-03-11	External IT/battery management	Charging energy
	Idle/off load	Resistive/efficiency losses
		“Elements essential to battery operation,” e.g., thermal regulation, vacuum, battery management system

# Stakeholder Comments and CAISO Response

- Stakeholder comments focused on station power definition and metering rules.
  - In both cases, stakeholders urged the CAISO to defer to the local energy providers (e.g., UDCs) to work out their own solutions
  - Solutions will be consistent with local regulatory authorities
- Some stakeholders inquired whether a 2-meter mandate would solve everything
  - CAISO agrees, but still an open question at the CPUC

# CAISO Proposal

- Reduce verbiage in station power definition.
- New definition, to be developed with stakeholders, will be something general that incorporates, by reference, the definitions of local regulatory authorities.
  - E.g., energy for operating the electrical equipment of an energy resource subject to a retail tariff, and as defined by the Local Regulatory Authority.
- As part of the interconnection process, resources interconnecting to the CAISO will work with their retail energy provider to ensure that their metering configurations accurately account for station power, where and as required by local regulatory authorities.

# CAISO Proposal

- BPM for Metering will offer examples, including agreed-upon wholesale uses, such as:
  - Charging energy
  - Resistive losses
  - Blackstart energy
  - Pumping load
  - Synchronous condensers
- Clarify permitted/prohibited netting rules in tariff and BPMs.
  - Currently these sections discuss auxiliary load generally

# NET BENEFITS TEST FOR DEMAND RESPONSE

# CAISO proposes to include additional gas prices in NBT calculation.

- Proposing to
  - Remove language in CAISO tariff that explicitly states California gas price indices
  - Adjust supply curve based on a simple average of all gas price indices within EIM regions
- Specific gas price indices used in calculation will be updated in the “Market Instruments Business Practice Manual”
  - On track for changes to be published by Fall 2017
  - Daily gas prices are published in OASIS



# Stakeholder Comments and CAISO Response

- Majority of stakeholders were either in support or had no comments on the proposal
- PG&E suggested possible gas price indices for EIM participants
  - CAISO already has gas price indices for EIM participants and will be made public in the Market Instruments BPM in Fall 2017.

# NON-GENERATOR RESOURCE ENHANCEMENTS

## Scope: Understanding physical use limitations and applicability for CAISO use-limitation designation for storage resources

- Modeling physical MW Limits based on time of day
- Modeling physical MW limits based on depth of cycling
- Model reduced MW throughput based on state of charge (“SOC”)
- Model annual or monthly MWh charge and discharge limitations
- Define rules for storage resources modeled as NGR to qualify as a use-limited resource (“ULR”)
- Metering, settlement, and market optimization consideration for storage under multiple use applications

# Current modeling capabilities within NGR to address physical limitations

Modeling physical MW limits based on depth of cycling, time of day and MW throughput based on SOC

## **Existing tools to address:**

- Resource implementation characterization
- Bidding practices
- Representing physical capacity constraints through CAISO outage management system

**Proposal:** These topics are being closed out in ESDER 2 but tracked as SCs and CAISO gain more participation experience with storage resources

# Addressing battery manufacturer performance guarantees

Modeling cumulative MWh charge and discharge limitations at resource level to help adhere to resource contractual stipulations or resource limitations

## **Existing tools to address:**

- Scheduling coordinators can reflect contractual or economic based limitations in their market bidding strategy

**Proposal:** Move discussion to ESDER 3 to further define the need to reflect costs as a function of depth and frequency of cycling

## Maximizing storage value under use limited resource status or multi-use application scenarios

**Proposal:** Advance ULR topic to ESDER 3 for further discussion and development

ESDER 3 will seek to leverage efforts of RSI and CCE3 stakeholder processes which are evolving the definition of ULR, the ULR application process, and market treatment of such defined resources

The related complexities of optimizing a wholesale market resource for grid reliability verses specific resource opportunities to maximize value across multiple-use applications will need to be further discussed in both CAISO and CPUC forums

# Stakeholder comments reiterated previous issues and proposed several new enhancements

## Topics addressed in ESDER 2

- Tools to restrict over-utilization or frequent cycling due to the fast ramping in excess of warranty or performance guarantees
- The ability for SCs to provide multiple bid stacks for optimization by the ISO based on the resource's state of charge

## Potential new topics for ESDER 3

- The ability to provide multi-point or multi-segment Ancillary Service bids.
- An ability to include a bid cost to allow resources to price maintenance and warranty costs into their bids based on SOC.
- Enhancements to address regulation dispatch divergence from RTD price signals.

# Stakeholder Comments and CAISO Response

## ISO Response to Stakeholder Comments

- The ISO is not in support of establishing MWh throughput limitations based on economic factors such as warranty or performance guarantees
- The ISO is in support of understanding how to reflect limitations as explicit costs based on NGR operation (depth and frequency of cycling represented through an explicit cost)
- This ISO supports discussion for SCs to provide multi-point or multi-segment AS bids in ESDER 3
- Enhancements to address 'regulation dispatch divergence from RTD price signals' will be discussed as a component of an upcoming stakeholder initiative on Regulation Pay for Performance.
- Discussion on allowing for participation less than 24x7 should be directed within the MUA portion of the ESDER Initiative.



# INCREASE LOAD CONSUMPTION AS DEMAND RESPONSE ENHANCEMENT

# Load Consumption Working Group Update

## **Purpose:**

Explore ability for Proxy Demand Response resources (“PDR”) to consume load based on an ISO dispatch instruction, including ability for PDR to provide regulation service

# Stakeholder Comments and CAISO Response

## Storage Community

- Unanimous support for a bi-directional PDR product. Urgency given oversupply/increasing amounts of renewable resource curtailments.
- Retail rate and retail-wholesale jurisdictional issues should not impede the ISO's efforts to develop a bi-directional PDR product.
- Urge the ISO to move the load consumption working group forward.

## Cross-section of stakeholders

- Important questions and policies need to be addressed and answered by stakeholders at the CPUC, and more time is needed prior to the ISO developing a bi-directional PDR product.
  - Interaction with rates
  - Demand charges as a fundamental barrier to address
  - Metering issues between retail and wholesale
  - Other models to consider for a wholesale consumption product

# Stakeholder Comments and CAISO Response

## CAISO Response

- By nature, demand response has rate impacts and interacts with retail rules and regulations.
- ISO agrees with parties that retail-wholesale interactions still require further vetting, especially at CPUC.
- ISO does not view issues as jurisdictional, but as impediments to robust participation in a bi-directional PDR product.
- ISO is concerned about investing time, money, and staff resources into developing a product where success and adoption depends significantly on resolution of key retail issues.
- The ISO supports pursuing a bi-directional PDR product, but in sequence with the identification and resolution of retail issues.

# Path Forward

- ISO encourages stakeholders to reinvigorate the LCWG, identify the key technical and policy issues to resolve, and develop well-informed solutions that can be introduced into the ESDER 3 initiative in 2018.
- If the CPUC launches a load consumption-working group, the LCWG should consider its interaction with this group and if a single working group is the prudent path forward.

# MULTIPLE-USE APPLICATIONS

# Multiple-Use Applications (MUA)

- MUA are those where an energy resource or facility provides services to and receives compensation from more than one entity
- Distributed Energy Resources could potentially provide and be compensated for services to end-use customers, distribution system and wholesale markets

# Stakeholder Comments Support Joint Regulatory Activities to Address MUA Development

- CAISO proposes to:
  - Continue collaborative efforts with the CPUC in the context of their energy storage track 2 proceeding
  - Pursue a separate CAISO initiative on MUA **only if** the collaborative efforts identify an issue that would be most appropriately addressed within one
- Stakeholders who believe an ISO initiative on MUA is needed should identify and describe the topic in their comments on the June 2 workshop (see next slide)
- Any such issues could be included in ESDER 3 scope



# Collaborative Activities on MUA Continue

- In context of CPUC Energy Storage Track 2 proceeding (R. 15-03-011), the CAISO has collaborated with CPUC staff to:
  - Issue a May 17, 2017 joint report offering preliminary findings, principles, recommendations and questions for further discussion
  - Jointly host a workshop on June 2, 2017 to discuss the report and obtain stakeholder feedback
- To date, there has not been a MUA issue or topic identified that requires separate treatment in a CAISO initiative
- Stakeholders can further inform the CAISO by providing comments to the June 2, 2017 joint workshop
  - Initial comments due to CPUC by June 16
  - Reply comments due by June 23

# ESDER PHASE 3

ESDER will continue in phase 3 and an issue paper will be released in September 2017.

- Enhancement to be addressed in ESDER3
  - The development, if feasible, of a load consumption product for DR resources and participation in the regulation market;
  - Defined rules for storage modeled as NGR to qualify as a use-limited resource;
  - Reflecting costs and modeling of physical limitations; and
  - Any issues identified in the Track 2 of the CPUC's energy storage proceeding (CPUC Rulemaking 15-03-011) on MUA.
- Stakeholders are encouraged to continue to submit potential topics for consideration in the issue paper.

# Scope Breakout - ESDER 3

2017				2018
Sep	Oct	Nov	Dec	Q1

## 1. Demand Response Enhancements

- Increase Load Consumption

May continue in

## 2. Non-Generator Resource Enhancements

- Reflecting Costs and Modeling of Physical Limitations
- Define Rules for Storage Modeled as NGR to Qualify as ULR

Continue in

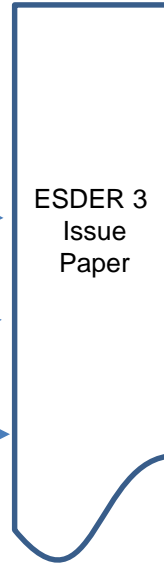
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Issues identified in Track 2 of the CPUC's energy storage proceeding

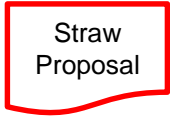
## 3. Multiple-Use Applications

## 4. ESDER 3 Topics

Put identified new topics in



ESDER 3 Straw Proposal posted in Q1 2018



# NEXT STEPS

## Next Steps

- Request stakeholders to submit written comments by close of business June 23
- Submit to comments mailbox: [initiativecomments@caiso.com](mailto:initiativecomments@caiso.com)

Milestone	Date	Activity
Draft Final Proposal	June 8	Post Draft Final Proposal
	June 15	Hold stakeholder conference call
	<b>June 23</b>	<b>Stakeholder written comments due</b>
	July 26-27	Present proposal to Board

Thank you!