



California ISO

Discretionary initiative prioritization

Working Group 3


Annual policy initiatives roadmap process 2024

May 15, 2024

Housekeeping reminders

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- This collaborative working group is intended to stimulate open dialogue and engage different perspectives.
- Please keep comments professional and respectful.
- Please try to be brief and refrain from repeating what has already been said so that we can manage time efficiently.
- If you need technical assistance during the meeting, please send a chat to the event producer

Instructions for raising your hand to ask a question

- If you are connected to audio through your computer or used the “call me” option, select the raise hand icon  located above participant and chat window on right side of your screen.
 - **Note:** *3 only works if you dialed into the meeting.
 - Please remember to state your name and affiliation before making your comment.
- You may also send your question via chat to Brenda Corona or to all panelists.

Prioritization working group #3 agenda overview

- Final set of discretionary initiative presentations
 - Explanation of submitted initiative
 - Impact of proposed change on market
 - Benefits & distribution of benefits
 - Costs & distribution of costs
 - Impact to market efficiency/reliability

2024 CAISO Policy Initiatives Catalog & Roadmap Process



Next steps:

- **Late May:** Draft Policy Catalog published
- **Early June:** Stakeholder meeting
 - Review Draft Policy Catalog
 - Review comment template & ranking criteria
- **Late June:** Stakeholders submit prioritization rankings of initiatives in Draft Policy Catalog
- **Early July:** Final Policy Catalog published

Discretionary initiative presentations:

Resource adequacy, storage and emerging technology, CPUC concerns, CAISO BAA reliability and ancillary services

Time	Topic	Entity
1:10 – 1:30	Enable non-generating resources to participate in inter-SC trade	GridStor
1:30 – 1:50	Maximum Import Capacity (MIC) enhancements: Process to allocate MIC on multi-year going forward basis to accommodate LSEs with long term contracts	Joint LSEs (CalCCA , Shell Energy North America, Six Cities)
1:50 – 2:10	CAISO BAA reliability and CAISO day ahead self scheduled exports	PG&E
2:10 – 2:25	AS pay for performance accuracy calculations	SCE (ISO)
2:25 – 2:40	Correction of the hourly shaping factors used in the maximum import bid price	CPUC Energy division
2:40 – 3:00	Liquidity of bilateral indices used in FERC Order 831 implementation	CPUC Energy division
3:00 – 3:20	Revisions to RAIM	CPUC Energy division

Discretionary initiative presentations:
Resource adequacy, storage and emerging technology, CPUC concerns, CAISO BAA reliability and ancillary services

Time	Topic	Entity
3:20 – 3:40	Long duration energy storage initiative	PG&E
3:40 – 3:55	Revision of DR control group settlement methodology	PG&E
3:55 – 4:15	Energy storage outage improvements	Vistra / IPP
4:15 – 4:20	Allow multi-stage generating (MSG) units to be used within an Aggregate Capability Constraint (ACC)	Middle River Power
4:20-4:40	Hydrogen electrolyzer market participation	NCPA
4:40 -5:00	Hybrid and co-located resource enhancements, including RA provisions for hybrid resources	TerraGen



California ISO

Maximum Import Capacity (MIC) enhancements:
Process to allocate MIC on multi-year going forward
basis to accommodate LSEs with long term contracts

GridStor

[California ISO - All comments \(caiso.com\)](https://www.caiso.com/CAISO/Comments/AllComments.aspx)



Enable Non-Generating Resources to Participate in Inter-SC Trade (IST)

Jason Burwen & Zhechong Zhao

May 2024

Current Market Design for NGRs

In the current market design, standalone battery storage projects are **NOT** available to be selected in the “Location” dropdown list for transacting Physicals in Inter-SC Trade (IST). Battery storage resources are categorized as Non-Generating Resources.

According to the SIBR Business Rule 121007, only registered Generator Resources are allowed for Physical Energy Product.

Create trade

Date: 05/13/2024

Coordinator: [Redacted]

Product type: PHY Energy

From: [Redacted]

Trade name: [Redacted]

Trade qty: [Redacted]

Trade type: Inter-SC Trades

Location: GANSO_1_WSTBM1

To: EXCHEC_7_UNIT 1
EXCLSG_1_SOLAR
FELLOW_7_QFUNTS
FIFTHS_2_FSSR1
FLOWD2_2_FPLWND
FLOWD_2_RT2WD2
FLOWD_2_WIND1
FMEADO_6_HELLHL
FMEADO_7_UNIT
FORBST_7_UNIT 1
FRESHW_1_SOLAR1
FRIANT_6_UNITS
FRNTBW_6_SOLAR1
FROGTN_1_UTICAA
FROGTN_1_UTICAM
FTSWRD_6_TRFORK
FTSWRD_7_QFUNTS
FULTON_1_QF
GALE_1_SR3SR3
GANSO_1_WSTBM1

Hours: [Redacted]

GridStor's Proposal

- CAISO should allow Non-Generating Resources (NGRs) to participate in Inter-SC trade and offer Physical Energy Product.
- Validation process expected to be status quo, as PHYs for NGRs will still be validated prior to and after the forward energy market clears.
- Market enhancement is low complexity for operations and can be completed in the near term with few resources.

Business Impacts	Description
SIBR Business Rules	Yes
BPM	BPM edits for sections that reference IST and NGR
SIBR UI	Yes, add NGR nodes

Rationale

- **MEET SB100 GOALS (Strategic Objective 2):** CAISO and California regulators expect energy storage projects to shift the timing of solar and wind power output away from oversupply hours and into hours where energy market prices signal a need, strengthening system resource adequacy and meeting California's GHG goals.
- **MORE EFFICIENT RULES & INTERFACES (Strategic Objective 3C):** Enabling battery storage to offer its high level of assurance/certainty in scheduling firm energy multiple days in advance of the operating day will improve overall market efficiency and reduce the level of uncertainty in the preschedule window -- enabling more storage technologies via efficient rules and interfaces that can be used for transactions across the WECC.
- **SUPPORT RESOURCE ADEQUACY (Strategic Objective 2C):** Allowing battery storage projects to participate in Physical IST would also complement the existing resource adequacy structure. When an RA resource experiences a forced outage, battery storage can offer supplement capacity or replacement energy by selling firm and physical product through IST. Similarly, being able to make transactions multiple days in advance of the operating day could mitigate challenges regarding energy sufficiency as it relates to storage providing RA.
- **AVOID DISCRIMINATION:** Allowing battery storage to transact Physical Energy through IST meets regulatory requirements to avoid undue discrimination among resource types.



California ISO

Enable non-generating resources to participate in inter-SC trade

Joint LSEs (**CalCCA**, Shell Energy North America, Six Cities)

[California ISO - All comments \(caiso.com\)](https://www.caiso.com)

Joint LSE MIC Enhancements Catalog Submission

May 15, 2024

Background

- The CAISO calculates Maximum Import Capability (MIC) annually to determine a MW quantity of out-of-state (OOS) resources simultaneously deliverable to the aggregate of CAISO load and allocates it to load serving entities (LSE)
- LSEs depend on OOS resources to meet RA requirements, and when they show OOS resources as RA, they must also show MIC
- The *CPUC's Preferred System Plan includes over 7 GW of out-of-state wind* by 2035 that will require MIC to count for resource adequacy (RA), and therefore Integrated Resources Planning (IRP) obligations
- MIC can be allocated on a multi-year basis but only once resources meet their commercial operating date (COD), complicating long-term contracting of new resources

Month Ahead September 2019-2023			
Year	NQC	RA Requirement	Amount of RA not Covered by CAISO Connected Resources
2019	50,898	50,242	(657)
2020	47,334	49,135	1,801
2021	44,843	48,351	3,508
2022	46,923	48,944	2,020
2023	49,977	52,476	2,499

Challenge #1: The Availability of MIC

- Depending on the intertie, there may be at least two sources of MIC availability challenges:

Insufficient MIC
to meet LSE demand on popular
interties

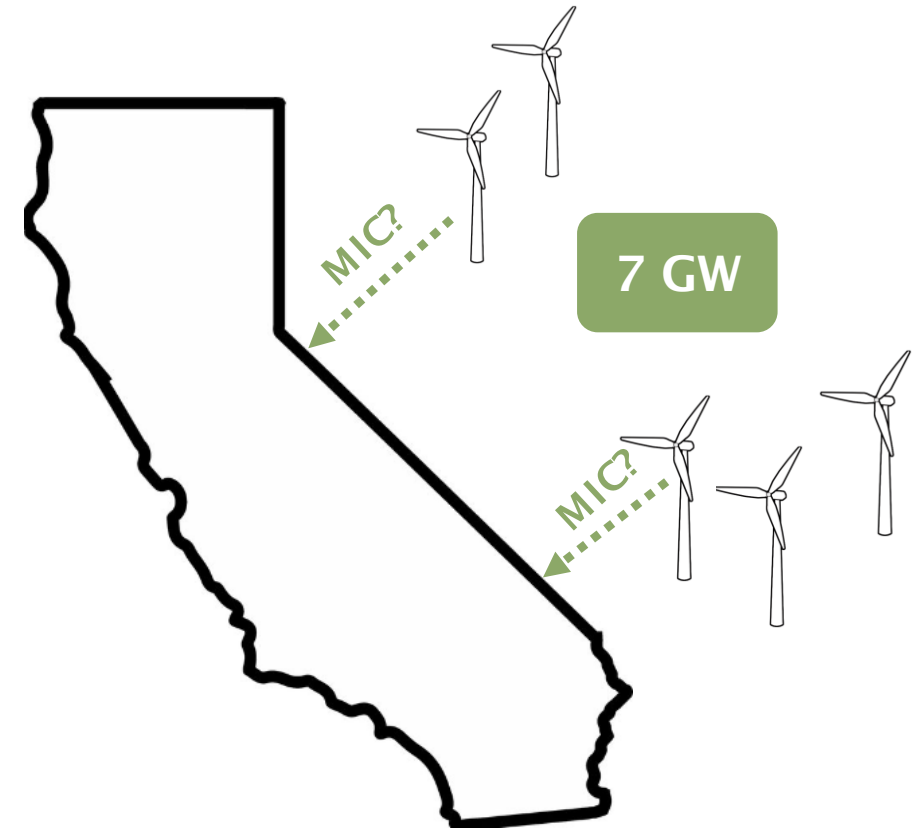
Unused MIC
either because of a cumbersome
trading mechanism, MIC was not
made available, or unusable location

- Data needed to understand the source of MIC availability challenges:
 - Monthly MIC allocated by intertie and LSE*
 - Monthly MIC shown by intertie and LSE*
 - Monthly MIC available to trade by intertie *
 - Monthly MIC traded by intertie

* These data points are available on OASIS but have data errors, so unable to reach conclusions at this time

Challenge #2: Risks to Long-Term Contracting

- RA contract used to lock in MIC must be active in the next RA year
- LSEs cannot secure MIC to support PPAs with online dates multiple years into the future. This creates immediate risks for:
 - CPUC-jurisdictional LSEs with mid-term reliability requirements with delivery dates between now and 2028 and their IRPs which plan procurement out to 2035
 - Non-CPUC jurisdictional LSEs, who are likewise actively planning and procuring to meet long-term needs
- Uncertainty around whether MIC will be available to support these projects is a barrier to LSEs moving forward with PPAs for OOS projects



Recommendation

Create a new initiative exploring the MIC calculation and allocation methodology

Follow-on to the generator deliverability initiative, which explored ways to increase deliverability of internal generation while balancing reliability and cost containment considerations

Types of proposals may include, but should not be limited to:

- A process to allocate MIC on a multi-year going forward basis to accommodate LSEs with long-term contracts, as opposed to only allowing multi-year MIC the year prior to resource COD.
 - E.g., To retain MIC for long-term contracts could require an annual demonstration of contracts to provide assurance that the MIC will be used by the LSE in the future
- A mechanism to make unused MIC better available to LSEs rather than creating a marketable right that requires cumbersome bi-lateral trading to obtain.
 - E.g., If an LSE does not show import RA contracts for a particular month in advance of T-45, the unused MIC



California ISO

CAISO BAA reliability and CAISO day ahead self schedule

PG&E

[California ISO - All comments \(caiso.com\)](#)

CAISO BAA Reliability and CAISO Day-Ahead Exports

Todd Ryan, Principal Analyst, FERC-CAISO Policy Team

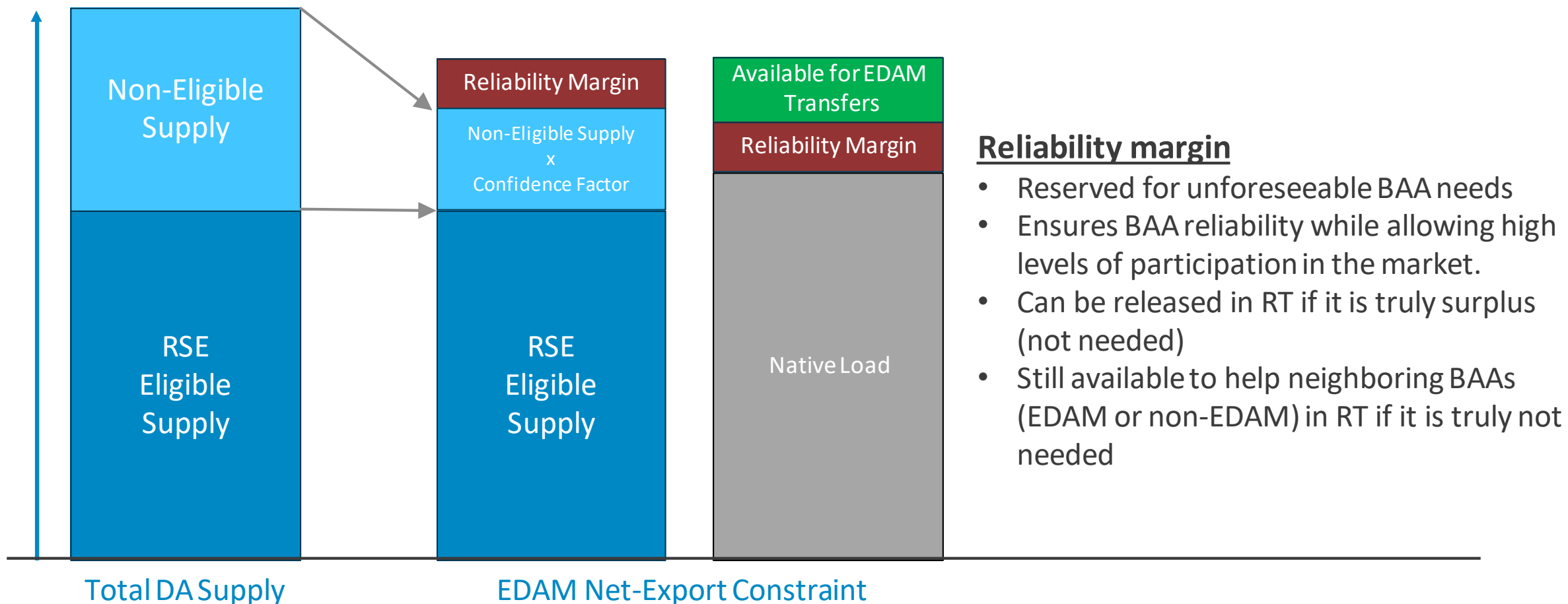


May 2024



The Net-Export Constraint Protects Reliability

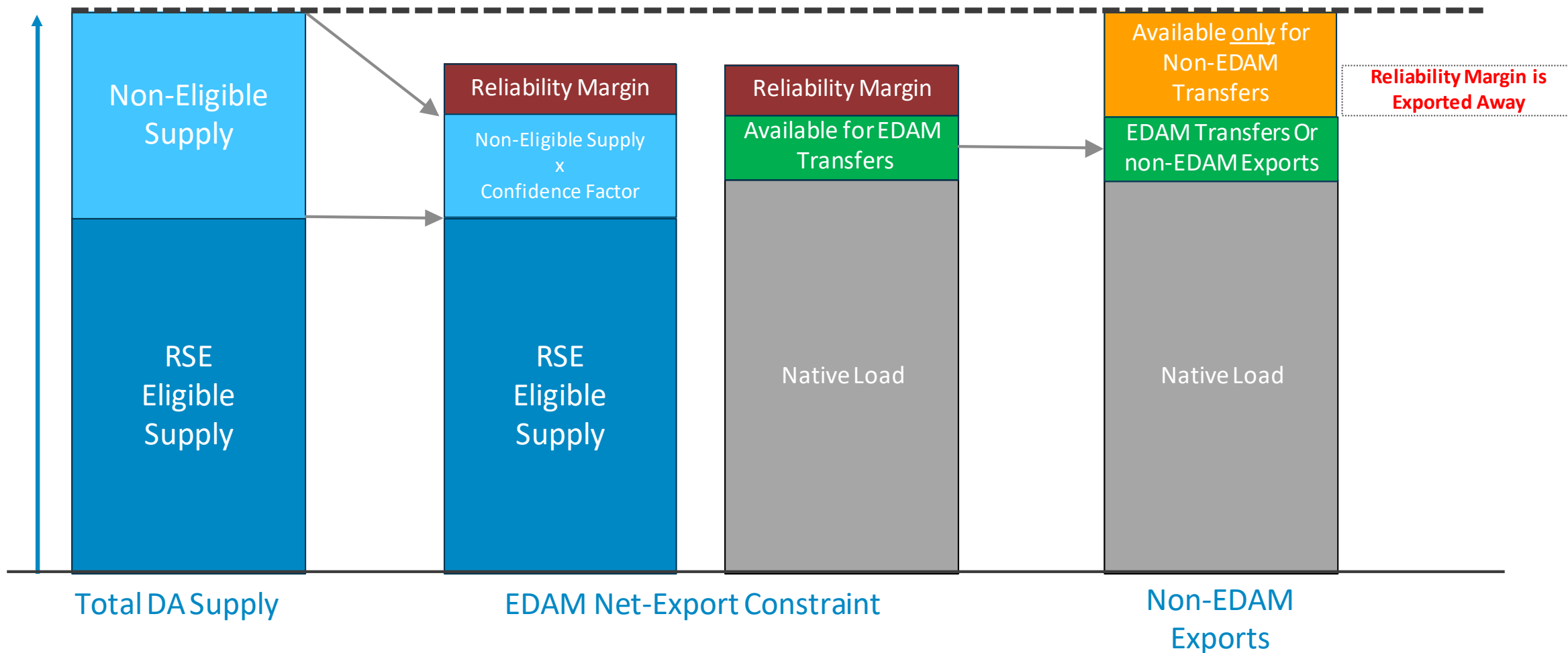
It makes sure a BAA does not overextend itself in the day-ahead timeframe.





This Day-Ahead Loophole should be closed

The Loophole eliminates the Reliability Margin and makes some supply only available to non-EDAM BAAs





This loophole should be closed

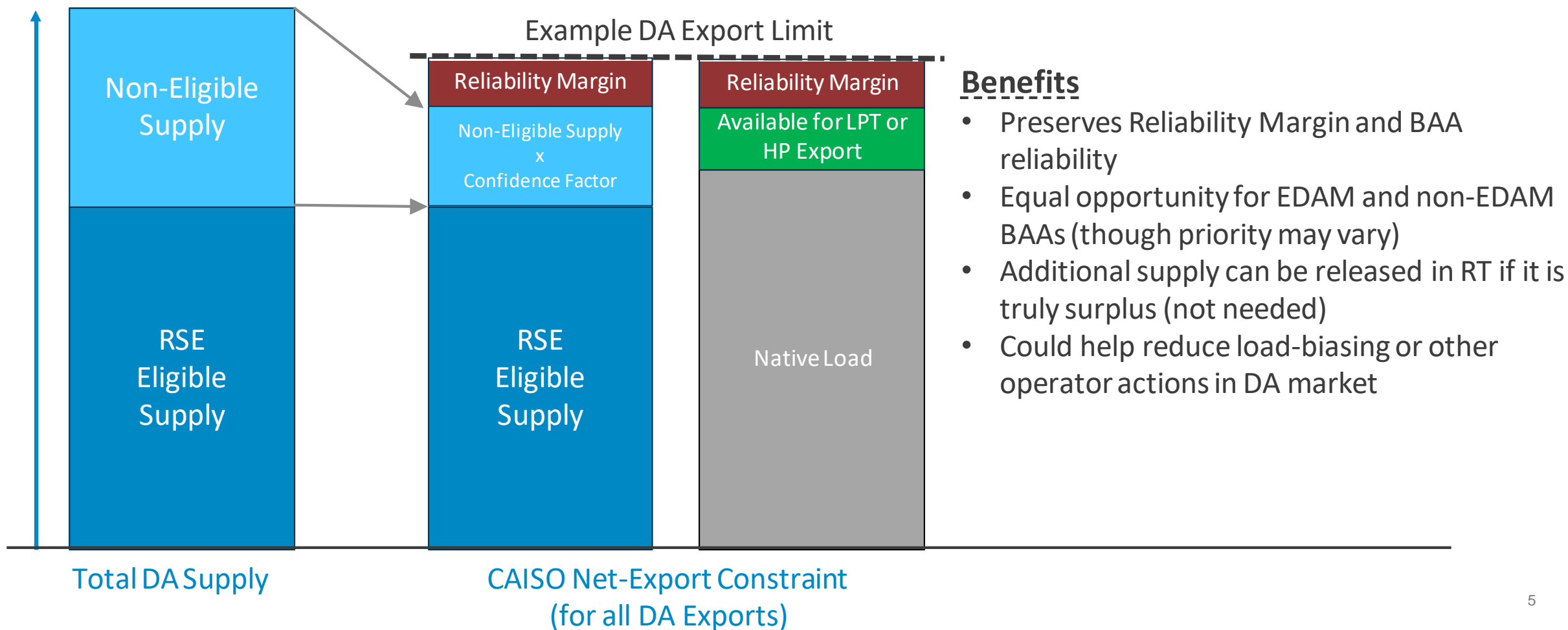
The loophole puts CAISO BAA Reliability at Risk as it undermines the EDAM Net-Export Constraint

- The loophole can eliminate the Reliability Margin
 - The Reliability Margin is insurance to make sure the CAISO BAA can meet its Day-Ahead Obligations
 - The loophole allows the Reliability Margin to be scheduled as low-priority exports to non-EDAM BAAs
 - Those low-priority exports wouldn't be cut until ~EEA2
 - Causing the Reliability Margin to no be there when then CAISO BAA needs it
- The loophole could allow for some supply only to be offered to non-EDAM BAAs
 - This is an incentives to remain out of EDAM



Reasonable DA Export Limits

Reasonable limits on all DA Exports would close the loophole





Reasonable Limits on all DA Exports

Reasonable Economic Limits on all DA Exports (out of CAISO BAA) is a reasonable practice for a BAA

- This should be a priority for the CAISO BAA and the CAISO markets team
 - It helps maintain reliability
 - Corrects a gap in EDAM design
 - It is a reasonable BAA function
 - Could help with other issues like DA load conformance



CAISO BAA reliability and CAISO day ahead self schedule

PG&E

[California ISO - All comments \(caiso.com\)](#)



California ISO

AS pay for performance accuracy calculations

SCE (ISO)

[California ISO - All comments \(caiso.com\)](https://www.aiso.com)

Ancillary Services Pay for Performance Accuracy Calculations

- SCE believes there are issues with the methodology that CAISO uses to evaluate, verify, and dispute the regulation pay for performance accuracy calculations.
- SCE sees issues with how CAISO market dispatches with very small regulation up and down awards (less than 1 MW) are measured for regulation accuracy.
- Measurements of such small quantities are meaningless in proving if a resource can provide accurate amounts of regulation awards, often time resulting in AS de-certification.
- Furthermore, the market rule does not consider how gas-fired generation with spinning mass and inertia cannot respond to extremely short duration and small quantity regulation up and regulation down dispatches when on AGC.

Ancillary Services Pay for Performance Accuracy Calculations

In order for this initiative to fully address SCE's concerns, the scope of this initiative should focus on the following areas:

- Small award (MW) for resources with large Pmax
- Small awards (MW) for resources regardless of Pmax
- Short duration (seconds) "dispatches/setpoints deltas" per 15-minute interval
- Small qty (count) of 15 min intervals with awards per month
- Data availability for verification
- Dispute process
- Allowance for 2% telemetry error
- Adjustment for 8 second data lag in calculations

Ancillary Services Pay for Performance Accuracy Calculations

- This proposed initiative will support “Strategic Objective 1 - Reliably and efficiently integrate new resources by proactively upgrading operational capabilities”. The proposed initiative impacts old and new resources that offer Ancillary Services.
- There is a major burden on scheduling coordinators to have to recertify AS resources. This will impact CAISO ability to procure AS regulation resources because those resources require recertification. In addition, it could also impact the number of available reserves within the CAISO market.



California ISO

Correction of the hourly shaping factors used in the maximum import bid price

California Public Utility Commission, Energy Division

[California ISO - All comments \(caiso.com\)](https://www.caiso.com)



California ISO

Liquidity of bilateral indices used in FERC Order 831 implementation

California Public Utility Commission, Energy Division

[California ISO - All comments \(caiso.com\)](https://www.aiso.com)



Revisions to RAAIM

California Public Utility Commission, Energy Division

[California ISO - All comments \(caiso.com\)](https://www.caiso.com)



Revisions to RAAIM

California Public Utility Commission, Energy Division

[California ISO - All comments \(caiso.com\)](https://www.caiso.com)



California ISO

Revisions to RAAIM

California Public Utility Commission, Energy Division

[California ISO - All comments \(caiso.com\)](https://www.caiso.com)



California ISO

Long duration energy storage initiative & Real-time ancillary service reoptimization

PG&E

[California ISO - All comments \(caiso.com\)](https://www.caiso.com)

Long Duration Storage Initiative

PG&E

May 15, 2024





Long Duration Storage Modeling Options

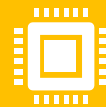
Market modeling of long duration energy storage: opportunity to build upon existing market models



Hydro (daily energy limit, monthly plan) – add charging capability



Pumped hydro (discrete pumping state, commitment costs) – add dispatchable range to pump model



Existing NGR model: determine where short duration assumptions hamper use, enable begin and end of day SOC targets (and potential SOC ancillary service), enable discrete charge/discharge commitment states



Hybrid (market participant manages state of charge, provides telemetry so CAISO can verify feasibility after the fact) – enable model for individual LDES, enhance telemetry for non-battery storage



Long Duration Storage Modeling Benefits

Enhance market operator capabilities to capture or model sources of value not represented in current market processes (energy sufficiency, long-term telemetry)



Seasonal energy shifting



Backup energy to cover renewable unavailability, avoid fossil peaking



Potential for uses of stored energy outside of electric markets



Potential Long Duration Storage Market Updates

Storage as a product distinct from dispatched energy



Enforce or price initial SOC and final SOC targets in DAM processes



Consider enhancing multi-day modeling to capture and price storage opportunity costs over one to two week horizon



Multi-month energy sufficiency products



Model storage as a spread over a participant-determined horizon

Intermittent Resource AS Initiative

PG&E

May 15, 2024

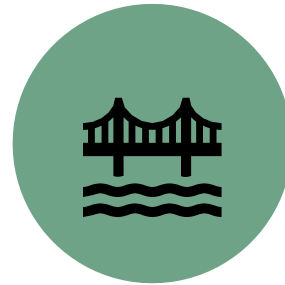




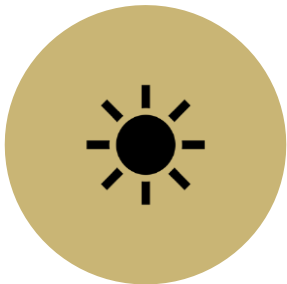
Ancillary Services for Solar (Intermittents/Hybrids)



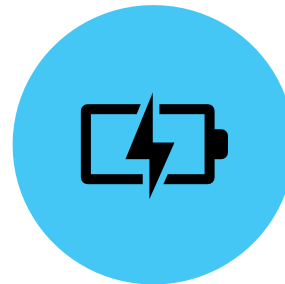
Certification and Performance Requirements



Locational Procurement



Real-time AS reoptimization



Dynamic limits, default bids and RTD AS procurement



Real-time AS reoptimization

Consider IR procurement as aiding AS reoptimization

Use dynamic limit tool to determine solar buy-back

Determine constraints on rebidding to dis-incent pure arbitrage plays

Thank You

Alva Svoboda

alva.svoboda@pge.com





Revision of DR control group settlement methodology

PG&E

[California ISO - All comments \(caiso.com\)](#)

Proposal to Revise Demand Response Control Group Settlement Methodology

PRESENTED TO:

CAISO's WEIM Regional Issues Forum

PRESENTED BY:

Jahon Amirebrahimi



Together, Building
a Better California



Background

Compared to other baseline methodologies for Demand Response (DR) settlement, CAISO's Control Group Methodology promises more accurate and precise payout to DR providers.^[1]

Utility Program	Baseline type	Proposed	
		Bias (MPE) ^[2]	Precision (CVRMSE) ^[2]
PG&E Residential AC cycling	Day matching	-4.00%	0.086
	Weather matching	-3.40%	0.098
	Control group	0.40%	0.051

However, despite its accuracy and precision, this methodology has rarely been utilized, if at all, for settlement by DR providers.

[1] CAISO 2017 Baseline Accuracy Report [2017BaselineAccuracyWorkGroupFinalProposalNexant.pdf \(caiso.com\)](#)

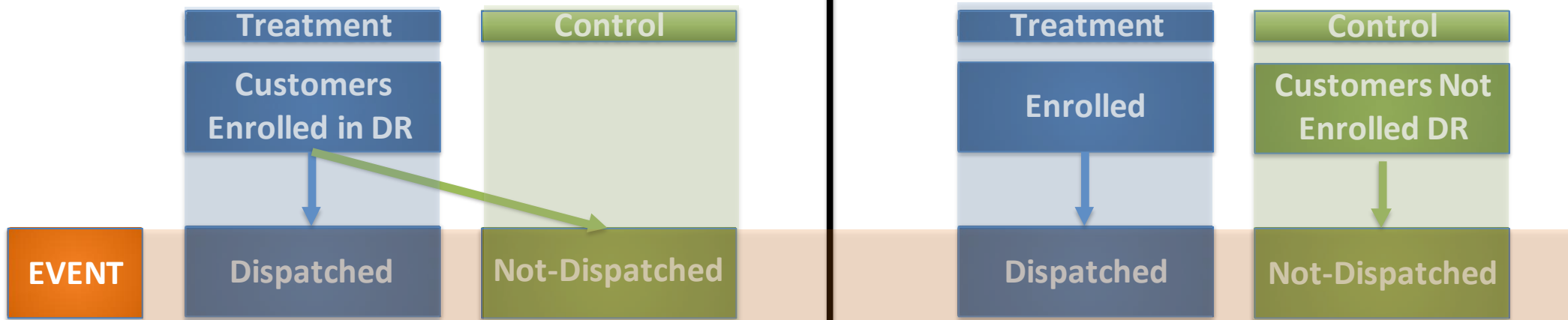
[2] MPE = Mean Percent Error, CVRMSE = Coefficient of Variation Root Mean Squared Error

1. Tariff and Business Practice Manual require registration of Control Group customers, *regardless* of whether or not they are enrolled in a Demand Response program.^[3]
 - a. Control groups are generated using “Hold-out” or “Matched” approaches.
 - b. Generating a “Matched” control group utilizes customers who aren’t enrolled in a demand response program (non-DR customers).
 - c. Currently, registration requirements these include non-DR customers.
 - d. IOUs face legal and operational barriers with non-DR customer registration:
 - i. Legal: IOUs cannot share non-DR customer personally identifiable information with CAISO unless they obtain consent from these non-participants and
 - ii. Operational: Other third party DRPs would encounter delays in registering non-DR customers used by IOUs’ matched control groups, which would inhibit competitive neutrality (i.e. Electric Rule 24).

1. Differentiate between “Hold-Out” versus “Matched” Control Groups

Hold-out: DR participants that are randomly withheld from dispatch during the event season.

Matched: Non-DR participants are not enrolled throughout the event season, yet exhibit similar baseline load profiles as DR Participants.

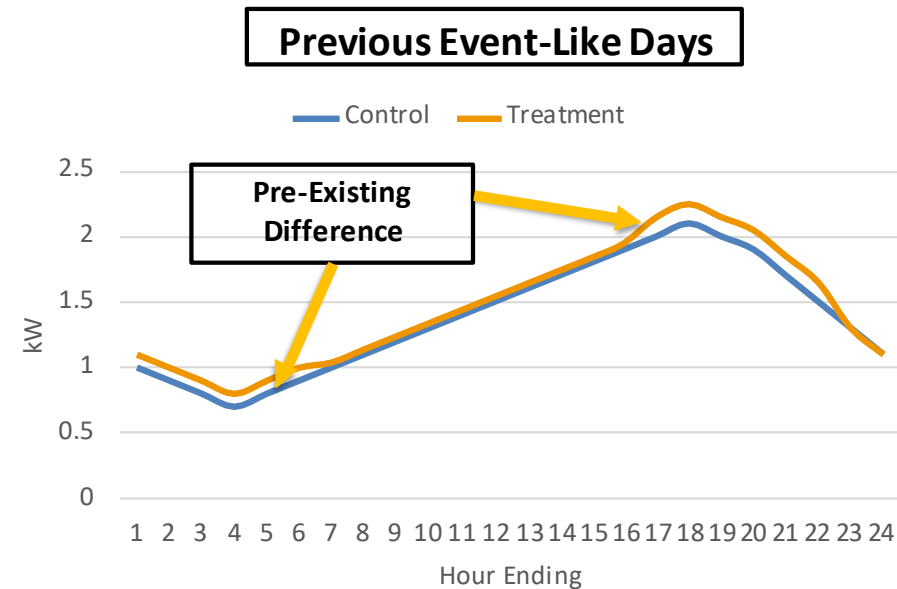
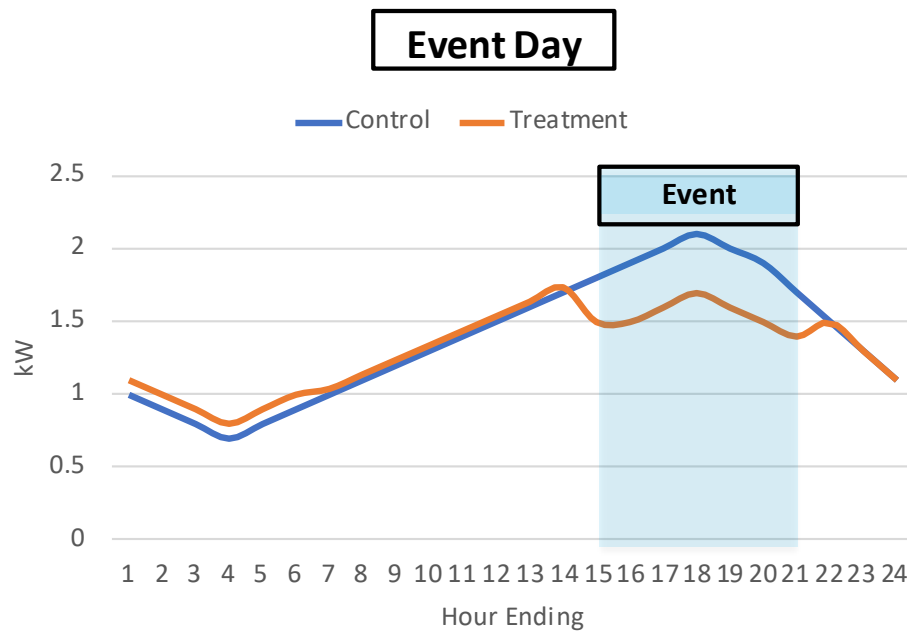


2. Remove registration requirements for Matched control groups;

- a. As Non-DR customers never participate in a DR program, registration should not be required.

Issue 2: Methodological

1. Tariff and BPM does not allow for a baseline adjustment to account for pre-existing differences between Control and Treatment group load profiles.^[4]



The current performance calculation is defined as the difference between hourly Treatment and Control group load on the event hours.

Currently, if there are pre-existing differences in load between Treatment and Control group customers, this bias is not removed from the performance calculation.

[4] Tariff Section 4.13.4.3, Section B, Page 68; Business Practice Manual Section 5.3, Page 38

2. The assessment period for validating the Control Group does not adequately reflect the conditions in which a demand response event is dispatched.

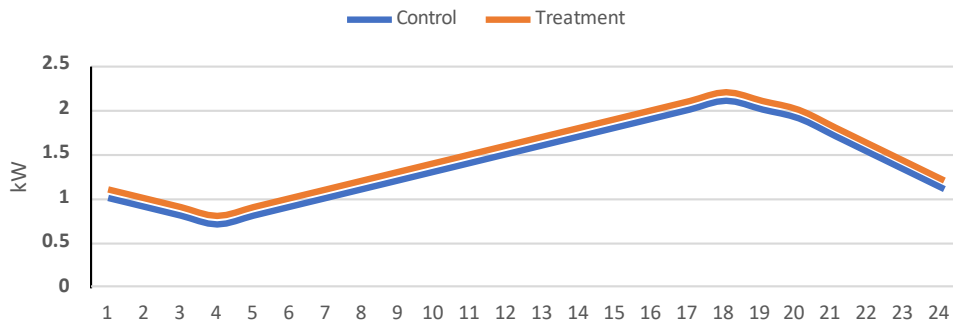


- a. The current validation method uses 75-day lookback period. The most recent 30 days are not used. Of the remaining 45 days in the lookback period, a minimum of 20 must be selected.^[5]
- b. There are minimal criteria for day selection, days do not need to resemble event conditions.

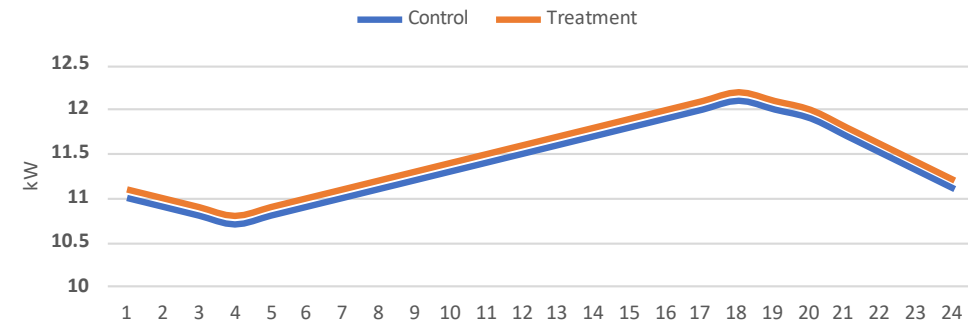
[5] Tariff Paragraph 4.13.4.3. Section C, Page 67

3. The metrics suggested to determine error fail when accounting for customer loads that are consistently small (values between -1 and 1). [6]

Small kW Values: Mean Percent Error = 5%



Large kW Values: Mean Percent Error = 1%



Although the difference between Control and Treatment Group load is the same for every hour (0.1 kW), the Mean Percent Error calculation will demonstrate larger error as baseline load approaches zero. [7]

[6] Note: Demand Response Registration User Guide Version 4.9's [Day Randomization Validation Template](#) suggests using a linear regression's beta coefficient, which is methodologically similar to Mean Percent Error.

[7] Hyndman & Kohler (2006) Another look at measures of forecast accuracy, International Journal of Forecasting 22(4), 679-688

1. Allow for a ten-in-ten load baseline adjustment.
 - i. Based on the treatment group's observed usage, select ten days for which the amount of totalized load was highest during the hours when the Demand Response Services were provided in the forty-five (45) calendar days prior to the Trading Day.
 - ii. Separately for the Treatment group and the Control group, calculate the simple hourly average of the collected Meter Data to determine a baseline amount.
 - iii. Divide the Treatment and Control group baseline to produce an adjustment factor.
 - iv. Multiply the adjustment factor by the calculated performance.
2. Validation days should be those used for the baseline adjustment.
3. The list of eligible validation metrics should be expanded.
 - i. DR providers should be able to select from an expanded list of CAISO approved validation metrics to account for a greater variety of estimation concerns. Some examples of alternative metrics include Relative Mean Absolute Error (RMAE), Mean Absolute Scaled Error (MASE) and Standard Deviation adjusted Mean Absolute Error (SDMAE).

1. More accurate, accessible, and clearer information about Stakeholder's Demand Response performance and settlement.
2. Prevents complications for Stakeholders with regard to dual enrollment between LSEs and third-party DRPs.
3. Improved Stakeholder confidence in the available CAISO market incentives for DR services.

Thank you!

Contact:

Jahon Amirebrahimi

Jahon.Amirebrahimi@pge.com



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a Better California



Energy storage outage improvements

Vistra & IPP and Marketers Sector, Regional Issues Forum

[California ISO - All comments \(caiso.com\)](https://www.caiso.com)

CAISO 2024 Policy Roadmap Storage Outage Improvements

(Vistra & on behalf of IPP & Marketers Sector)

May 15, 2024

Cathleen Colbert

cathleen.Colbert@vistracorp.com

412-720-7016

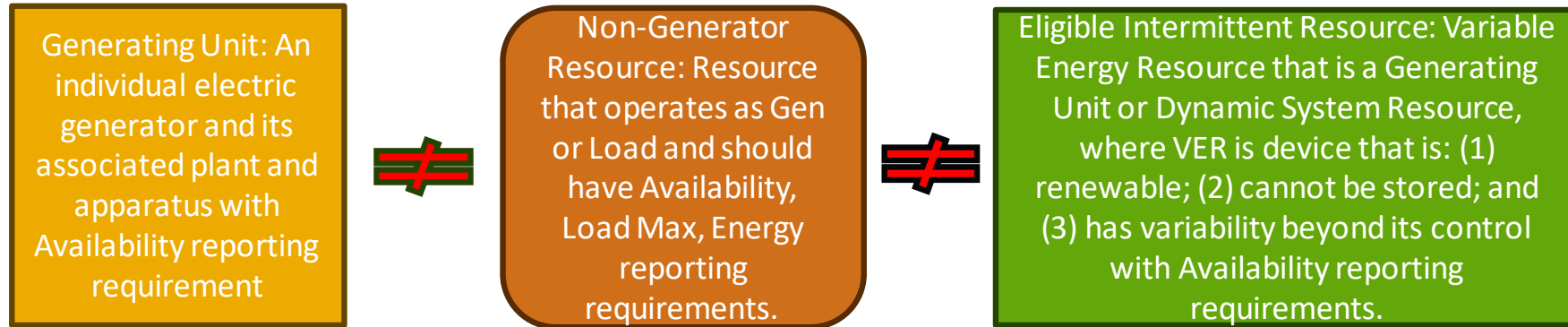
A decorative graphic at the bottom of the slide consisting of a dark blue curved line above a green curved line, resembling a stylized horizon or a wave.

- Opportunity cost of not improving outage rules and OMS is increasing reliability risks where Value of Lost Load likely outweighs costs.
- During periods of light loads and ample supply, lack of outage reporting requirements, unclear nature of work categories, and the manual nature and time delays of managing forced outages utilizing the current OMS process may not cause a reliability event.
- However, during tight system condition days, these policy gaps and performance limitations could create unforeseen risks negatively impact system reliability.
- Proposed scope will allow resources to be managed more effectively on all days, providing efficiency and reliability benefits to operations.
- While many issues are storage, co-located, or hybrid gaps there are likely other OMS improvements that can benefit all resources increasing the value of this initiative.¹

¹ See BPA outage scope request could also be included at minimal additional cost. See slides 36-37
<https://www.caiso.com/InitiativeDocuments/Presentation-Annual-Policy-Roadmap-Catalog-working-group-May8-2024.pdf>.

- Issue #1: No Tariff outage reporting requirement for stand-alone storage, co-located resources, or hybrid resources
- Issue #2: Available nature of work types do not cleanly match the types of outages the new technology faces, and there is lack of understanding within the CAISO of the physical outages affecting the new technology.
- Issue #3: Outage management system functionality is not agile enough to facilitate minimizing the gap between change in availability and the market seeing that change driving need for operational improvements, and in some cases does not even allow adjusting the charging availability (Load Max).

Issue #1: No Tariff outage reporting requirement for storage, co-located, or hybrid resources



- Section 9.3.10.3 applies requirements for advance reporting to the CAISO of anticipated and actual Forced Outages *affecting its Availability (Pmax)* for:
 - Generating Units (a)
 - Resource-Specific System Resource (a) **Not applied to NGR, Co-Located or Hybrid**
 - Eligible Intermittent Resource (b)
- Section 9.3.10.3.1 applies requirements if prior notice of a Forced Outage on its Availability (Pmax) cannot be given to the CAISO for:
 - Generating Units (a)
 - Resource-Specific System Resource (a) **Not applied to NGR, Co-Located or Hybrid**
 - Eligible Intermittent Resource (b)
- Good Utility Practice dictates outages should be submitted, however without Tariff reporting requirements leads to inconsistent practices, and it is past time to develop Tariff outage reporting requirements.

Issue #2 available nature of work are largely for generating units not non-generating units

- Existing nature of work types were designed for conventional generating units outages and should be revisited to include:
 - Foldback (design characteristic not modeled yet)
 - Inverter outages
 - Rack outages
 - Full output outages for array of reasons
- Effort should discuss outage causes for new technologies including:
 - If existing cards can be used, need to add storage causes in the nature of work description in the outage management BPM
 - If greater transparency into the outage causes is needed (separating foldback from other issues) explore new card type
- Effort would ensure outages can be submitted for the Load Max (Pmin) in addition to Availability (Pmax) especially for Test Energy

- Outage Management System (OMS) has limitations if addressed would improve visibility into actual capabilities, and should be enhanced to:
 - System must automatically accept updates to existing forced outage card.
 - System must allow existing or new overlapping outage cards that can adjust Availability, Load Max, Max Energy and Min Energy values on one card and allow non-NULL values in addition to NULL for other card(s).
 - System must allow existing or new overlapping outage cards with adjustments to Availability, where system will allow different values on the two or more cards and system will transfer the most restrictive (highest curtailment MW or MWh) for each parameter to downstream systems.
 - System should add a single Out-of-Service checkbox for NGRs which would result in the system seeing both OOS boxes in the Availability and Load Max tabs being checked. This would allow a single check to reflect full unavailability across Maximum Output to Minimum Output for NGR.
 - System should retain outage card values when existing outage card's end date is extended.

- Adopt outage reporting requirements for storage, co-located, and hybrid resources including with proposed thresholds for Availability, Load Max, Max Energy, and Min Energy tabs on outage cards,
- Ensure nature of works used by storage outage type are better representation of the cause so that it can be clearly seen outages that are due to known engineering characteristics the market does not model versus other outage types,
- Allow Load Max changes on the testing card in addition to Availability,
- Automate manual processes that the Grid Operations and Plant Operations teams must perform, and
- Address concerns with delays in communicating the real-time physical capability of storage resources.

Appendix

- CAISO added Non-Generating Resource participation model in 2010
- Energy Storage and Distributed Energy Resources stakeholder initiatives largely focused on participation model leaving certain areas of policy missing
- On May 20, 2021, Vistra submitted comments on Energy Storage Enhancement's Issue Paper highlighting three areas of concern with existing storage policies including outage management system practices ([May 2021 comments](#))
- On July 20, 2021, Vistra presented additional context for the outage management clarifications on slide 8 ([July 2021 presentation](#))
- On January 18, 2022, Vistra submitted comments on the straw proposal expressing disappointment that operational concerns we proactively brought to CAISO were not included in ESE ([Jan. 2022 comments](#); [May 2022 comments](#); [August 2022 comments](#))
 - In addition, another issue was raised that foldback impacts in the model was also not included in NGR and in lieu outages are the mechanism to reflect foldback
- In Q1 2023, Vistra leadership communicated concerns with ability to effectively manage storage is overly burdensome due to need to manage known design characteristics through outage cards and facing issues with Outage Management System.
- In Q2 2023, Vistra submitted a white paper providing technical explanations for stand-alone storage outages and recommending appropriate clarifications with specific operational improvements requested for Outage Management System.
 - CAISO has been evaluating these requests for almost a year.

- **Foldback design characteristic:** Engineering phenomena when energy storage is at either high or low state of charge, the charging or discharging current must be limited to ensure the operating limits of the equipment are not exceeded. CAISO should adopt modeling enhancements to capture charging or discharging rate impacts to Availability or Load Max but they do, have to manage with outage cards.

Best Nature of Work (NoW) Category: Technical Limitations not in Market Model, however not currently allowed by CAISO so have to use Plant Trouble

- **Inverter outage:** Storage operators not able to forecast when, how many, or whether inverter outage will result in full reduction or partial reduction in inverter capability.

Best Nature of Work (NoW): Plant Trouble

- **Rack outage:** Instances when racks (or cells) disconnect from the rest of the operating bank. Storage operators must restore the bank to a similar SOC level those racks that disconnected to allow for them to reconnect to the bank and return to operation.

Best Nature of Work (NoW): Plant Trouble

- **Full Plant outage:** Entire storage resource can become unavailable for various reasons including safety management at resource or neighboring site, control system(s) failures, electrical failure (breakers/cables e.g.) at the array level, transformer failures, or electrical phenomena (lightning) resulting in entire transmission substation failure.

Best Nature of Work (NoW): Plant Trouble

- **Co-located or hybrid outages:** TBD



California ISO

Allow multi-stage generating (MSG) units to be used within an Aggregate Capability Constraint (ACC)

Middle River Power

[California ISO - All comments \(caiso.com\)](https://www.caiso.com)

Multi-Stage Generating Units within Aggregate Capability Constraints

- When the CAISO implemented the ACC in 2020, it proposed, and FERC accepted, that certain resource types (e.g., MSG and Pumped Storage Hydro) could not be used within an ACC
 - CAISO: No such resources expressed interest, increased complication
- ACC has evolved to include sub-constraints and pseudo-tied resources, but still excludes certain resource types
- MRP operates an MSG that shares an interconnection with a BESS and a solar project
- MRP requests the CAISO allow MSG units to be used within an ACC
- This will require Tariff changes (Section 27.13)



California ISO

Hydrogen electrolyzer market participation

Northern California Power Agency

[California ISO - All comments \(caiso.com\)](https://www.caiso.com)



California ISO

Hybrid and Co-Located Resource Enhancements Resource Adequacy Provisions for Hybrid Resources

Terra-Gen, LLC

[California ISO - All comments \(caiso.com\)](https://www.aiso.com)

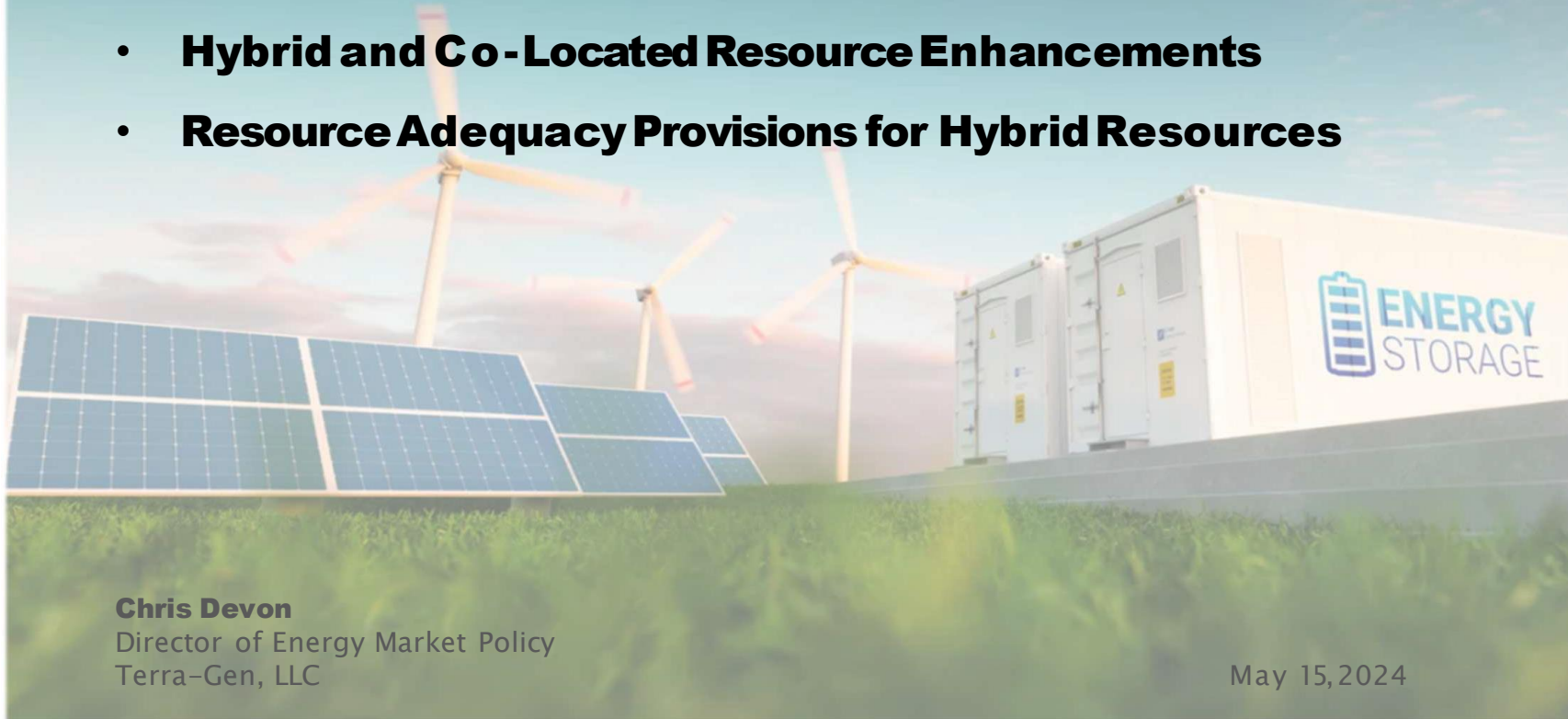
Terra-Gen, LLC



CAISO Annual Policy Initiatives Roadmap Process – 2024

Terra-Gen Policy Initiative Catalog Stakeholder Submissions:

- **Hybrid and Co-Located Resource Enhancements**
- **Resource Adequacy Provisions for Hybrid Resources**



Chris Devon
Director of Energy Market Policy
Terra-Gen, LLC

May 15, 2024

About Terra-Gen

Terra-Gen is a leader in the clean energy sector

We focus on bringing affordable clean energy and meaningful economic growth to the communities where we operate

- Established in 2007, Terra-Gen has successfully developed over 5,000 MW of utility-scale wind, solar, and energy storage assets throughout the United States and owns and operates several projects in California.
- Terra-Gen's assets located in California represent over **1,500 MW of energy storage**, with an additional 1,000 MW under construction, expected to come on-line in 2025.
- The initial phase of Terra-Gen's Edwards Sanborn project, located in Kern County, California, is currently the largest solar-plus-storage project in the world.
 - Phase 1 comprises 807 MWs of solar and 971 MWs of energy storage, with 3 GWh of storage capacity. When complete, the Edward Sanborn franchise will provide up to **3.35 GW** of solar-plus-storage to the CAISO grid.

Terra-Gen, LLC - Public



**CATALOG SUBMISSION:
HYBRID AND CO-LOCATED RESOURCE
ENHANCEMENTS**

Revisiting Hybrid Resource Participation Rules

- CAISO has not openly discussed the appropriate use of hybrid or co-located resource market participation and related operational tools, and the interactions with other processes, including bidding and provision of Ancillary Services (AS), and other related provisions and procedures.
 - CAISO's Hybrid Resources Revised Final Proposal policy paper includes a very brief section on AS that indicates hybrid resources may provide AS but provides little detail or specific expectations for aspects of AS provision or AS market participation approaches. (See CAISO [Revised Final Proposal, Oct. 2020](#) at pp. 17).
 - CAISO has provided general guidance on its expectations for bidding and the use of Dynamic Limits through simplified examples that only include energy market participation. The only examples that CAISO has provided do not address AS market participation or the provision of AS by hybrid resources. (See CAISO Revised Final Proposal, Oct. 2020 at pp. 19-23).
- Current provisions and possible enhancements related to hybrid resource operations and AS provision should be explored in further detail to provide needed guidance and possible clarifications.

Provision of Regulation by Hybrid Resources

- In the case of provision of Regulation, CAISO has not provided adequate opportunity for open discussion on the appropriate use of outage submissions versus the utilization of the Dynamic Limits concept.
 - CAISO has provided sporadic guidance to SCs to utilize outage submissions to indicate AS operating capability limitations during challenging conditions. In these instances, CAISO operators may block these units providing AS and from AS market participation for an extended period. (See CAISO Operating Procedure [2210D Ancillary Service Blocking and Disqualification](#)).
- During the prior stakeholder initiative effort, CAISO acknowledged issues regarding the problematic nature of requiring the use of outages; these included timing concerns as well as overly-burdensome processes for SC submission. (See CAISO Revised Final Proposal, Oct 2020 at pp. 3-4, 9-10, and 20).
 - The timeframe for SCs to provide the submission of outages through OMS and subsequent lag in their application through the market systems causes a delay in effective operating capability CAISO's systems and operators observe.

Hybrid resource operational limitations are best addressed through use of Dynamic Limits

Hybrid and Co-Located Resources – Open Issues

- CAISO has not openly discussed more complex hybrid and co-located resource market participation issues in a formal stakeholder initiative setting since it concluded its initial efforts in 2020–21.
 - During prior stakeholder discussions, CAISO committed to follow up on more complex and difficult issues (AS Provisions, Grid-Charging Restrictions, and Resource Adequacy) after concluding its initial stakeholder efforts.

Hybrid resource participation refinements should not be considered discretionary

- In the pending energy storage enhancements initiative, CAISO should consider improvements to hybrid and co-located resource models to enable them to operate more effectively within the CAISO markets.
 - Supports CAISO’s Strategic Objectives #1, #2, and #3.

CAISO should prioritize this item as a prior commitment to continue the development of hybrid participation models



**CATALOG SUBMISSION:
RESOURCE ADEQUACY PROVISIONS FOR
HYBRID RESOURCES**

Hybrid Resource - RA Provisions

- Hybrid resource policy for Resource Adequacy (RA) were never thoroughly discussed during CAISO's prior 2020–21 stakeholder initiative.
 - CAISO revised final proposal only included a brief section regarding RA and significant RA issues were descoped or never thoroughly addressed. (See CAISO [Revised Final Proposal, Oct. 2020](#) at pp. 25–27).
- CAISO provided hybrid resource bidding examples, and proposed system/generic RA RAAIM exemption for hybrids. CAISO also reviewed general Must Offer Obligation issues, such as 24 by 7 bidding requirements.
 - Some of these items were never formalized in CAISO's tariff language drafting process and have not been fully reflected in the CAISO Tariff and BPMs. (See CAISO [Tariff Section 40](#); Sections 40.6, 40.9, and 40.10, and CAISO [Reliability Requirements BPM](#) Section 7.1.1.).
 - It is also important that CAISO further review grid-charging restrictions impacts on hybrid resources, interactions with RA provisions, and bidding and operational expectations. These aspects have not been fully vetted or discussed in an open stakeholder process.

Formalizing Additional Hybrid Resource RA Provisions

- CAISO should provide an opportunity to review and openly discuss the treatment of hybrid resource RA related rules and procedures to address any concerns with applicable RA provisions.
 - CAISO should review hybrid resource RA provisions related to generic/system and flexible RA and discuss the application of flexible RA RAIM, as well as formalizing Must Offer Obligation provisions in the CAISO Tariff and BPMs.
- CAISO should address the prior omissions and align its Tariff and BPM provisions with its existing guidance and practices for hybrid resources providing RA and discuss additional issues that may be identified.
- Initial information provided by CAISO to inform the effort should include a formal review of existing applicable provisions and gap analysis.

Hybrid Resource RA Issues

- CAISO has not openly discussed hybrid resource RA provision in a formal stakeholder initiative setting since it concluded its initial efforts in 2020–21.
 - During prior stakeholder discussions, CAISO committed to follow up on more complex and difficult issues (AS Provision, Grid Charging Restrictions, and Resource Adequacy) after concluding initial stakeholder efforts.

Review of hybrid resource RA provisions should not be considered discretionary

- In the pending energy storage enhancements initiative, CAISO should consider discussing clarifications for hybrid resource RA provisions to enable them to operate effectively within the CAISO markets.
 - Supports CAISO's Strategic Objectives #1, #2, and #3.

CAISO should prioritize this item as a prior commitment to clarify hybrid resource RA provisions

For reference

- Visit 2024 process webpage for more information:
- <https://stakeholdercenter.caiso.com/RecurringStakeholderProcesses/Annual-policy-initiatives-roadmap-process-2024>
- If you have any questions, please contact Brenda Corona at bcorona@caiso.com or isostakeholderaffairs@caiso.com

New training series: Resource Operations Readiness Training

Training Goal: to prepare customers in advance of summer to meet ISO expectations for successful resource management, especially during tight conditions.

These courses build on concepts shared during the May 1st Resource Interconnection Fair.

Resource Performance
Expectations
May 7th

- Dispatch/Operating instruction response
- Hybrid resource management
- Outage cards completion
- Flex Alerts/EEA response

Battery Performance
Expectations
May 15th

- Resource capabilities
- Correct Nature of Work
- Off-Grid Charging Indicator
- Physical management requirements

Managing Intertie
Transactions
May 16th

- Wheel-through concepts
- Export priority
- Tagging expectations
- Flex Alert/EEA

WEIM Resource
Performance
Expectations
May 22nd

- Assistance Energy Transfer
- Demand Response process for WEIM

Register today at: <https://caiso.regfox.com/resource-operations-readiness-training-series>

Contact CustomerReadiness@caiso.com with questions.

Share this information with your staff!

SAVE THE DATE |

2024 STAKEHOLDER SYMPOSIUM

OCT. 30, 2024
SACRAMENTO, CA

The California ISO Stakeholder Symposium will be held on Oct. 30, 2024 at the Safe Credit Union Convention Center in Sacramento, California.

A welcome reception for all attendees will be held the evening of Oct. 29.

Additional information, including event registration and sponsorship opportunities, will be provided in a future notice and on the ISO's website.

Please contact Symposium Registration at symposiumreg@caiso.com with any questions.



A new **caiso.com** is coming in late May

Training sessions will be held on
May 23 from 9:00 a.m. – 10:00 a.m.
May 29 from 10:00 a.m. – 11:00 a.m.

Watch the Daily Briefing for details and
follow us on social media.