California ISO

RA Modeling & Program Design:
Modeling Improvements + Straw Proposal Leanings and Options

February 11, 2025

Housekeeping Reminders

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- These collaborative working groups are intended to stimulate open dialogue and engage different perspectives.
- Please keep comments professional and respectful.

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- If you are connected to audio through your computer, open the participant and chat panels on the bottom right. 
- If you dialed in to the meeting, press *3 to raise your hand.
- Please remember to state your name and affiliation before making your comment.
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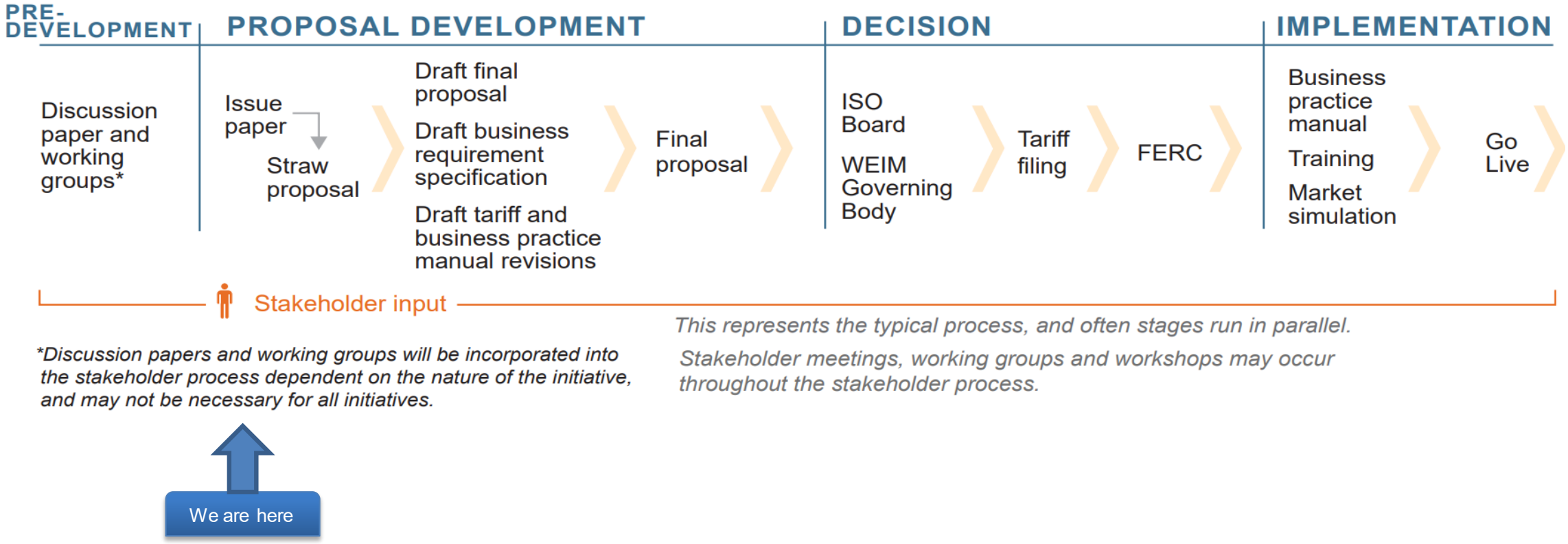
Working Group in context



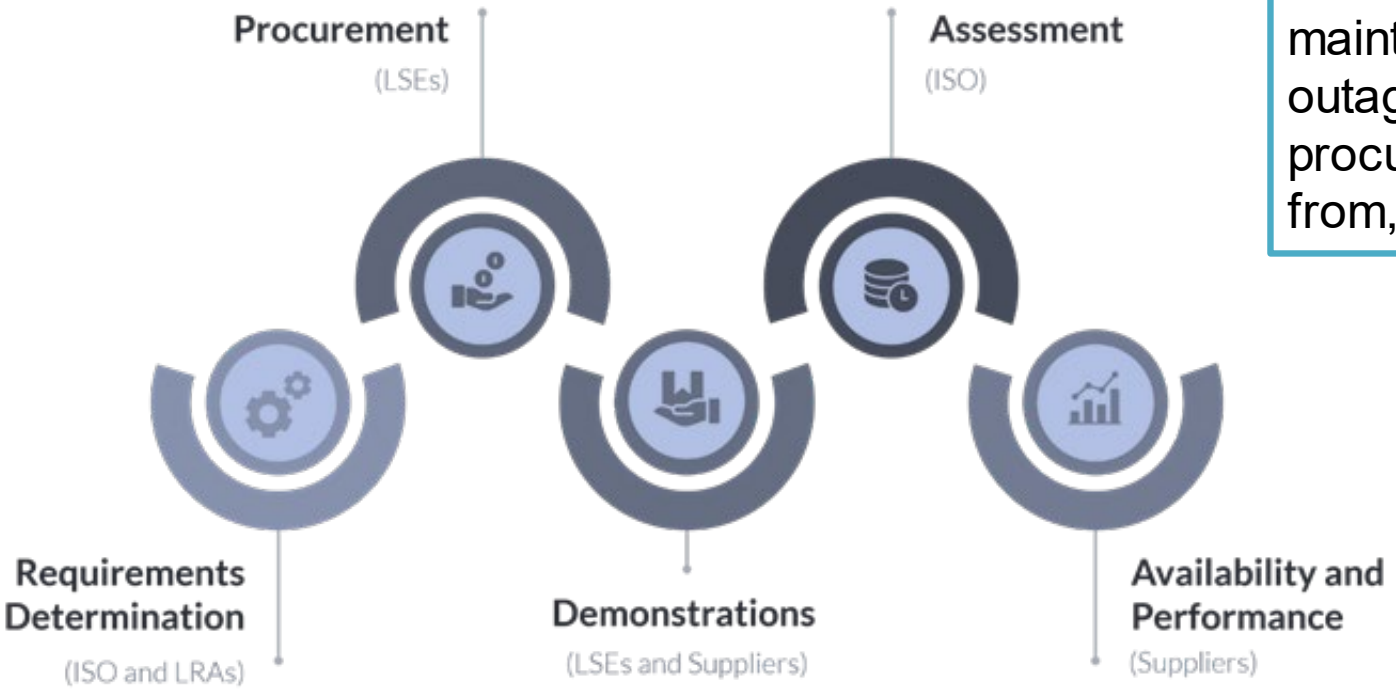
Preview – Tomorrow's agenda: Tracks 2 and 3

Time	Topic	Speaker
9:00 - 9:15 AM	Welcome & Framing	Partha Malvadkar
9:15 - 10:00 AM	Track 3: Visibility	Hilary Staver
10:00 - 10:20 AM	MRP Visibility	Nuo Tang
10:20 - 10:35 AM	Break	
10:35 - 11:30 AM	Track 2: Outage and Substitution	Anja Gilbert
11:30 - 12:00 PM	Stakeholder Presentations	LSEs & DMM
12:00 - 1:00 PM	Lunch	
1:00 - 3:00 PM	Track 2: Availability and Incentive Mechanisms	Anja Gilbert
2:45 - 3:00 PM	Next Steps	Partha Malvadkar

RA package options and leanings

Topic	Summary
Modeling and Defaults	Updated defaults provided as a tool to LRAs to adopt our default rules based on state-of-the-art, transparent probabilistic modeling
UCAP	• Addition to CAISO NQC process to reduce QC values based on resources' forced outage rates • "Supply cushion UCAP" - looks at each RA resource's forced outage rate during a portion of the "tightest" hours of each season (876 hours in each summer and non-summer season) over the past few years to develop a UCAP factor • Applies a derate to resources that do not receive a QC value from an LRA derived from a probabilistic or performance-based methodology (exceedance, ELCC…)
Ambient Derate	Outage data-driven approach to capture ambient derates during historic peak conditions in NQC
RAAIM	New mechanism, Measuring Unavailable RA (MURA), which would assess unavailability during stressed grid conditions and allocate the penalty costs collected from under performing-RA to load
Outage and Substitution	• New processes for conditional approval of outages (without substitution) and a pool design (when substitution is needed) • New definition added for "urgent" outage which functionally is akin to a forced outage
Visibility	Monthly reporting requirements for RA-eligible capacity not shown as RA

Anticipated benefits putting the pieces together



More efficient processes for maintenance with conditional outages and a pool to procure substitute capacity from, if needed. (T2)

Greater insights ahead of requirements from modeling and visibility efforts. (T1 & T3)

More accurate demonstrations from UCAP design. (T1)

Improved availability due to a more accurate UCAP and an improved availability mechanism. (T1 & T2)

Proposed schedule

		Q1	Q2	Q3	Q4
Resource Adequacy Modeling and Program Design					
	Track 1: Modeling, Defaults, and Accreditation	**Policy development**		**Decision (Default Counting Rules/PRM)**	**Implementation (Default Counting Rules/PRM)**
	Track 2: Outage & substitution and availability and incentive mechanisms	**Policy development**		**Decision**	
	Track 3a: Backstop reform and long-term EDAM RSE solutions	**Policy development**			
	Track 3b: RA status visibility	**Policy development**		**Decision**	**Implementation**

TRACK 3: RESOURCE VISIBILITY

RA Track 3 covers multiple areas related to CAISO's backstop procurement mechanisms

1. Resource Visibility

- New reporting requirements for RA-eligible capacity not shown as RA

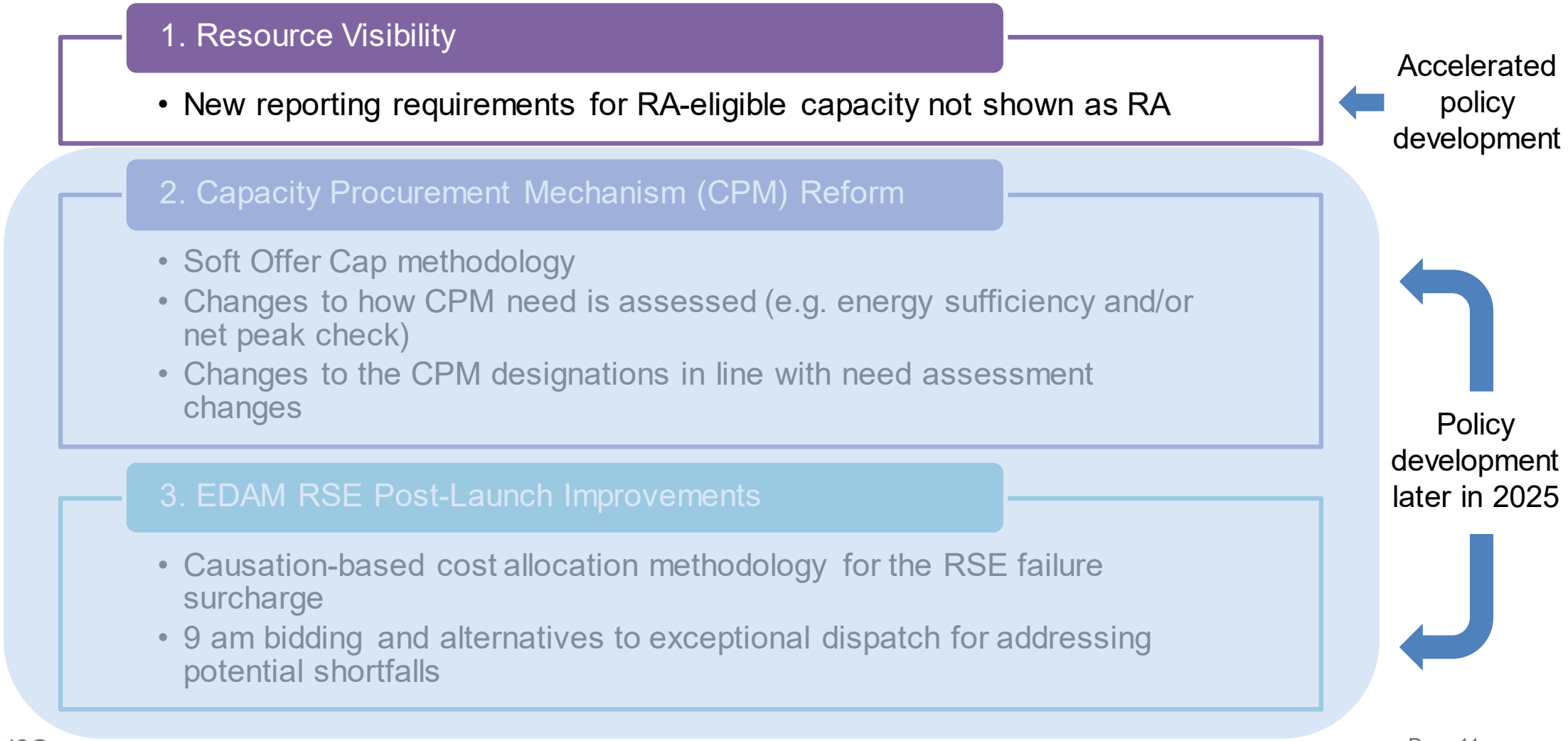
2. Capacity Procurement Mechanism (CPM) Reform

- Soft Offer Cap methodology
- Changes to how CPM need is assessed (e.g. energy sufficiency and/or net peak check)
- Changes to the CPM designations in line with need assessment changes

3. EDAM RSE Post-Launch Enhancements

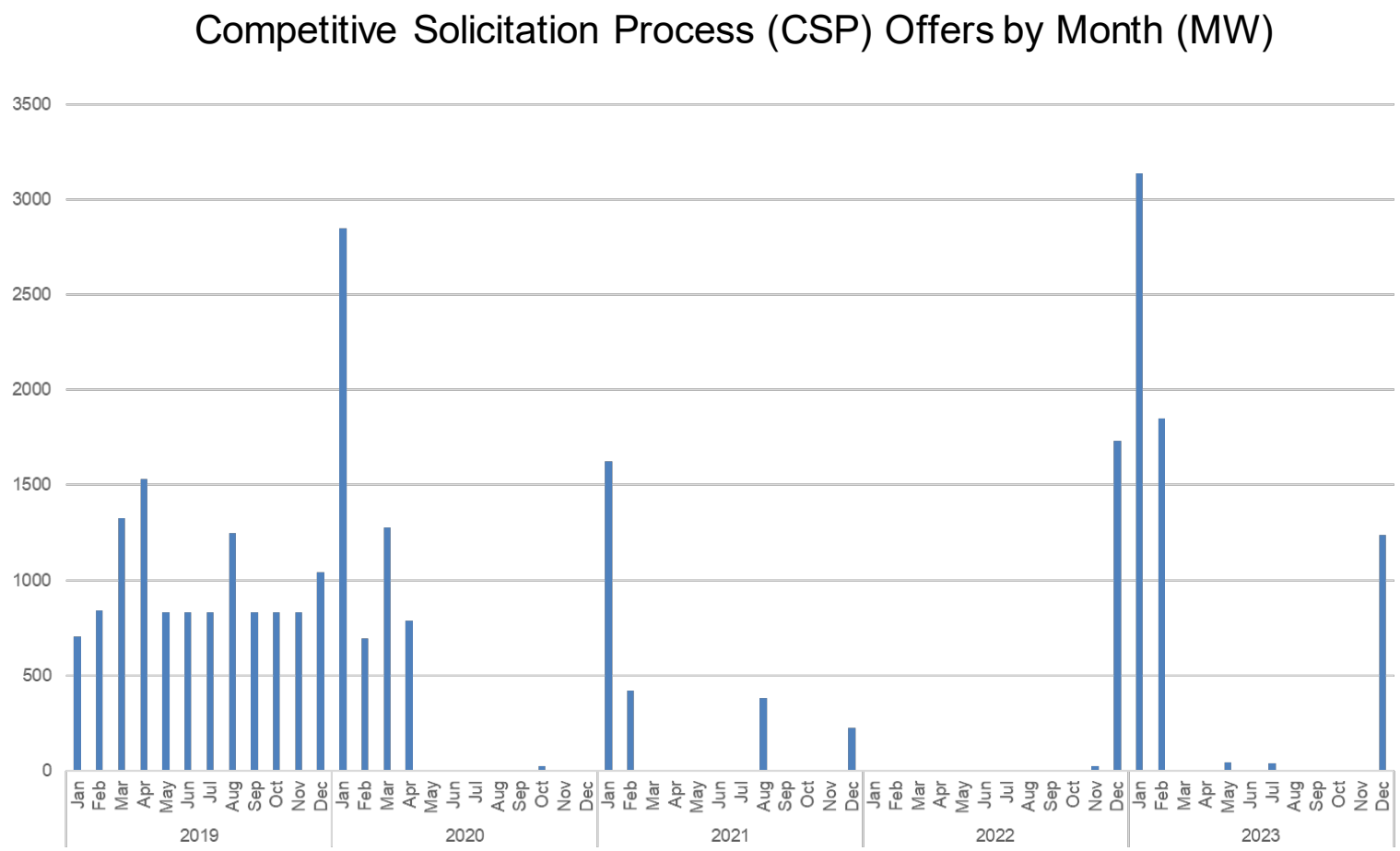
- Causation-based cost allocation methodology for the RSE failure surcharge
- 9 am bidding and alternatives to exceptional dispatch for addressing potential shortfalls

RA Track 3 covers multiple areas related to CAISO's backstop procurement mechanisms



Resource Visibility

- **Goal**: Provide operators with enhanced visibility into the capacity available for Capacity Procurement Mechanism designations, especially in higher-risk months



Themes in Stakeholder Feedback

- Overall neutrality to support regarding new visibility requirements, especially for capacity sold outside the balancing authority area

- Concern that reporting requirements not carry additional obligations or availability requirements

- Continued interest in approach to credited DR programs

Straw Proposal Options

- Monthly reporting requirements for RA-eligible capacity not shown as RA:
  - Sold outside the CAISO BAA
  - Held for substitution
  - Held for anticipated outages
  - Not contracted
  - Contracted but not needed to meet LSE's requirement
- This information could be collected on a year-ahead basis in addition to monthly
- Potential second phase to address additional changes/categories as appropriate

STAKEHOLDER PRESENTATION: MRP

BREAK

RA Track 2: Availability and Incentive Mechanisms & Outage and Substitution

Outage and Substitution

- New processes for conditional approval of outages (without substitution) and a pool (when substitution is needed)
- New definition added for “urgent” outage

Availability and Incentive Mechanisms

- New mechanism to incent availability during tight grid conditions

TRACK 2: OUTAGE AND SUBSTITUTION

Track 2: Outage and Substitution Reform

Proposal: Allow conditional approval of planned outages without substitution.

If taking a planned outage would result in a reliability impact, procure from a pool.

Conditional Approval of Outages

- Recognizing reliability conditions can change and the negative reliability consequences of the former POSO process, the CAISO cannot always give certainty of when outages could be taken that would never impact reliability (when the SC does not provide substitute capacity)
- However, the CAISO is open to exploring allowing *conditional* outages
  - Receiving a conditional outage approval would mean the resource does not have to provide substitute capacity
  - If reliability conditions change, the CAISO may go back to the SC and indicate when substitute capacity must be provided
  - If capacity is required, the SC would be able to procure from a substitute capacity pool

Considerations for Conditional Outages

- What metric should be used to determine what is conditionally approved?
  - Supply plan showings
  - Gross net peak value
  - Other?

Pool Design

There are various attributes and options to consider with the pool design. Highlighted in bold below are the straw proposal leanings.

Product Definition

- Granularity: hourly, **daily**, weekly, monthly
- Participation: **voluntary** or required
- Type of RA: local, **generic**, flex
- Quantity: MW, marginal ELCC

Visibility

- Options: none, **calendar**, new tool

Access Priority

- Options: none, **right of first refusal** (the SC that provides capacity can access it at any point for substitution, if not sold)

Price to Buy/Sell

- Options: administratively set, SC set, **SC set w/cap**

Procurement Mechanism

- Mechanism Options: administrative matching, reverse second price auction (DMM); reverse dutch auction (MRP); least cost auction
- Timeline Options: Before T-28 and/or between T-28 to T-8

Addition of Urgent Outage Type

- Update definition to include “urgent” outage which would be a type of “forced” outage but align with RC west definitions

- After the short-range study window (i.e., a rolling weekly deadline), these are the outage types considered:
  - **Urgent**: A facility/equipment that is known to be operable, yet carries an increased risk of a Forced outage occurring. The facility/equipment remains in service until personnel, equipment and/or system conditions allow the outage to occur.
  - **Opportunity**: A facility/equipment outage that can be taken due to a change in system conditions, weather or availability of field personnel
  - **Forced outages**: A facility/equipment is removed from service real-time with limited or no notice

STAKEHOLDER PRESENTATIONS: LOAD SERVING ENTITIES AND DMM

CAISO RA MPD Initiative

Joint LSEs: CalCCA; SCE; Six Cities; PG&E

- This presentation covers two high priority topics scoped at the CAISO RAMPD:
  - Outage definitions and planned outage substitution process revision
  - UCAP design and implementation methodology and RAAIM revision
- Starting with the CAISO problem statements, we define principles for considering policy options.
- We then list questions that deserve further discussion for the policy development.
- *The material is focused on the clarifying questions put forth in the presentation rather than advocacy of positions. Each of the Joint LSEs continues to consider its positions on the issues in this initiative, and this presentation is for discussion purposes only.*

Planned outage substitution process: CAISO's problem statement and options for considerations

- **Background/Problem statement from CAISO Issue Paper:**
  - **"RA Substitution process should be reassessed as this procedure likely results in:**
    - Inefficiencies as multiple SCs hold back RA capacity for outage substitution for a partial-month outage.
    - Artificial tightness in the RA bilateral market due to holding back capacity for outage substitution.
    - Potential maintenance delays if substitute capacity is not available.
    - Higher forced outage rates because planned outages cannot be scheduled and the resource ultimately experiences a forced outage".
- **CAISO's options for considerations:**
  - **Outage definitions to align with Reliability Coordinator Procedure RC0630:**
    - Forced; urgent; planned and opportunity outage.
  - **Outage process revision options:**
    - 1) Voluntary Planned Outage Substitution Pool; 2) Planned Outage Buffer; 3) Annual or Seasonal Showings; 4) Remove planned outage substitution requirements: replace with strong incentives and better information on periods of risk; 5) Rolling Back the 2021 POSO Rules

Questions on outage definitions

- Does the **new "urgent" outage type change** the current CAISO **forced outage definition** (i.e.; Maintenance Outage submitted 7 days or less prior to the start date for the Outage are considered as Forced Outage)?
  - The issue paper stated it will give the CAISO the ability to deny the outage if there is a reliability concern. CAISO already has this authority. What are the **benefits of the definition change**?
- What is **the timing** and what are **the requirements** associated with each outage type?
- How the **outage** will be approved? What will be the **approval process**?
- Are there **risks** that the outage **won't be approved**?
- What will be the **substitution requirements** for each **outage type**? **Penalties**?
- In terms of UCAP: Can you **convert** a **forced** outage to a **planned outage**? Under what circumstances? What will be the **process** with a UCAP framework for **"curing" extended forced outage**?

Planned outage substitution process revision options

- **Principles to evaluate planned outage substitution revision options:**
  - **Clear and efficient:** provide **clarity on the substitution rule**: i.e., clarity if substitution should be provided and who should provide the substitution based on clear criteria.
  - **Promote advance planning:** allows generators to **submit** planned outage requests **well in advance**.
  - **Be flexible:** allow to have planned outage **requests on short notice** (2 months to 8 days out).
- **Only the Voluntary Planned Outage Substitution pool meets the principles**
  - **Pros: granularity** (daily; weekly; monthly); **simpler transactions** (can pool multiple substitution needs into a single transaction)
  - **The following features of the pool needs to be discussed:**
    - What will be the process for **outage approval** by CAISO with the pool?
    - **How** will the pool be **operated**? What will be **the pool timeline** to access substitution capacity? What will be the intra-month process?
      - Between T-28 and T-8 (before the forced outage definition applies)?
    - **Price of the capacity**: Auctions? Administrative prices with cost justifications? Mix of both?

LUNCH

TRACK 2: AVAILABILITY AND INCENTIVE MECHANISMS

Track 2: Availability Assessment Reform

Proposal: New mechanism, **Measuring Unavailable RA (MURA),** which would assess unavailability during stressed grid conditions and allocate the penalty costs collected from under performing-RA to load.

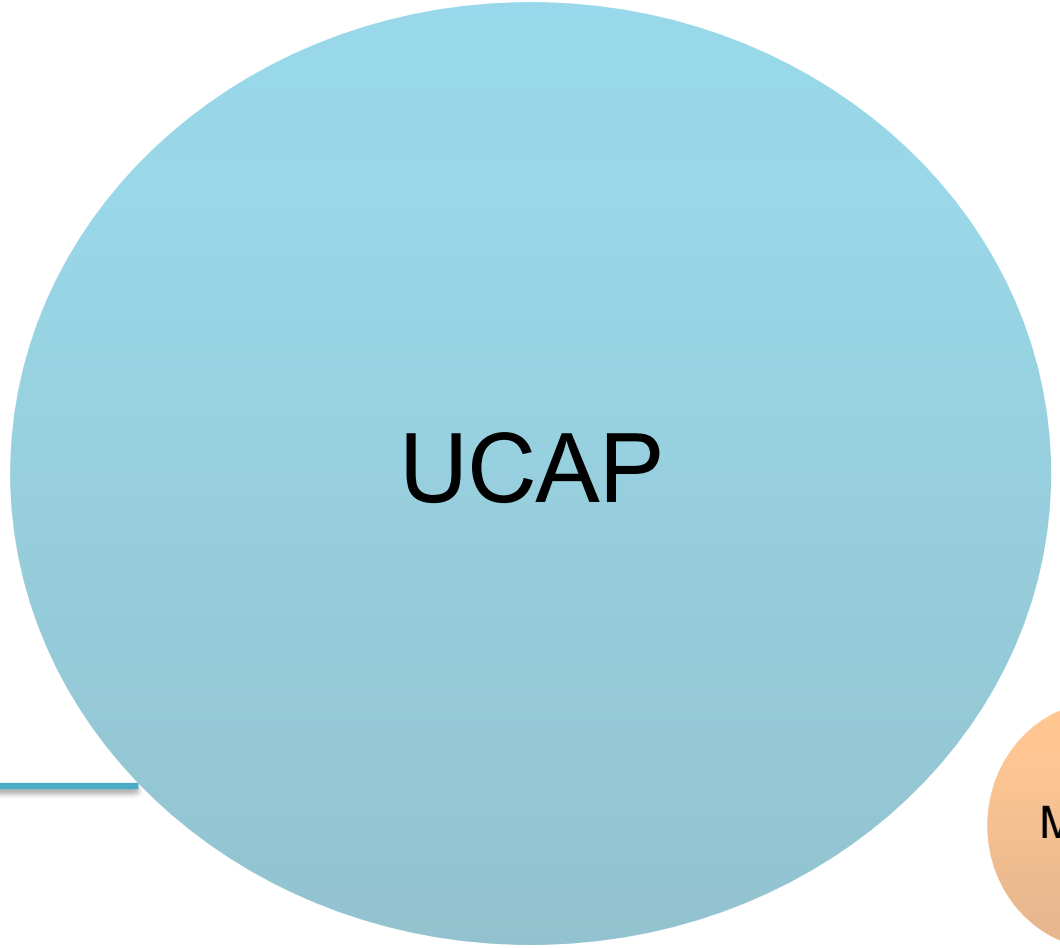
As this is a new mechanism, certain RAAIM features will no longer exist: AAH, allocating penalty collected to over-performers, deadband, exemptions (implicitly reflected in the MOO and outage cards), etc.

Key questions for stakeholder feedback on defining:

- Availability
- Assessment period
- Price of penalty
- Cost allocation of penalty collected

UCAP / Availability Mechanism Crossover

UCAP Answers: What was the resource's availability based on forced outage rates in times of need (~900-1800 hours a year)?



MURA Answers: What was the resource's unavailability based on if they met their MOO during critical hours (~10-50 hours a year)?

Looks back: Year ahead accreditation based on historic data (past few years)

MURA

Assesses current performance: Tallied daily for applicable Tx/RMO/EEA events

MURA: Design Options

Availability

- **RA: Meet the Must offer obligation (MOO)**

Resource adequacy resources have a MOO to bid into the CAISO market the amount of NQC the resource has shown in their supply plan.

The WG can revisit the MOOs and outage cards and will discuss if there should be another approach to defining availability.

Assessment Period

- AAH
- **Tx/RMO/EEAs**
- Reserve shortages

The CAISO recommends starting with Tx/RMO/EEAs as the assessment period. There are tradeoffs between number of events and the extent it meets the policy objective.

The WG will discuss when the penalty should be applied.

Price of Penalty

- VOLL
- **RA benchmarking**
- Scaled RTD price

The CAISO recommends starting with RA benchmarking.

The WG will discuss the philosophy of different approaches to penalty pricing.

Cost Allocation

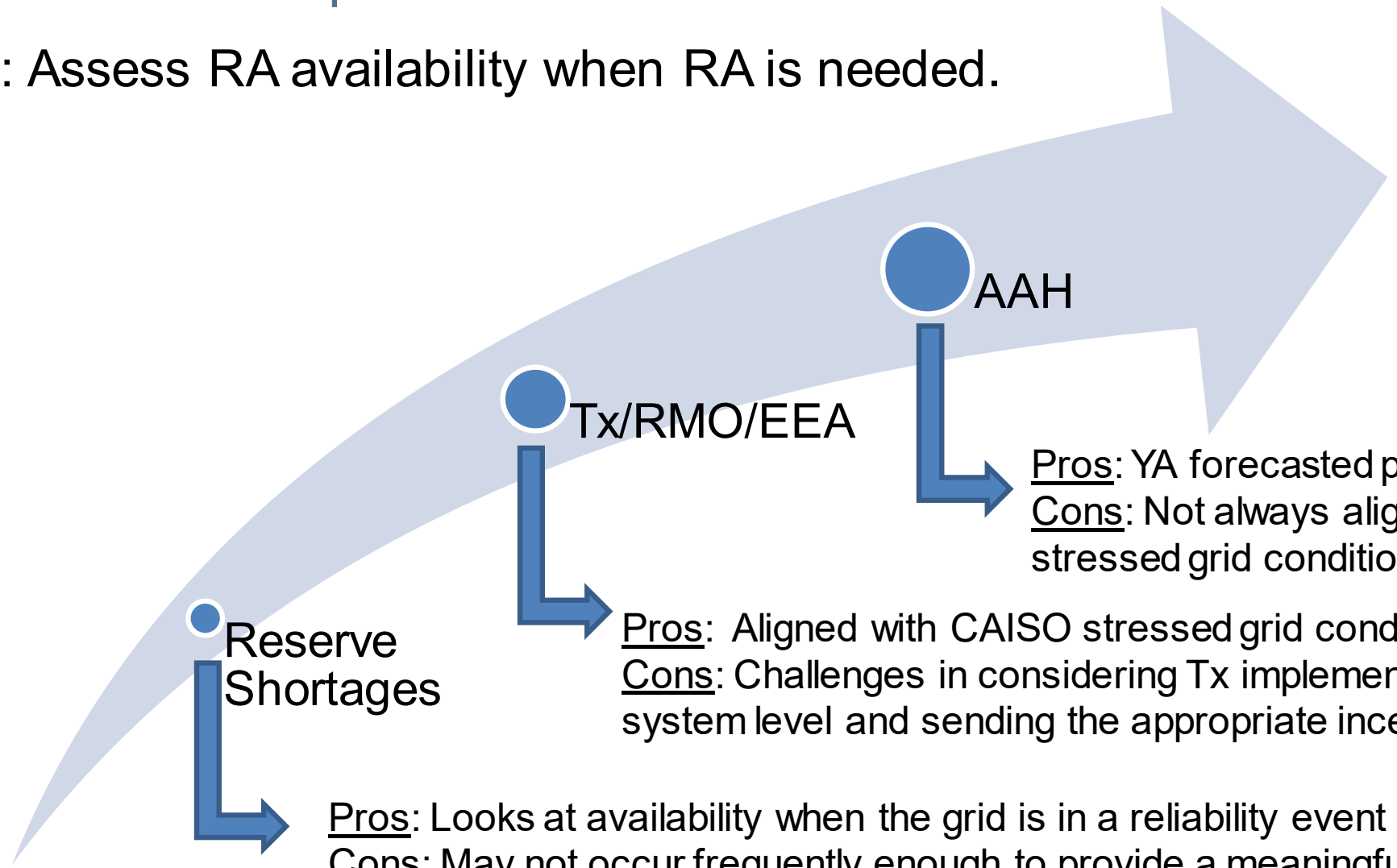
- **Load**

The CAISO recommends starting with allocating the penalty collected to load in line with cost causation- as unavailable RA deteriorates the level of service load procured from RA to be available.

The WG will discuss the incentives created with allocating the revenue collected from penalties to different parties.

Assessment Period Options: Tradeoff Discussion

Objective: Assess RA availability when RA is needed.



Historical Frequency of Grid Emergency Events

Summary of Restricted Maintenance Operations, Flex Alerts, Transmission and Energy Emergencies Issued from May 2022 to Present

	Flex Alert	Restricted Maintenance Operations	Transmission Emergency	EEA Watch	EEA1	EEA2	EEA3
2022	11	16	10	9	6	5	1
2023	0	6	2	2	1	0	0
2024	0	18	23	1	0	0	0
2025	0	2	0	0	0	0	0
TOTALS	**11**	**42**	**35**	**12**	**7**	**5**	**1**

Note: Source last updated January 22, 2025

Price Options

VOLL — Value of Loss of Load

- Represents the economic consequence of a loss of load event

RA Benchmarking — Bilateral RA Prices

- Represents the contractual cost of bilateral RA prices either in the forward or historic context

RTD — Real Time Prices

- Represents the real time impact that unavailability could contribute towards
- This could be scaled based on the level of scarcity (e.g., EEA 3 penalty as 10x RTD)

What is the penalty price of RAAIM set by?

- The current RAAIM mechanism is 60% of the capacity procurement mechanism soft offer cap price, which puts RAAIM at $4.40/kW/mo
- The soft offer cap:
  - Is a proxy for the system marginal capacity cost and serves as a 'safe harbor' value that capacity owners are allowed bid up to, and receive that value for compensation if designated for a CPM award
  - Was set as a subset of the fixed costs for a new resource and includes insurance, ad valorem, and fixed operations and maintenance costs, but not capital and financing costs or taxes
  - Costs' were set using a mid-cost 550 MW advanced combined cycle resource with duct firing capability.

Penalty Approaches: Value of Loss Load

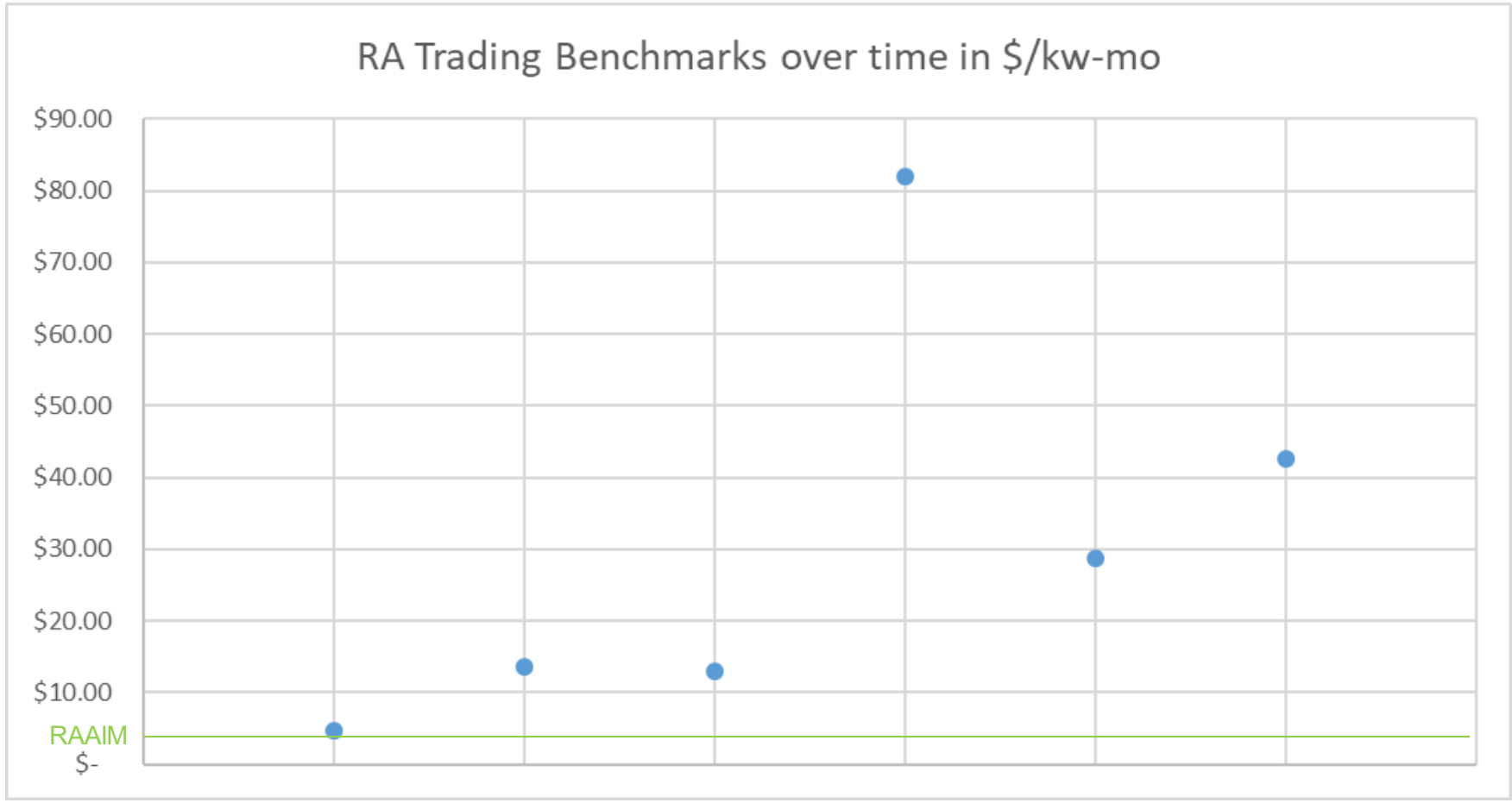
- VOLL represents an estimation of the economic cost to consumers for an involuntary interruption of electricity supply. It essentially quantifies the value that consumers place on reliable electricity service.

- Instead of tying availability and incentive mechanisms penalty prices to the CPM soft offer cap, they could be anchored to and scaled based on VOLL estimates.

How VOLL could be used

- The general principle in many markets is to design the Operating Reserve Demand Curve (ORDC) so that it reflects the Expected Value of Lost Load (EVLL).
  - EVLL represents the risk-weighted cost of load shedding. It's the product of the consequence of load shedding (VOLL) and the probability of load shedding occurring (LOLP, or loss of load probability). EVLL = VOLL * LOLP
  - As the LOLP increases (meaning reserves are becoming more scarce and the risk of load shedding is rising), the price of reserves should increase proportionally, approaching the VOLL as the probability of an outage approaches 100%
- Applied at CAISO, this would mean:
  - Conduct studies to estimate the economic cost of outages for different customer types
  - Set administrative penalty prices for various levels of reliability, derived from the VOLL estimates. For example, the penalty price for reaching an EEA 3 (which could lead to load shedding) could be set at or near the estimated VOLL.

Bilateral RA Trading Prices Over Time



Penalty Approaches: Factor of Real Time Pricing

- The RTD price represents the actual cost of serving load in a 5 minute interval.
- Could be scaled to align with the grid condition (e.g., EEA 3 at 10x RTD)
- Arguments for using the RTD price: If load has procured RA for a desired level of service and unavailability increases those prices, should the price returned be commiserate with the increased prices unavailable generation is contributing to?
- Arguments against using RTD:
  - Using energy as a penalty for RA may not reflect the unavailability consequence
  - Unavailable RA may not be the sole driver for high marginal real time prices
  - Scenarios exist in which penalty prices may too low to incentivize availability during stressed grid conditions

Price Options: Pros and Cons

VOLL — Value of Loss of Load

- Pros: As scaled, could represents the economic consequences of a loss of load event
- Cons: If not appropriately scaled, could be prohibitively high (e.g., MISO's recent VOLL estimates are at $35,000/MWh)

RA Benchmarking — Bilateral RA Prices

- Pros: If priced right, represents an equivalent value of missing capacity
- Cons: Challenges in data lags with RA trading prices

RTD — Scaled Real Time Prices

- Pros: Represents the economic consequences that unavailable RA contributed to
- Cons: Using energy as a penalty for RA may not reflect the unavailability consequence; unavailable RA may not be the sole driver for high marginal real time prices; scenarios exist in which penalty prices may too low to incentivize availability during stressed grid conditions

Next Steps

- Comments due: February 25th
- Track 3 visibility straw proposal: March 7th
  - Stakeholder meeting: Week of March 17th
- Track 1 and 2 straw proposals: April 7th
  - Stakeholder meeting: Track 1 and 2: April 23rd
- Items for future working group discussion (per 2024 discussion paper):
  - Flexible Resource Adequacy reforms
  - 2024 Policy Catalog item: Maximum Import Capability enhancements

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