California ISO

Resource Adequacy Modeling and Program Design Working Group

November 1, 2023

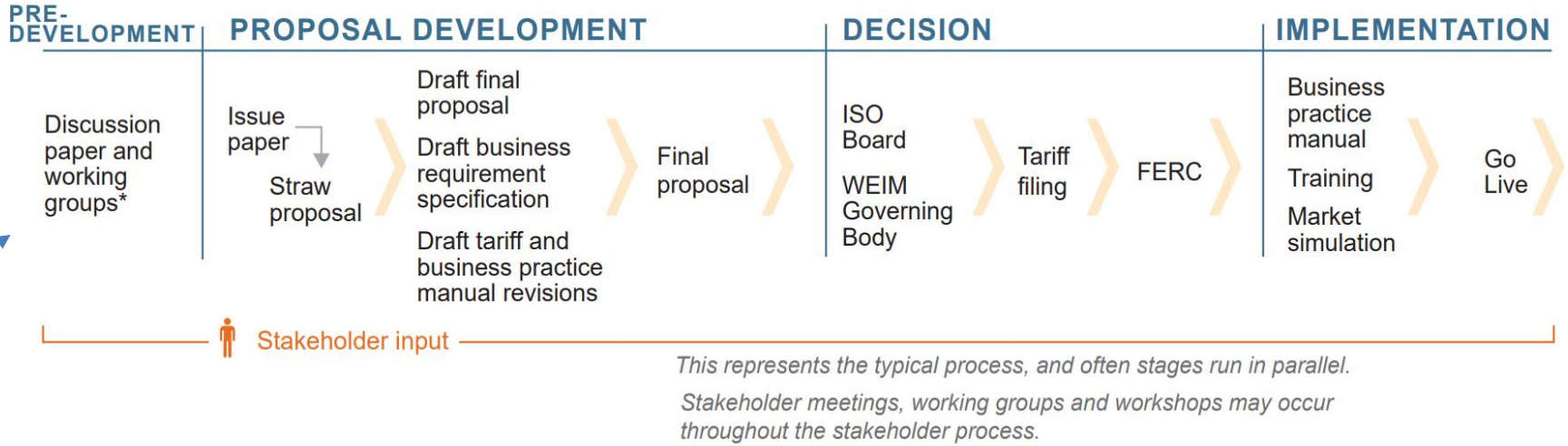
Housekeeping Reminders

- This call is being recorded for informational and convenience purposes only. Any related transcriptions should not be reprinted without ISO's permission.
- These collaborative working groups are intended to stimulate open dialogue and engage different perspectives.
- Please keep comments professional and respectful.

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 on the bottom of your screen. Note: #2 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 all panelists.

Working Group in Context



Agenda

Time	Topic	Discussant
9:00-9:10	Logistics	Kaitlin McGee
9:10-9:20	Welcome & Purpose	Jeff McDonald
9:20-10:30	Review Problem Statement 1 Stakeholder Feedback	Jeff McDonald
10:30-11:30	Problem Statement 1:CAISO Modeling	Aditya Jayam Prabhakar
11:30-11:45	Break	
11:45-12:05	Introduce Stakeholder Feedback on Problem Statements 2 & 3	Jeff McDonald
12:05-12:25	Introduce Stakeholder Feedback on Principles and Goals	Jeff McDonald
12:25-12:35	Day-Ahead Sufficiency and Settlements	CB Hall /Partha Malvadkar
12:35-12:55	Process Feedback & Roadmap for Working Group	Jeff McDonald
12:55-1:00	Next Steps	Jeff McDonald

RAMPD: Working group goals

Stakeholders have the opportunity to present and provide input on key components leading up to proposal development:

1. **Develop principles/goals**
   - Define and illustrate principles for resource adequacy
2. **Form initial problem statements**
   - Form problem statements reflecting stakeholder concerns
3. **Align on priorities and establish meeting cadence**
   - Balance staff & stakeholder bandwidth
4. **Refine problem statements**
   - Explore current ISO operations, functionality, processes meant to address problem statements
   - Develop methodology for analysis, define data needs
5. **Determine action items**
   - Provide a bridge between working groups and proposal development

Working group progress to date

Meeting Goals

1. ***Refine Problem Statement 1*** through review of participant comments, discussion, and a deep-dive presentation from ISO staff on reliability modeling, gaps, and suggestions for change.
2. ***Better understand issues within Problem Statements 2 & 3*** through review of participant comments and discussion, with an eye toward more detail in the coming meetings.
3. ***Refine Principles and Goals*** through review of participant feedback and discussion.
4. ***Refine the path of meeting topics*** through January by way of review of a proposed path and discussion.
5. ***Establish opportunities, and volunteers, for participant presentations*** in near-term scheduled meetings.

Problem Statement Topical Areas

1. Overall System Reliability Information
2. Requirements for RA Capacity and Program Tools
3. LRA RA Responsibility and Cost Allocation

Problem Statement 1
Overall System Reliability Information

There is a need for additional consistent, transparent, and timely information on the sufficiency of the RA fleet in the CAISO Balancing Authority Area (BAA). Without this, there are challenges in:

- Accessing and communicating the system wide sufficiency of the CAISO BAA in light of the contracted RA fleet; and
- Addressing such concerns in a timely and efficient manner.

Sub-issues:

- RA Portfolio Evaluation does not exist today
- Lack of Non-RA Visibility
- Outdated Default Planning Reserve Margin

Problem Statement 1: Participant Comments

Themes	Commenters
General support	CalCCA, LSA, MRP, PGP, WTPF
Requested an overview of the current processes	CDWR, CPUC's ED, Six Cities, SCE
Increase visibility into non-RA	Support: CalCCA, CPUC's ED, PG&E, NCPA De-prioritize: MRP
PRM	- Concerns about changing from default to minimum PRM: CPUC, NCPA - Support for analysis from the ISO and potentially changing the PRM:CDWR, MRP, WPTF
Re-evaluate the counting rules	CPUC's ED, MRP
Multi-year RA	Suggests: TEA, WPTF Opposes: NCPA

Problem Statement 1 on Modeling: Detailed Comments

CalCCA

- Supports 'portfolio evaluation' modeling approach to help CAISO meet reliability targets in all hours and recommend the problem statement expand to include west-wide issues
- Highlights transparency needed to minimize backstop procurement
- Recommends publishing aggregated RA showings (month-ahead and year-ahead) so stakeholders better understand RA trends
- Supports gaining visibility into credited resources
- Provides in-depth recommendations for modeling & assessments

CDWR

- Requests the CAISO show why the current assessment/showings are not sufficient (e.g., monthly RA showings & the 7-day RA trend)
- Suggests tracking non-RA resources on an hourly basis
- Default PRM may need be updated, pending a study

Problem Statement 1 on Modeling: Detailed Comments

CPUC – Energy Division

- Recommends the ISO clarify what would be different from CPUC's reliability studies done in the RA and IRP
- Recommends the ISO studies and the inputs and assumptions be aliened with these regular RA LOLE studies and the PRM calibration process to ensure there isn't confusion regarding reliability and procurement needs
- Agrees the ISO should have more visibility into non-RA resources (i.e., not shown on a supply plan), and suggests the ISO be able to ID these resources as committed to CA load

CPUC – Public Advocates Office

- Observes some of the issues are in the domain of LRAs (e.g., portfolio evaluation, PRM determination, and capacity accreditation) and requests explanation of how the ISO interprets its jurisdiction on these issues

Problem Statement 1 on Modeling: Detailed Comments

Large-scale Solar Association

- Supports assessments/modeling, encourages alignment with CPUC

Middle River Power

- Supports BAA-level assessment to determine if the portfolio meets a 0.1 LOLE
- Provides suggestions on assessing if LSEs within the CAISO footprint (in aggregate) have secured enough capacity to meet a 0.1 LOLE
- Recommends a discussion on how counting methodologies interact with the default PRM

Problem Statement 1 on Modeling: Detailed Comments

NCPA

- Non-RA: willing to provide CAISO with more info about non-RA, but concerned about remedies to 'withholding' generation, which is often due to substitution requirements.
- Default PRM: NCPA members often match their PRM to CAISO's.
- Engaged with CEC's public utility PRM proceeding

PG&E

- Provides edits to the problem statement to read, "Current processes and procedures do not provide sufficient visibility into the generation fleet to enable CAISO to ensure system reliability."

Problem Statement 1 on Modeling: Detailed Comments

PGP

- Supports and comments, that “sufficiency” is a short term concept while RA is “long term”. Sub issues:
  1. RA Portfolio Evaluation should align with a procurement timeframe.
  2. Non-RA visibility: Less relevant when the market is tight and the rest of the region now has a separate RA program. Non RA shouldn’t be monitored for backstop.
  3. Updating the PRM should include planning to a regional standard (consistent with industry best practices and WRAP)

Problem Statement 1 on Modeling: Detailed Comments

Six Cities:

- Recommends additional specification and information from the CAISO (e.g., What additional information is required to analyze the sufficiency of the RA fleet?)
- Questions the usefulness to predict the RA fleet beyond 3 years given uncertainties with MIC and deliverability
- Recommends modifications to the CAISO default PRM should be coordinated with the CEC and LRA processes

SCE:

- Suggests peak load for assessing RA is not adequate
- Recommends alternative methods for assessing the reliably contributed by the RA fleet be examined
- Recognizes role of western RA programs and role of climate change

Problem Statement 1 on Modeling: Detailed Comments

WPTF:

- Supports the framing that the default PRM and default counting rules are outdated
- Suggests having an outdated PRM and counting rules results in an inability to plan to a reliability standard

- Reliability Modeling Today
- Current RA Modeling Gaps
- Suggestions for Future RA Modeling

CAISO RA MODELING

Resource Adequacy is a regulatory construct developed to ensure there will be sufficient electric resources (capacity) to serve electric demand in all but the most extreme conditions

RELIABILITY MODELING TODAY

Resource adequacy is forward planning and procurement process to ensure sufficient capacity is made available to the ISO in the right places and at the right times

CEC

Sets load forecasts for all load serving entities

CPUC/LRAs

Local regulatory authorities oversee resource adequacy programs for jurisdictional load serving entities

CAISO

Oversees approx 80% of California load (small portion of Nevada) via

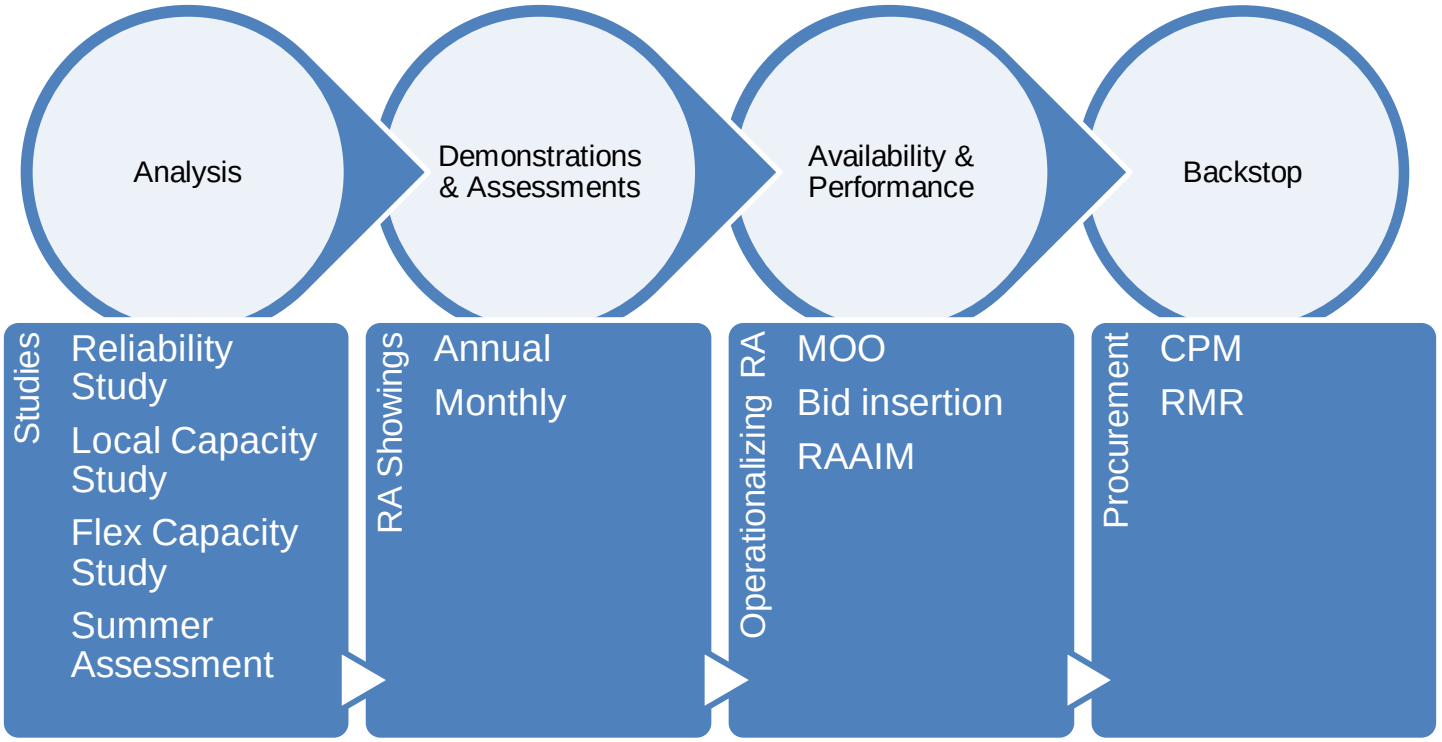
Resource Adequacy Tariff

- *CPUC-jurisdictional LSEs represents ~90% of load in the CAISO BAA.*
- *Long term resource planning is the responsibility of Local Regulatory Authority (LRA).*

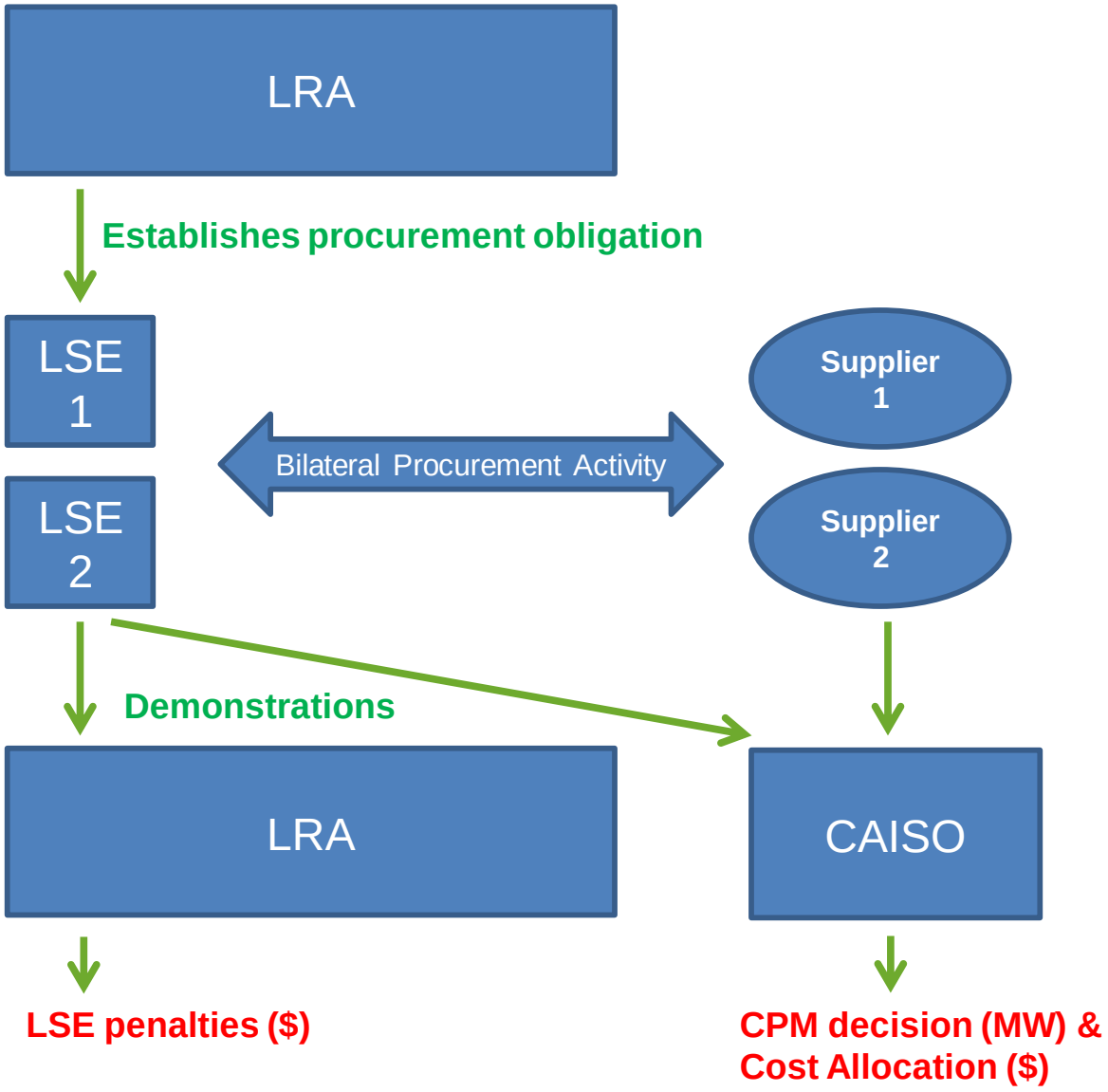
Responsibilities are shared across entities to ensure Resource adequacy

The goal	Process	Responsible Party
How much is needed?	Requirements determination	CEC, ISO, LRA
How do we get it?	Procurement	LSE
Here's what we have…	Demonstrations	LSE & Supplier
Do we have enough?	Assessment	ISO & LRA
Is it available when needed?	Availability & Performance	Supplier

Current components of CAISO's Resource Adequacy process



Procurement & demonstration (showing) of RA



Annual Showings assessment

- **September**: Year ahead requirements are finalized
- **End of October**: LSEs and Suppliers make the year ahead showings
- **November**: CAISO makes any deficiency determinations and LSEs have a chance to cure
- **December**: CAISO may procure backstop capacity through the Capacity Procurement Mechanism (CPM)

- 90% System RA requirement for Summer Months- May to September
- 100% Local requirement all 12 months
- 90% Flexible requirement for each month

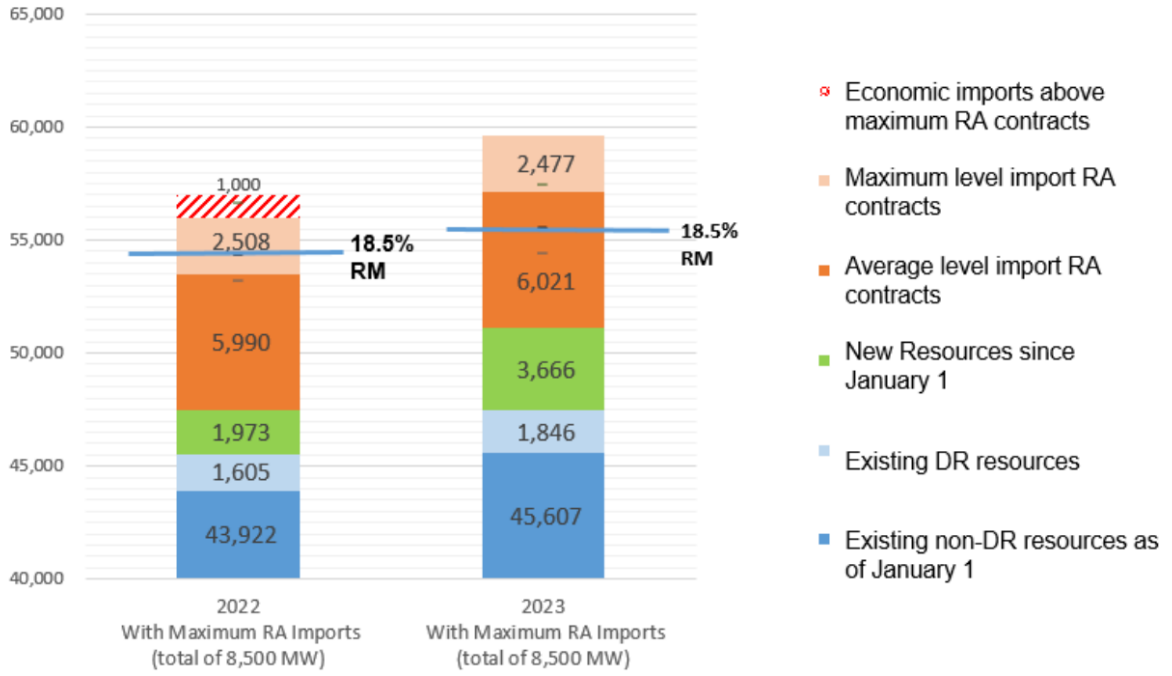
CAISO Current System RA assessments

CAISO's assessments of system RA sufficiency which inform whether CAISO will issue CPM are deterministic assessments and compare shown NQC to the following:

- **Annual**: 90% of annual LRA RA requirements, comprised of:
  - 1-in-2 CEC IEPR coincident gross peak load
  - LRA-determined PRMs
- **Monthly**: 100% of monthly LRA RA requirements, comprised of:
  - 1-in-2 CEC IEPR coincident gross peak load
  - LRA-determined PRMs

CAISO's deterministic stack analysis calculates operating reserve margin sufficiency for the Summer Assessment

Figure ES-1: September 2022 and 2023 Base Case and Sensitivities at 8 pm on Peak Day (MW) – No Solar



Existing non-DR resources are those resources online by January 1 of each year, and new resources are those resources online or scheduled to come online since January 1 of each year.

Assessment of the expected summer supply and demand conditions for the CAISO BAA to address overall progress towards resource planning targets

Table 1: Summary of Resource Requirements to Achieve Resource Planning Targets

Capacity (MW)	2023	2024	2025	2026
Calculation of Required NQC to meet LOLE Target				
Preferred System Plan New Additions	2749	5348	1955	412
Cumulative new Preferred System Plan Additions	2749	8097	10052	10464
ISO PLEXOS LOLE Simulation Results				
NQC Surplus (Shortfall) to meet LOLE Target	421	1313	(1294)	(1412)
Cumulative New NQC Additions needed to maintain 1-in-10	2328	6784	11346	11876
Comparison of Required Amounts to Authorized Procurement				
Procurement Authorizations (NQC)	2825	6000	1500	2000
Cumulative Procurement Authorization (NQC)	2825	8825	10325	12325
Cumulative surplus (shortfall) in authorizations by year	497	2041	(1021)	449
Comparison of Required Amounts to Current Projection				
NQC Installed Surplus (shortfall) above PSP by June 1, 2023	(1551)			
Surplus (Shortfall) meeting LOLE Target with June 1 resources	(1130)			
NQC Installed Surplus (shortfall) above PSP by Sept 1, 2023	543			
Surplus (Shortfall) meeting LOLE Target with Sept 1 resources	964			

Current high hydro conditions provide an *additional* 1340 MW margin, achieving a 1-in-10 target even with only resources forecast online by June 1

Source: [2023-Summer-Loads-and-Resources-Assessment.pdf (caiso.com)]

The ISO assesses the reliability level of what has been planned in the IRP and if those targets are on track, considering the status of resources moving forward in the ISO interconnection queue, augmented by the procurement requirements established by the CPUC and considering if those resources have power purchase agreements in place.

CAISO's Deterministic Production Cost Model is used for calculating GHG and RPS compliance; and detailed resource operations analysis

- Covers the entire WECC footprint with 25 zones
- Model all resources individually
- Utilizes a single scenario based on a 1-in-2 load forecast, solar, and wind generation profiles from a selected historical weather year

CAISO's Stochastic Production Cost Model is used to assess system resource sufficiency, calculate LOLE and identify shortfalls in portfolio capacity and flexibility

- Covers four CAISO zones (PG&E-Bay, PG&E-Valley, SCE, and SDG&E) and one outside zone, representing 21 zones outside CAISO
- Models all resources within the four CAISO zones individually
- Run 500 iterations (scenarios) of Monte Carlo simulations

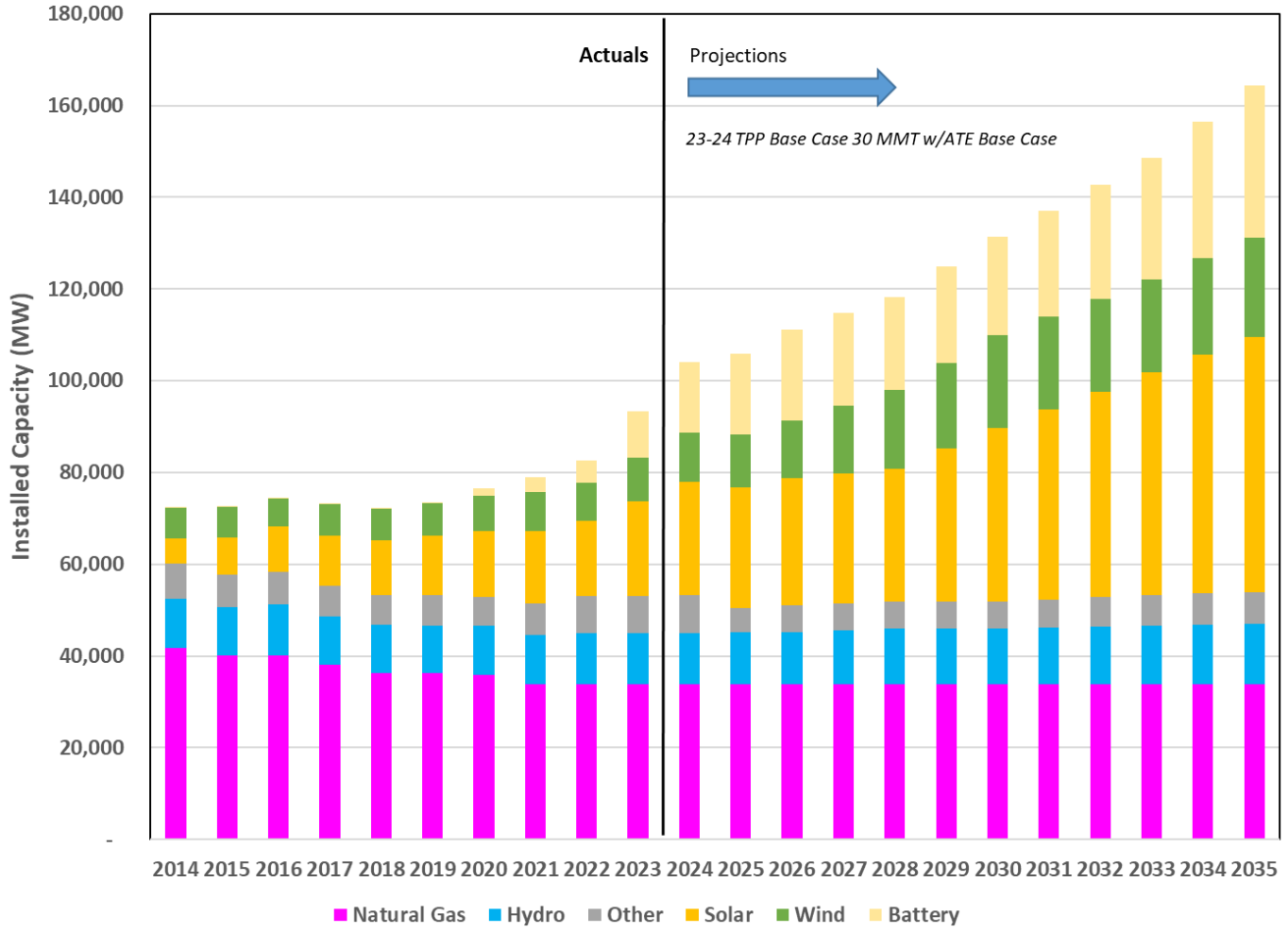
CURRENT MODELING GAPS

Problem Statement 1:
Overall System Reliability Information

There is a need for additional consistent, transparent, and timely information on the sufficiency of the RA fleet in the CAISO Balancing Authority Area (BAA). Without this, there are challenges in:

- Accessing and communicating the system wide sufficiency of the CAISO BAA in light of the contracted RA fleet; and
- Addressing such concerns in a timely and efficient manner.

Accelerated fleet transition:
Shift to Energy-and Availability-Limited Resources



Ensuring resource adequacy in an accelerate fleet transition environment calls for forward looking assessments

Supply side	Varied, yet aggressive, policy objectives across the Western Interconnect
	Tight resource availability
	Localized resource planning assuming system wide sufficiency
Demand side	Electrification of transportation and increased BTM solar
	Energy efficiency and new demand response resources
	TOU rates and load shifting programs
Reliability metrics	LRAs use varying PRMs that may change monthly and may change year over year
	A variety of PRMs and counting rules
	SOD implementation at the CPUC going forward
RA roles	LRA and LSE obligations
	CAISO and LRA rules and performance requirements

Currently CAISO lacks assessments that would answer the following questions for the ISO BAA

Key Question	Sufficiency Analysis of	RA Timeframe	What is missing?
Are the year ahead RA showings adequate?	RA Showings	Year Ahead	There is no assessment to see if the ISO BAA has sufficient capacity in the year ahead with enough time to cure.
Is the current level of authorized procurement and contracted capacity sufficient?	Existing installed capacity + authorized procurement	Years 2-4	There is no assessment today that checks to see if during years 2-4 if there is enough installed capacity and authorized capacity in the ISO BAA.
Is the LT plan producing resource adequate portfolios to meet reliability targets?	Resource plans by consolidating information from all IRPs	Years 5-10	There is no assessment today to determine if planning in the ISO BAA will result in a reliable system in years 5 to 10.

Will current processes be sufficient as resource fleet transitions?

SUGGESTIONS FOR FUTURE RA MODELING

Do we have sufficient resources, and are we procuring and planning for enough capacity to meet reliability across all time horizons?

What is this?

- Reliability modeling based on a 1-in-10 loss of load expectation (LOLE)

- Supply side
- Demand Side
- Electrification
- Higher loads

It is not…

- A replacement for LSEs' current obligations with its LRA

Proposed study framework for the year-ahead timeframe

Objective

- Are year-ahead RA showings adequate?
- If RA showings are insufficient, year ahead assessment allows for enough time for actions to cure

Assumptions

- 100% Annual RA Showings in the year ahead timeframe
- All other assumptions will be consistent with ISO's Summer Assessment

Methodology

- Similar to Summer Assessment, perform a stochastic assessment with only RA showings

Proposed study framework for the 2 to 4 year-ahead timeframe

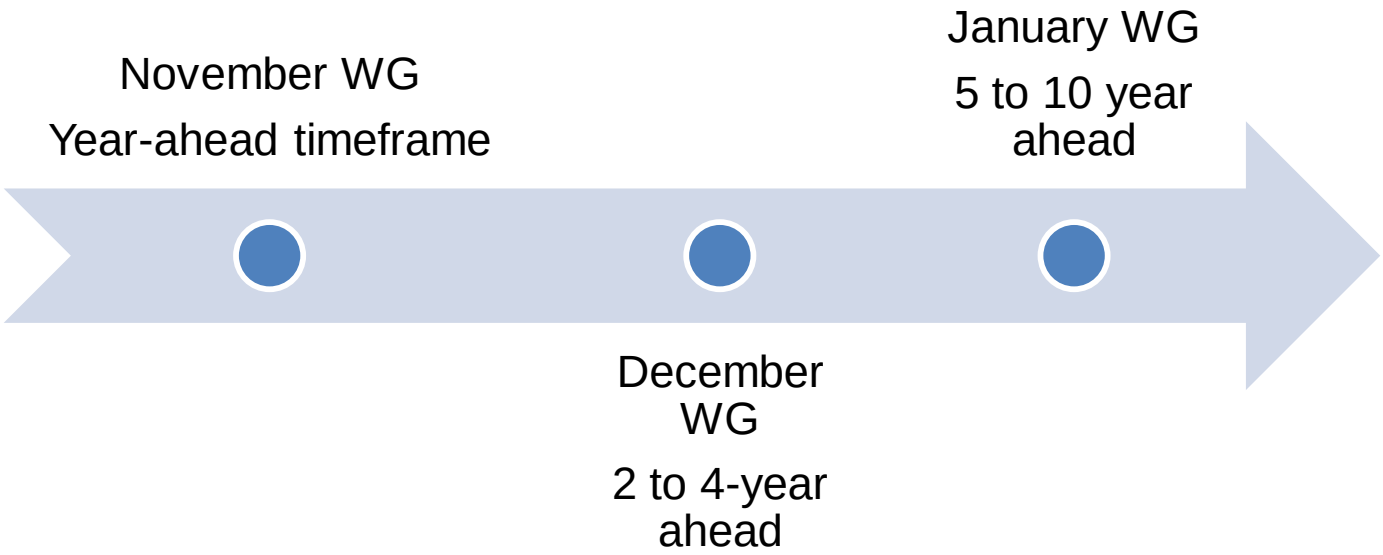
Objective	• Is the current level of authorized procurement and contracted capacity sufficient?
Assumptions	• Existing installed capacity + authorized procurement • All other assumptions will be consistent with ISO's Summer Assessment
Methodology	• Determine if enough capacity is expected to be available system-wide by performing a stochastic assessment

Proposed study framework for 5 to 10 year ahead timeframe

Objective	• Is the long-term plan producing resource adequate portfolios to meet reliability targets for years 5 to 10?
Assumptions	• Consolidate projected resource capacity from all LRA IRPs.
Methodology	• By performing a stochastic assessment, determine the BAA's PRM requirement and calculate ELCC values for all resources. • Review LOLE hours to understand system risk profiles

Modeling Next Steps

- Request feedback on proposed framework for the year-ahead timeframe for discussion during the next WG meeting



- Request feedback on proposed study framework for the 2 to 4-year ahead and 5 to 10 year ahead timeframe for discussion during subsequent WG meetings

BREAK

Problem Statement 2
Requirements for RA Capacity and Program Tools

The CAISO's current requirements and tools (e.g., outage, must-offer, bid-insertion, and resource performance and availability rules) have not been updated recently in light of evolving market and regulatory structures, and could result in:

- RA supply not available when and where needed;
- Inefficient procurement and investment (e.g. maintenance and capital upgrade) decisions; and
- Implementation challenges for the CAISO and market participants

Sub-Issues:

- Current requirements for RA capacity
- RAAIM
- Lack of a tool to incentivize performance
- Rules for substitution and planned outages
- The need for a comprehensive review of the CPUC's Slice-of-Day reform and the translatability and trasactability of WRAP

Problem Statement 2
Participant Comments

Theme	Stakeholders
Slice of Day: Evaluate impact on BAA (historical analysis), explore aligning with availability, and more	CalCCA, CDWR, SDG&E, Six Cities, SCE, TEA
Re-evaluate RAAIM	DMM, CPUC's ED, PAO, MRP, Six Cities
Assess Flex RA	CDWR, CPUC's ED, NCPA
Consider including / emphasizing UCAP	CalCCA, CPUC's ED, PG&E, DMM
Review substitution rules	CalCCA, MRP, NCPA
Review CPM & Cost Allocation	AReM, CalCCA, DMM, CPUC's ED
Not supportive of energy sufficiency checks	NCPA

Problem Statement 3
LRA RA Responsibility & Cost Allocation

Market participants are concerned about inequitable costs and cost allocation. Stakeholders have expressed a need for a transparent and common framework for evaluating reserve margins and counting rules, and understanding of an LRA RA program's contribution to overall system reliability.

Sub-issues:

- ***Definitions and Requirements:*** The CAISO lacks a common definition, method of measurement, or standard to ensure that various LRAs bring a portfolio of resources that are accessible in the right place, available at right time, and provide the right attributes needed to evaluate if LRA programs are reliable.
- ***EDAM RSE Cost Causation:*** Aligning cost and benefit allocation with causation associated with the EDAM RSE, as a result of a deficiency or procurement of cure capacity.

Problem Statement 3
Participant Comments

Theme	Stakeholders
Defer this issue to the LRA's authority	NCPA
PRR 1280	AReM, CalCCA
ISO BAA Rules	Not in scope: CalCCA, TEA Unsure if in scope: Six Cities, SCE
Break into two problem statements	MRP

Principles and Goals

Principles:

- Reliable
- Efficient / Cost-Effective
- Implementable
- Durable
- Adaptable
- Transparent

RA Goals:

1. The CAISO's established modeling, and visibility enable a reliable overall system.
2. Procurement and trading is efficient, cost-effective, fungible, and affordable.
3. The RA program is implementable, adaptable, and compatible with different programs.

Summary of Participant Comments: Principles

Additions

- "Simple" (PG&E)
- "Consistency" in LRA RA standards to avoid cost shifts between LRAs (AReM)
- "Transactable" (MRP)
- "LRA legal rights (NCPA)
- "Affordable" (NCPA)
- "Equity" (PGP)
- "Consistency" (PGP)

Other comments

- Make “cost causation” explicit (CDWR)
- Clarify “efficiency” (MRP)
- Prioritize principles (SCE)

Summary of Participant Comments: Goals

Additions

- Durable (CalCCA)

Subtractions

- "cost effective/least cost/affordable" (PGP, SEI)
- Reference to out of market actions (Six Cities)
- Environmental goals (Six Cities)
- 0.1 LOLE (Six Cities)

Edits

- Define reliable as 0.1 LOLE (MRP)
- Define affordable (MRP)

Summary of Participant Comments: Goals (cont.)

Edits (cont.)

- Implementable should include CAISO system overhauls like CIRA (MRP)
- Define “interoperability” (MRP)
- Update to “will allow for efficient trade of capacity products throughout the Western region” to account for PUC and WRAP (Six Cities)
- Refer to all LRAs not just the CPUC (Six Cities)
- Harmonization edit (Six Cities)
- RA as an element of the electricity market (SCE)

Upcoming initiative: day-ahead sufficiency and settlements

Topic	Sub-Topic
Calculate day-ahead RSE position at 9am	Obtain 9am advisory RSE results *(EDAM policy)*
	Quantify day-ahead offers expected between 9am and 10am from RA resources
	Account for reliability demand response resources *(in line with EDAM policy)*
Cure RSE shortfalls calculated at 9am	Use existing authority to cure RSE shortfalls
	Use new authority to procure "RSE cure capacity"
Allocate RSE-related costs and revenues	Allocate RSE cure capacity costs, based on causation
	Allocate RSE failure surcharges and revenues, based on causation

Note: many of the topics above overlap with RA policy and may require coordination with RA modeling and program design. We are outlining these topics today to ensure stakeholder awareness

Process
Participant Comments

A number of comments were provided that can be considered process related. More direct comments received are

- Leverage discrete working sessions (by topic) and establish timelines & deliverables (PG&E, CalCCA, MRP)
- The ISO should provide more data and analysis (CDWR, MRP, Six Cities)
- Take a slower pace and provide material a week in advance for thorough review (PGP, PAO)
- Progression: start with purpose and objective of the existing RA program (via RA 101 course), then develop problem statements, and then establish principles for solutions (WPTF)

Proposed Schedule Through January 2024

Date	Topics
November 8, 2023	• Review of Slice of Day
November 17, 2023	• Refine Problem Statement 1 • Refine Principles and Goals • Review Modeling – Year-Ahead Focus • Deep Dive: Outage and Substitution • Review Slice of Day Issues (possibly)
December 11, 2023	• Refine Problem Statements 2&3 and Data Analysis Needs • Review Modeling – Mid-Term Focus • Deep Dive: Resource Counting and Incenting Availability Revisit Outage and Substitution Issues
January 16, 2024	• Review Modeling – Long-Term Focus • Deep Dive: CAISO Backstop Mechanisms • Revisit Resource Counting and Incenting Availability Day-Ahead Sufficiency and Settlements

Next steps

- Next working group meeting: Friday, Nov. 17, 2023.
  - Meeting on Slice of Day on Wednesday, Nov. 8, 2023.

- Please submit written comments on the November 1st working group meeting by Monday, November 13th, through the ISO's commenting tool using the link on the initiative webpage:

  https://stakeholdercenter.caiso.com/StakeholderInitiatives/Resource-adequacy-modeling-and-program-design

- Please contact Jeff McDonald (jmcdonald@ceadvisors.com) to indicate if you would like to present, the topic you would like to present on and, how this topic relates to your proposed problem statement.