



California ISO

Resource Adequacy Modeling and Program Design Working Group

December 6, 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.

Agenda

Time	Topic	Discussant
9:00-9:10	Logistics	Kaitlin McGee
9:10-9:20	Welcome & Goals	Jeff McDonald
9:20-10:10	CAISO Presentation: Level Setting: Resource Adequacy Showing Assessment	Abdul Mohammed-Ali
10:10-10:25	Break	
10:25-12:00	CAISO Presentation: Potential Modeling Framework: Year Ahead Reliability Visibility	Aditya Jayam Prabhakar
12:00-1:00	Lunch	
1:00-1:30	Review Stakeholder Survey Results	Jeff McDonald
1:30-2:30	Review Problem Statement 2 & 3 Stakeholder Feedback	Jeff McDonald
2:30-2:45	Break	
2:45-3:15	CAISO Presentation: CAISO RA Analysis & Reporting	Abhishek Hundiwale
3:15-3:45	DMM Presentation: DMM RA Annual Reporting	Amelia Blanke
3:45-4:00	Next Steps	Jeff McDonald

WELCOME & GOALS

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

Meeting Goals

- 1. Level set on current CAISO RA processes and data** through review of participant comments, discussion, and presentations on
 - RA showing assessment – the ISO’s current process for assessing sufficiency
 - CAISO RA Analysis & Reporting
 - DMM RA Annual Reporting
- 2. Refine Problem Statement 1 (modeling & visibility)** through review of participant comments, discussion, and presentations from ISO staff on potential modeling.
- 3. Refine issues within Problem Statements 2 (program design) & 3 (cost causation)** through review of participant comments and discussion, with an eye toward more detail in the coming meetings.
- 4. Discuss topic priority and sequencing** through review of participant comments and polling.
- 5. Refine the path of meeting topics** through February by way of review of a proposed path and discussion.
- 6. Establish opportunities, and volunteers, for participant presentations** in near-term scheduled meetings.

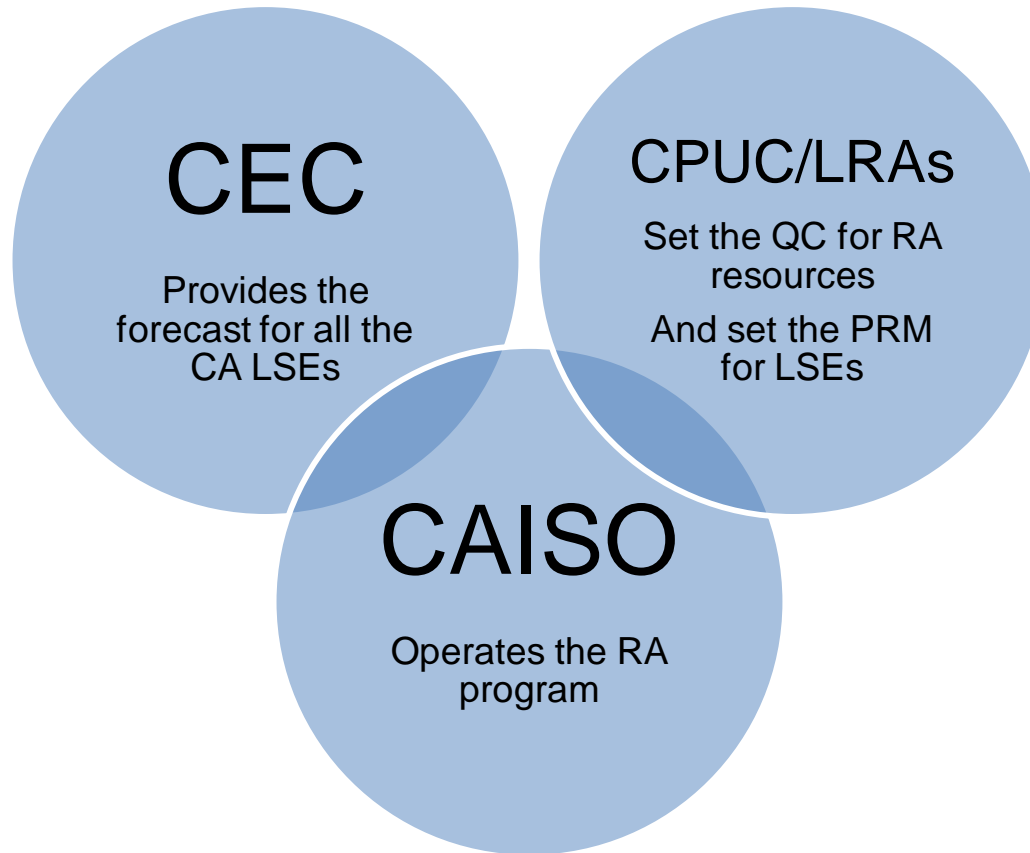
LEVEL SETTING: RESOURCE ADEQUACY SHOWING ASSESSMENT

Purpose

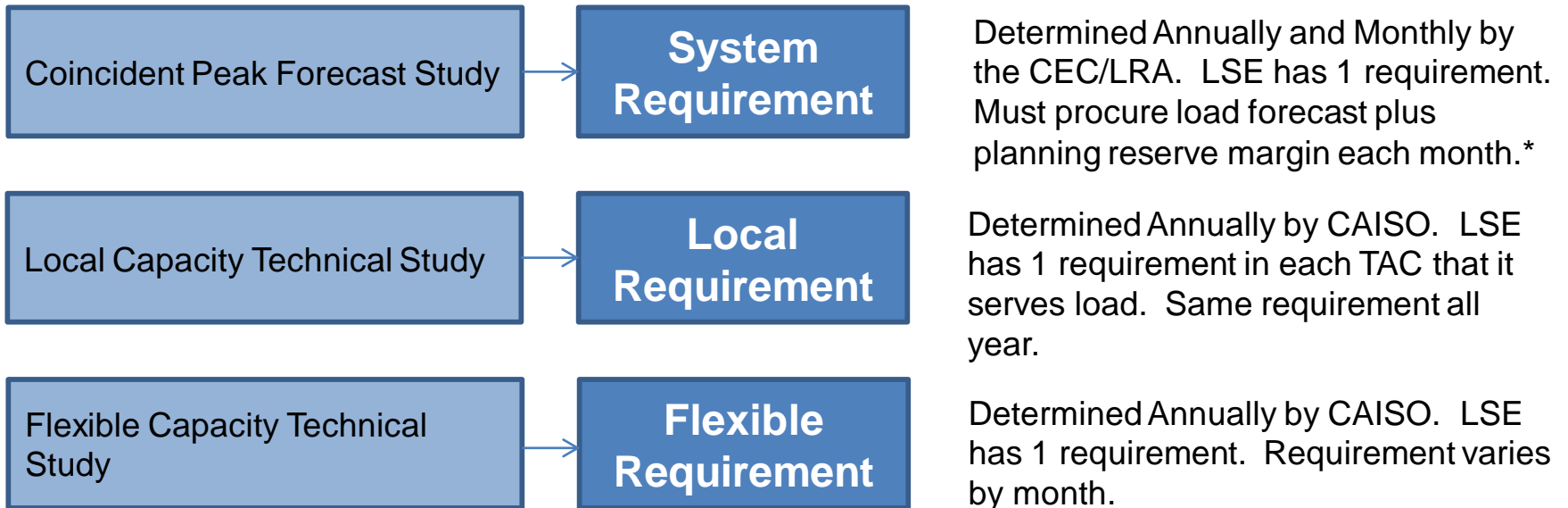
- Respond to stakeholder requests for RA 101
- Follow up on questions that arose from the November 1 working group meeting on the ISO's showing mechanics, data inputs, and the CPM processes.

Introduction

Establishment of the RA program:



Three types of requirements for LSEs



* Percentage can vary based on LRA

Three types of capacity must be secured

System Capacity

Capacity from a resource that is qualified for use in meeting system peak demand and planning reserve margin requirements

Local Capacity

Capacity from a resource that is located within a Local Capacity Area capable of contributing toward the amount of capacity required in a particular Local Capacity Area

Flexible Capacity

Capacity from a resource that is operationally able to respond to Dispatch Instructions to manage variations in load and variable energy resource output

Procurement & Showings of RA

1. LRA mandates procurement of target of next year and month peak load forecast + PRM.

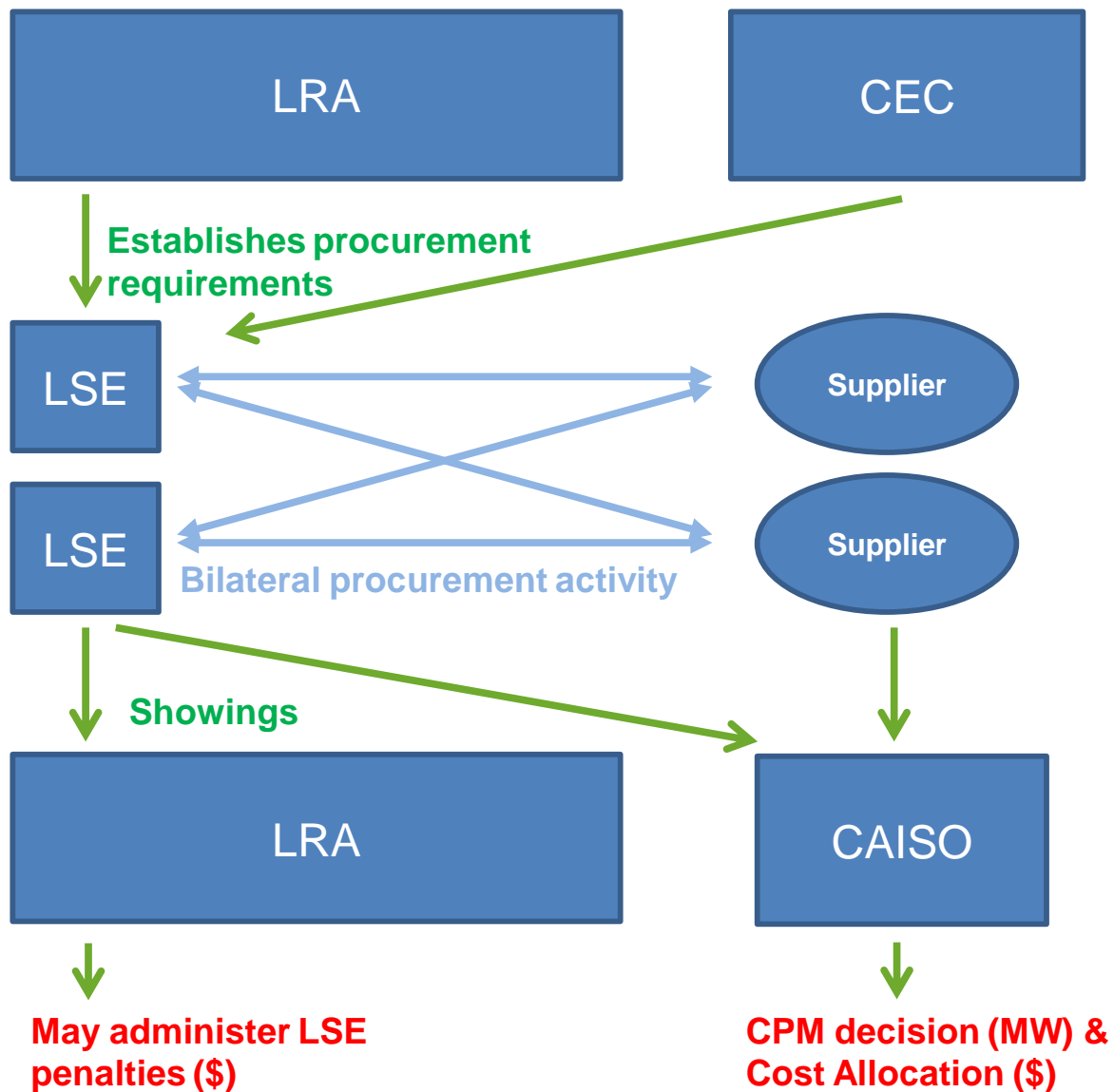
2. LSEs engage in bilateral procurement of capacity to meet this requirement.

3. LSEs demonstrate procurement via showings to LRA and CAISO

4. Suppliers show RA sales to CAISO.

5. LRA ensures LSE compliance.

6. CAISO ensures suppliers corroborate LSE showings and met needs.



System RA Sufficiency Check

Obligation Per LSE

PRM

1 in 2
CEC
Forecast

Total Obligation

LSE 3

LSE 2

LSE 1

Total RA

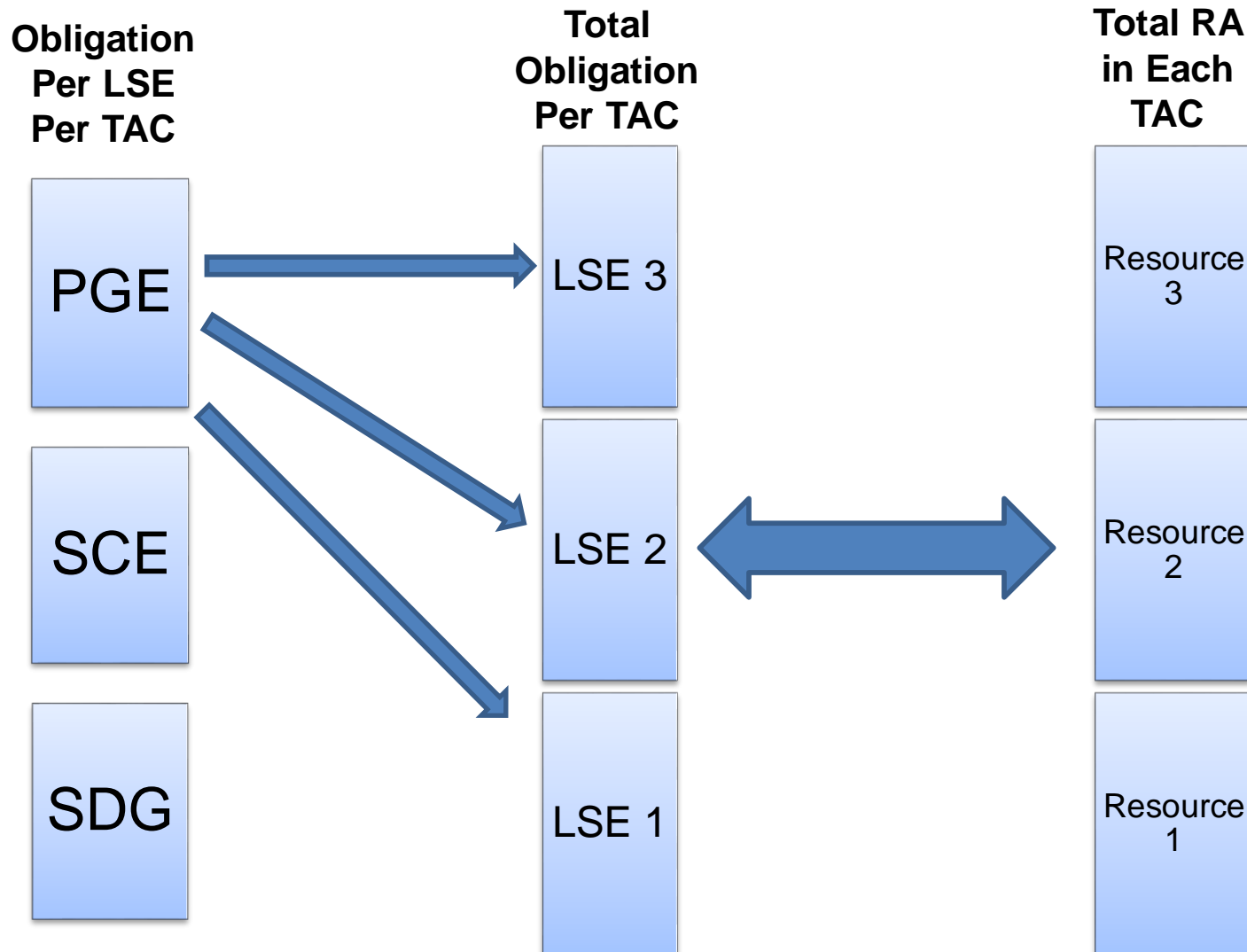
Resource 3

Resource 2

Resource 1



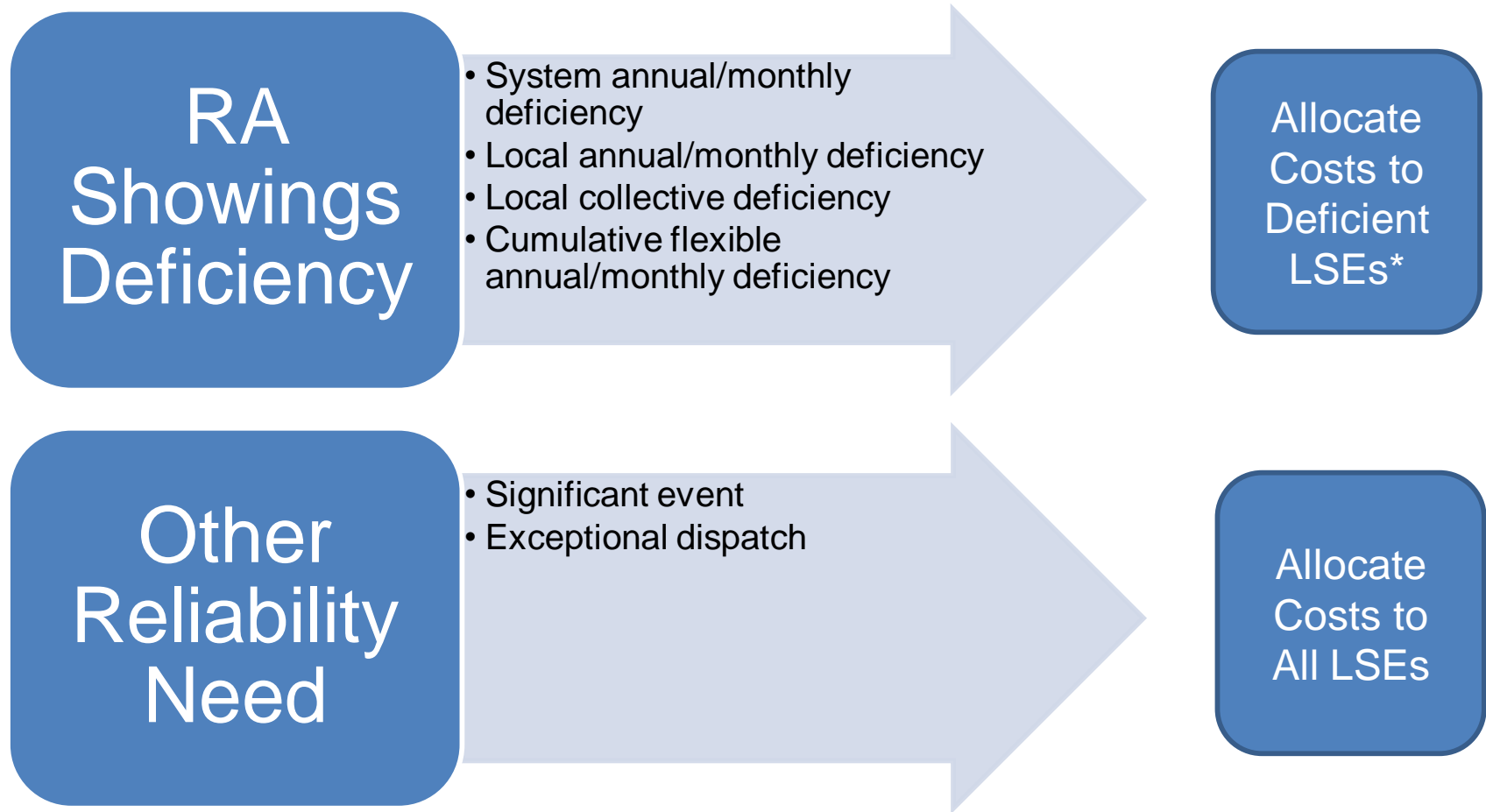
Local RA Sufficiency Check



Capacity Procurement Mechanism (CPM)

- Suppliers can offer local, system and flexible capacity into competitive solicitation process (CSP)
- Soft offer cap is updated at least every four years
- Existing CAISO CPM authority
 - System annual/monthly deficiency
 - Local annual/monthly deficiency
 - Local collective deficiency
 - Cumulative flexible annual/monthly deficiency
 - Significant event
 - Exceptional dispatch

CPM Designation Process

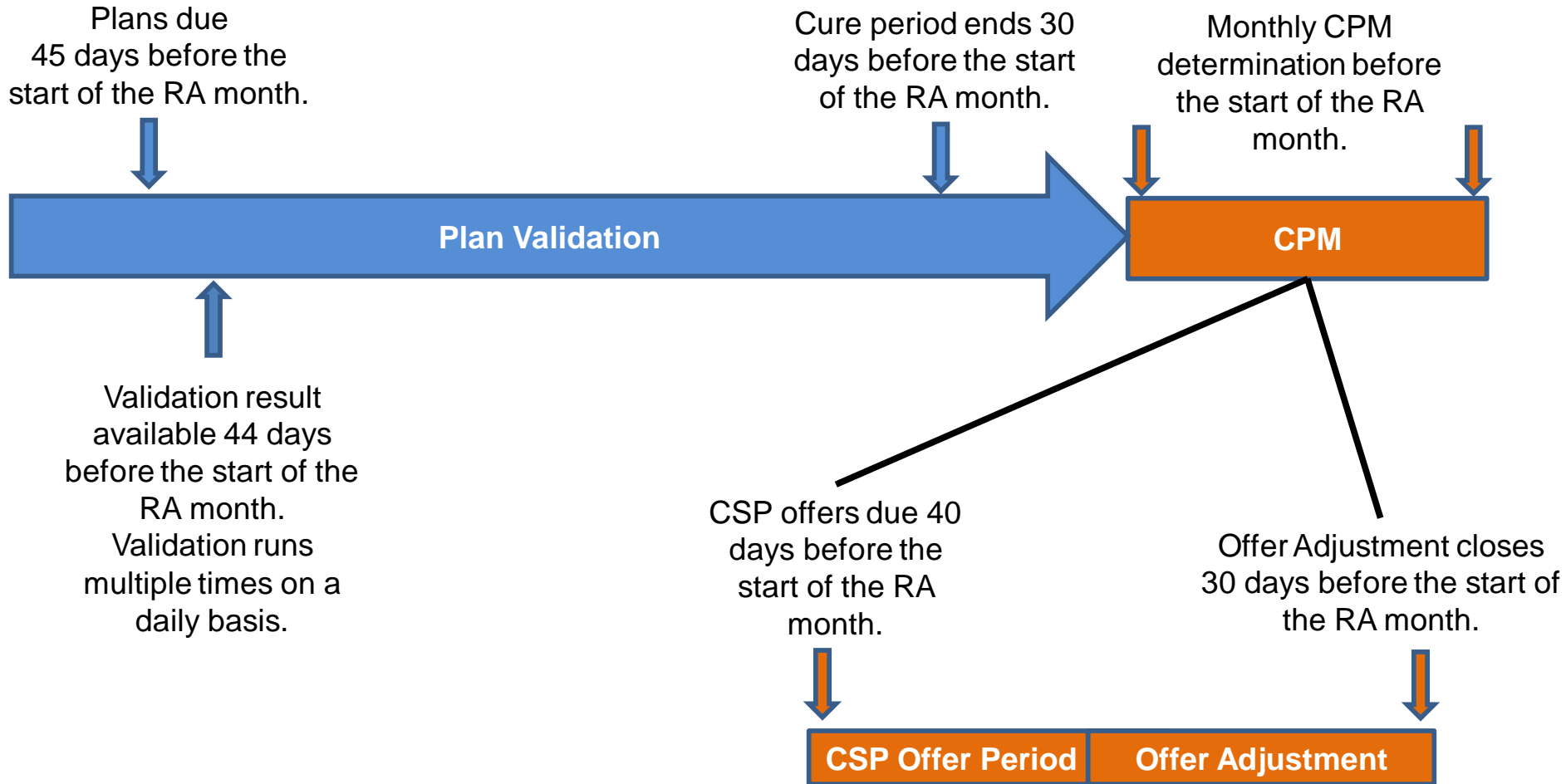


*for local collective deficiencies, costs allocated to deficient LSEs first then to all LSEs pro rata

Timeline for annual showings

- September: Year ahead requirements are finalized
- October: LSEs and Suppliers make the year ahead showings (due on the last business day of the month)
- 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)

Timeline for monthly showings



Slice of Day Recap Slide

- Workshop hosted on November 8
- Key Takeaways: CAISO will continue to consume a single QC value from all LRAs, including under the CPUC's Slice of Day reforms:
 - Wind and solar counting methodologies will shift from ELCC to an exceedance-based approach
 - CPUC's counting methodology for energy storage will not change; only how entities can show storage to the CPUC will change
 - Dispatchable and non-dispatchable resource QCs will not change
- Next Steps:
 - FAQs will be published by the ISO in the coming weeks
 - An additional workshop may be added to review edge cases and allow for additional Q&A

Questions

BREAK

MODELING STUDY SCOPE

Modeling Approach Shared with Working Group on 11/1

The world is changing, more VERs, probabilistic modeling of risks necessary. RA modeling will be around three time horizons to answer these specific questions:

Question	Sufficiency Analysis of	RA Timeframe	What are we looking for?
Are the year ahead RA showings adequate?	RA Showings	Year Ahead	Does the ISO BA have a MW shortfall or excess? Approach: Similar to Summer Assessment but with only RA showings; since year-ahead showing requirements are only 90% of total requirements, develop assumptions for last 10%
Is the current level of authorized procurement and contracted capacity sufficient?	Existing installed capacity + authorized procurement	Years 2-4	Do we have enough collectively and who needs to bring more? Approach: LOLE and ELCC by resource types
Is the LT plan producing resource adequate portfolios to meet reliability targets?	Resource plans by consolidating information from all IRPs	Years 5-10	To determine if the ISO BAA has sufficient resources for years 5 to 10. Approach: Find a way to translate that to PRM, ELCC for all resources, LOLE hours, etc.

A framework to assess year-ahead sufficiency of the shown RA and forecasted eligible RA capacity

SHORT TERM STUDY SCOPE

The modeling problem statement reflects the need for transparent and timely information on the ISO BAA's RA fleets' resource sufficiency and if it is meeting a 0.1 LOLE

- ***SH Feedback:***

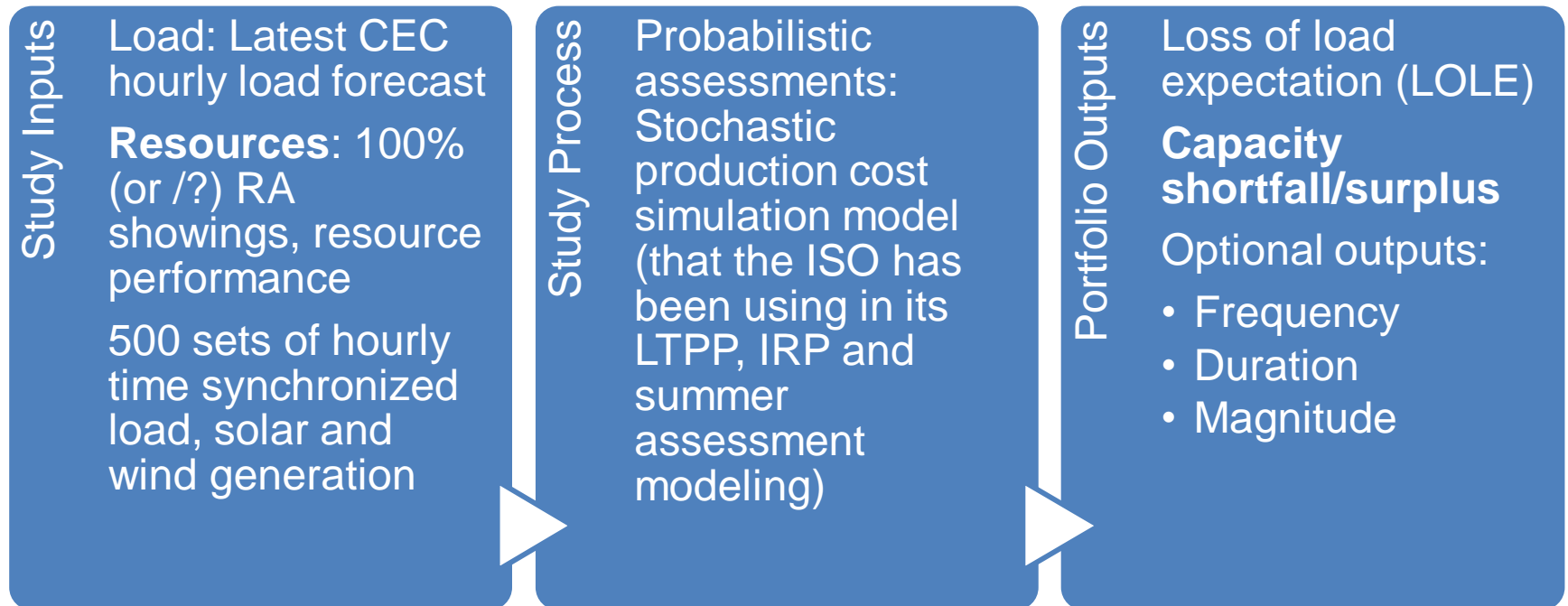
- There is a need for the CAISO to ensure the collective ability of the RA programs within its footprint meet a 0.1 LOLE.
- There is also a need for a comprehensive evaluation of the existing RA mechanisms to ensure that RA is providing the appropriate reliability for the CAISO grid.

- **Objective** is to provide transparent, timely information to stakeholders and assess if the shown RA fleet and forecasted eligible RA capacity in the CAISO BAA for the year ahead timeframe is sufficient to meet a 1-in-10 LOLE.

The ISO is responsible for operationalizing resources and maintaining reliable system operations

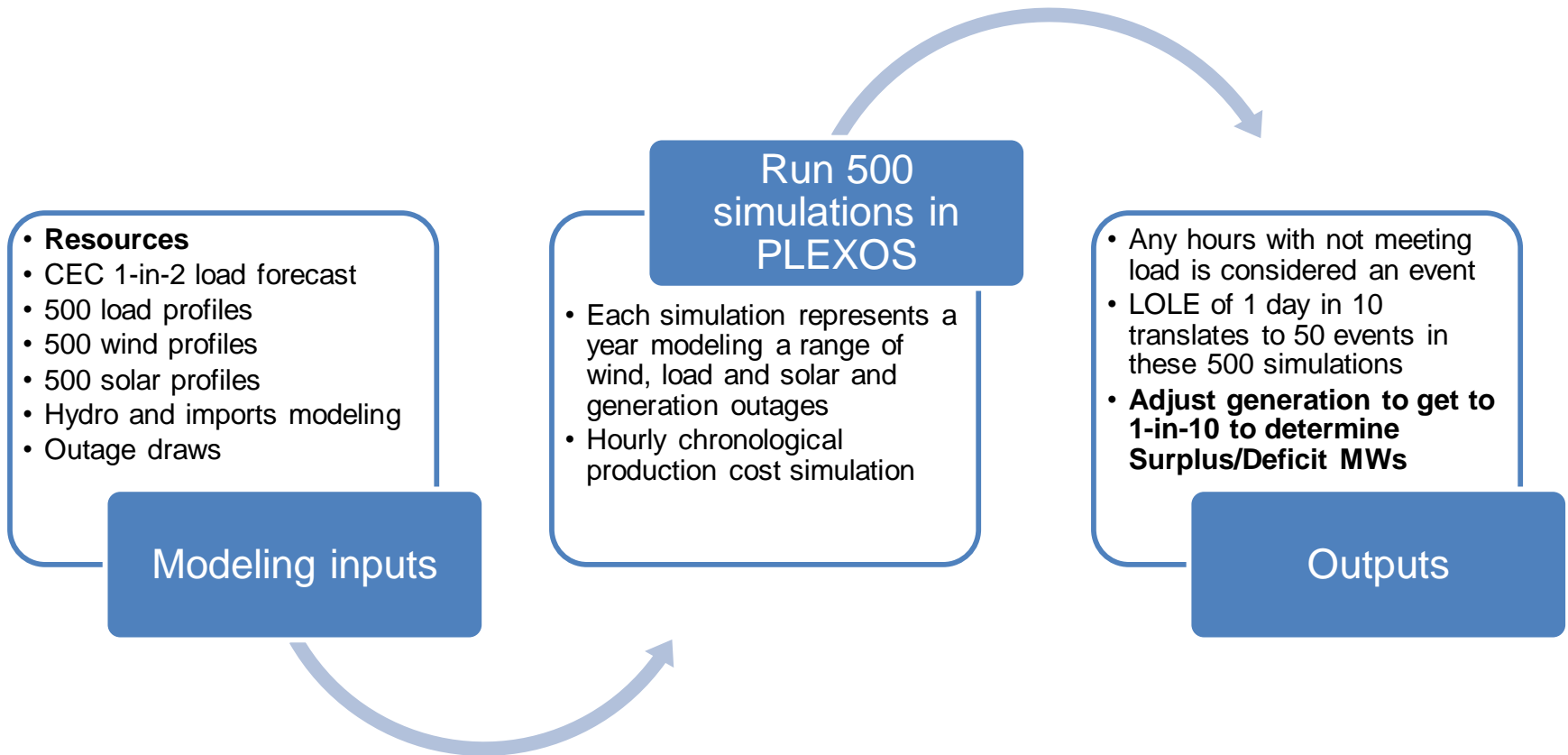
- The ISO would like to align with stakeholders on the inputs, assumptions, and design of these analyses.
- CAISO will continue to closely coordinate its modeling work with the CEC and CPUC – and seeks to align inputs and assumptions.
- The modeling exercise does not pre-suppose how results will be used or imply the ISO will take any particular action. The ISO welcomes discussions on potential use cases.
 - The ISO does not intend to subsume LRA programs.
 - Any specific actions taken (*e.g.*, by LRAs, the ISO, the state) based on study results will require further stakeholder discussion.

Potential modeling inputs and outputs

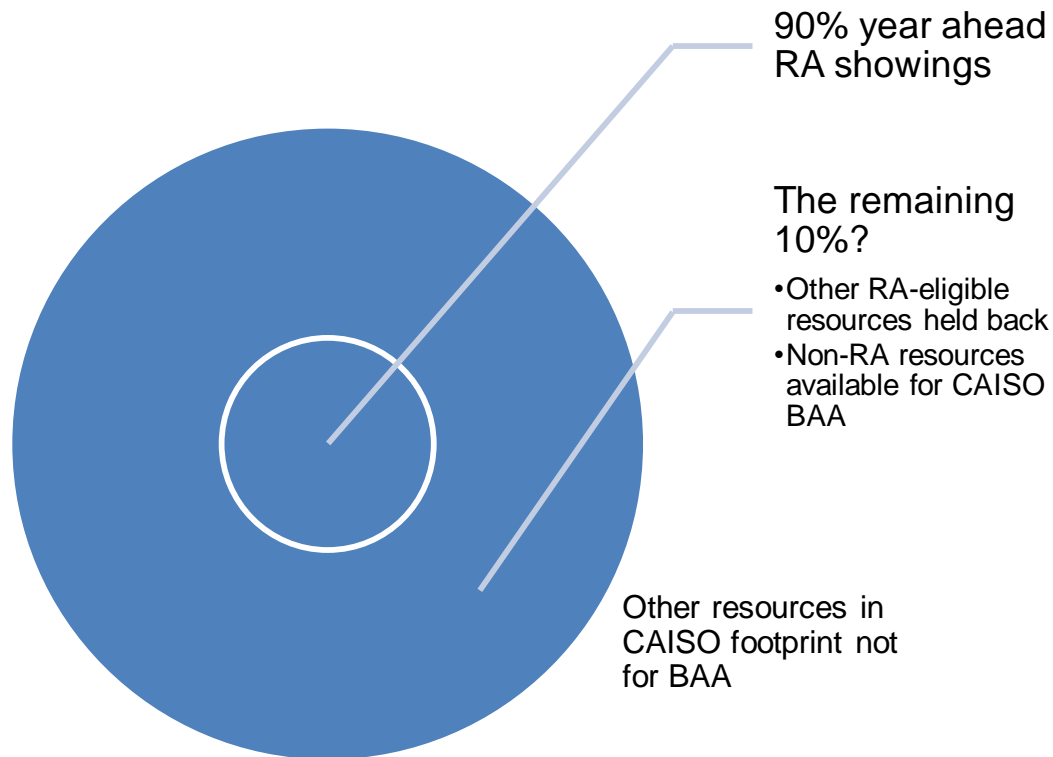


This modeling differs from other agency modeling as it would focus on shown RA and forecasted eligible RA capacity.

The ISO's stochastic production cost model, with only the shown RA portfolio, will be used for the RA year ahead sufficiency assessment



Resources - CAISO's Summer Assessment includes all installed capacity but not all new resources will be available as RA. The short term study will be based on RA showings and forecasted RA eligible resources...



100% Shown RA: CAISO requests input on what resources should be included in the assessment to get 100% shown capacity equivalent amount for each month

Options	Resource Assumptions
RA Resources	<ul style="list-style-type: none"> • 90% RA shown in the Annual showings requirement (for the months May thru Sept), • How to determine a reasonable assumption for the remaining 10% for the Summer months? <ul style="list-style-type: none"> • RA held back for substitution requirements, • RA eligible but not shown beyond RA showings requirement • What to assume for 100% of the non-summer months?
Resources that will not be included	<ul style="list-style-type: none"> • Resources inside CAISO BAA with contracts external to the ISO • Energy-only and emergency resources
Changes in the year-ahead timeframe	<ul style="list-style-type: none"> • Known retirements, • RA eligible resources with a future COD

Inputs and Assumptions – What we have today

- Stochastic load, solar and wind generation profiles: ISO developed a methodology for creating numerous unique hourly stochastic load, solar, and wind generation profiles¹
 - Load profiles (use CEC IEPR forecast)
 - Using this methodology, 500 sets of hourly time synchronized load, solar and wind generation profiles will be created for stochastic simulations
- Hydro profiles for run-of-river hydro resources
- Demand response data
- Import assumptions
- Retirement assumptions
- Does not include strategic reserve/emergency resources

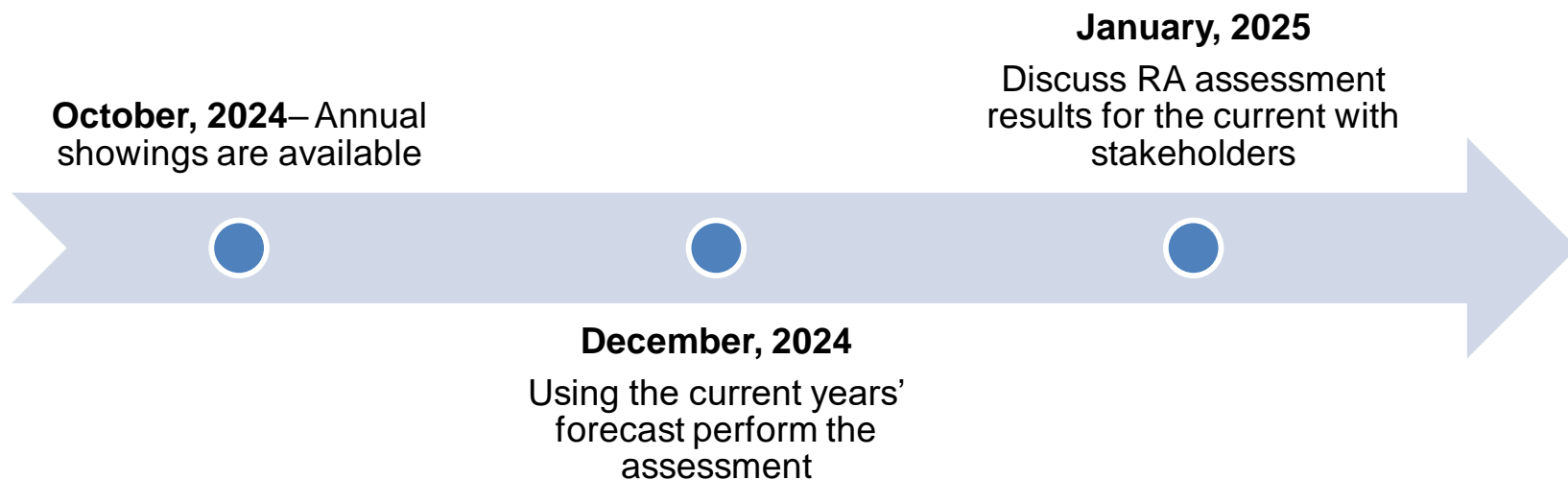
The methodology was filed as part of CAISO's expert testimony in the CPUC Long-Term Procurement Plan (LTPP) proceeding in 2014

¹ http://www.caiso.com/Documents/Aug13_2014_InitialTestimony_ShuchengLiu_Phase1A_LTPP_R13-12-010.pdf

http://www.caiso.com/Documents/Nov20_2014_Liu_StochasticStudyTestimony_LTPP_R13-12-010.pdf

The entire assessment process from model building to results takes about 3 months

For example:



LUNCH

STAKEHOLDER PRIORITIZATION SURVEY RESULTS

Feedback on Sequence / Priorities

The following are topics that were explicitly identified as priority or more important in sequencing.

- Slice of Day (SoD): CalCCA, PG&E, SCE, SDG&E
- Capacity Procurement Mechanism (CPM): CalCCA, PG&E, SCE
- Unforced Capacity Methodology (UCAP): CalCCA, PG&E, SCE
- Extended Day Ahead Market (EDAM) Crossover: SDG&E, SCE, WAPA
- Longer term RA frameworks: SCE, WAPA

There was less explicit mention of prioritization in the participant feedback. To increase participation in the statement of priorities, a poll will be conducted to provide additional explicit ranking by working group participants.

Feedback on Sequence / Priorities

From the comments submitted, there were numerous topics listed in the priorities / sequence section, however most only had one proponent.

Topic	Proponents
Address LoLE	1
Alignment with CPUC Rules	1
Capacity Market	1
Evaluate Current RA	1
Flex RA Need	1
ISO Jurisdiction v. LRAs	1
Local RA from Outside BAA	1
Long Term RA	1
LRA Alignment w/ ISO RA	1
PPR 1280 / CPM Rules	1
RA and EDAM RSE Alignment / Cost	1
RA Substitute Capacity	1
Slice of Day	3
UCAP / RAAIM	3

Slido Poll

Proposed Edits to Problem Statement 1

Cal CCA proposed the following changes to Problem Statement 1:

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) **and in the non-CAISO WECC** Without this, there are challenges in:

- Accessing and communicating the system-wide sufficiency of the CAISO BAA in light of the contracted RA fleet;
- **Anticipating the amount of RA imports the CAISO can expect and the amount of RA-eligible resources within CAISO that will be contracted to entities outside the state; and**
- Addressing such concerns **around CAISO BAA system-wide RA sufficiency** in a timely and efficient manner.

Sub-issues:

- RA Portfolio Evaluation does not exist today
- Lack of Non-RA Visibility, **where non-RA is defined as RA-eligible resources not shown on a supply plan and not available to the CAISO BAA for its use in meeting RA or CPM needs (e.g., supply contracted outside the state, supply held back for substitution, etc.)**
- Outdated Default Planning Reserve Margin

Problem Statement 4 on LoLE

Proposed Problem Statement via Middle River Power:

There is a need for the CAISO to ensure the collective ability of the RA programs within its footprint meet the 0.1 LOLE metric. If the RA programs within the CAISO footprint do not meet this metric, then the CAISO shall engage in backstop procurement, regardless of whether the shown RA fleet is sufficient to meet the LSE requirements.

Sub-Issue: There is a need for additional information regarding the sufficiency of the LRA RA programs to meet 0.1 LOLE.

Proposed Analysis: Quantify the extent the 0.1 LoLE was met or not met in prior years.

REVIEW PROBLEM STATEMENT 2 AND 3 FEEDBACK

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

Other Feedback Participant Comments

Theme	Stakeholders
Explore a centralized capacity market	WAPA
Assess the need for flexible RA	SCE

BREAK

CAISO RA ANALYSIS & REPORTING

Background

- Stakeholders have been interested in what metrics CAISO can provide regarding:
 - RA showings
 - Performance of the RA resources
- This presentation is to level-set on what data the CAISO currently produces on RA to help inform what data stakeholders would like to see to understand the problem statements.

Current RA metrics published by CAISO

1) Public Information

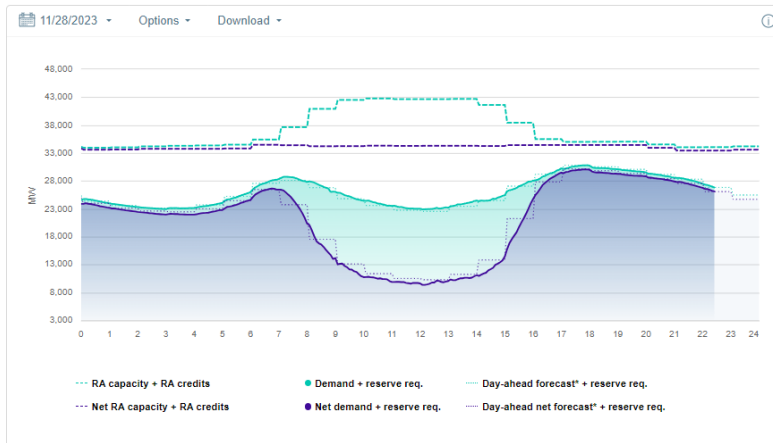
- a) CAISO Today's Outlook
- b) Monthly Summer Performance Report
- c) Monthly Market Performance Report
- d) OASIS

CAISO Today's Outlook

Current Demand trend Net demand trend **Resource adequacy trend** 7-day resource adequacy trend

Resource adequacy capacity trend

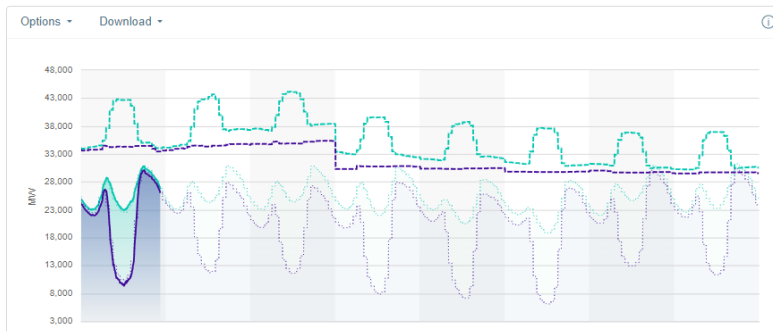
Resource adequacy (RA) is energy designated by the state to be bid into the market for the reliable operation of the power grid, minus the impacts of outage derates. Any energy needed over that designated amount has to be procured in the real-time market.



*Note: Values for the 7th day of the day-ahead forecasts will complete by 9:30 PT.

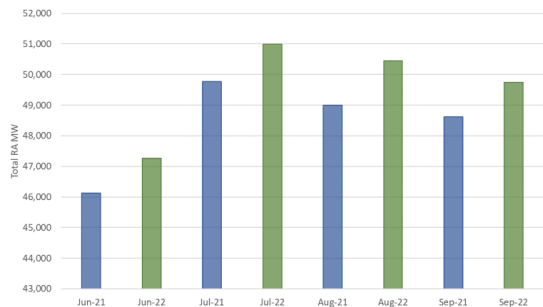
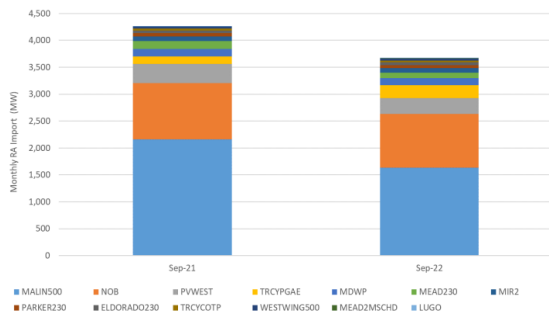
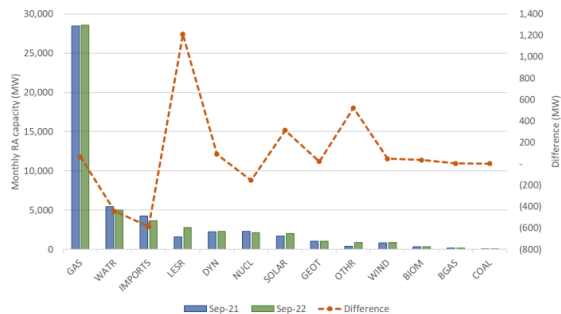
7-day resource adequacy capacity trend

Resource adequacy capacity forecast for today plus the next 7 days, in megawatts, compared to demand forecast plus reserve requirements.



- Reports the resource adequacy capacity trends and comparing them with demand and day - ahead forecast for the energy serving load in the CAISO BAA.
- It includes a 7-day resource adequacy capacity forecast compared to the 7-day demand forecast plus reserve requirements.
- Assumptions:
 - Includes the RA credits
 - Includes the VER forecast
- Link:
<http://www.caiso.com/TodaysOutlook/Pages/default.aspx#section-ra-capacity-trend>

Monthly Summer Performance Report

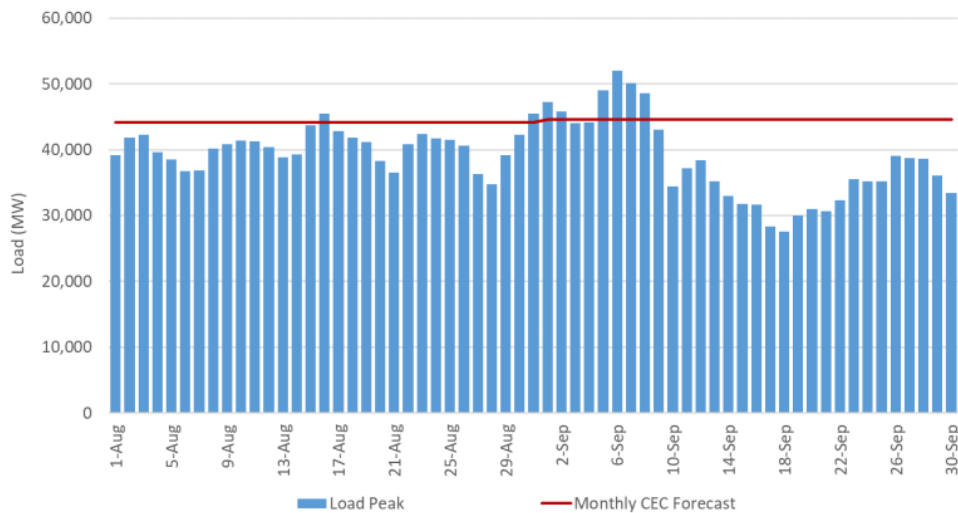


- Reports the monthly RA showings for each summer month and comparing them with previous months/ years.
- Includes the RA showings by fuel type and RA imports classified by intertie.

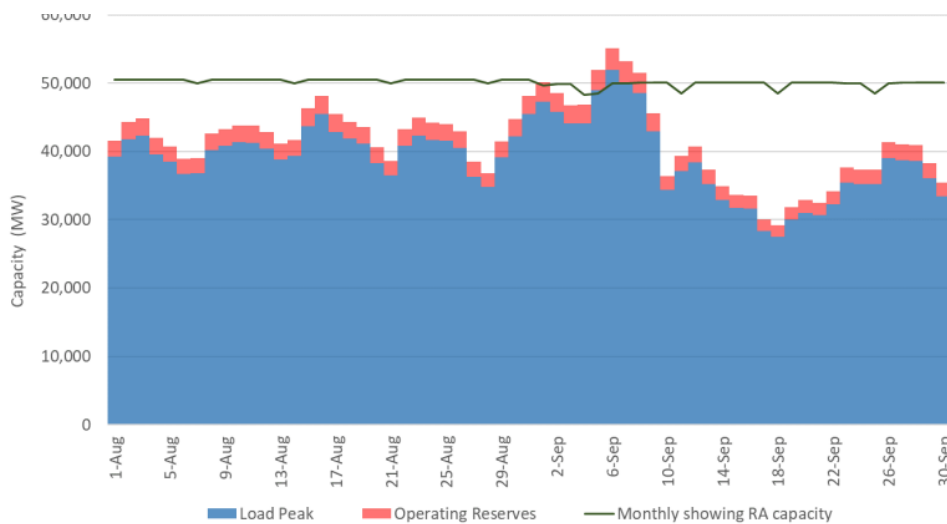
• Link:

<http://www.caiso.com/market/Pages/ReportsBulletins/Default.aspx>

Monthly Summer Performance Report - contd

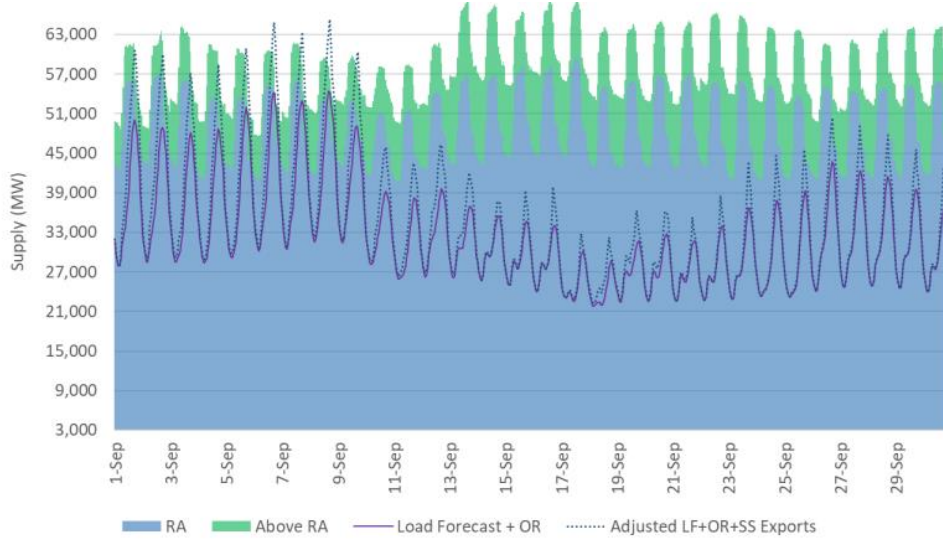


Comparison of Peak Load with the CEC forecast, which is used to assess RA requirements.

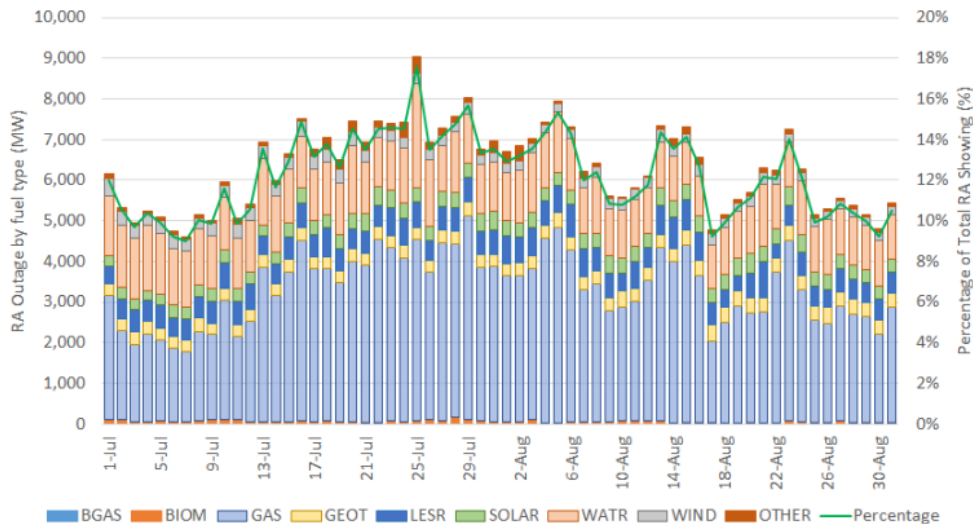


Comparison of Peak load with Monthly RA showings to analyze if there are instances of RA showings lower than peak load.

Monthly Summer Performance Report - contd

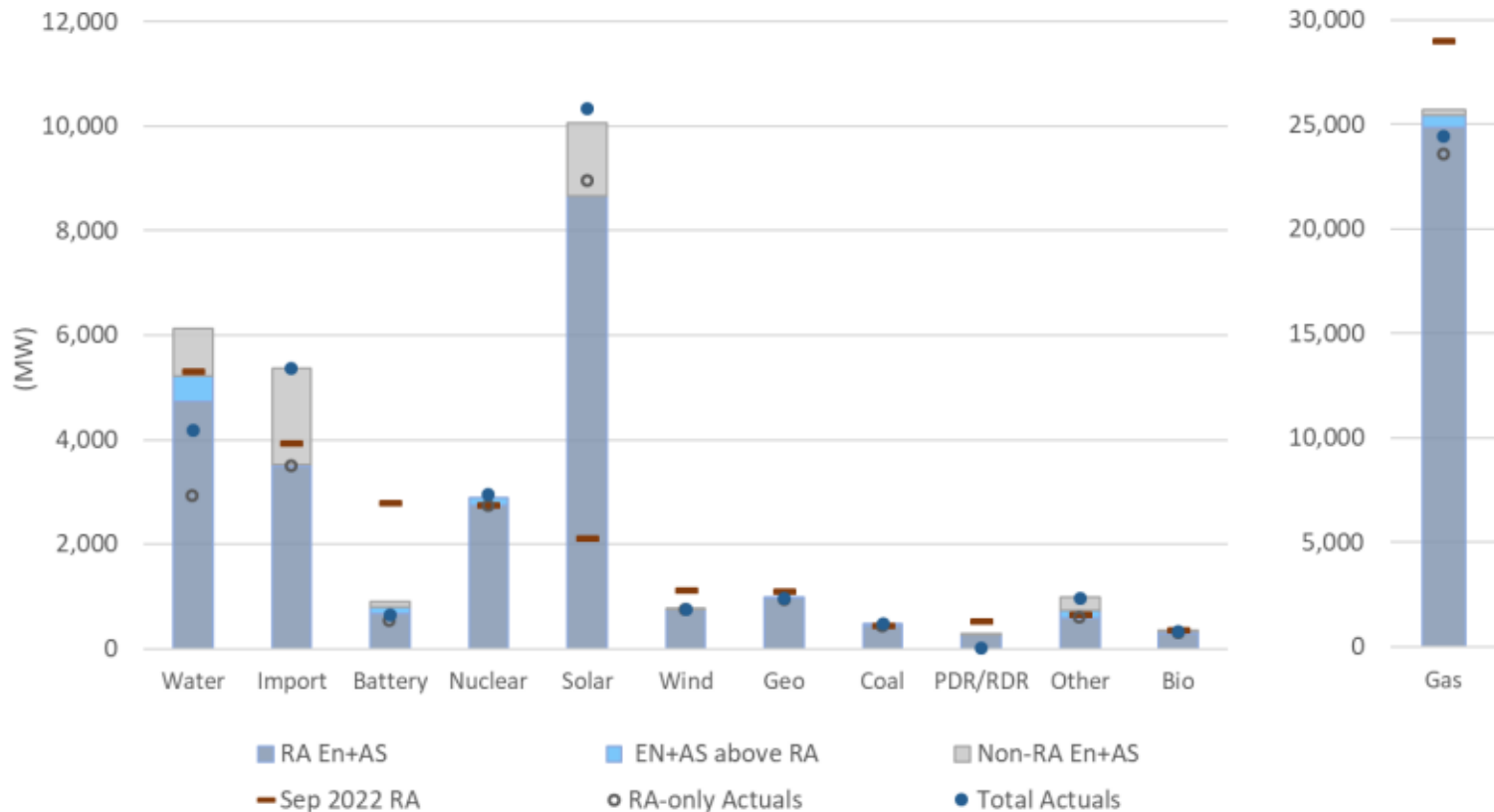


- Breakdown of Day-ahead supply capacity as RA capacity and above RA capacity.
- Volume of RA capacity by fuel type that is either derated or on outage and compares it against the monthly RA showings.



Monthly Summer Performance Report - contd

Performance of resources against their shown RA values



Comparison of real time supply and actual production with RA capacity. Analyzed during the tight supply conditions – e.g. Sep 2022 heat wave.

Monthly Market Performance Report

Table 2: Resource Adequacy Availability and Payment

Month-Year	Total Non-Availability Charge	Total Availability Incentive Payment	Flexible Average Actual Availability	System Average Actual Availability
Oct21	\$5,983,248	-\$2,726,837	94.0%	92.0%
Nov21	\$2,551,072	-\$2,428,396	96.0%	95.0%
Dec21	\$1,558,546	-\$2,833,036	97.0%	97.0%
Jan22	\$1,828,883	-\$1,828,883	98.0%	96.0%
Feb22	\$1,995,180	-\$1,995,180	96.0%	97.0%
Mar22	\$3,423,662	-\$2,053,541	93.0%	96.0%
Apr22	\$3,359,640	-\$2,155,567	94.0%	95.0%
May22	\$7,153,667	-\$2,694,437	89.0%	94.0%
Jun22	\$3,323,716	-\$2,980,397	95.0%	96.0%
Jul22	\$2,903,137	-\$3,510,328	96.0%	96.0%

- Reports the Resource Adequacy Availability Incentive Mechanism (RAAIM) settlements that are used to determine the availability of resources.
- Includes the Availability Incentive Payments and Non-Availability Charges
- Link (Market Performance Reports > Monthly market performance reports: <https://www.caiso.com/market/Pages/ReportsBulletins/Default.aspx>)

Resource Adequacy and Minimum Load (OASIS)

Date From: 11/27/2023 To: 11/27/2023 Market/Process: DAM Apply Reset

Download XML Download CSV

Resource Adequacy and Minimum Load

1 - 10 of ???

Market	Opr Date	RA MLC Name	HE01	HE02	HE03	HE04	HE05	HE06	HE07	HE08	HE09	HE10	HE11
DAM	11/27/2023	Number of Units Committed	65.00000	63.00000	62.00000	64.00000	69.00000	75.00000	87.00000	189.00000	175.00000		
DAM	11/27/2023	RA Number of Units Committed	55.00000	54.00000	54.00000	56.00000	60.00000	65.00000	77.00000	177.00000	164.00000		
DAM	11/27/2023	Start-Up Cost US\$	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	38.67667	76.85333	0.00000		
DAM	11/27/2023	RA Start-Up Cost US\$	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	38.67667	76.85333	0.00000		
DAM	11/27/2023	Minimum Load (MW)	3,895.00000	3,812.00000	3,743.00000	3,743.00000	3,707.00000	3,707.00000	3,680.00000	3,299.00000	2,193.00000	2	
DAM	11/27/2023	RA Minimum Load (MW)	3,873.00000	3,790.00000	3,721.00000	3,721.00000	3,685.00000	3,685.00000	3,658.00000	3,427.00000	2,321.00000	2	
DAM	11/27/2023	Minimum Load Cost (MLC) US\$	428,738.21000	402,497.71000	395,390.88000	400,043.32000	410,118.91000	427,868.63000	433,973.03000	418,665.04000	275,111.35000	245	
DAM	11/27/2023	RA Minimum Load Cost (MLC) US\$	428,387.81000	402,182.80000	395,112.18000	399,764.62000	409,804.72000	427,501.33000	433,605.73000	418,297.74000	274,815.75000	245	
DAM	11/27/2023	Capacity Committed (MW)	16,601.00000	16,321.00000	15,923.00000	15,805.00000	16,412.00000	17,174.00000	18,161.00000	18,045.00000	13,338.00000	12	
DAM	11/27/2023	RA Capacity Committed (MW)	12,507.00000	12,171.00000	11,829.00000	11,784.00000	11,940.00000	12,251.00000	12,681.00000	12,349.00000	8,284.00000	7	

- Reports the total CAISO committed and total CAISO RA committed numbers for day-ahead (DAM), residual unit commitment (RUC) and real time market (RTM) plus the totals across all the markets.

DMM RA ANNUAL REPORTING



DMM's Resource Adequacy reporting metrics, a sample

December 6, 2023

Department of Market Monitoring

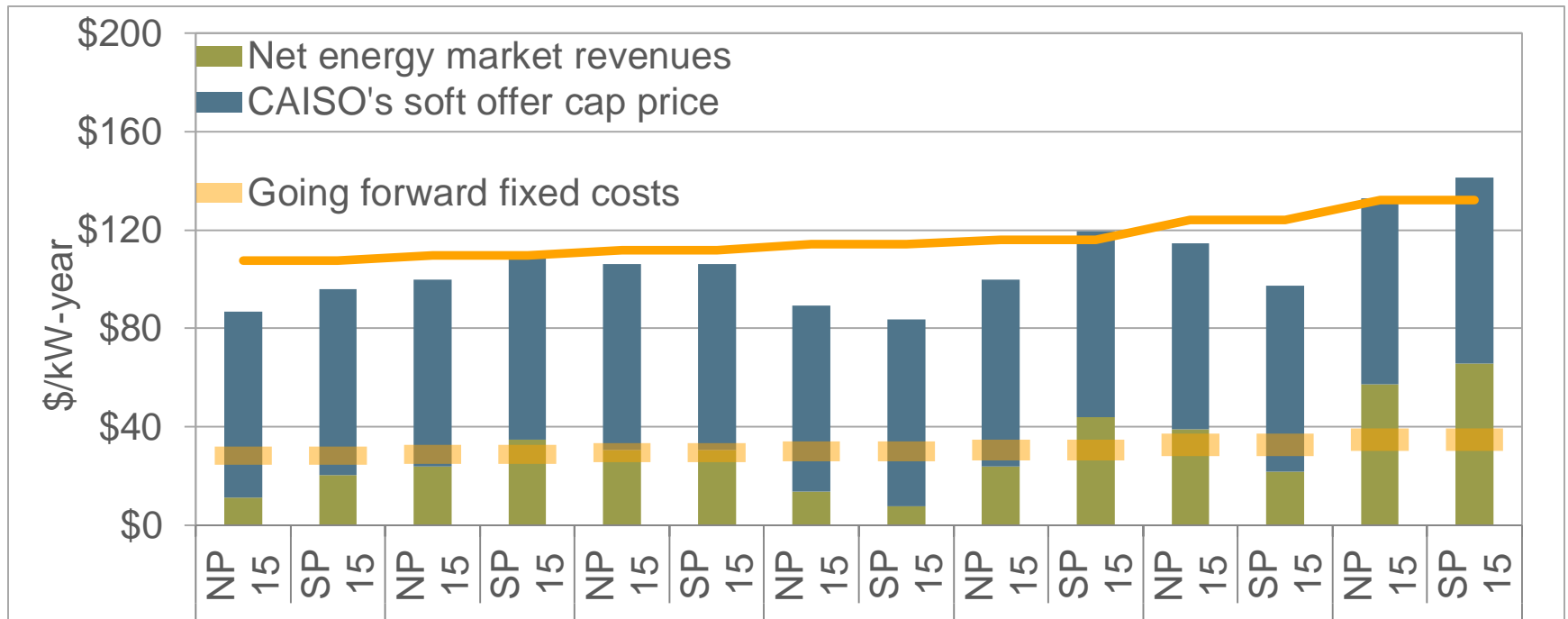
<http://www.caiso.com/Documents/2022-Annual-Report-on-Market-Issues-and-Performance-Jul-11-2023.pdf>

<http://www.caiso.com/Documents/2022-Special-Report-on-Battery-Storage-Jul-7-2023.pdf>

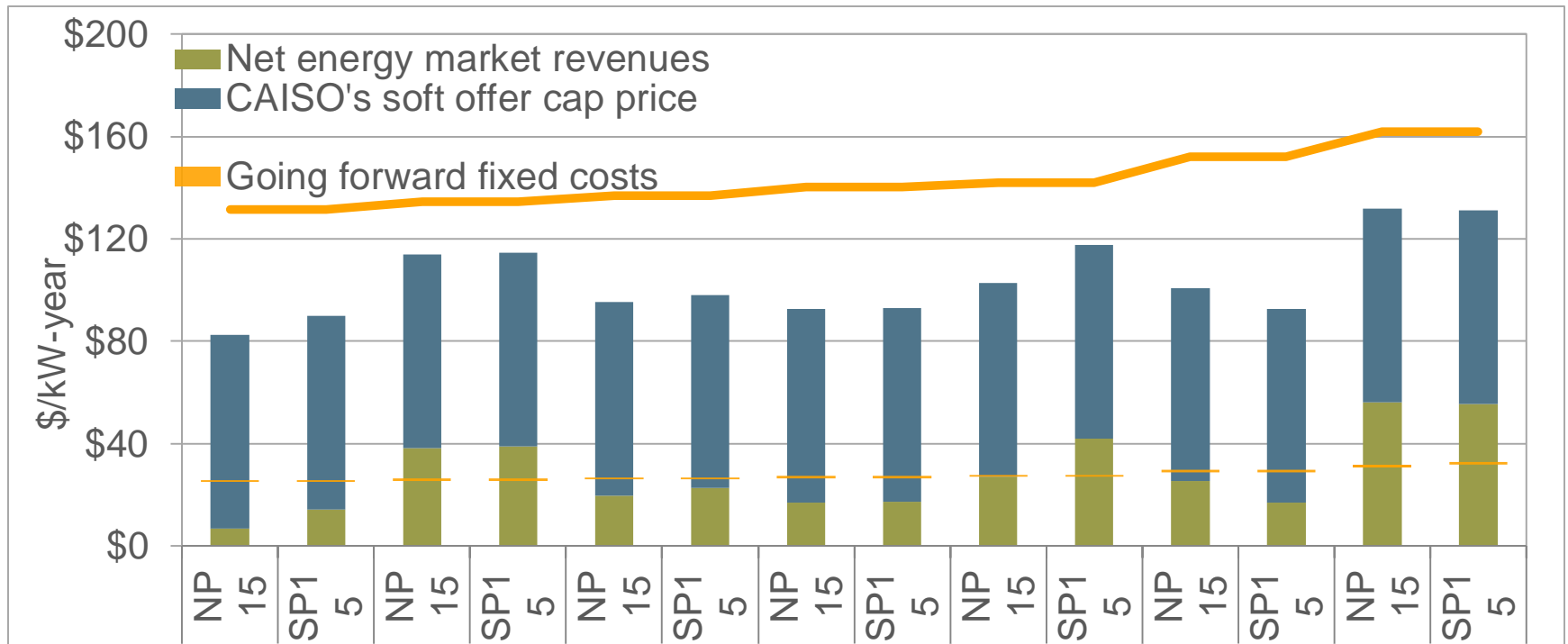
<http://www.caiso.com/Documents/Presentation-Report-MarketConditions-Issues-Performance-August-September2020-Dec18-2020.pdf>

<http://www.caiso.com/market/Pages/MarketMonitoring/Default.aspx>

Estimated net revenue of hypothetical combined cycle unit rose to \$57/kW-year in NP15 and \$66/kW-year in SP15, above going forward fixed costs



Estimated net revenues of hypothetical combustion turbine rose to \$56/kW-year in NP15 and SP15, above going forward fixed costs

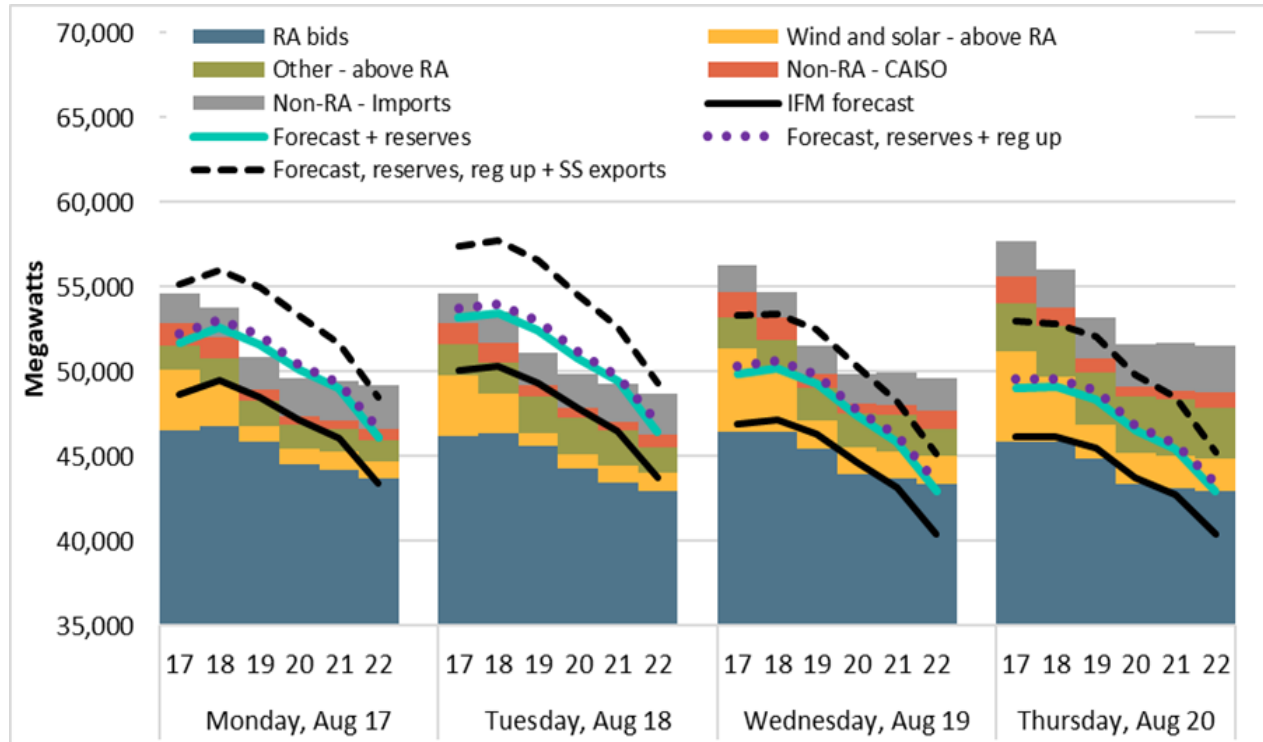


State policy also contributed to competitive market outcomes in CAISO

- California relies on long-term procurement planning and resource adequacy requirements placed on load serving entities by the CPUC to ensure that sufficient capacity is available to meet system and local reliability requirements
- CPUC policies also have a major impact on the type of different generating resources retained and added to the CAISO system
- Load shift from investor owned utilities to community choice aggregators
- Decrease in long-term capacity contracts

Available capacity from resource adequacy units insufficient to meet demand in peak net load hours.

2020 analysis

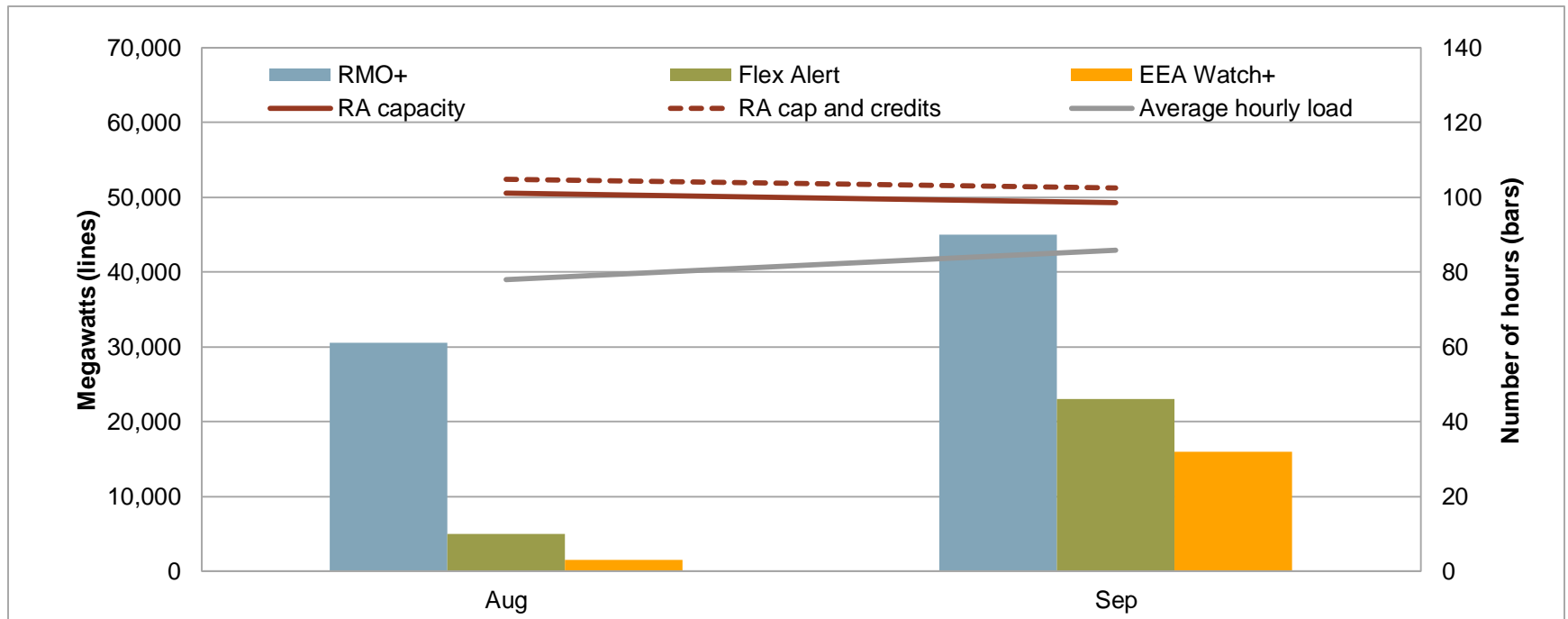


Source: DMM Report, Figure 3.20, p. 30

Average total system resource adequacy capacity, availability, and performance by system emergency notification category

Year	Alert category	Number of hours	Total RA capacity	Day-ahead market			Real-time market				Meter	Uncapped meter
				Capacity de-rate	Bids and self-schedule	Schedules	Capacity de-rate	Bids and self-schedule	Schedules	Uncapped schedules		
2020	RMO+	390	47,723	94%	87%	61%	93%	86%	58%	68%	55%	64%
	Flex Alert+	154	48,602	95%	87%	67%	93%	85%	63%	73%	61%	68%
	Alert+	97	45,404	95%	89%	72%	94%	88%	68%	79%	65%	73%
2021	RMO+	359	41,480	93%	88%	57%	92%	87%	52%	66%	50%	63%
	Flex Alert+	38	48,878	94%	88%	81%	92%	87%	77%	87%	73%	81%
	Alert+	14	49,359	93%	85%	80%	92%	85%	77%	85%	73%	80%
2022	RMO+	151	49,799	95%	90%	75%	94%	89%	69%	83%	64%	77%
	Flex Alert+	56	49,509	95%	91%	85%	93%	89%	77%	88%	72%	81%
	EEA Watch+	35	49,390	95%	90%	87%	93%	89%	79%	89%	74%	81%
	EEA 2+	17	49,490	95%	91%	89%	93%	90%	82%	92%	78%	85%

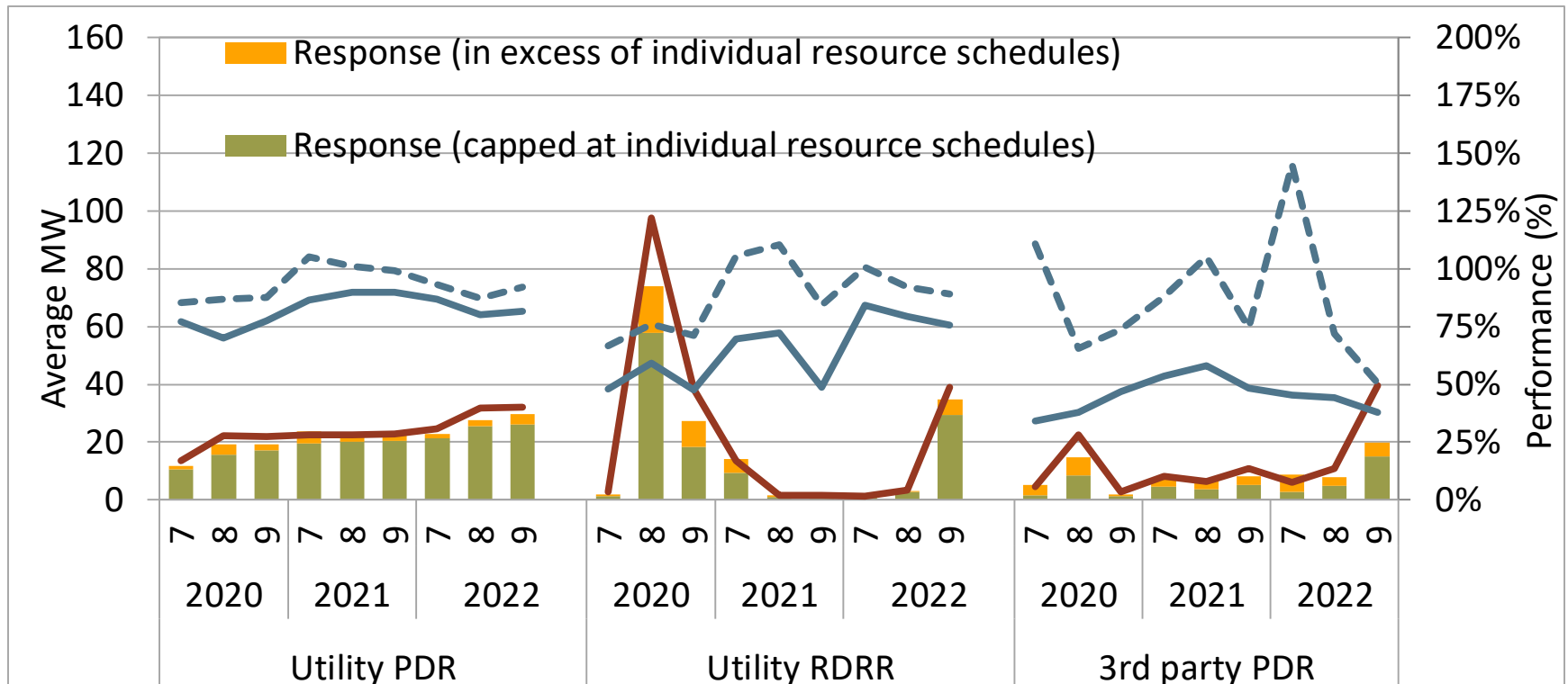
Average hourly resource adequacy capacity and load (2022 emergency notification hours)



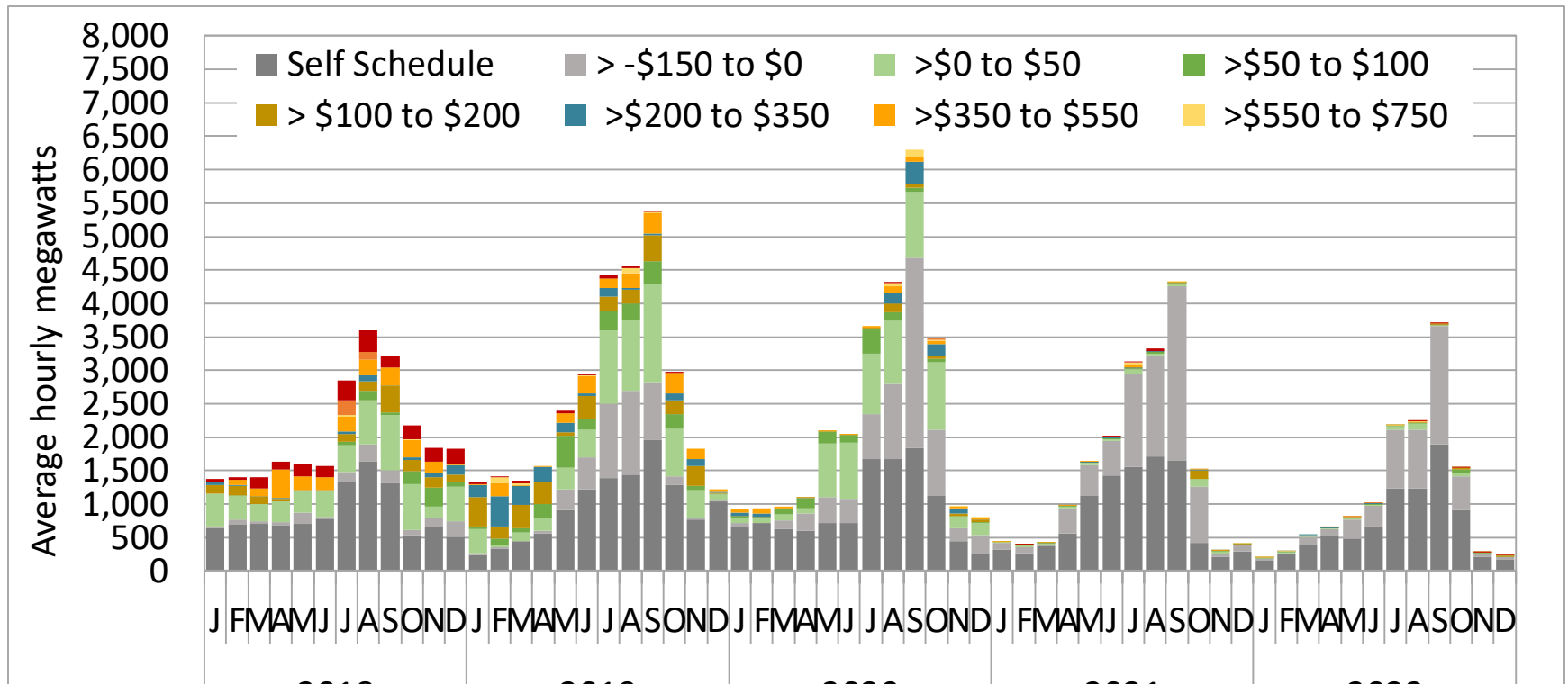
Average system resource adequacy capacity, availability, and performance by fuel type (emergency notification hours)

Resource type	Total RA capacity	Day-ahead market			Real-time market					Meter	Uncapped meter
		Capacity de-rate	Bids and self-schedule	Schedules	Capacity de-rate	Bids and self-schedule	Schedules	Uncapped schedules	Uncapped schedules + AS		
Must-Offer:											
Gas-fired generators	19,415	93%	93%	91%	90%	90%	86%	88%	89%	89%	83%
Other generators	1,489	93%	93%	88%	93%	93%	91%	97%	97%	88%	93%
Subtotal	20,903	93%	93%	91%	91%	90%	86%	89%	90%	90%	83%
Other:											
Imports	3,171	98%	95%	93%	100%	94%	92%	94%	94%	90%	90%
Imports-MSS	273	100%	46%	46%	100%	49%	46%	46%	46%	46%	46%
Use-limited gas units	9,010	93%	92%	90%	91%	90%	73%	76%	86%	68%	68%
Hydro generators	5,335	97%	93%	92%	95%	92%	67%	78%	103%	63%	63%
Nuclear generators	2,774	100%	100%	100%	100%	100%	100%	104%	104%	99%	99%
Solar generators	2,036	100%	51%	51%	98%	57%	54%	157%	157%	47%	47%
Wind generators	1,141	100%	56%	55%	100%	80%	79%	165%	165%	65%	65%
Qualifying facilities	876	97%	95%	94%	92%	90%	88%	106%	106%	86%	86%
Demand response (PDR)	417	97%	67%	24%	94%	51%	35%	36%	36%	14%	14%
Storage	2,774	93%	92%	70%	92%	92%	51%	53%	84%	31%	31%
Other non-dispatchable	679	96%	91%	78%	93%	90%	83%	89%	96%	76%	76%
Subtotal	28,487	96%	88%	84%	95%	88%	73%	88%	99%	67%	79%
Total	49,390	95%	90%	87%	93%	89%	79%	89%	95%	74%	81%

Demand response resource adequacy performance, July-Sept 4-9 p.m.



Average hourly resource adequacy imports by price bin



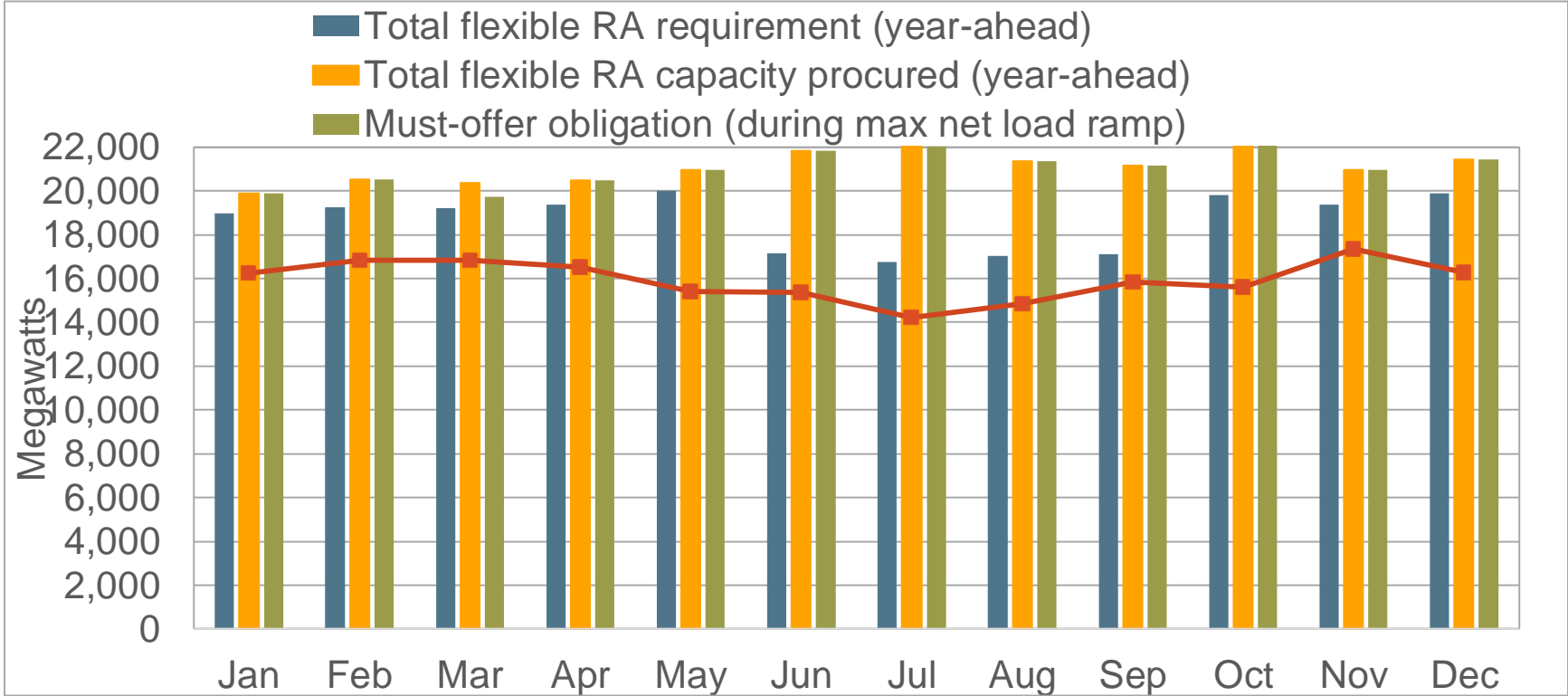
Investor-owned utilities procured most system resource adequacy capacity

Load Type	Total RA capacity	Day-ahead market			Real-time market				Meter	Uncapped meter
		Capacity de-rate	Bids and self-schedule	Schedules	Capacity de-rate	Bids and self-schedule	Schedules	Uncapped schedules		
Community choice aggregator	10,972	95%	90%	84%	93%	89%	80%	92%	75%	85%
Direct access	3,890	94%	88%	85%	91%	86%	79%	94%	75%	86%
Investor-owned utility	30,230	95%	92%	89%	93%	90%	78%	87%	73%	79%
Municipal/government	3,918	97%	86%	83%	97%	87%	80%	88%	77%	83%
Not on a plan	380	82%	78%	77%	82%	71%	76%	77%	75%	76%
Total	49,390	95%	90%	87%	93%	89%	79%	89%	74%	81%

Average system resource adequacy capacity and availability by RAIM category

RAAIM category	Total RA capacity	Day-ahead market			Real-time market				Meter	Uncapped meter
		Capacity de-rate	Bids and self-schedule	Schedules	Capacity de-rate	Bids and self-schedule	Schedules	Uncapped schedules		
Non-RAAIM exempt	40,044	95%	94%	90%	93%	92%	81%	85%	76%	79%
RAAIM exempt	9,346	94%	76%	74%	92%	78%	70%	106%	63%	91%
Total	49,390	95%	90%	87%	93%	89%	79%	89%	74%	81%

Flexible resource adequacy procurement during the maximum net load ramp



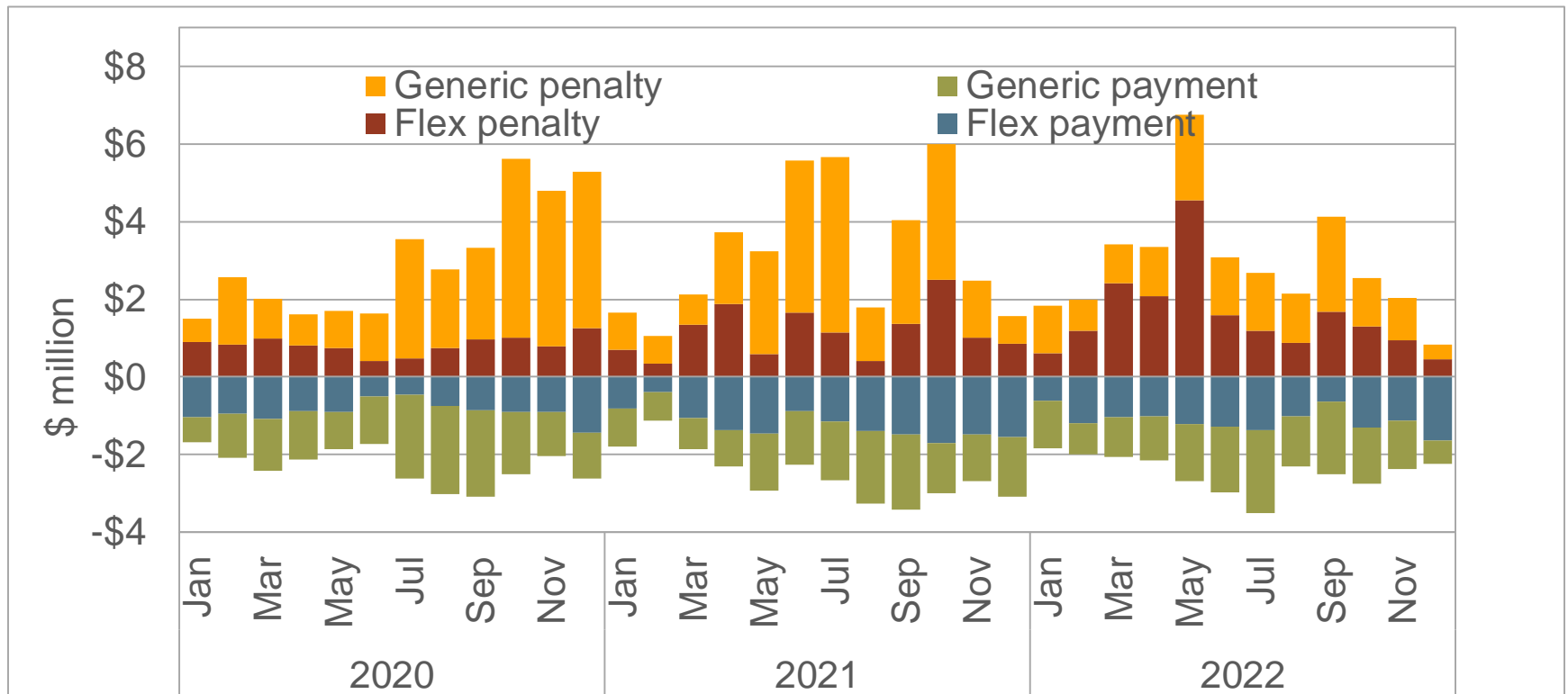
Average flexible resource adequacy capacity and availability

Month	Average DA flexible capacity (MW)	Average DA Availability		Average RT flexible capacity (MW)	Average RT Availability	
		MW	% of DA Capacity		MW	% of RT Capacity
January	18,886	17,252	91%	13,125	11,760	90%
February	19,250	16,004	83%	12,572	10,847	86%
March	18,661	13,365	72%	13,112	10,104	77%
April	19,123	14,999	78%	13,403	11,010	82%
May	19,803	15,490	78%	13,434	11,261	84%
June	21,033	18,347	87%	15,070	12,735	85%
July	21,083	18,646	88%	15,539	13,370	86%
August	20,490	18,263	89%	15,881	13,595	86%
September	20,208	17,245	85%	15,917	13,379	84%
October	21,274	18,666	88%	16,467	14,241	86%
November	19,824	16,455	83%	14,948	12,748	85%
December	19,536	16,915	87%	15,051	12,776	85%
Total	19,931	16,804	84%	14,543	12,319	85%

Average flexible resource adequacy capacity and availability by load type

Load Type	Average DA flexible capacity (MW)	Average DA Availability		Average RT flexible capacity (MW)	Average RT Availability	
		MW	% of DA Capacity		MW	% of RT Capacity
CCA	4,389	3,764	86%	2,975	2,654	89%
DA	1,682	1,454	86%	1,295	1,158	89%
IOU	13,198	10,976	83%	9,663	8,001	83%
Muni	658	605	92%	607	502	83%
Total	19,926	16,799	84%	14,539	12,315	85%

Monthly RAIM penalties and payments



Intra-monthly capacity procurement mechanism costs

Resource	Designated MW	CPM Start Date	CPM End Date	CPM Type	Price (\$/kW-mon)	Estimated cost (\$ mil)	Local capacity area	CPM designation details
ELCAJN_6_UNITA1	19	8/31/22	10/29/22	ED	\$6.31	\$0.24	SDG	CPM Designation for Exceptional Dispatch to address a potential thermal overload in the San Diego Local Area for the next contingency event
MRCHNT_2_PL1X3	36	9/1/22	9/30/22	ED	\$6.31	\$0.23	SYS	Initial CPM Designation
PALOMR_2_PL1X3	64	9/1/22	9/30/22	ED	\$6.31	\$0.41	SYS	Initial CPM Designation
Total	120					\$0.88		

Designated reliability must-run resource capacity (2016–2022)

RMR Start Date	RMR End Date	RMR resource name	MW
5-Dec-2016	N/A	Oakland Station Unit 1	55.00
5-Dec-2016	31-Dec-2020	Oakland Station Unit 2	55.00
5-Dec-2016	N/A	Oakland Station Unit 3	55.00
1-Jan-2018	31-Dec-2018	Metcalfe Energy Center	593.16
1-Jan-2018	31-Dec-2019	Feather River Energy Center	47.60
1-Jan-2018	31-Dec-2019	Yuba City Energy Center	47.60
1-May-2020	31-Dec-2022	Channel Islands Power	27.50
1-Jun-2020	31-Dec-2020	E.F. Oxnard	47.70
1-Jun-2020	N/A	Greenleaf II Cogen	49.20
1-Feb-2021	31-Dec-2022	Midway Sunset Cogeneration Plant	248.00
1-May-2021	31-Dec-2022	Kingsburg Cogen	34.50

NEXT STEPS

Proposed Schedule Through February 2024

Date	Topics
January 16, 2024 (hybrid)	<ul style="list-style-type: none">• Refine Problem Statements 2&3 and review associated data analysis needs• Review modeling: mid-term focus• Deep dive: resource counting and incenting availability• Data review: outage and substitution issues
February 7, 2024 (virtual)	<ul style="list-style-type: none">• Review modeling: long-term focus• Deep dive: CAISO backstop mechanisms• Revisit resource counting and incenting availability• Discuss EDAM crossover issues

Next steps

- Next working group meeting: January 16 (hybrid: Folsom and virtual)
- Please submit written comments on the December 6th working group meeting by Wednesday, December 20th, through the ISO's commenting tool using the link on the working group webpage: <https://stakeholdercenter.caiso.com/Comments/MyOrgComments>
- 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.