Regional Resource Adequacy Workshop #10: Technical Design

August 11, 2026

Agenda

- Themes from Stakeholder Comments
- CAISO RA Study Proposal
- Load Forecast Proposal
- Resource Accreditation Methodology and Stakeholder Presentation
    - Western Power Trading Forum (WPTF)

Technical Design: Themes from Stakeholder Comments

Accreditation Methodology & Capacity Counting

- Prioritize stable, predictable and bankable accreditation values
- Rely on established reliability methodologies
  - LOLE-based PRMs, ELCC for renewables & storage
- Modernize capacity counting for emerging resource types
  - Hybrid storage, DERs, interregional transmission

Technical Design: Themes from Stakeholder Comments

LOLE, PRM & Reliability Modeling

- Strong support for a probabilistic framework
  - 1-in-10 LOLE
- Transparent modeling assumptions and data inputs
- Modeling should reflect real-world system conditions
  - Transmission constraints, weather-driven load & renewable performance, demand-side resources, NCLs, emerging technologies

Technical Design: Themes from Stakeholder Comments

Operationalizing RA Requirements / Must-offer

- Support for linking RA showings to operational performance
- Must-offer obligation (MOO) a suggested construct
- Support for measuring performance using actual operational data

Technical Design: Themes from Stakeholder Comments

Long-term Planning / IRP Alignment

- RA program should compliment, not replace, long-term planning
- Accreditation method and reliability requirements should align with planning frameworks
- Durable investment signals and forward visibility
- Some support for stronger year-ahead requirements

Regional Resource Adequacy Study Proposal

Regional RA Workshop

August 11, 2026

Today's Agenda

Regional RA study proposal: High-level straw proposal and study timeline.

Straw study proposal

REGIONAL RA STUDY PROPOSAL

A two-phase study process, each providing valuable insight into the development of a regional RA program

Phase 1: LOLE Study

- Foundation for the RA study.
- Reliability impacts of a joint program.
- Identification of any limitation on interregional reliability support that should be considered in the RA program.

Phase 2: RA Study

- Resource accreditation.
- Planning reserve margins.
- Region specific needs or requirements if any.

The LOLE and RA study uses a 1-in-10 LOLE metric to assess if the system has sufficient resources to ensure reliability

- Loss of Load Expectation (LOLE) modeling is a method to probabilistically determine the likelihood of loss of load under different grid conditions given a certain level of capacity on the system.
- The 1-in-10 LOLE target allows for 1 unserved energy event in every 10 sample years, on average.
  - Some samples may have multiple events, but most will have none.
- LOLE events can be defined in multiple ways, such as:
  - Unserved energy expected on the system, including RA and non-RA resources.
  - When RA resources are insufficient to meet modeled demand and reserves.

Phase 1:

LOLE STUDY

Phase 1: LOLE study for the regional RA footprint

Step 1: Zonal Analysis to identify BAA grouping

Step 2: Model Development (Regional RA footprint)

Step 3: Assess the Reliability of the Regional RA Footprint

Individual Zones	System as a whole

Step 4: Calculate the Shortfall/Surplus Over the 0.1 LOLE Target

Step 1: Zonal modeling and analysis

Zone 1: PACW, PGE, SCL

Zone 2: PACE, IPCO

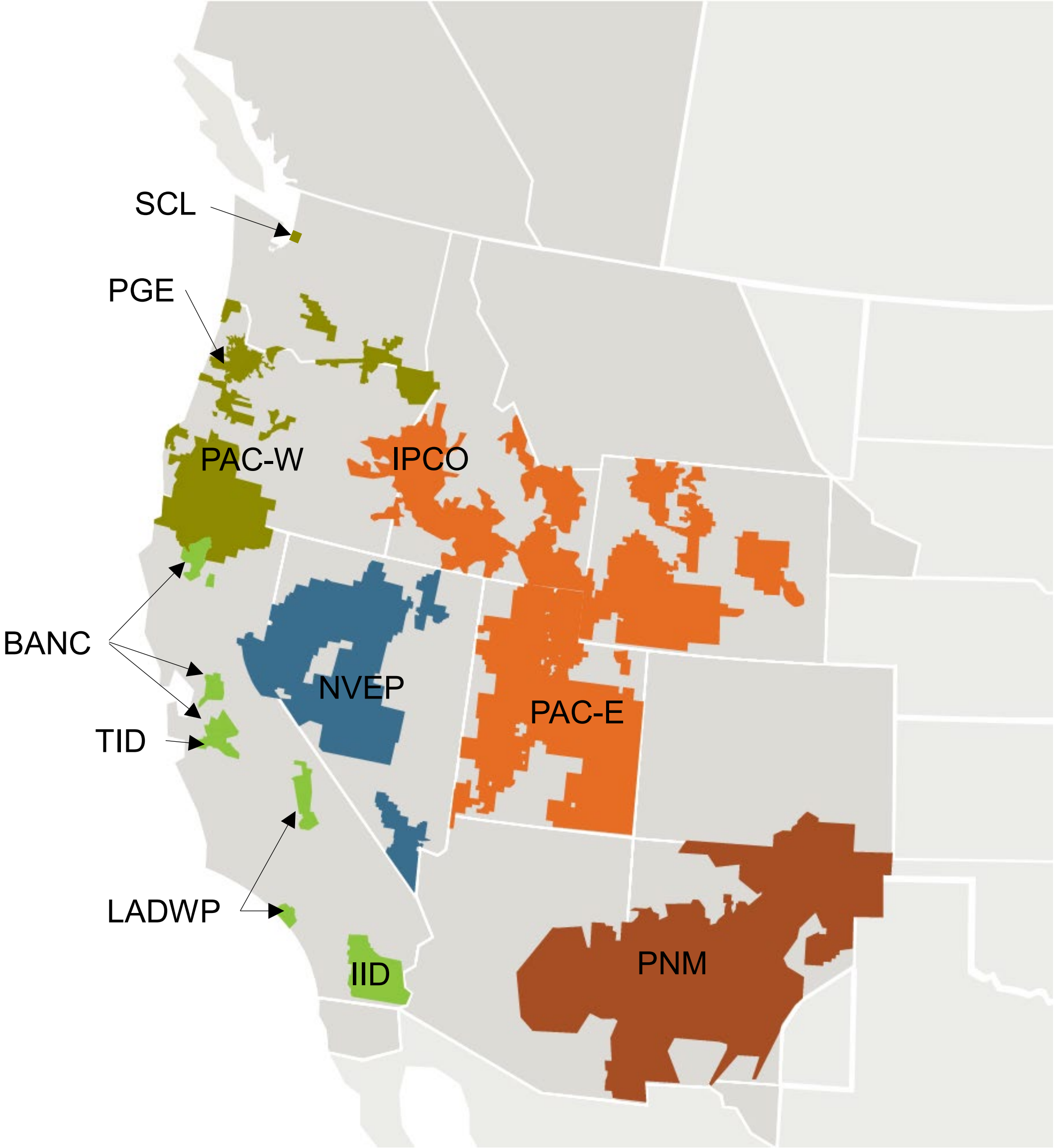
Zone 3: PNM

Zone 4: TID, BANC, IID, LADWP

Zone 5: NVEP

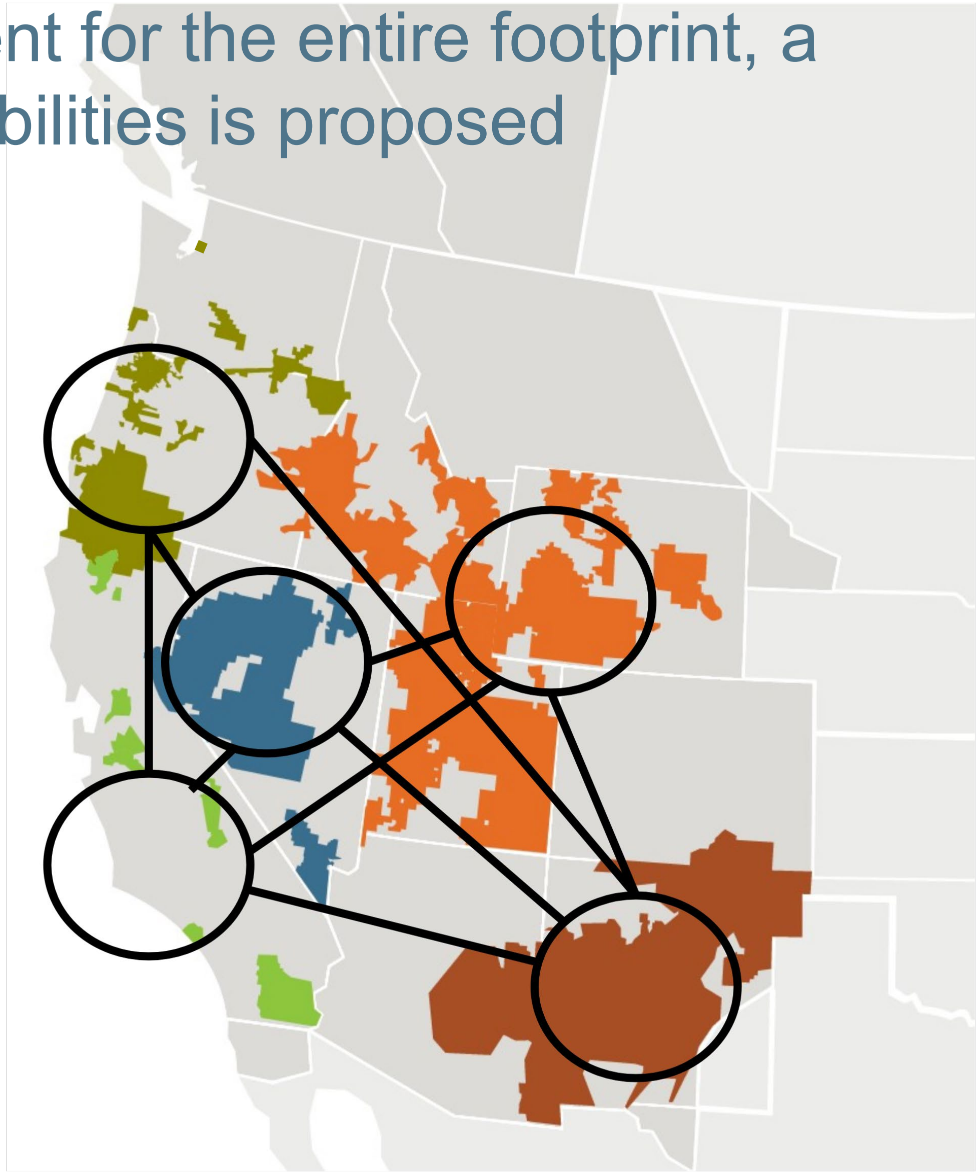
WECC approximate 2027 peak load projections (MWs) for each zone

	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Winter	10,000	10,750	2,250	6,750	4,750
Summer	10,000	14,500	3,000	13,000	9,000



Step 1: In lieu of a deliverability assessment for the entire footprint, a zonal model with inter-zonal transfer capabilities is proposed

Zones	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Zone 1					
Zone 2					
Zone 3					
Zone 4					
Zone 5					



Step 2: Model development. Data for modeling will be sourced from internal systems and participating entities

Inputs	Modeling Methodology	Primary Source	Secondary Source
Resources (Existing + New)	Resource-specific with operating parameters, where applicable	Regional RA entity data request	• WECC SRA/NERC LTRA models • WECC SERVM model
Transmission paths	BAAs/Zones modeled consistent with Zone analysis with inter-BAA / interzonal ratings enforced	WECC path ratings	• WEIM transfer limits (base + dynamic) • WECC SERVM model
Import/Export limits	Limits modeled between each BAA/Zone	Regional RA entity data request	• WEIM BAA import/export transfer limits • WECC SERVM model
Fuel, Transport and GHG prices	Resource/fuel-region specific	CPUC System Reliability Modeling Datasets	• WECC SERVM model
Wheeling charges	Hurdle rates + Carbon price across interties modeled	CPUC System Reliability Modeling Datasets	• WECC SERVM model

Data for modeling will be sourced from internal systems and participating entities

Inputs	Modeling Methodology	Primary Source	Secondary Source
Hydro profiles	Internal stochastic hydro process	Regional RA entity data request 10-year historical data	
Solar and Wind profiles	• Internal mean reversion model • Each of 10 weather years to have 50 base profiles created using random walk process	Regional RA entity data request 10-year historical data	
Outage profiles	Internal stochastic outage process using PLEXOS	Regional RA entity data request Resource-specific NERC GADS data	• CAISO OMS • WECC SERVM model
Load profiles	• Internal mean reversion model • Each of 10 weather years to have 50 base profiles created using random walk process	Regional RA entity data request 10-year historical data and monthly median peak forecast with growth factor	
Reserve requirements	Model contingency reserves only	Regional RA entity data request	6 percent of load

Steps 3 and 4: Assess individual and collective zone reliability to quantify diversity benefits and determine the shortfall/surplus

1 → 2 → 3

1. Simulate each zone individually

- Calculate LOLE
- Determine surplus/shortfall

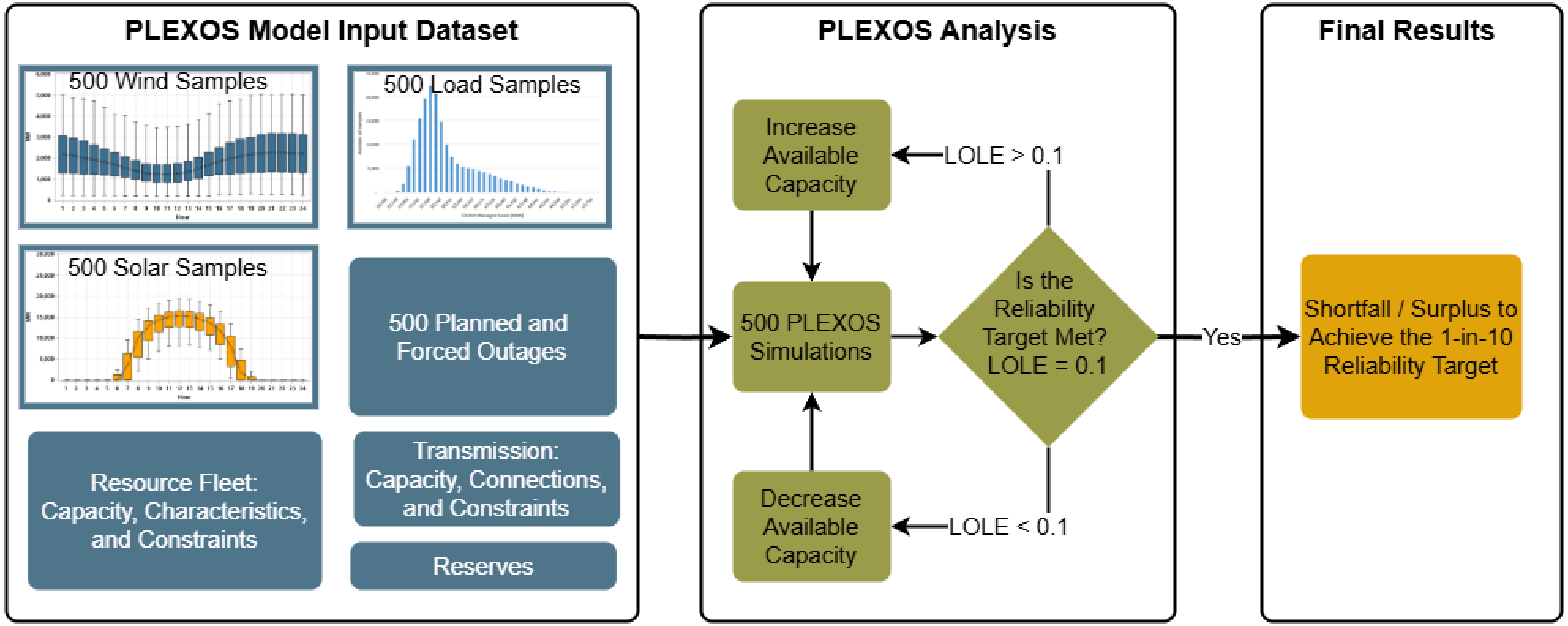
2. Simulate whole Regional RA footprint

- Calculate LOLE
- Determine surplus/shortfall

3. Evaluate the need for zonal requirements

- Determine if zone retain specific surplus/shortfalls

High level overview of the LOLE analysis and shortfall/surplus determination.



The PLEXOS analysis calibrates the model to a specific LOLE result by adjusting a specific input until that target is reached.

Key questions that will need to be answered as part of the study scope

- What is changed in the model to adjust the reliability?
  - This is the calibration variable.
  - Possibilities include:
    - Level of imports allowed.
    - Perfect capacity or perfect load.
    - Scaling load.
    - Removal of specific generators.
- How are the adjustments applied?
  - Equally to each region.
  - Based on the load of the region.
  - Based on individual shortfalls.
- What if any changes in source data should be made?
- How is a LOLE Event defined? It could be:
  - When unserved energy would occur?
  - When some level of reserves are unmet?
  - When non-RA resources or are required to meet reserves and demand?
- What set of reserves should be included?
  - Are all these reserves required, or can some go unserved without a LOLE event?

Phase 2:

RESOURCE ADEQUACY STUDY

Phase 2: Resource accreditation, PRM determination, and zonal need allocations

Step 1: Modify the LOLE model for the RA study

↓

Step 2: Resource Accreditation Methodologies

ELCC	UCAP	Other

↓

Step 3: Monthly PRM Determination

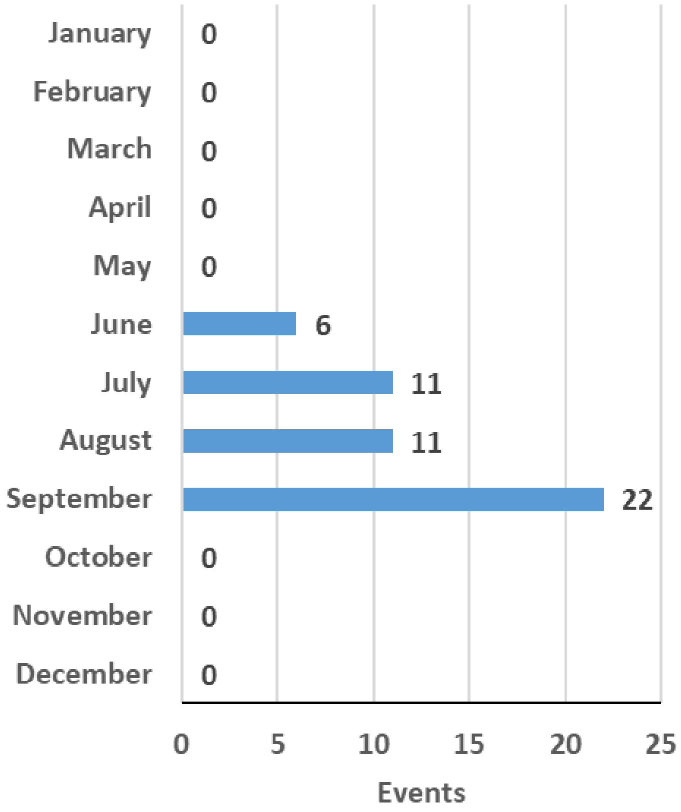
↓

Step 4: Zonal Need Allocation and Imports/Export Constraints

Step 1: Modify the LOLE model for the RA study

- Set the number of LOLE events by month.
  - Procurement needs are not inherently the same in months just because the LOLE events are the same.
  - Adjusting the LOLE events for a month impacts that month's procurement needs

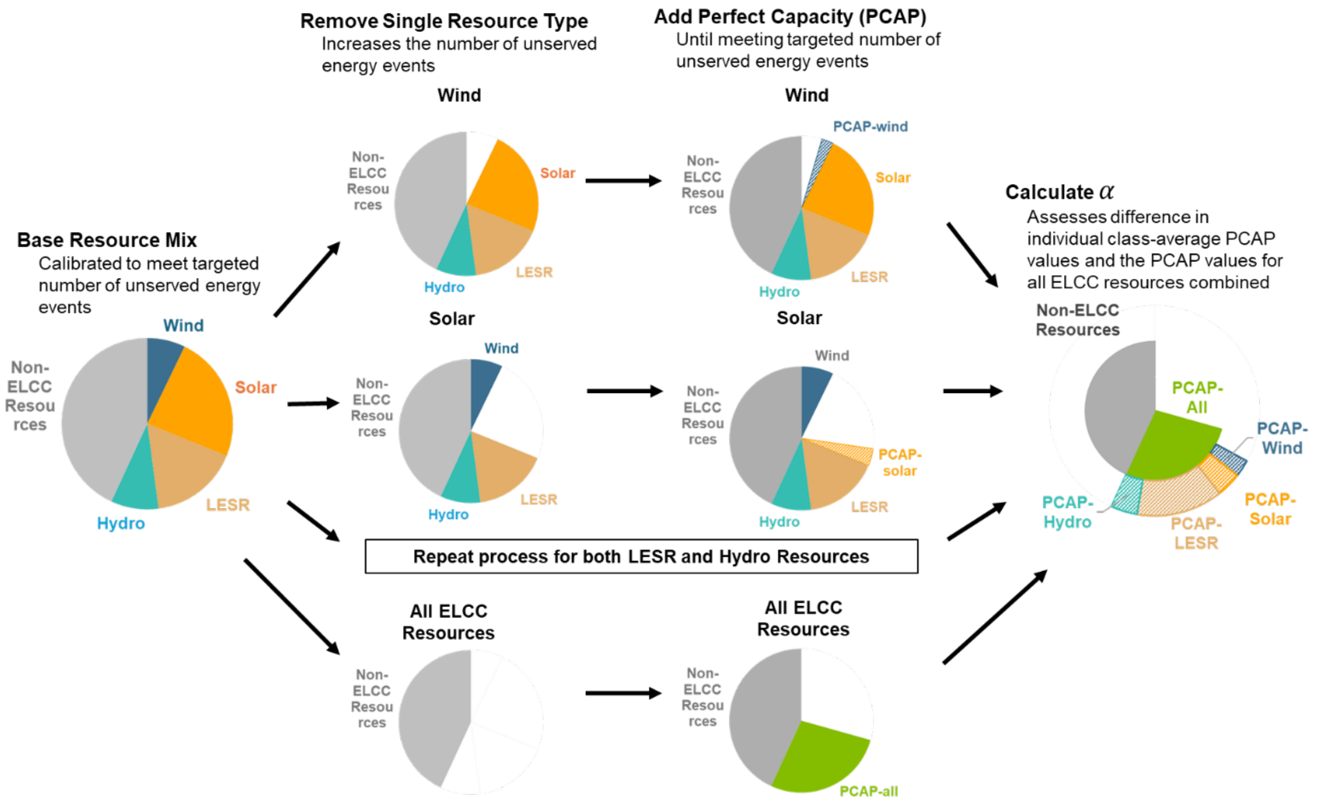
	Increase Procurement	Decrease Procurement
Increase LOLE Events		✖
Decrease LOLE Events	✖	



Step 2: Calculate the QC values by resource type

Resource types	Proposal
Fossil Thermal, Dispatchable	Seasonal UCAP for each resource
Renewable Thermal and Other, Dispatchable	
Nuclear	
Supply Side Demand Response	DR programs determined by the Demand Response QC methodology
Run-of-River Hydro	QC values calculated by the PSP using the RoR QC methodology
Dispatchable Hydro	QC values determined by the Storage Hydro QC methodology
Battery Storage (includes hybrid and co-located)	Average ELCC, with unit specific, seasonal adjustments based on availability
Wind	Average ELCC, with unit specific, seasonal adjustments based on performance
Solar (including solar thermal)	

For class average ELCC values, the LOLE analysis is repeated for each ELCC resource, and for all resources together



- Individual ELCCs are adjusted to account for interactive effects between all ELCC resources.
- ELCC values will be calculated for each resource class across the region.
  - Zone specific ELCCs may be beneficial in the future.

Step 3: The PRM is calculated for each month of the year, and is based on the QC needed to reach a modeled 0.1 LOLE

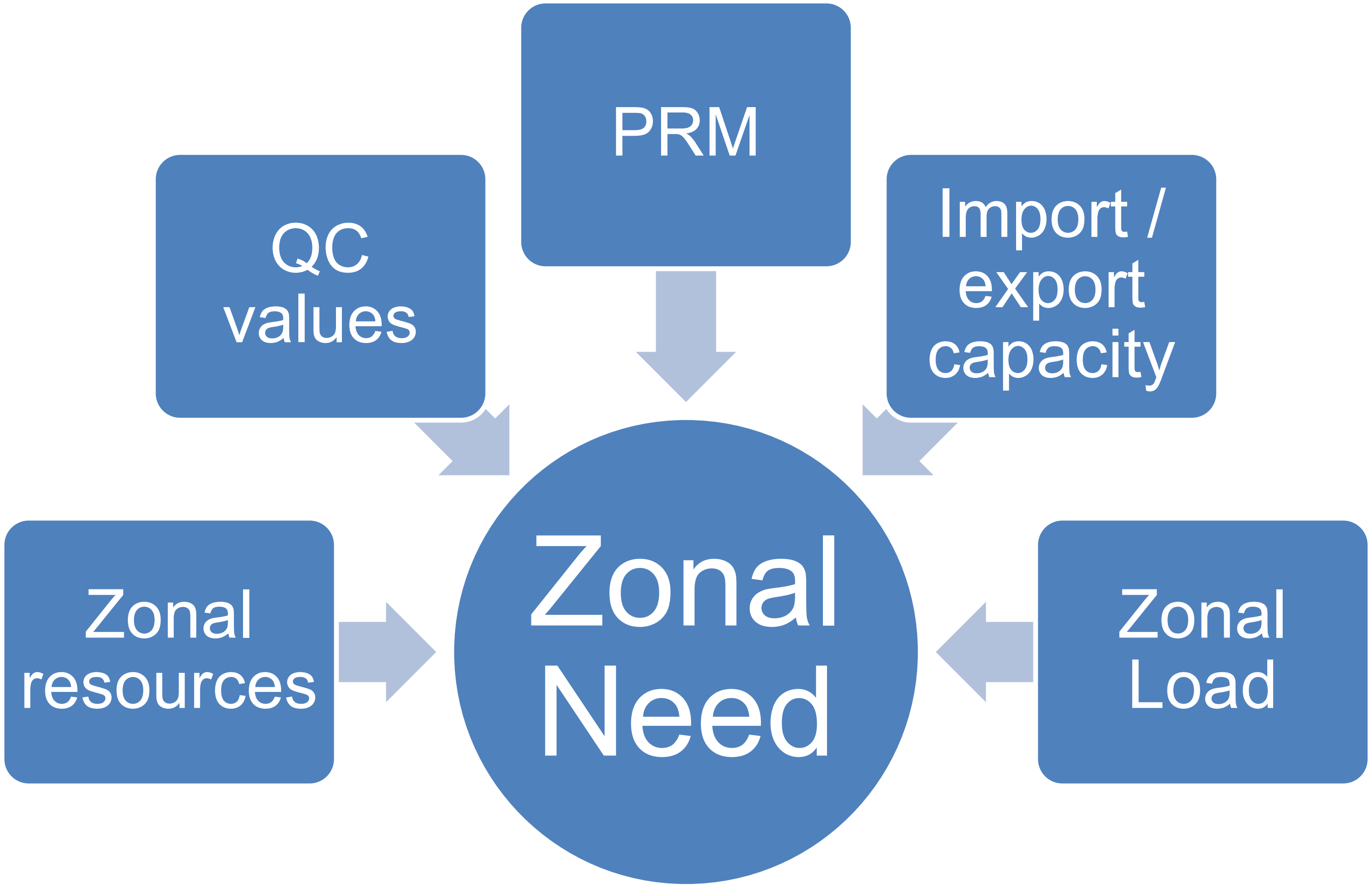
- The QC values assigned to each resource is used.
- Only the QC values of the resources in the model are included in the PRM calculation.

$$PRM_{month} = \left(\frac{Modeled\ QC_{month}}{Peak_{month}} - 1\right) \times 100\%$$

Where,

$$Peak_{month} = 1 - in - 2\ peak\ load\ from\ the\ modeled\ load\ distribution\ for\ the\ month$$
$$Modeled\ QC_{month} = the\ total\ QC\ for\ all\ modeled\ resources\ for\ the\ month$$
$$PRM_{month} = The\ planning\ reserve\ margin\ for\ the\ month$$

Step 4: Assessment of the zonal need allocation and import/export constraints



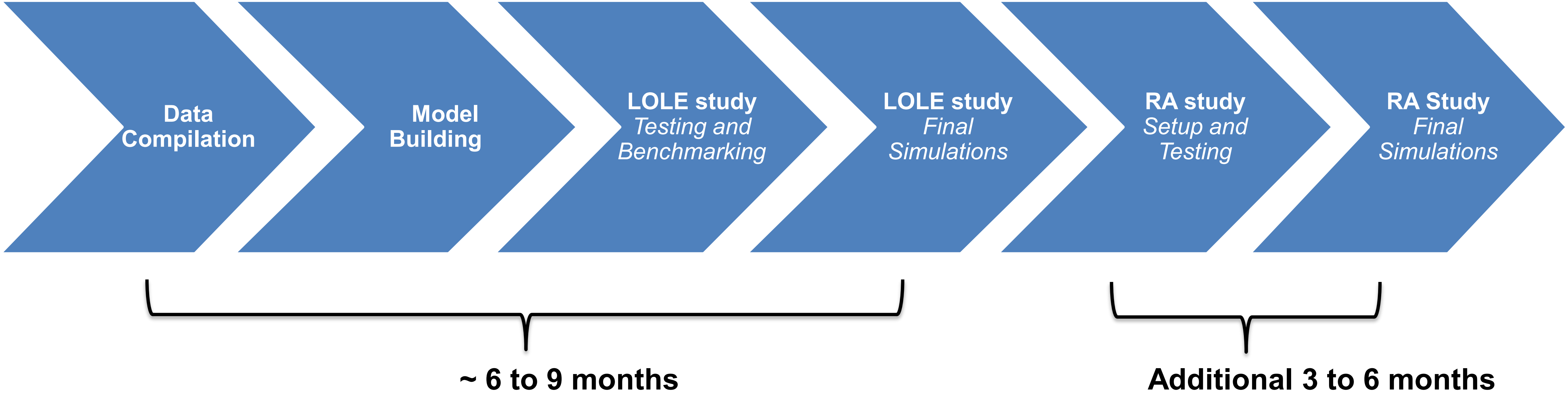
Key questions that will need to be answered for phase 2

- What is changed in the model to adjust the reliability when:
  - Calibrating individual months to the LOLE event target.
  - Calculating ELCC values.
- How are the adjustments applied?
  - Equally to each region.
  - Based on the load of the region.
  - Based on individual shortfalls.
  - Based on installed capacity.

Study:

TIMELINE ESTIMATE

Regional RA pilot study process could take anywhere from 9 to 15 months to complete



Modeling tools: CAISO has access to both PLEXOS and SERVM production cost models

PLEXOS

- High-resolution, co-optimized energy market simulation.
- Supports nodal and zonal modeling, unit commitment, economic dispatch, capacity expansion, and resource adequacy.
- Significant user control over simulations inputs and constraints.
  - Robust scenario analysis, including probabilistic inputs.
- Able to incorporate uncertainty through multi-stage simulation models.
  - Mimics real time and day ahead markets
- Linear or mixed-integer optimization software.
  - Full access to all equations used in the optimization.

SERVM

- Probabilistic reliability and production cost zonal model.
- Supports resource adequacy, capacity valuation, and economic dispatch.
- Supports scenario analysis
- Able to incorporate forecast uncertainty in profiles through model settings.
- Proprietary algorithms for simulations.

EDAM RA Load Forecast Proposal

- The proposed load forecast methodology draws upon historic **coincident peak** (gross) loads and applies a default load growth assumption.
- Participant load forecasts are based upon the participant's **historical contribution** to recent coincident system peak loads of the RA program footprint.
- Load forecasts are calculated with monthly granularity
- Each month, **coincident peak hour of the RA footprint** determines when the program takes a snapshot of each participant's load.
- The coincident peak hour of the RA footprint is identified each month using load data with hourly granularity for each participant.

EDAM RA Load Forecast Proposal

- A rolling five-year history of load values inform the load forecast.
- The **median** value for each month has a **default annual load growth assumption** applied **<u>twice</u>** (or potentially more times, based on future program design choices).
- Applying the annual load growth assumption multiple times is necessary to forecast into future years, based on historical data.

Example

Participant "A" Coincident Peak Contribution - Past 5 Years

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2021	2416	2298	1853	1728	2068	2135	3038	2770	2326	2092	1848	2327
2022	2350	2154	2106	1712	1932	2396	2847	2938	2247	2021	1982	2385
2023	2457	2249	1843	2003	1947	2391	2738	2869	2293	1814	2171	2400
2024	2391	2015	1971	1707	2092	2372	2763	3000	2620	2063	2055	2438
2025	2392	2177	2038	1728	2057	2501	2904	2911	2390	2126	2027	2376

Example Calculation

The median value from the past five years is identified, and the load growth assumption is applied.

For this example, a **2% default annual load growth assumption** is used, but the RA Workgroup can determine a more appropriate default value, if desired.

	Jan
2021	2416
2022	2350
2023	2457
2024	2391
2025	2392

Median: 2392 MW → **Default annual load growth assumption:** 2% → **Jan 2027 Forecast:** 2489 MW

Formula:

2392 * 1.02 * 1.02 = 2489

Some Pros & Cons

Pro:

- Standardized approach treats all participants equally
- Simple to administer
- Some regional precedent in this approach

Con:

- Beyond one year, may be too inaccurate
- No weighting of any given year
- Emerging load patterns take multiple years to be reflected in forecasted values

Exceptions

- If a participant’s own data shows the **default load growth assumption** should change, this is allowed with supporting data and/or attestation

- Additionally, if a participant experiences significant load additions (or subtractions) – the participant is expected to inform the program. Examples being data center additions, or industrial customer loss.

Adherence Requirement?

- While not part of this proposal, the RA Workgroup may determine certain ramifications apply for failing to provide data needed to produce a reasonable forecast.

Proposed Resource Accreditation Methodologies

Resource Type	Counting Method
Thermal / Nuclear	UCAP
Wind / Solar	ELCC analysis
Storage (Batteries)	ELCC analysis
Dispatchable Hydro	TBD- Potentially proprietary, based on performance during System Critical Hours
Run-of River Hydro	Historical performance
Demand Response	Based on ability to sustain load reduction for specified # of hours
Hybrid (VER + Battery)	Combined ELCC of each, up to the interconnection limit

Regional Resource Adequacy

Technical Workshop

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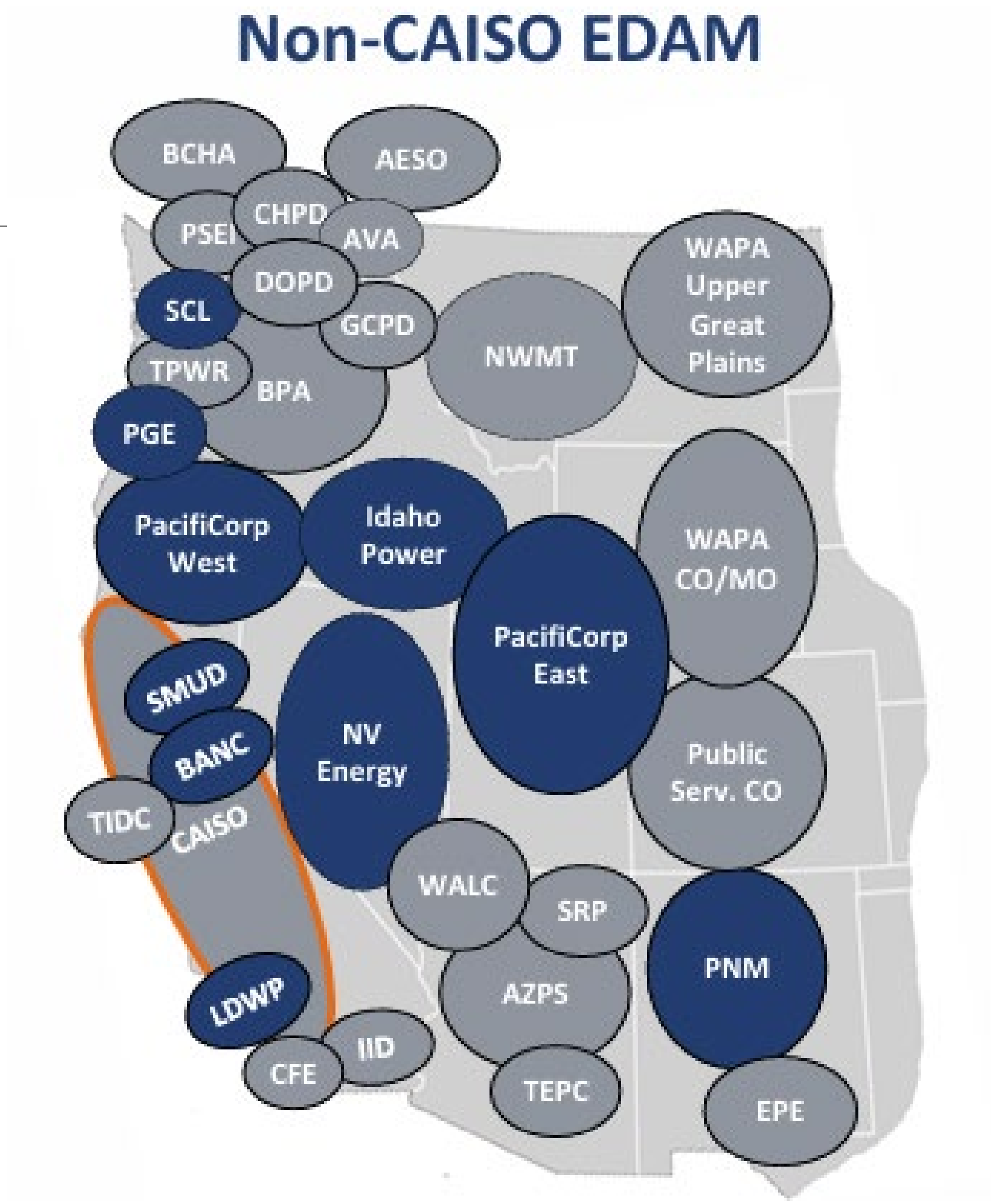
Western Power Trading Forum
Regional Resource Adequacy workshop | August 11, 2026

About the Western Power Trading Forum

- WPTF is a broad-based, nonprofit trade forum dedicated to competition across the western footprint
  - Diverse membership includes utilities, generators, renewable developers, community choice aggregators, power markets, scheduling coordinators, financial institutions and others
- The CAISO Committee provides WPTF members with information and advocacy on CAISO and ROWE market rules, policy initiatives, and market developments
- The CAISO Committee is run by Gridwell consultants that:
  - Maintain subject matter expertise across energy and RA topics
  - Track and participate in stakeholder initiatives
  - Brief and educate members on proposals, decisions, and market developments
  - Develop positions, submit comments, and participate in CAISO Board, WEM Governing Body, and FERC proceedings
  - Advocate on resource adequacy, market design, and other issues affecting western markets



Regional Resource Adequacy Program

Resource adequacy programs are often complex, contentious, and challenging to establish

- WPTF supports this initiative and commends the ROWE Resource Adequacy group for undertaking this effort during an especially busy period
- WPTF also supports the intended voluntary nature of the program

Source: Brattle Regional RA Program Footprint PRM Study

Incentive Based Program

- Consideration: Focus on emphasizing incentives for the participation and performance of the program rather than relying primarily on compliance penalties

  – Why?
    - Heavy penalties can suppress early adoption
    - Monitoring issues that may not be resolved by design choices now provides transparency on the topic for future development

Load Forecasting

- Coincident system peaks versus gross load peaks
  - WPTF supports the initial concept to utilize coincident system peaks rather than each individual gross load peaks that may occur at different time frames
    - Coincident peak forecast measures each participant's expected load during the hour when the system reaches its peak
  - WPTF agrees that this proposal should align the obligation to the participant that has the most impact to the overall system during the time when an event is most likely

Non-Conforming Large Loads

- Consider a phased approach with monitoring
  - 3 Options:
    - Count non-conforming large loads the same as any other load addition into the program. (p50 load * PRM)
    - Lower the PRM applied to the non-conforming large load by the amount of forecast error that is not needed and ensure the program properly captures any self-supply, demand response, or curtailment capabilities
    - Allow certain non-conforming large loads that meet certain program requirements to be carved out of the program.
      - The event duration should be specified
      - The load should be completely curtailable or have sufficient back up supply
      - The non-conforming load would have no access to the program's supply

Non-Conforming Large Loads Considerations

- Considerations?
  - 3 Options:
    - Count non-conforming large loads the same as any other load addition into the program. (p50 load * PRM)
      - The most conservative approach but may result in carrying more capacity than maybe necessary
    - Lower the PRM applied to the non-conforming large load by the amount of forecast error that is not needed and ensure the program properly captures any self-supply, demand response, or curtailment capabilities
      - This could be analyzed and monitored for continuous refinement
    - Allow certain non-conforming large loads that meet certain program requirements to be carved out of the program.
      - Curtailment occurs at the BA level and not from an RA program operator. A BA may decide not to curtail the load and instead utilize the program. The design could be monitored and refined

Program Transparency

- WPTF believes that program transparency and reporting are essential for program success

- Reporting:
  - Monitored issues provide transparency on the problem and grants stakeholders the information needed for solution development
    - Identify during program development
  - Perceived or theoretical problems may identify whether the problem exists
  - Program capacity meeting or exceeding the requirements
  - Program performance following reliability events

Capacity Accreditation

- WPTF's position is that qualified and accredited MWs should be treated as fungible within the RA program, regardless of resource type or ownership
  - A MW is worth the same in terms of reliability
- Capacity should be accredited equally among resources based on expected availability during the most critical hours identified from LOLE study

Resources & Double Counting

- The program may benefit from creating a database of all registered resources
  - WPTF supports the participants' proposal to utilize information that already exists through the market to reduce the burden on participants

- Database benefits:
  - Streamlines commercial transactions
  - Transparency into any issues of resource over-allocation
    - An additional layer of accreditation may only be necessary from the resource owner during instances where a discrepancy exists
  - Illustrate if excess capacity exists in the program

WSPP Schedule C

- WPTF supports continued use of WSPP Sch C product

- Proposals:
  - Conduct a study to determine the reliability of the WSPP Sch C product and potentially set limits on the amount
  - Create a registration process to register a seller into the program that meets certain program requirements
    - This registration could also be used to allow the seller to participate in a trading tool if one were ever created.
  - Allow WSPP Sch C from other RA programs and add requirements that ensure the capacity is in excess of their RA requirement
    - Prior to the WRAP Forward Showing deadline for the applicable month the product is procured

QUESTIONS

Timeline: 2026

To allow for more collaboration with the goal of developing an Initial Proposal with broad support, the following schedule is proposed:

Summer/Fall Workshops

July 9-Sept 17

Initial ROWE Board Seated

Oct

Work Group drafts Initial Draft Proposal

Oct 8-Nov 10

Work Group publishes Initial Draft Proposal

Nov 12

Workshop to review Initial Draft Proposal

Nov 19

Open comment period on Initial Draft Proposal

Nov 12-Dec 31

Timeline: 2027

Dates are approximate; feedback from Initial ROWE Board may result in changes to timeline

Work Group reviews Initial Draft Proposal comments

Jan 15

Work Group incorporates feedback; drafts Revised Initial Proposal

Jan 15-Feb 12

Work Group publishes Revised Initial Proposal

Feb 16

Workshop to review Revised Initial Proposal

Feb 23

Preparation of Initial Proposal Package for ROWE Board

Feb 16-mid March

Deliver Initial Proposal Package to ROWE Board

Late March

Summer/Fall Workshops

August

- Workshop #10, August 11: Technical Design
- **Date change**: Workshop #11, August 27: Transmission and Governance

***Comments on August workshops due 9/10**

September

- Workshop #12, September 10: Technical Design
- Workshop #13, September 17: Updates on Governance, Technical Design, Transmission, Compliance, and Data

***Comments on September workshops due 10/1**

The issue of how to address data will be included in workshops but the Work Group is still determining timing and where to best incorporate these discussions

Where to find materials

All workshop dates, **zoom links**, and materials are located at: https://rowesternenergy.org/regional-resource-adequacy/

Reach out with questions or comments by emailing: resourceadequacy@rowesternenergy.org

The ROWE is not a sponsor of the initiative or the initial stakeholder process, but is lending the use of its website for hosting materials.

Open Forum for Discussion

- Please raise your hand to be unmuted
- Announce your affiliation/entity you represent

Appendix

CASE STUDY:
CAISO BAA STUDY PROCESS

CAISO Default RA Study Process

- CAISO performs an RA study every year to establish default counting rules and monthly PRMs applicable to Local Reliability Authorities (LRA) that do not establish these values.
- As part of the study, CAISO conducts Loss of Load Expectation (LOLE) modeling.
- The CAISO RA study process is shared today as an example process for a fully-designed and implemented study and to introduce the elements and concepts of a study. It is not intended as a proposal for the regional RA study design.
- The CAISO uses the PLEXOS model.

A multi-step process is used to establish monthly qualifying capacity values and the planning reserve margin

Step 1: Model Development

Include only RA-eligible resources

Step 2: Model Simulations

Assess shifting of LOLE event risk

Step 3: Resource Accreditation Methodologies

ELCC	UCAP	Other

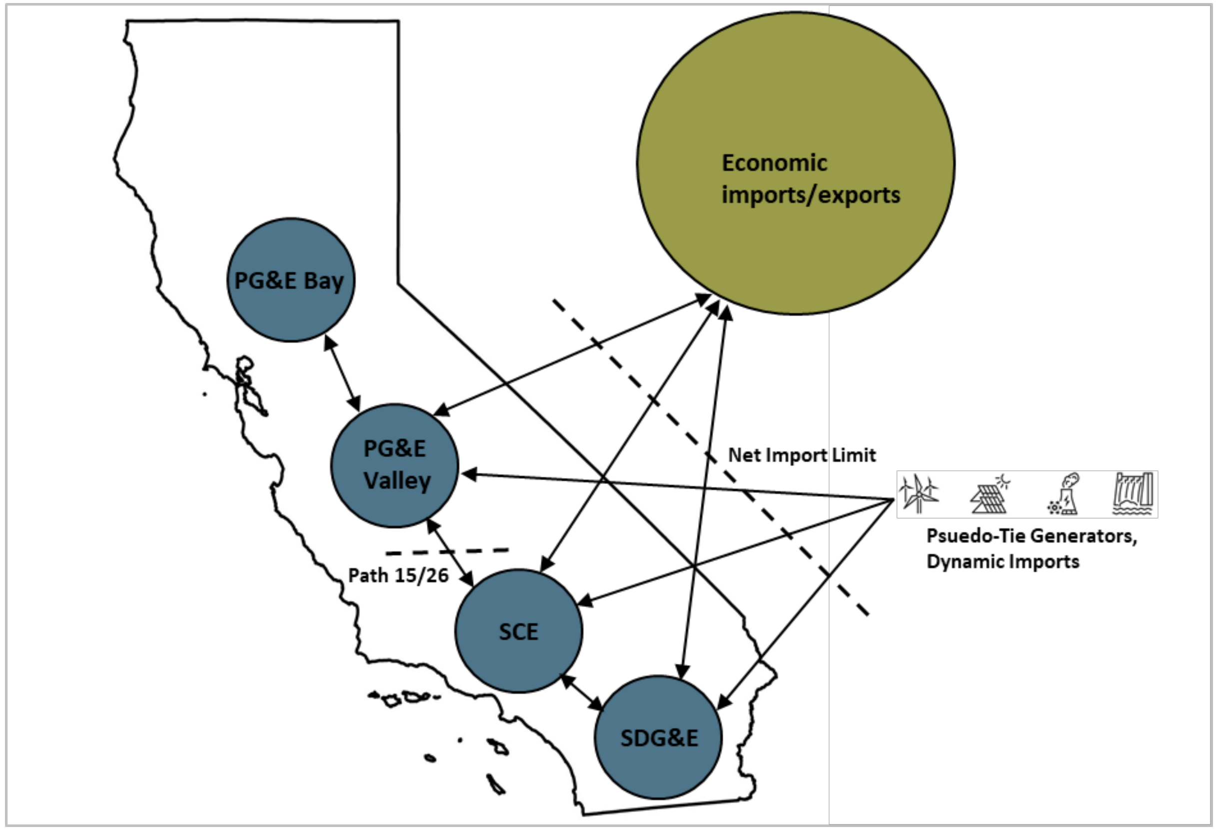
Step 4: Monthly PRM Determination

Calculate the PRM required for each month

STEP 1:

MODEL DEVELOPMENT

The model topography splits CAISO into four regions, with one external region



- The CAISO's RA model maintains a detailed representation of individual generation resources and loads inside the CAISO across four zones with inter-zonal limits enforced
- Economic imports and exports are modeled as a single external market zone and are directly connected to the CAISO through the PG&E Valley, SCE and SDG&E zones
- The interchange from the external zone is subject to the CAISO's net import limit as well
- The zones also have ancillary services and load following requirements modeled, either as fixed profiles or as a certain percent of their loads

LOLE is the number of days per year where the modeled resources are insufficient to serve load, regulation up, spinning or non-spinning reserves. Shortfalls of load following up reserves do not contribute to loss of load

Priority	Modeled Reserves	Description	Included in LOLE?
1	Unserved Energy (USE)	Unserved Energy is load that could not be met due to a shortage in generation and/or transmission capacity	Yes
2	Regulation up reserves	Requirements based on the 95th percentile of day-ahead and real-time requirements from the past three years	Yes
3	Spinning reserves	1.2% of load	Yes
4	Supplemental or non-spinning reserves	4.8% of load	Yes
5	Load following up	Used to address intra hour differences in load	No

CAISO models allow for unserved energy or reserves based on penalty prices. This gives modelers some control over the order of what goes unserved, without adding hard constraints.

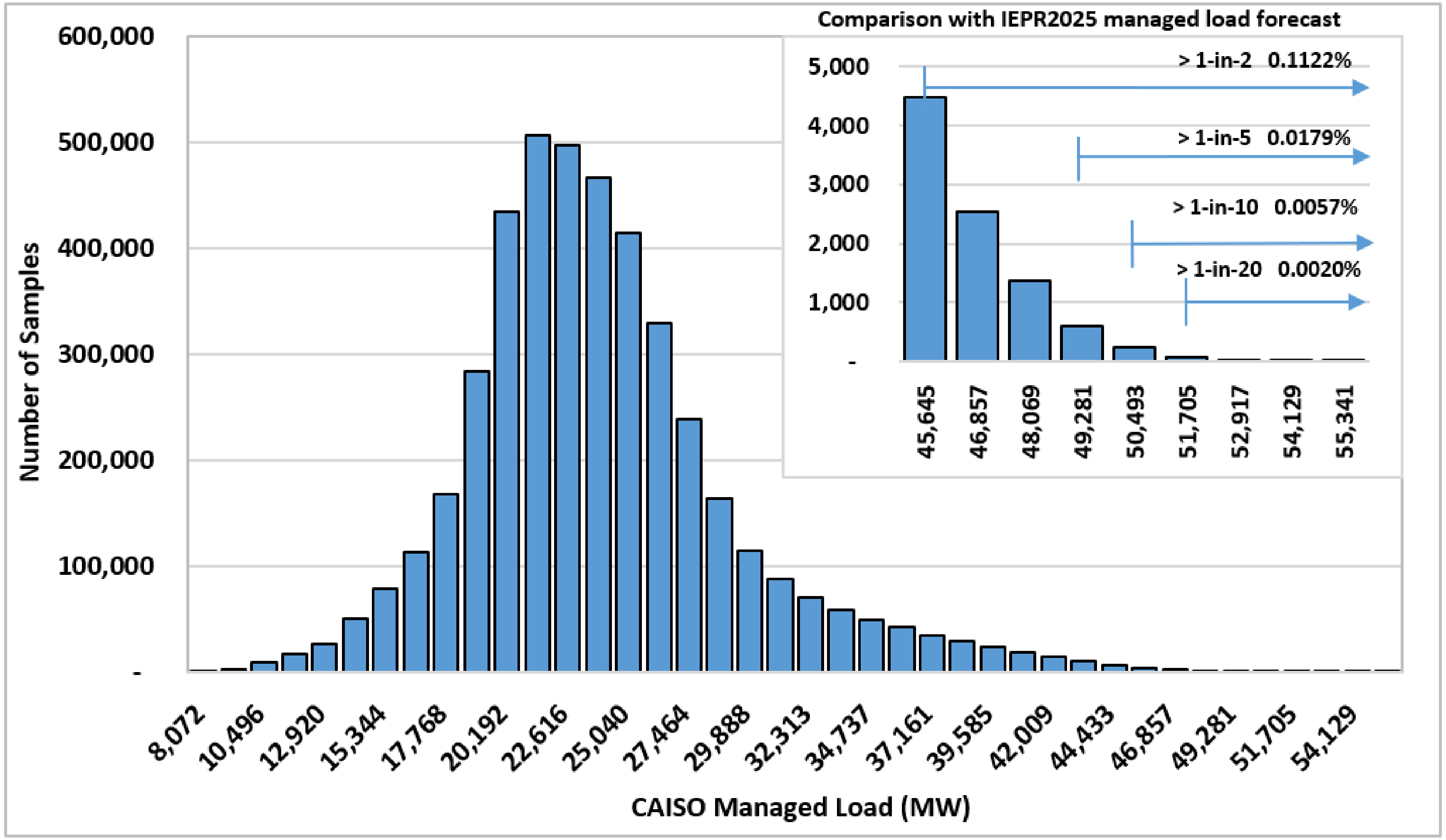
The model includes five stochastic variables – load, wind, solar, hydro and outage profiles

- Solar, wind, and load shapes:
  - Produced using a mean reversion stochastic model
  - 500 samples are produced
  - The single profile for each variable is allocated to the various zones based on the ratio of their contribution in the base profile
- 500 hydro year profiles were create based on historical hydro energy distribution (2000 – 2024)
- CAISO's resource specific OMS data was used to create 500 independent outage samples in PLEXOS

Stochastic profiles methodology was filed as part of CAISO's expert testimony in the CPUC Long-Term Procurement Plan (LTPP) proceeding, Appendix A, pg. 5 – 19, Nov 20, 2014: https://www.caiso.com/documents/nov20_2014_liu_stochasticstudytestimony_ltpp_r13-12-010.pdf

500 Load profiles are based on the CEC's IEPR hourly forecast, with the CAISO historical load profiles (2015 – 2025) used in the regression model

Frequency distribution of the loads in the stochastic model compared to the CEC 2025 IEPR Peak Forecast for the CAISO



Stochastic hydro, solar, and wind profiles are created using a regression model and are modeled as aggregated resources

Solar and Wind

- Solar and wind profiles make use of:
  - Nameplate capacities by zone.
  - NREL data and models for generation output.
  - Base profiles from actual generation or modeled generation depending on availability and quality.
- Renewable components of hybrid resources are modeled separately from the battery portion.

Hydroelectric

- Historical weather years are randomly allocated to samples based to mimic hydrological year probabilities:
  - RoR hydro is modeled as a fixed generation profile, similar to wind and solar.
  - Dispatchable hydro is modeled with an energy budget and min/max generation profiles.

Thermal, battery, and pumped hydro resources are individually modeled in the simulations

Fixed attributes include:

- Nameplate capacity
- Storage capacity
- Heat rates
- Round trip efficiencies
- Ramp rates
- Temperature derates by month

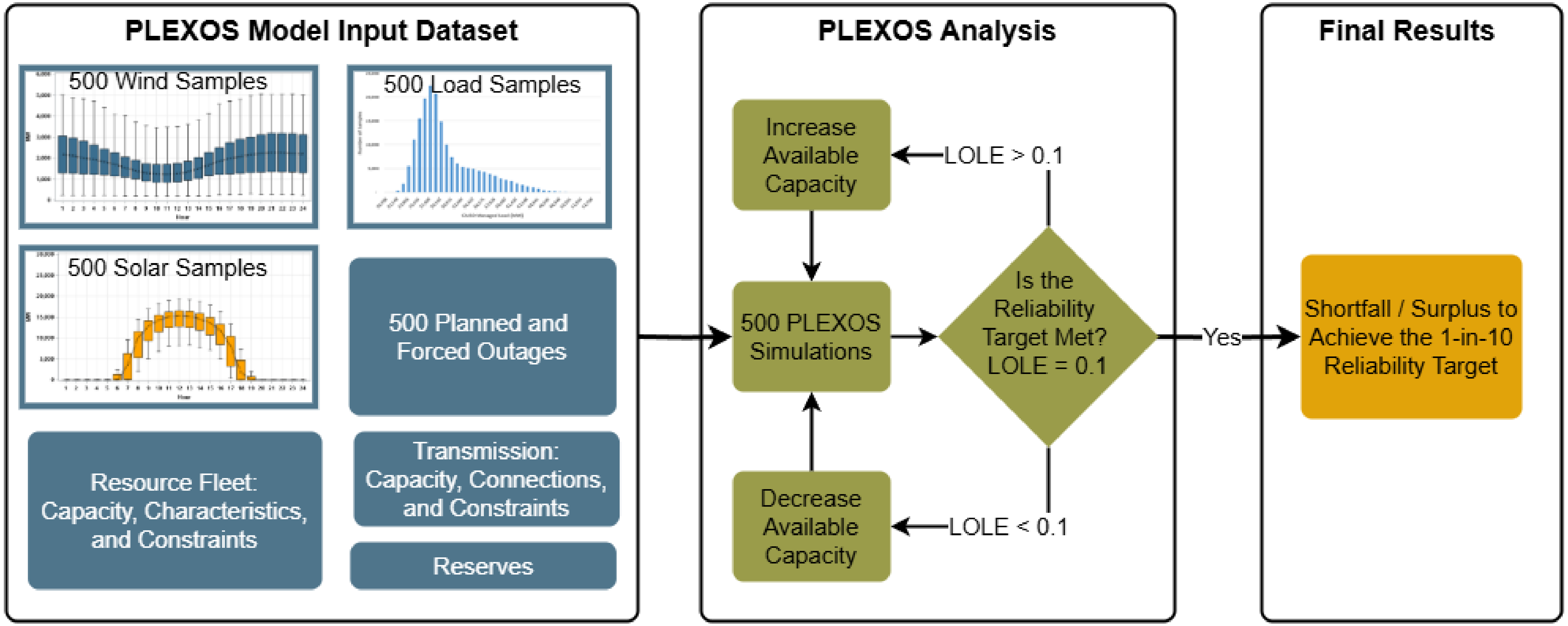
Samples include fixed outage rates

- Forced and maintenance outages Outage rates based on CAISO's resource specific OMS data.
- Planned maintenance factor is used to schedule outages by month into appropriate periods of higher reserves.
  - Planned outages are not used in ELCC models.
- Outages are calculated in advance resulting in a unique outage profile for every sample.

STEP 2:

MODEL SIMULATIONS

High level overview of the LOLE analysis and shortfall/surplus determination



The PLEXOS analysis calibrates the model to a specific LOLE result by adjusting a specific input until that target is reached.

The CAISO RA study uses three calibration approaches when calculating the PRMs and ELCC values

Import Adjustment

Annual adjustment to the net import limit to reach 0.1 LOLE.

Gas Generation

Reduce gas generation by month to eliminate excess capacity by month.

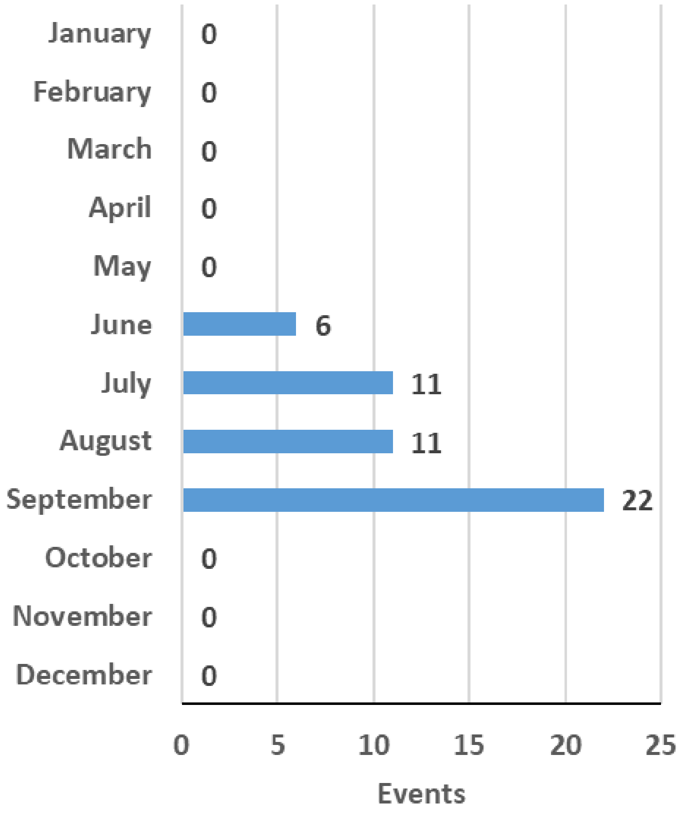
Perfect Capacity

Replace ELCC resources with perfect capacity.

The annual calibration provides a distribution of 50 unserved energy events which may be modified to balance procurement requirements and resource availability, among other things

Adjusting the LOLE events by month is a way to adjust the reliability target of a month.

- Increase/decrease the targeted reliability of the month compared to the assessed reliability in a month.
- Adjusting the LOLE events for a month impacts the total resource need for that month.
- Allowing more events in one month does not:
  - Ensure a higher or lower resource need compared to other months.
  - Mean a month is more or less reliable, just that you want the RA rules to target a different reliability.
- A month with 0 LOLE events does not me there is no risk, only that the requirements target no LOLE events in that month.



STEP 3:

RESOURCE ACCREDITATION

Default Resource Adequacy Qualifying Capacity Types

Resource types	California default methodology
Fossil Thermal, Dispatchable	Seasonal UCAP for each resource
Renewable Thermal and Other, Dispatchable	
Pumped Hydro, Dispatchable	
Nuclear	
Fossil Thermal, Nondispatchable	Monthly average generation
Renewable Thermal and Other, Nondispatchable	
Pumped Hydro, Nondispatchable	
Participating load	Reduction in demand per dispatch
Supply Side Demand Response	Annual performance to dispatch
Battery Storage (includes hybrid and co-located)	Average ELCC, with unit specific, seasonal adjustments based on availability
Dispatchable Hydro	
Run-of-River Hydro	Average ELCC, with unit specific, seasonal adjustments based on performance
Wind	
Solar (including solar thermal)	

Seasonal UCAP is calculated for each season based on both partial derates and full outages on at risk days during at risk hours

- Outages are sourced from the CAISO's outage management system (OMS).
- All outages and derates are included, except Transmission Induced generation outages, as defined in the Outage Management BPM.

$$UCAP_{season} = P_{max} - \frac{1}{n}\sum_{i=1}^{n}\left(P_{out,i}\right)$$

$$n = Total\ number\ of\ at\ at\ risk\ hours\ on\ at\ risk\ day, during\ the\ season$$

$$P_{out,i} = Average\ capacity\ unavailable\ due\ to\ a\ forced\ outage\ during\ hour\ i,$$

$$P_{max} = Installed\ capacity$$

- The UCAP value will be a weighted average forced outage rate, with the most recent seasons receiving a higher weight:

$$Final\ UCAP_{season} = 0.45(UCAP_{season-1}) + 0.35(UCAP_{season-2}) + 0.20(UCAP_{season-3})$$

Monthly average generation QC method for self reported nondispatchable thermal units, excluding nuclear and solar thermal

- Qualifying capacity is awarded based on the historic average hourly performance of the unit in that month of the year during the evaluation period.

$$QC_{month} = \frac{\sum_{i=1}^{3} Gen_{month,i}}{\sum_{i=1}^{3} Hours_{month,i}}$$

$$Gen_{month,i} = Total\ generation\ from\ the\ resource\ in\ the\ month\ and\ year\ i$$
$$Hours_{month,i} = Total\ number\ of\ hours\ in\ the\ month\ and\ year\ i$$

Performance based QCC applies to supply side demand response resources and participating load resources included on the NQC list

Performance Factor (PF)

- Demand response
- Calculated at the DR provided level
- Annual value, calculated from the evaluation period

$$PF = \frac{\sum_r \sum_h \min(dispatch_{r,h}, reduction_{r,h})}{\sum_r \sum_h dispatch_{r,h}}$$

Where,

$dispatch_{r,h} = dispatch\ quantity\ of\ resource, r,$
$in\ hour, h.$

$reduction_{r,h}$
$= demand\ reduction\ of\ resource, r,$
$in\ hour, h.$

Average Load Reduction

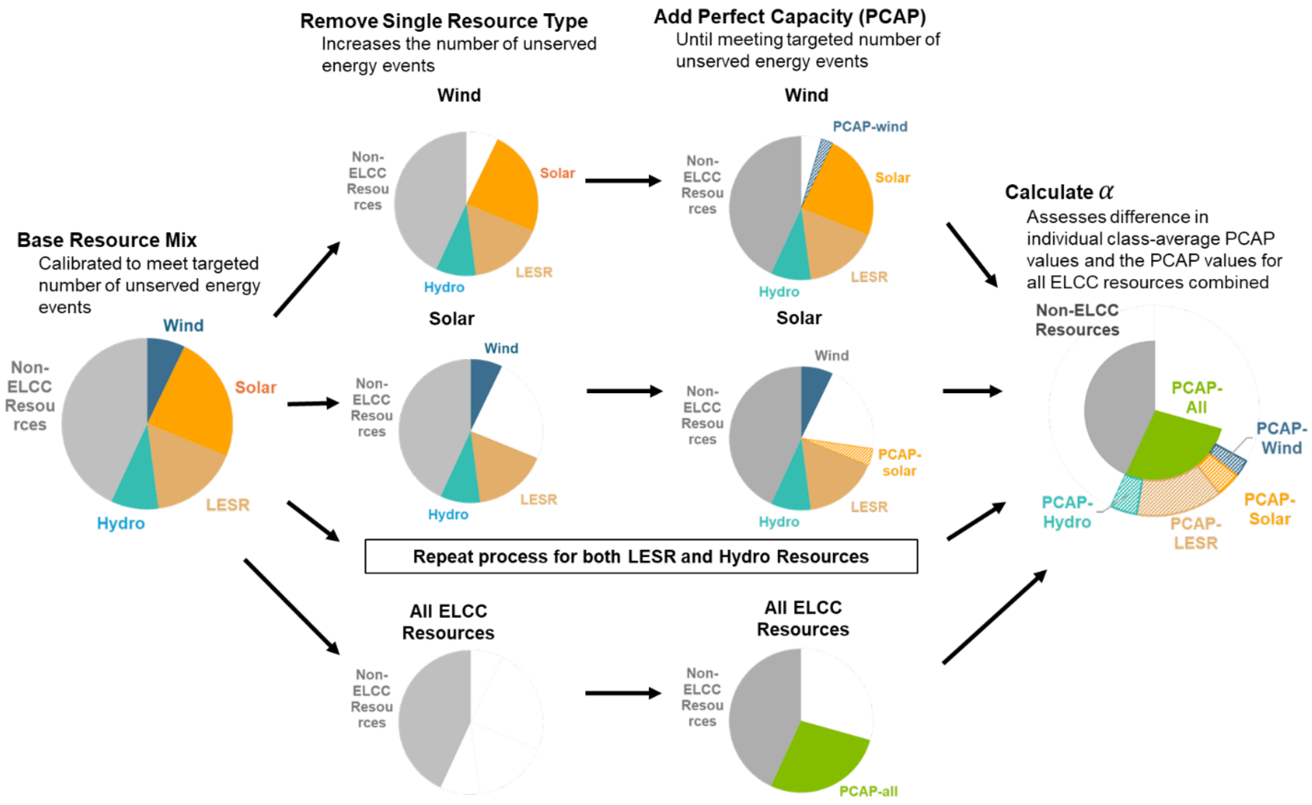
- Participating loads
- Annual value, calculated from the evaluation period

$$QC = \left(\frac{1}{n}\sum_{i=1}^{n} Reduction_{\,i}\right)$$

Where,

$Reduction_{\,i} = the\ load\ reduction\ in\ time\ period\ i$
$n = Total\ number\ time\ periods\ dispatched$

Class average ELCC values are calculated for batteries, run of river hydro, storage hydro, solar and wind



ELCCs are adjusted to account for interactive effects between ELCC resources.

$$ELCC_{class} = \alpha \frac{PCAP_{class}}{ICAP_{class}}$$

Where,

$$\alpha = \frac{PCAP_{all}}{\sum_{class} PCAP_{class}}$$

Unit specific apportionments preserve the total qualifying capacity of a resources type from the class ELCC, but rewards more available and better performing resources

Availability Based

- Batteries and storage hydro.
- Monthly outage rates considering all hours of the month.

$$ELCC_{resource} = ELCC_{class} \times \frac{(1 - FOR_{resource})}{(1 - FOR_{class})}$$

Performance Based

- Run of river hydro, solar, and wind.
- Monthly capacity factors using only generation during at-risk hours for each month.

$$ELCC_{specific} = ELCC_{class} \times \frac{CF_{specific}}{CF_{class}}$$

Hybrid resources that employ multiple resource receive qualifying capacity values based on the aggregation of the components

- QC values are calculated for each resource type behind the same point of interconnection using class average ELCC values against the installed capacity for that type.
- The total QC awarded is the minimum of the sum of the individual QC values and the interconnection limit.

$$QC_{hybrid} = \min\left[\left(QC_{type\ 1} + QC_{type\ 2}\right), (Interconnection\ Limit)\right]$$

STEP 4:

DETERMINE MONTHLY PLANNING RESERVE MARGIN (PRM)

The PRM is calculated for each month of the year, and is based on the QC needed to reach a modeled 0.1 LOLE

$$PRM_{month} = \left(\frac{Modeled\ QC_{month}}{Peak_{month}} - 1\right) \times 100\%$$

Where,

$$Peak_{month} = 1 - in - 2\ peak\ load\ from\ the\ modeled\ load\ distribution\ for\ the\ month$$
$$Modeled\ QC_{month} = the\ total\ QC\ for\ all\ modeled\ resources\ for\ the\ month$$
$$PRM_{month} = The\ planning\ reserve\ margin\ for\ the\ month$$