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Assembly Bill 209 Publicly Owned Utility Planning Reserve Margin Workshop

Lead Commissioner Workshop

November 16, 2023

Introduction

- Q&A and Comments: Zoom Q&A function
- Administrative questions: Zoom Chat function
- Public comments due November 30, 2023
- CEC Docket 21-ESR-01

Comments from the Dais

Agenda

- AB 209 Requirements and Goals
- Resource Adequacy in the CAISO Balancing Area
- POU Approaches
  - NCPA
  - Six Cities
- CEC Proposed Options to Setting PRMs
- Q&A
- Public Comment

AB 209 Requirements and Goals

AB 209 Requirements

…develop recommendations about approaches to determine an appropriate minimum planning reserve margin for local publicly owned electric utilities within the Independent System Operator balancing…

The approaches shall take into consideration:

- climate change,
- extreme weather events,
- cost effectiveness,
- and feasibility,
- and may vary by utility type.

The recommendations shall include an implementation timeline taking into account potential impacts on resource needs and availability of clean energy resources.

The commission shall from time to time revise, as appropriate and in accordance with the process set forth in this subdivision, the planning reserve margin recommendations to ensure that each local publicly owned electric utility is adequately accounting for its contribution to reliability.

PRC 25704.5(b)

The Resource Adequacy Landscape is Shifting Fast

- **August 2022:** AB 209 Passed
- **August 2022:** Western Resource Adequacy Program tariff filing at FERC
- **April 2023:** CPUC Slice of Day Framework adopted for 2025
- **August 2023:** CAISO EDAM tariff filing at FERC
- **September 2023:** AB 1373 Signed
- **September 2023:** CAISO begins RA Working Group

POU PRM Workstream

Goals

- Data and situational awareness to support reliability analysis and summer preparedness
- Fulfill AB 209 Requirements
- Feed into AB 1373 Implementation

Approach

- Take time for discussion with POUs
- Leverage existing best practices
- Maximize consistency

Workstream Timeline

2023

- AB 209: Discussion of best practices and options.
- AB 1373: Evaluate POUs based on existing PRMs.

2024

- AB 1373: Evaluate POUs based on existing PRMs
- AB 209
  - May: Publish recommended approach in the California Reliability Outlook
  - June: Adopt CEC recommended PRM approach

2025

- AB 1373: Evaluate POU based on updated PRMs

Today's Workshop Goals

- Understand the current resource adequacy landscape in the CAISO balancing area
- Develop a common understanding of proposed options to setting planning reserve margins in response to AB 209
- Receive feedback on the pros and cons of different approaches

Planning Reserve Margins

"Planning reserve margin is designed to measure the amount of generation capacity available to meet expected demand in planning horizon. Coupled with probabilistic analysis, calculated planning reserve margins have been an industry standard used by planners for decades as a relative indication of adequacy."

-North American Electric Reliability Corporation

PRMs are typically expressed as the percentage of generation need above a median year forecast.

Planning Reserve Margins

To simplify, PRMs are often described by being broken into components:

- Operating reserves
- Demand Uncertainty
- Supply uncertainty

PRM	Operating Reserves	Demand Uncertainty	Supply Uncertainty
Historic Thermal-based Systems	6%	9%	
Joint Agency Reliability Planning Assessment			
CPUC 2024 Requirement - 17%	6%	6%	5%
2020 Equivalent Event - 22.5%	6%	9%	7.5%
2022 Equivalent Event– 26%	6%	12.5%	7.5%

Proposed Options for Setting PRMs

Mark Kootstra

Lead Modeler
Energy Assessment Division

Recommendation Principles

Recommendations should be:

1. Conceptually accessible
2. Duplicatable/usable by POUs
   a. Identify default assumptions
   b. Allows POUs to use utility specific information
3. Incorporates the unique characteristics of each POU
4. Work with the existing compliance accounting mechanisms (CAISO NQC list)
5. Acknowledges the interdependence inherent within balancing authority area.

Proposed Options for Setting PRMs

1. Monte Carlo Simulation (stochastic) approach with ELCC/NQC accounting.
   a. Use all resources or only those contracted with the POU.
   b. Use CAISO wide load or POU specific load.
2. Analytical method (convolution), which uses probability distributions to capture uncertainty.
   a. Assess only the uncertainty of the resource not assigned ELCC values.
   b. Assess the uncertainty of the entire resource mix.

CAISO Wide v. POU Specific

CAISO Wide

Pros:

- Captures the interdependency of the CAISO system.
- The study can be done at once for all entities, creating consistency.

Cons:

- Does not consider a POU’s unique demand and supply characteristics.

POU Specific

Pros:

- Considers the POU’s actual demand and supply situation.
- Each POU can analyze their own system based with their detailed understanding.

Cons:

- Ignores the interdependency of the CAISO system. This is expected to drive up PRMs.
- Inconsistency in approach and assumptions is likely.

Terms

Loss of Load Expectation (LOLE)– the expected number of days in a year for which available generation capacity is insufficient to serve demand at least once in that day. California typically targets a LOLE of 0.1 days/year.[1]

Effective Load Carrying Capability (ELCC)- a measure of the resource adequacy contribution of resources derived directly from loss-of-load probability modeling.[2]

Net Qualifying Capacity (NQC) – the resource adequacy potential of a generating unit that accounts for the deliverability of power from the unit to the system.

1. NERC. *Probabilistic Adequacy and Measures, Technical Reference Report*. July 2018
2. *N. Schlag, Z. Ming, A. Olson, L. Alagappan, B. Carron, K. Steinberger, and H. Jiang, "Capacity and Reliability Planning in the Era of Decarbonization: Practical Application of Effective Load Carrying Capability in Resource Adequacy," Energy and Environmental Economics, Inc., Aug. 2020*

Monte Carlo Simulation Approach

Key steps for this approach:

1. Evaluate the reliability of the system by analyzing the operations under various weather years and combinations of unplanned outages at generating facilities.
   1. Use all resources or only those contracted with the POU.
   2. Use CAISO wide load or POU specific load.
2. Calibrate the resource mix to a 0.1 LOLE (or the selected target).
3. Add up the NQC values for the resource mix, appropriately scaled to the get to the 0.1 LOLE target.
4. Divide the total NQC required by the forecasted peak, and subtract 1, to get the total PRM.

Analytical Method (Convolution)

Assessment of uncertainty in supply and demand using probability distributions.

When assessing the supply uncertainty:

1. Assess only the uncertainty of the resource not assigned ELCC values.
2. Assess the uncertainty of the entire resource mix.

Both approaches follow the same process, but the second option would use the expected profiles for wind and solar and the ELCC values attributed to those resources when calculating the PRM need.

This convolution method is used by WECC within their Western Assessment of Resource Adequacy published in 2022.

Analytical Method Steps

Key steps for this approach:

1. Develop a probability distribution for demand (all hours of the year).
2. Develop a probability distribution for supply (all hours of the year).
3. Merge the probabilities together, and calculate the LOLE.
    a. If the LOLE is too high, scale up the supply and repeat.
    b. If the LOLE is too low, scale down the supply and repeat.
4. Add up the NQC values for the resource mix, appropriately scaled to the get to the 0.1 LOLE target.
5. Divide the total supply (NQC) by the forecasted demand, multiply by 1.06, and subtract 1 to get the PRM need.
    a. This last is necessary because the analytical method does not directly capture operating reserves and ancillary service requirements.

A Brief Example

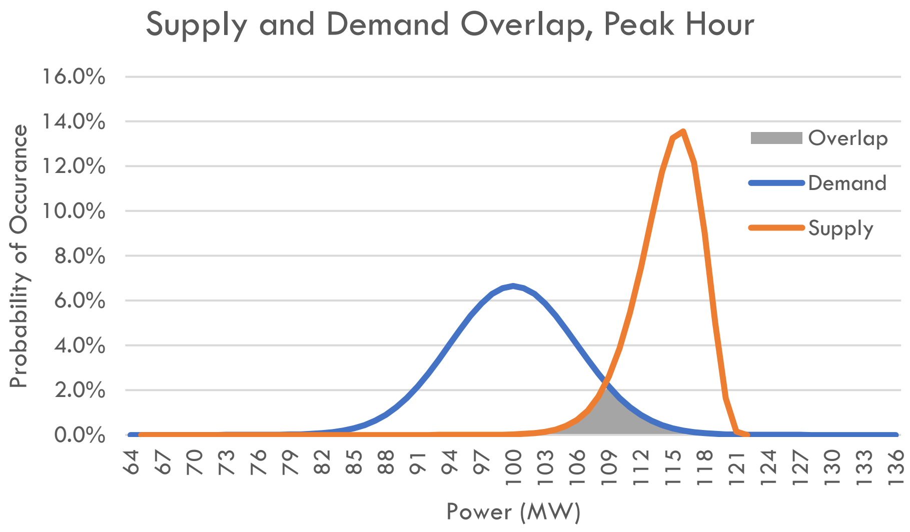
Load:

- Forecasted Peak: 100 MW
- Shape: CAISO 2022 CED
- Uncertainty: Normal distribution, 6% standard deviation

Supply:

- NQC: 122 MW (all dispatchable)
- Mix: Plants with no ELCC values from the CAISO NQC list scaled
- FOR: NERC GADs

Operating Reserves: 6%



Results:

- LOLE: 0.1 days/year
- PRM: 29.5%

$$PRM = 1 - 1.06\left(\frac{122\ MW}{100\ MW}\right) = 29.5\%$$

Q&A

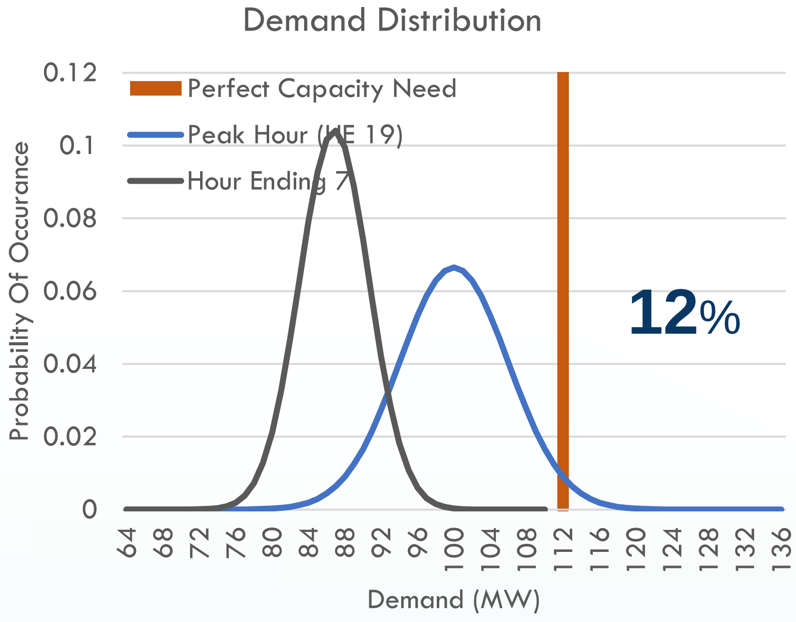
Appendix

Compare to an Additive Approach

Using the same assumptions from the main presentation, adding the uncertainty greatly increases the PRM.

Reserves
6%

+



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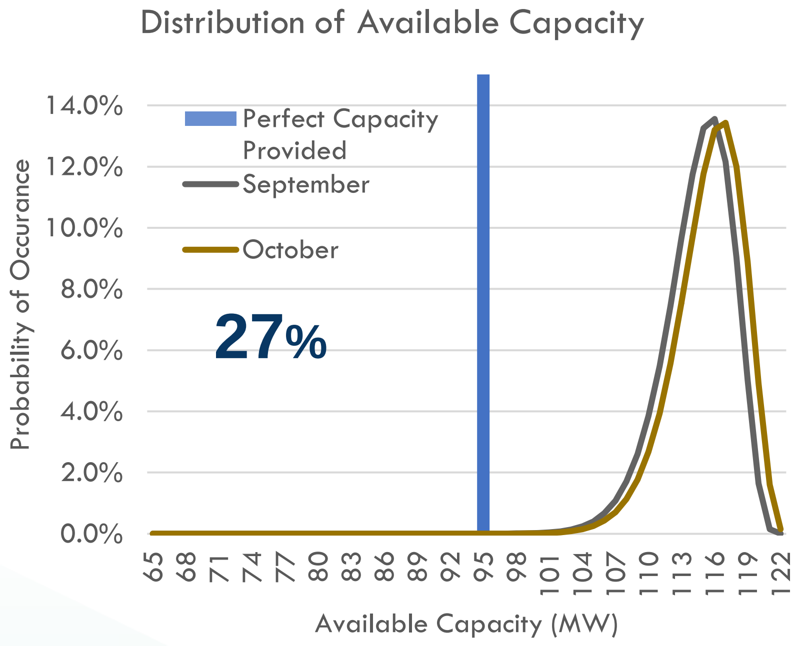
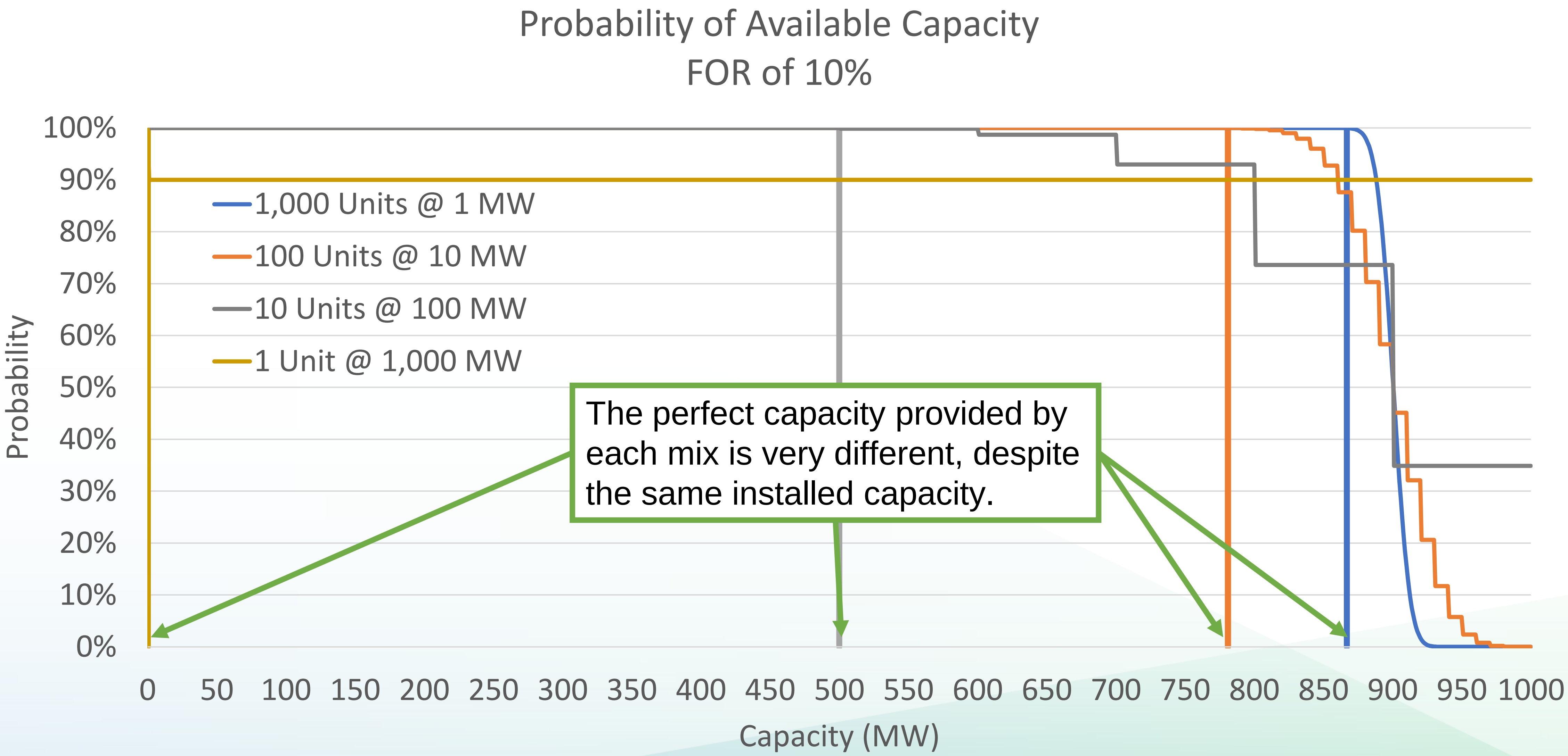


= 45% PRM

It gets much worse when you consider variable renewable energy resources, depending on how you credit them for resource adequacy.

Why All At Once



Loss of Load Day

$$LOLD = \sum_{d=1}^{D} \left[1 - \prod_{h=1}^{H} (1 - I_{dh}) \right]$$

Where,

$H = the\ total\ number\ of\ hours\ in\ a\ day$
$h = index\ representing\ each\ hour\ in\ a\ day$
$D = the\ total\ number\ of\ days\ in\ a\ year$
$d = index\ representing\ each\ day$
$I_{dh} = The\ probability\ that\ load\ will\ go\ unserved\ in\ hour\ h\ of\ day\ d$

This equation is an adaptation from NERC. Probabilistic Adequacy and Measures, Technical Reference Report. July 2018