RESOURCE ADEQUACY

Resource Adequacy After UCAP

Aligning implementation and availability incentives

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WPTF WESTERN POWER TRADING FORUM

About WPTF

- Western Power Trading Forum is a non-profit, trade forum dedicated to competitive markets and transparency throughout the western interconnection
- Carrie Bentley and Kallie Wells run the CAISO Committee, which is an advocacy and information service for WPTF members

wptf.org

Goal of Presentation

1

Surface need for new CAISO terms and tables after CPUC UCAP Adoption

Different values must be considered for accreditation, showing, MOO, RAAIM, exports, RSE support, transitional measures settlements, and backstop procurement.

2

Highlight RA market impacts of RAAIM proposal

Event-driven, uncapped exposure will be priced into bilateral contracts, financing, substitution and the value of RA.

CAISO's RA role extends beyond visibility

> **The ISO is responsible for ensuring that capacity shown as RA is visible and operationally available in ISO markets.**

True, but incomplete

Tariff and BPM responsibilities also include:

- Reliability: operate the system reliably
- Studies: establish local, flexible need and deliverability
- Values: apply QC and publish NQC
- Demonstrations: validate plans and supply
- Market rules: set MOO and availability rules
- Compliance: enforce deficiencies and procure backstop

UCAP affects the entire RA architecture, which CAISO is under a tariff obligation to effectuate.

SECTION 1

UCAP implementation

A forward accreditation change must be translated across every CAISO capacity function.

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- Separate counting, operational and deliverability values
- Account for different RA programs
- Ensure full transparency of RA obligations

The CPUC Adopted UCAP Methodology for 2028 RA Year

Illustrative thermal resource

UCAP = (1 - 10% EFORd) × 100 MW = 90 MW

UCAP is a forward counting value. It is not a new physical operating limit.

UCAP changes a MWs reliability value

- UCAP moves expected forced-outage risk out of the Planning Reserve Margin and into individual resource capacity-counting rules.
  - Impacts ~80% of CAISO capacity by resource type
  - Only applies to capacity procured by CPUC jurisdictional LSEs
- A UCAP MW already is discounted for expected forced outages, but still assumes the full Pmax amount will be offered into the market
  - If only offered in UCAP value, grid would be less reliable because outages would occur off the UCAP value
  - Must-offer value becomes key term in many CAISO processes, since ultimately this is what the CAISO needs operationally to preserve reliability
- UCAP at the CPUC is based on Pmax, but a resources Pmax is not always fully deliverable
  - Need a new term to ensure reliability, PmaxRA, or Pmax adjusted for deliverability, interconnection, testing, or other physical constraints
  - Without addressing deliverability, the UCAP value may overstate a partially deliverable resource's contribution to reliability

WPTF supports CAISO's MOO approach with a small change

$$\text{MOO} = \text{shown RA} \times \frac{\text{Pmax}}{\text{NQC}}$$

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Illustration

Shown RA	NQC	PmaxRA	Calculated MOO
90 UCAP MW	90 MW	100 MW	100 MW

Post-UCAP implementation needs separate capacity values

Value	What it represents	Primary uses
Pmax/installed capacity	Maximum physical operating capability	Starting point for operational capability
PmaxRA /ACAP or accredited capacity	Pmax adjusted for deliverability, testing, or other physical constraints; reflects the actual, deliverable megawatts a resource can reliably provide during peak load seasons	Maximum an LRA can set its QC value
LRA-specific QC	Capacity value established by the applicable LRA methodology	LRA compliance accounting and contract denomination
Maximum QC / CAISO NQC	Maximum RA CAISO permits to be shown on RA and Supply plans	RA showing cap and MOO scaling denominator
Shown RA	Capacity actually shown on RA and supply plans	RA compliance, substitution, and RAAIM exposure

One post-UCAP number cannot serve every CAISO function without double counting or lost capability.

NQC cannot carry every post-UCAP function

CAISO function	Required capacity concept	Will current definition of NQC work?
Forward count and payment	LRA-specific accredited MW or contract MW	Maybe: Some contracts are based on PmaxRA value, some UCAP value (so NQC would work), and others MOO value
Deliverability ceiling/studies	CAISO deliverable capability	No: Deliverability must be maintained for resources entire MOO
Monthly showing validation	Contract-denominated shown RA capped by LRA-specific accreditation	Yes: And also, must preserve the shown value for LRA RA program administration
Must-offer obligation	Physical capability linked to showing	No: MOO must be formula based and will often be higher than NQC
RAAIM, substitution, transitional measures overlap calculations	Shown accredited MW	No: Measure delivery of the RA commitment, so will use shown RA value just like today
Export RA available MW	Excess RA MW can be exported at a high priority	No: Will double count excess if use shown RA or NQC value, must account for MOO MW
CPM deficiency cure	Explicit backstop procurement denomination	No: Cannot use excess NQC as available for CPM

Local and Flexible RA

- How will the CAISO change their local and flexible RA studies to account for UCAP?

SECTION 2

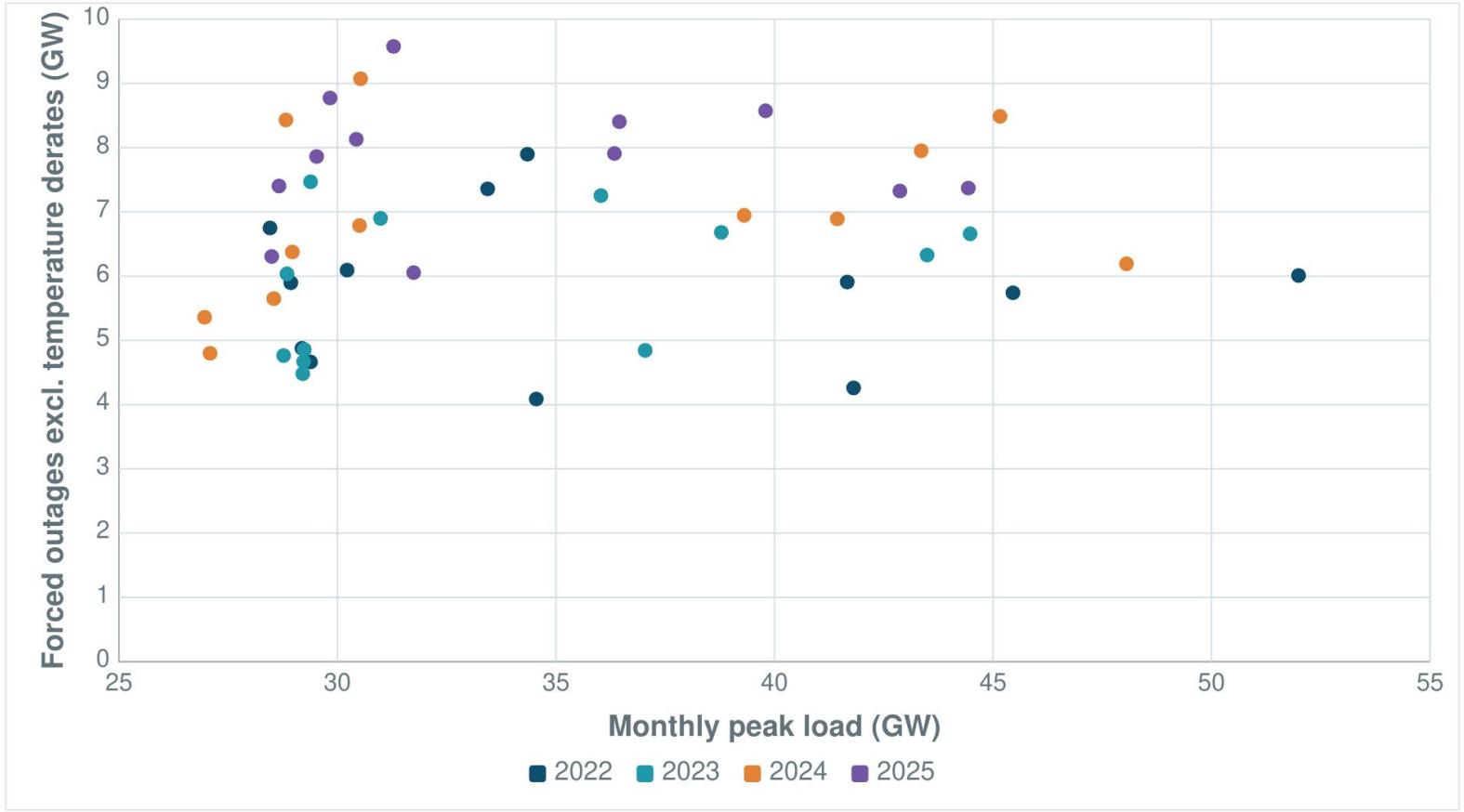
RAAIM design

Measure the availability of shown RA, diagnose the cause of stress, and keep exposure contractable.

FOCUS

- No demonstrated failure in the current record
- An RSE failure is not proof of generator non-performance
- Keep the current capacity price unless evidence supports a change

Forced outages, as expected, are random



r ≈ 0.11

Simple descriptive correlation

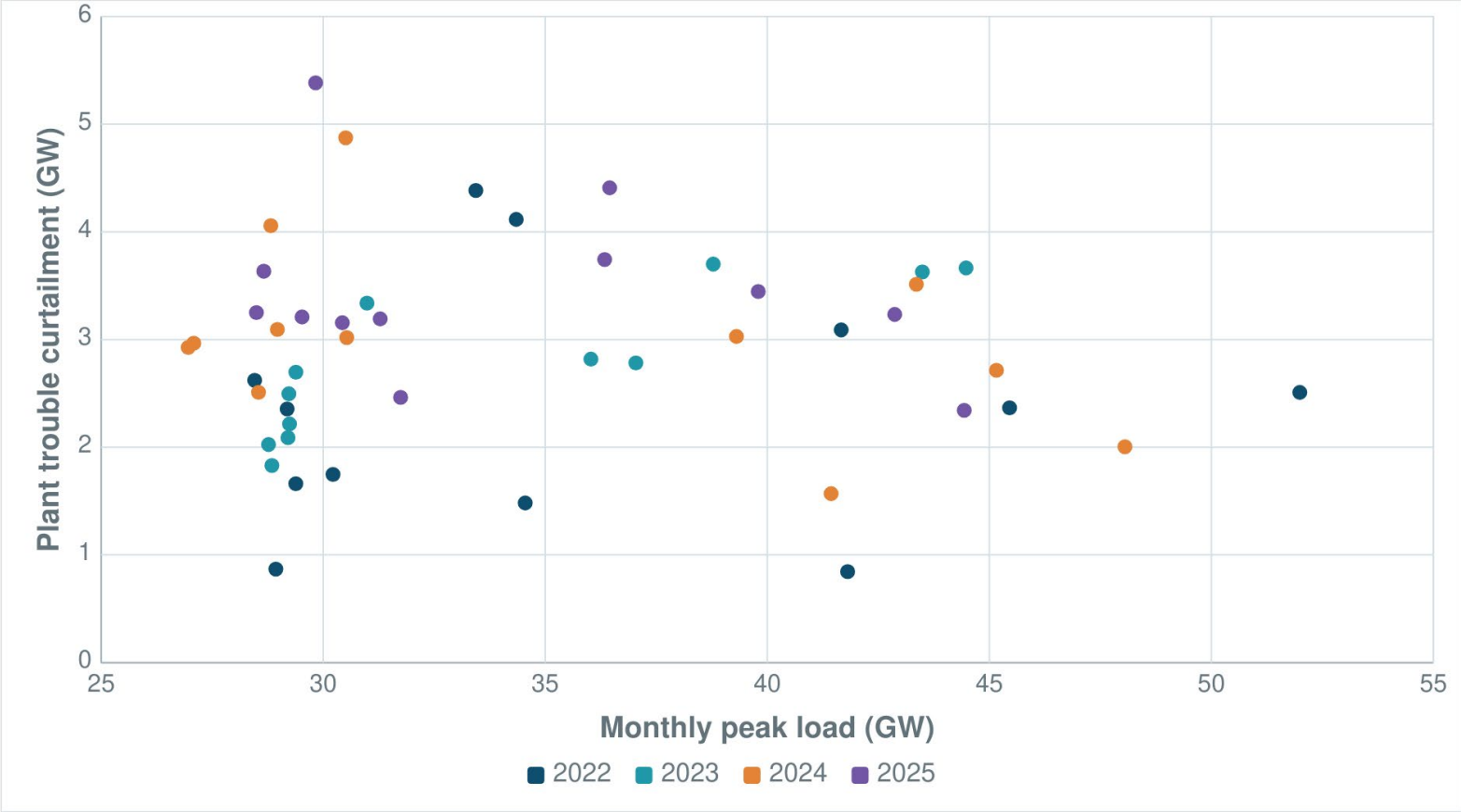
- Very weak correlation between monthly peak load and forced outages
- Cannot conclude RAAIM is ineffective or effective at this goal
- Forced outages continue to look random across years, load, and prices

Data
CAISO daily curtailed/non-operational reports → MRP monthly compilation → WPTF replot

Descriptive, not causal. 39 available monthly observations; 2024 and 2025 are incomplete.

Source: MRP 2022-2025 Outage Summaries, compiled from CAISO daily reports; WPTF replot and calculation

The data do not establish RAAIM failure or success



Descriptive, not causal. 39 available monthly observations; 2024 and 2025 are incomplete.

r ≈ -0.02

Simple descriptive correlation

- CAISO defining RAAIM as a process to reduce forced outages
- No correlation for plant trouble outages, as expected they are random
- Cannot conclude RAAIM is ineffective or effective at this goal

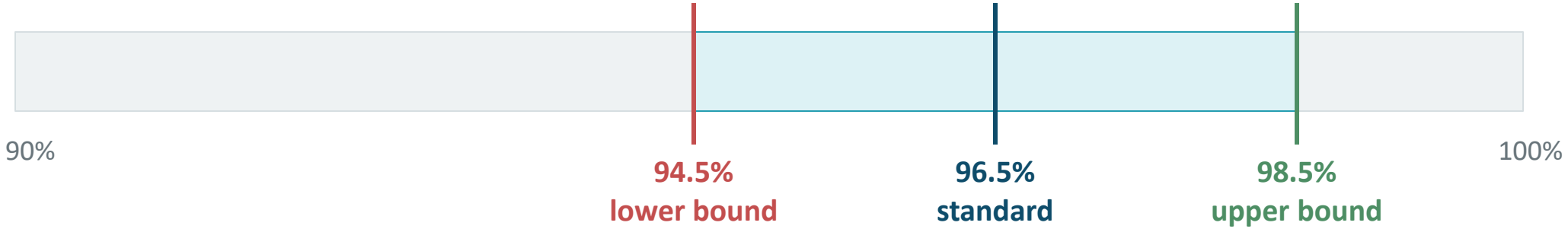
Data

CAISO daily curtailed/non-operational reports → MRP monthly compilation → WPTF replot

Source: MRP 2022-2025 Outage Summaries, compiled from CAISO daily reports; WPTF replot and calculation

UCAP itself does not justify a RAAIM redesign

Current monthly availability scale



Conceptual continuity

- Today's 94.5% floor already recognizes that not every ICAP MW is available every hour. The floor was set at 94.5% to recognize the PRM included an expectation of some forced outages and only if resource outages exceeded this expectation, should they be penalized.
- UCAP removes expected forced unavailability from the forward MW value itself, so if CAISO assesses RAAIM on UCAP value, this is consistent with RAAIM today.
- Applying the existing capacity-based RAAIM price to shown UCAP does not require an automatic price increase, just removing the buffer.

Identify the failure before changing the remedy

Claim CAISO would need to establish	What the record must show	Remedy if the claim is supported
Current RAAIM price is too weak	Resource availability and RAAIM exposure over time, controlling for fleet mix, seasons and event conditions	Calibrate the price upward to increase maintenance/performance, not to an energy-market price
Substitution is not preserving RA	Requests, substitute offers, acceptance, timing, reason codes and whether planned work became forced	Fix eligibility, timing and processing friction before increasing resource penalties
Shown RA causes stressed-hour shortfalls	Event-level causation across LSE procurement, requirements, load forecast, imports, deliverability, non-RA and RA	Trigger a resource charge only for shortfall attributable to shown RA non-performance
New liability is commercially manageable	Retrospective settlements, tail-event frequency, contract pass-through and effect on RA offers/prices	Define caps, transition, existing-contract treatment and dispute rights before launch

The record must distinguish an incentive failure from a process failure and a procurement failure.

The proposal changes trigger, proof, and price

Design element	Current RAAIM	CAISO Tier 1	CAISO Tier 2
When it applies	Monthly Availability Assessment Hours	Forecast stress selected and fixed at T-3	Hours when the CAISO BAA fails upward EDAM RSE
What trigger shows	Resource availability over the month	A forecast of possible system stress	A BAA-level sufficiency failure, not its cause
MW assessed	Availability below the 94.5% floor	Shown RA shortfall in selected hours	Shown RA shortfall during RSE-failure hours
Price unit	About $4.40/kW-month; capacity based	Day-ahead LMP; energy based	$2,000/MWh; event-energy based
Primary issue	Benchmark must translate to shown UCAP	Forecast can clear; LMP does not price capacity availability	Load, requirement, forecast or system conditions may cause failure

The proposal moves from a monthly capacity construct to event-driven energy exposure and treats a system trigger as a resource finding.

RSE failure is not a generator finding

The EDAM Resource Sufficiency Evaluation (RSE) identifies a BAA-level shortfall; it does not identify the cause.

LRA failure

The forward RA requirement was set too low.

Forecast / system need

Actual load or net load exceeds the forecast used for procurement or scheduling.

Imports / deliverability

Import, transfer, deliverability, non-RA or broader BAA conditions limit sufficiency.

Shown RA insufficiency

LSEs failed to show sufficient capacity on RA plans and because of SOD/CAISO translation issue there was no backstop

Only the fourth cause is a RAAIM availability failure

Tier 2 should require an attributable shown-RA shortfall; the RSE result alone should not shift load-side or system risk to generators.

A five-hour Tier 2 event can cost $1 million

100 MW × **5 hours** × **$2,000/MWh** = **$1,000,000**

$10/kW-month	Equivalent exposure from one five-hour event
$2/kW-month	Equivalent exposure from one-hour event
$4.40/kW-month	Current RAAIM price for a full month

Without a defined cap and transition, sellers will price this tail risk into RA contracts.

WPTF recommendation keeps the signal capacity-based

Design choice	Current approach	CAISO proposal	WPTF Recommendation
Base RAAIM	60% of CPM soft-cap price; monthly	Replaced or supplemented by event tiers	Apply today's capacity price to shown UCAP unless evidence supports a change
Tier 1 trigger	No separate stress tier	Forecast hours fixed at T-3	If retained, assess only when stress actually materializes ex post
Tier 1 price	Capacity-based	Day-ahead LMP	Use Reliability Capacity Up (RCU), a short-term capacity price, not energy LMP
Tier 2 causation	Resource availability measured directly	Automatic during CAISO BAA RSE failure	Require an attributable shown-RA shortfall; do not shift load/system causes
Risk controls	Monthly, bounded construct	Cap contemplated but not defined	Fixed transparent cap, event/annual stop-loss, phase-in and existing-contract treatment

Default: shown UCAP × today's RAAIM price. Fallback: actual stress × RCU, with attribution and hard limits.

WPTF's specific recommendations

UCAP implementation

- Store Pmax, PmaxRA/ACAP, LRA QC, maximum NQC and shown RA separately.
- Make all except shown RA transparent tables on CAISO website.
- Preserve LRA and contract denomination in CIRA; track partial sales and residual capability.
- Scale MOO to deliverable physical capability; assess RAAIM on shown accredited RA.
- Repair CPM: comparable MW for deficiency, physical MW for cure, cost to deficient load.
- Determine Local and Flexible RA policy

RAAIM design

- Publish evidence before concluding current RAAIM has failed.
- Retain today's capacity price on shown UCAP unless a change is demonstrated.
- If Tier 1 remains, require actual stress and use RCU—not day-ahead LMP.
- For Tier 2, require attribution; an RSE failure alone is not proof.
- Cap exposure and phase in changes, including treatment of existing contracts.

Procurement deficiencies belong with load; attributable availability failures belong with resources.

APPENDIX

Post-UCAP function map

A controlling value should be identified for every CAISO function now tied to NQC.

FOCUS

- Use the map as a tariff and BPM drafting checklist
- Validate it with full, partial and multi-LRA examples

Every NQC-linked function needs a post-UCAP rule

Function	Post-UCAP question	WPTF proposed controlling value
RA and supply-plan validation	How much may be shown and counted?	LRA QC, converted if needed, and capped by maximum QC / CAISO NQC
MOO	How much must be offered?	Shown RA × PmaxRA / maximum QC
Generated bids	What quantity may CAISO bid for the resource?	The operational MOO quantity
RAAIM	What quantity is penalized?	Shown RA, the quantity counted on RA plans
CPM eligibility	What capability may CAISO procure?	Uncommitted deliverable physical capability, subject to existing CPM rules
System backstop	What determines deficiency and procurement?	Shown RA in comparable terms for deficiency; deliverable capability for procurement

Residual capability also needs a post-UCAP rule

Function	Post-UCAP question	WPTF proposed controlling value
Local backstop	What capacity can resolve the local need?	Deliverable local capability, subject to existing commitments
High-priority export RA	What capability may support the export?	Residual deliverable physical capability after CAISO RA obligations
External RSE support	What capacity may support another BAA's Resource Sufficiency Evaluation?	Residual operational capability, with no double counting
Transitional measures	What quantity receives implementation protection?	Capability associated with the applicable market obligation—not automatically UCAP QC
Outage substitution	What quantity can replace unavailable shown RA?	Eligible residual capacity expressed in terms consistent with the shown obligation
Partial and multi-LRA resources	How are different QC denominations aggregated?	Convert to consistent resource shares and cap total commitments at maximum QC