

**BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA**

Order Instituting Rulemaking to Oversee the
Resource Adequacy Program, Consider
Program Refinements, and Establish Forward
Resource Adequacy Procurement Obligations

Rulemaking 19-11-009
(Filed November 7, 2019)

**FINAL TRACK 3.B2 PROPOSALS OF THE CALIFORNIA INDEPENDENT SYSTEM
OPERATOR CORPORATION**

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EXECUTIVE SUMMARY

The CAISO presents two independent proposals to reform the Commission's existing resource adequacy program. These proposals are summarized below:

Proposal 1: Unforced Capacity Methodology for System Resource Adequacy – The Commission should adopt an unforced capacity (UCAP) methodology consistent with the proposal the CAISO ultimately adopts in its Resource Adequacy Enhancements initiative. The UCAP methodology will assess capacity needs and resource contributions taking into account resource availability and deliverability. The UCAP methodology recognizes unit-specific forced outage rates and accurately reflects this information in procurement.

Proposal 2: Multi-Year System Capacity Requirements – The CAISO recommends the Commission adopt multi-year system resource adequacy framework for its load serving entities. Multi-year system resource adequacy requirements are necessary to maintain near-term reliability and ensure continued operation of existing generation resources.

The CAISO looks forward to working collaboratively with the Commission to develop these proposals and improve the resource adequacy program to meet changing system conditions and resource needs.

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I. Introduction

The California Independent System Operator Corporation (CAISO) hereby provides its final proposals for Track 3.B2 per the December 11, 2020 *Assigned Commissioner's Amended Track 3.B and Track 4 Scoping Memo and Ruling* (Amended Scoping Memo).

II. Discussion

A. Proposal 1: Unforced Capacity Methodology for System Resource Adequacy

The Commission should adopt an unforced capacity (UCAP) methodology consistent with the proposal the CAISO ultimately adopts in its Resource Adequacy Enhancements initiative. The UCAP methodology will assess capacity needs and resource contributions taking into account resource availability and deliverability. The UCAP methodology recognizes unit-specific forced outage rates and accurately reflects this information in procurement.

1. Background

The rapid transformation to a more variable and energy-limited resource fleet and the migration of load to smaller, more diverse load serving entities (load serving entities) requires re-examining all aspects of the resource adequacy program. In 2006, at the onset of the resource adequacy program in California, natural gas, nuclear, and hydroelectric resources were the predominant generation technology types. Although some of these resources were subject to use-limitations due to environmental regulations, start limits, or air permits, they were generally available to produce energy when needed given they had fairly dependable fuel sources.

However, as the fleet transitions to achieve the objectives of SB 100,¹ the CAISO now must rely on a much different and more diverse resource portfolio to reliably operate the grid. In the Resource Adequacy Enhancements stakeholder initiative, the CAISO, in collaboration with Commission Energy Division staff and stakeholders, is exploring reforms to the resource adequacy rules, requirements, and processes to ensure it can continue to operate the grid reliably under transforming grid conditions.

The State needs a vastly more robust resource adequacy framework to ensure future reliability as system conditions change rapidly, resources retire, and competition for limited capacity increases across the west. Accordingly, the CAISO is finalizing a proposal through its resource adequacy enhancements stakeholder initiative to move to a UCAP paradigm that would: (1) account for unit-specific forced outage rates ahead of resource adequacy showings (rather than through capacity substitution provisions and after-the-fact charges); (2) help load serving entities identify which resources have high availability and can contribute the most to reliability; and (3) incentivize resource owners to invest in proper maintenance to increase their resources' availability and, therefore, the amount of resource adequacy capacity they can sell.²

2. Proposal Summary

The CAISO's UCAP proposal in its Resource Adequacy Enhancements initiative has two primary elements. First, it utilizes a UCAP counting methodology to determine maximum resource adequacy capacity values for generation resources.³ Second, it establishes UCAP/net qualifying capacity (NQC)-based procurement requirements.

This UCAP counting methodology moves away from the current resource counting methodology, which derives NQC value by modifying the qualifying capacity value by deliverability adjustments. A UCAP counting methodology will determine a resource's UCAP/NQC value by discounting its deliverable qualifying capacity value to account for recent

¹ The objective of SB 100 is "that eligible renewable energy resources and zero-carbon resources supply 100% of retail sales of electricity to California end-use customers and 100% of electricity procured to serve all state agencies by December 31, 2045." https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180SB100

² Moving to a UCAP paradigm will also mean eliminating the resource adequacy availability mechanism (RAAIM).

³ The CAISO uses the term UCAP/NQC to refer to the net qualifying capacity which incorporates derates for availability through the unforced capacity evaluation. The CAISO uses this term to clarify that NQC will represent a different capacity valuation under the UCAP paradigm than NQC does today.

historical unit forced and urgent outage rates during tight resource adequacy supply hours.⁴ This change is necessary because the tools the CAISO currently uses to incentivize resources to provide replacement capacity for forced outages are ineffective as explained below. The UCAP methodology will better incentivize load serving entities to procure more reliable resources, maintain their resources, and encourage resources to avoid forced outages. Additionally, removing the static, expected forced outage rate from the planning reserve margin (PRM), and, instead, incorporating the UCAP into resource capacity values will allow resource adequacy requirements to dynamically change with the fleet's forced outage rate. The CAISO proposes the Commission adopt the UCAP counting methodology to determine maximum resource adequacy capacity values for generation resources.

The second element of the CAISO's proposal is to establish UCAP/NQC-based procurement requirements. Setting requirements in terms of UCAP/NQC is much more accurate and resource-specific to inform load serving entity procurement decisions. Better visibility, transparency, and procurement decisions can help the CAISO reliably meet system needs. Over the course of this proceeding and through the CAISO's Resource Adequacy Enhancements stakeholder initiative, the Commission and CAISO should work collaboratively to set the correct UCAP system requirement levels and ensure the Commission's resource adequacy requirements support the CAISO's reliability requirements.

3. UCAP-Based Resource Counting Rules

Currently, the CAISO relies on substitution rules and the RAIM to discipline capacity availability. However, experience shows these rules (1) may not ensure resources going on outage provide substitute capacity in a timely manner, (2) create a perverse "capacity withholding" risk management incentive, (3) allow for cross-subsidization of outages within a Scheduling Coordinator's (SCs) portfolio of resources, and (4) do not provide a sufficient up-front incentive for resource owners to reliably maintain resources. The CAISO discusses these

⁴ As part of the Resource Adequacy Enhancement initiative, the CAISO will be aligning its balancing authority area outage definitions and study processes with the RC West outage definitions and processes. Through this alignment, urgent outage will represent outages that are submitted after the short range study window, where the unit is known to be operable but is in imminent danger of being forced out, and the outage is needed to make repairs to keep the unit operable and are given the same priority as forced outages.

flaws in the current framework below.

By definition, a Scheduling Coordinator's (SC) need to find substitute capacity for forced outages occurs with very little notice. Often, it is either impossible for the SC to find substitute capacity, or the capacity costs more than the SC is willing to pay.⁵ To mitigate the risk of being unable to find substitute capacity, an SC may withhold capacity from the bilateral market to self-provide substitute capacity. This decreases the amount of capacity available for both month-ahead resource adequacy sales and to provide substitute capacity.

Additionally, most SCs have a portfolio of resources, which allows them to recoup RAAIM charges assessed against a resource with poor availability through incentive payments paid to another resource with greater availability. Thus, at the end of the month the SC may face no financial consequences if some of its resources perform poorly. This cross-subsidization reduces the incentive to procure replacement capacity for resources that become unavailable, potentially leaving the CAISO with insufficient available capacity. This increases backstop capacity procurement risk and can degrade system reliability. The CAISO assessed 2018 and 2019 RAAIM charges and found many SCs recovered all or most of their RAAIM non-availability charges through RAAIM incentive payments to other resource adequacy resources in their portfolios. Further, RAAIM only offers an after-the-fact penalty and does not actually incentivize or assure sufficient resource availability up-front,⁶ allowing resources to defer maintenance until the outage occurs. These represent some of the flaws the CAISO has identified with the existing RAAIM structure.⁷

Under the proposed UCAP paradigm, the Commission would continue to determine qualifying capacity values, including ELCC values, for resources. The CAISO would then establish NQC values using a two-step process. First, the CAISO will conduct a resource deliverability assessment to adjust QC for deliverability to determine the deliverable qualifying capacity (DQC). This DQC process will be the same as the current NQC approach with no changes to the deliverability assessment.

⁵ The latter is particularly true if the resource is above the 94.5 percent availability.

⁶ See the CAISO's December 18, 2020 Final Track 3.B Proposal, Attachment C. Available at: <http://www.caiso.com/Documents/Dec18-2020-FinalTrack3BProposals-ResourceAdequacy-Exhibits-R1911009.pdf>.

⁷ *Id.*

Second, the CAISO will identify the hours of greatest need by identifying the hours with the tightest resource adequacy Supply Cushion⁸ and then consider the resource's historical forced and urgent outages and derates to calculate seasonal availability factors during those hours for the prior three years. The CAISO proposes to weight the most recent years more heavily to create a Weighted Seasonal Average Availability Factor. The CAISO will apply this Weighted Seasonal Average Availability Factors to the resource DQC to determine the resource's final net qualifying capacity (NQC). The resource's must-offer obligation would equal its shown DQC. By requiring resources to bid at their deliverable capacity this provides additional capacity to cover the capacity from other units that are expected to be on a forced outage at any given moment. This would provide the self-substitution for the expected forced outage rate of the resource adequacy portfolio and thus improve reliability by providing substitute capacity up front rather than waiting until real time.⁹ Annually, the CAISO would calculate and publish monthly DQC and NQC values for all resources.¹⁰

The CAISO proposes to calculate two seasonal availability factors for UCAP determination purposes, one for on-peak months (May-October) and one for off-peak months (November-April). UCAP values will not be affected by CAISO approved planned or opportunity outages.¹¹

The CAISO and the Commission would use the resulting UCAP/NQC values to validate system, local, and flexible resource adequacy showings. The basic UCAP methodology would apply to dispatchable thermal and storage resources. For resources with qualifying capacity values calculated using an ELCC methodology,¹² the CAISO would use the ELCC value, with

⁸ Resource adequacy Supply Cushion is defined as the Daily Shown resource adequacy (excluding wind and solar resources) minus Net Load, minus Contingency Reserves, minus Outages. The resource adequacy Supply Cushion identifies which hours have the greatest system resource adequacy risk or, in other words, not having enough capacity to cover net demand, operating reserves, and outages.

⁹ *I.e.*, shown NQC divided by the Weighted Seasonal Average Availability Factors.

¹⁰ Annually, the CAISO will determine a unit's distinct DQC and NQC value for each month of the upcoming year. This will take into account both the unit's deliverability and availability. Given the relationship between DQC and UCAP/NQC, although the CAISO will only calculate a resources' Weighted Average Availability Factors on an annual basis, if a resource's DQC value increases mid-year, as allowed under the existing tariff, the CAISO will update the resource's DQC and UCAP/NQC value accordingly.

¹¹ Opportunity outages are facility/equipment outages that do not meet the short range window requirements for planned outages, but which can be taken due to a change in system conditions, weather, or availability of field personnel.

¹² Although storage resources have an ELCC value, this is currently set to 1, so the CAISO will apply the basic

any reductions for deliverability, as the UCAP/NQC value because the ELCC methodology already accounts for forced outages. For non-dispatchable resources with qualifying capacity values that already take into account their forced outage rate, the DQC and UCAP/NQC values will be equal.¹³ The CAISO has also developed special UCAP methodologies for QFs, hybrid and co-located resources, hydro resources, and imports that best capture their availability. Specific details regarding the CAISO's current proposals for calculating UCAP values for these resource types are provided in Section 6.1.1 of the CAISO's Sixth Revised Straw Proposal in the Resource Adequacy Enhancements stakeholder initiative.¹⁴ As indicated above, the CAISO will continue to vet these matters further with the Commission and stakeholders.

4. UCAP-Based Procurement Requirements

Through this proceeding and the CAISO Resource Adequacy Enhancements initiative, the CAISO proposes to work jointly with the Commission to apply the framework provided in its preliminary portfolio assessment and determine the appropriate metrics for establishing the appropriate level of procurement and measures of reliability. Historically, the PRM accounts for reserve requirements, load forecast error, and a static forced outage rate.¹⁵ Under the CAISO's UCAP proposal, the PRM need not consider a forced outage rate because it will be embedded in

UCAP methodology to storage resources to account for their forced outage rates.

¹³ During the February Workshop, Energy Division staff asked whether non-dispatchable resources should also be excluded from the calculation of the hourly resource adequacy Supply Cushion consistent with the CAISO's proposed treatment for wind and solar resources. The CAISO proposes to exclude wind and solar resources from the resource adequacy Supply Cushion calculation because the ELCC values for these resource do not represent the energy output for that hour. By excluding wind and solar resources from the shown resource adequacy and subtracting the net loads rather than gross loads, the resource adequacy Supply Cushion takes the actual energy output of variable energy resources into account. Because non-dispatchable resource qualifying capacity already includes average forced outage rate estimates, there is no need to further derate those values to generate an appropriate UCAP/NQC. Additionally, the NQC for a non-dispatchable resource should represent the expected energy output of the resource. It is appropriate to include non-dispatchable resources in the resource adequacy Supply Cushion calculation because the CAISO can use them to meet net demand and cover reserves and outages. Excluding them could underestimate the resource adequacy Supply Cushion.

¹⁴ See the CAISO's December 18, 2020 Final Track 3.B Proposal, Attachment C. Available at: <http://www.caiso.com/Documents/Dec18-2020-FinalTrack3BProposals-ResourceAdequacy-Exhibits-R1911009.pdf>.

¹⁵ The purpose of the resource adequacy program is to ensure the CAISO can serve forecasted peak load while carrying operating reserves for three percent of load and three percent of generation, or cover the Most Severe Single Contingency according to BAL-002-WECC-2a, and have sufficient capacity to provide regulation and the flexible ramping product. BAL-002-WECC-2a found here: <https://www.nerc.com/layers/15/PrintStandard.aspx?standardnumber=BAL-002-WECC-2a&title=Contingency%20Reserve&jurisdiction=United%20States>

the resource UCAP/NQC values. After removing forced outages, the PRM will only need to account for load forecast error and reserve requirements.

In prior proposals, the CAISO used daily forced outage data reported to the CAISO's Customer Interface for Resource Adequacy (CIRA) to estimate the expected forced outage rate of the resource adequacy fleet. Using this data, the CAISO estimated resource adequacy forced outage rates to be 9.78%. Initially, the CAISO believed the CIRA data represented the greatest percentage of coincident resource adequacy outages during a single hour on each day. Upon further evaluation, CAISO staff determined the data represented the sum of the worst outages for each resource adequacy resource over the course of single day. Because the data represents cumulative outages rather than coincident outages, the CAISO's previously calculated 9.78% average forced outage rate is an upper bound and the actual historic forced outage rate may be lower.¹⁶ CAISO is working to provide detailed forced outage rates, but has not completed this analysis. However, specific forced outage rate data are not necessary to consider the solid principles and benefits a UCAP-based procurement system provides. These benefits include better incentivizing up front procurement of substitute capacity for forced outages and robust, long term maintenance practices to keep unit specific forced outage rates low.

One of the core elements of the CAISO's Resource Adequacy Enhancements stakeholder initiative is developing and using a production simulation tool that can assess how likely the shown monthly resource adequacy fleet supports grid reliability in all hours. The CAISO will conduct a monthly portfolio deficiency test of the shown resource adequacy fleet to determine if the resource adequacy portfolio is adequate to serve load under various load and net load conditions during all hours of the day. The portfolio deficiency test will use only the shown resource adequacy fleet in a stochastic production simulation to determine if the CAISO can serve forecasted gross and net-load peaks, and maintain adequate reserves and load following capability, in that resource adequacy compliance month. A stochastic monthly assessment of the resource adequacy fleet poses unique challenges that do not exist under the simple accounting tools currently used to ensure resource adequacy compliance. However, two core challenges must be addressed:

¹⁶ The CAISO's sixth revised straw proposal uses this same data and the analysis presented therein should also be viewed as the upper bound estimations of outage rates. Currently, the resource adequacy Supply Cushion is strongly correlated with net loads, and therefore the CAISO expects it would select similar hours as UCAP assessment hours.

- (1) Establishing a defined reliability criteria (*i.e.*, probability of resource adequacy deficiency or loss-of-load expectation) that determines procurement targets and backstop procurement triggers; and
- (2) Determining the quantity and attributes of capacity needed to address a portfolio deficiency.

The CAISO has not yet answered these questions. Instead, using actual resource adequacy showings from July 2020, the CAISO provided a framework to consider how to derive answers to further vet with stakeholders.¹⁷ The CAISO will further consider these issues in its Resource Adequacy Enhancements stakeholder initiative.

5. UCAP Proposed Implementation

The CAISO intends to seek CAISO Board approval of a final UCAP proposal as part of the Resource Adequacy Enhancements stakeholder initiative in the third quarter of 2021. The CAISO will conduct a shadow analysis of the UCAP methodology during the 2022 resource adequacy year. The CAISO proposes the UCAP paradigm become binding for the 2023 resource adequacy year. This timing is important because it avoids multi-year procurement that could be split between the current counting methodologies and the UCAP counting methodologies. The CAISO intends to coordinate this implementation timeline with its other proposals for availability limited resource procurement, resource adequacy import rules, and a forthcoming proposal on multi-year flexible capacity procurement requirements.

B. Proposal 2: Multi-Year System Capacity Requirements

The CAISO recommends the Commission adopt a framework for transitioning to multi-year system resource adequacy requirements for its load serving entities. The CAISO recognizes specific details must still be established in subsequent resource adequacy proceedings. However, California can no longer allow resources to retire because the resource adequacy paradigm and planning standards have not caught up to the current and future needs of the system. Multi-year system resource adequacy requirements are necessary to maintain near-term reliability and ensure continued operation of existing generation resources.

¹⁷ A link to the portfolio assessment can be found at <http://www.caiso.com/InitiativeDocuments/PreliminaryPortfolioAnalysis-ResourceAdequacyEnhancements.pdf>

1. Background

In Decision (D.) 19-02-022, the Commission adopted three-year forward local resource adequacy requirements.¹⁸ The Commission did not adopt multi-year system or flexible requirements at that time, though it did provide that future resource adequacy proceedings should consider such requirements.¹⁹ In its December 18, 2020 submission, the CAISO proposed a multi-year system resource adequacy requirement. This proposal continued to support the core tenets of its 2018 testimony regarding the need for multi-year capacity procurement.

Since issuance of D.17-09-020, the need for a multi-year forward system capacity procurement has grown more acute, as indicated by the Commission's 3,300 MW system capacity procurement authorization in D.19-11-016 for 2021 through 2023 system needs. The Commission authorized this emergency incremental procurement in the integrated resource planning (IRP) proceeding because the resource adequacy program does not have a forward capacity mechanism to address peak or non-peak system needs beyond a single year forward. More recently, the Commission issued an IRP ruling addressing mid-term system needs (2024 through 2026) and the retirement of the Diablo Canyon Nuclear Power Plant.²⁰ Although the IRP proceeding has recently identified resource adequacy shortages, the resource adequacy program is not currently equipped to address forward contracting needs and compliance in the near-term that will serve as a bridge to the mid- and longer-term planning under IRP.

Finally, the CAISO recently submitted a resource stack analysis in the Commission's emergency electric reliability proceeding (R.20-11-003) showing potential system deficiencies in 2021, even with recently authorized procurement and continued reliance on once-through-cooling generation. Compounding this problem, almost 400 MW of resources announced their intent to retire or mothball from the CAISO system in 2020. The CAISO Board of Governors authorized the CAISO to retain these resources under a cost-based reliability must-run (RMR) backstop contract—including the first ever system-based RMR—which was needed to support system-wide reliability needs.²¹ Unlike an RMR to meet local capacity needs, a system-level

¹⁸ See, <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M270/K469/270469481.PDF>, at pp. 20-22.

¹⁹ *Id.* at pp. 32-33.

²⁰ Administrative Law Judge's Ruling Seeking Feedback on Mid-Term Reliability Analysis and Proposed Procurement Requirement, Order Instituting Rulemaking to Continue Electric Integrated Resource Planning and Related Procurement Processes, Rulemaking 20-05-003, February 22, 2021.

²¹ See: <http://www.caiso.com/Documents/DecisiononReliabilityMust-RunDesignations-Memo-Dec2020.pdf>

RMR designation signals all existing resources are necessary to ensure reliability. The CAISO’s studies show the need to both procure incremental resources and to retain all resources in the existing fleet (at least until sufficient new resource capacity is available to replace them). A multi-year system resource adequacy requirement can help maintain necessary resources, while avoiding the need for the CAISO to engage in out-of-market procurement.

2. Proposed Framework

The Commission should adopt a multi-year system resource adequacy framework for its load serving entities. Multi-year system resource adequacy requirements are necessary to maintain near-term reliability and ensure continued operation of existing generation resources. Based on these system needs, the CAISO recommends that the Commission adopt a three-year forward system resource adequacy framework for its load serving entities. The requirement targets should be set as follows:

Year	Requirement
Year 1	100%
Year 2	100%
Year 3	80%

Setting relatively high multi-year system resource adequacy requirements will help maintain existing resources while avoiding CAISO out-of-market procurement.²² The Commission should adopt this multi-year system resource adequacy framework now and direct parties to develop all details necessary to establish multi-year resource adequacy requirements for the 2023-2025 resource adequacy years.²³

²² The Commission can adopt multi-year system resource adequacy framework now, notwithstanding any ongoing CAISO stakeholder initiatives. The benefits of multi-year forward system resource adequacy requirements are clear, though specific details regarding load migration and resource counting rules need further development.

²³ The CAISO also supports Track 3B.1 proposals and comments by Middle River Power, Powerex and San Diego Gas & Electric Company regarding the need for seasonal resource adequacy requirements. The CAISO recommends adopting and implementing a seasonal resource adequacy requirement construct prior to implementing multi-year resource adequacy requirements.

III. Conclusion

The CAISO appreciates the opportunity to submit proposals.

Respectfully submitted,

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