Memorandum

To: ISO Board of Governors

From: Anna McKenna, Vice President, Market Design and Analysis

Date: October 22, 2025

Re: **Decision on Resource Adequacy Modeling and Program Design Track 1: Modeling and Default rules**

This memorandum requires ISO Board of Governors action.

EXECUTIVE SUMMARY

Management proposes updating the ISO tariff's default resource adequacy rules to best reflect the capabilities and characteristics of the evolving resource fleet. These proposed changes will modernize the ISO's default qualifying capacity criteria and planning reserve margin rules, aligning them with current best practices in reliability planning. These proposed default methodologies only apply where local regulatory authorities have not established their own methodologies for providing input into the ISO's resource adequacy program and preserves the autonomy of local regulatory authorities to set their own rules. However, it is imperative that the ISO's default resource adequacy rules remain effective if called upon, and they may serve as a reference for local regulatory authorities seeking to revise their own resource adequacy program rules.

The ISO's current default resource adequacy rules, established in 2006, do not reflect the latest reliability assessment techniques that have evolved to account for the changing resource fleet and their operational characteristics. The proposed updates provide local regulatory authorities with access to more accurate and transparent information on the reliability contributions of various resource types and individual resources. With this proposed framework, Management seeks to ensure that, if applied by all local regulatory authorities within the ISO's balancing authority area, the ISO balancing authority area would meet an industry-standard reliability benchmark.

Management's proposed changes comprise Track 1 of the ISO's broader Resource Adequacy Modeling and Program Design initiative, which the ISO initiated in response to stakeholder concerns about the lack of transparent information on the reliability impact of the current default resource adequacy rules -- particularly regarding whether they meet current industry practices.

The ISO's default resource adequacy framework includes a planning reserve margin, which defines the additional generating capacity that load serving entities should procure above the forecast peak demand to ensure reliability. The default rules also include qualifying capacity criteria that determine how much of a resource's capacity can be counted towards the default resource adequacy capacity procurement requirement.

Management proposes revising both the default qualifying capacity rules and process for establishing the planning reserve margin to more accurately reflect the relative contributions of different resource types and individual resources to maintaining ISO balancing authority area reliability and how resources work together to meet the total system need. In support of the proposed changes the ISO will implement an annual, transparent modeling process that allows stakeholders to review and provide input on the assessments.

Management recommends the ISO Board of Governors approve the proposed updates to the default qualifying capacity criteria and planning reserve margin as described in this memorandum. These updates will enhance the accuracy of reliability assessments within the ISO balancing authority area, while maintaining the autonomy of local regulatory authorities in setting their own resource adequacy rules.

> ***Moved, that the ISO Board of Governors approves the Resource Adequacy and Program Design Track 1 final proposal as described in the memorandum dated October 22, 2025; and***
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> ***Moved, that the ISO Board of Governors authorizes Management to make all necessary and appropriate filings with the Federal Energy Regulatory Commission to implement the changes proposed in this memorandum, including any filings that implement the overarching initiative policy but contain discrete revisions to incorporate Commission guidance in any initial ruling on the proposed tariff amendment.***

BACKGROUND

<u>Resource Adequacy in the ISO Balancing Authority Area</u>

The ISO tariff includes a resource adequacy near-term default planning process for load serving entities in the ISO balancing authority area that do not have explicit resource adequacy requirements established by their local regulatory authority to help ensure sufficient generation supply to meet electricity demand under reasonably expected conditions. The California Public Utilities Commission (CPUC) is the largest local regulatory authority that regulates resource adequacy requirements for the load serving entities under its jurisdiction, which collectively serve the majority of load in the ISO balancing authority area. The remaining local regulatory authorities in the ISO balancing authority area also establish their own resource adequacy requirements.

As part of the near-term resource adequacy planning process:

- The California Energy Commission provides monthly forecasts of median peak electricity demand for the following year.
- The CPUC and other local regulatory authorities set the planning reserve margin to which their jurisdictional load serving entities must procure. The planning margin is the percentage of additional capacity that must be procured above the forecast peak demand to ensure reliability.
- Local regulatory authorities also define the qualifying capacity criteria, which determine how much of a resource's capacity can be credited towards meeting a load serving entity's procurement obligation. Qualifying capacity criteria, the term used in the ISO tariff, is also sometimes referred to as counting rules or accreditation methodology.

All capacity procured under the resource adequacy programs of local regulatory authorities are subject to must-offer rules in the ISO day-ahead and real-time markets, which the ISO manages through the market systems. Together, these resource adequacy processes and requirements ensure that the capacity is committed to the ISO when and where it is needed to maintain reliable system operations.

Currently, when the local regulatory authority has not defined its own planning reserve margin and qualifying capacity criteria, the ISO applies a default planning reserve margin of 15 percent and default qualifying capacity defined in tariff Section 40.8.

Resource Adequacy Modeling and Program Design Working Group

In October 2023, the ISO launched a stakeholder-driven working group process with the objective of collaboratively enhancing the ISO's resource adequacy tariff provisions in response to an evolving generation mix, increasing supply variability, and changes in local regulatory authority resource planning frameworks within the ISO balancing authority area. Through a series of collaborative meetings, the working group developed consensus on key problem statements and priorities as part of the Resource Adequacy Modeling and Program Design initiative.

Through that process, the working group reviewed the ISO tariff default qualifying capacity criteria and planning reserve margin, which apply only when local regulatory authorities have not set their own resource adequacy program rules. Stakeholders expressed concerns about whether current planning reserve margins and the qualifying criteria established by the local regulatory authorities accurately reflect critical reliability factors -- such as forced outage rates, performance, and availability.

The working group found that the ISO's default rules, last updated nearly 20 years ago, were outdated and inconsistent with current resource adequacy best practices. The working group recommended that the ISO update these rules to ensure that, if adopted by all local regulatory authorities within the ISO balancing authority area, the resulting load serving entity capacity portfolios would be expected to achieve an acceptable reliability standard.

Track 1 of the Resource Adequacy Modeling and Program Design Initiative

The problem statements developed during the working group process served as the foundation for Track 1 of the Resource Adequacy Modeling and Program Design initiative. This track focused on leveraging the ISO's reliability modeling capabilities to update the default qualifying capacity criteria and default planning reserve margin outlined in the ISO tariff. The objective was to ensure that if these default rules were adopted by all of the local regulatory authorities, the ISO balancing authority area would meet the 1-in-10 year loss of load expectation (LOLE) criteria, a widely accepted industry target. ISO analysis determined that the existing default qualifying capacity criteria and planning reserve margin do not accurately reflect the relative reliability contribution of different resource types and are likely inadequate to enable the ISO to meet the 1-in-10 year LOLE.

PROPOSAL

Annual Process to Update Default Values

Management proposes updating the ISO's default qualifying capacity criteria and default planning reserve margin tariff provisions. Rather than hardwiring specific values into the tariff, the updated tariff provisions would prescribe an annual framework for establishing qualifying capacity and the planning reserve margin values. The framework will consist of a process and methodologies that are robust and resilient to changing circumstances. The proposed qualifying capacity criteria is designed to more accurately reflect the reliability contributions of various resource types and individual resources in the current fleet to maintaining balancing authority area reliability.

Management is committed to working with stakeholders during this annual process to ensure they have the opportunity to provide input into the assessments and that the results are transparent.

The ISO would conduct an annual process with three critical steps:

1. *Model development*: Build a probabilistic model with a capacity portfolio that includes enough resource adequacy-eligible resources in the balancing authority area to achieve a level of system reliability that meets a 1-in-10 year LOLE target.

2. *Default qualifying capacity value development*: Apply the default qualifying capacity criteria to develop qualifying capacity values either on a unit-specific basis or as an average for a resource class.
3. *Determination of monthly default planning reserve margins*: Sum the qualifying capacity values from step 2 and divide by the month's median peak load forecast to calculate the monthly default planning reserve margin.

Default Qualifying Capacity Criteria

Management proposes differentiated default qualifying capacity criteria for use in step 2 that best represents the relative contribution of a resource type to system reliability. These proposed methodologies, summarized in Table 1 alongside the current ISO tariff default qualifying capacity criteria, would produce either resource-specific values[1] or class-average values applicable to all resources within a given category and more accurately reflect the reliability contribution of each resource type that measures energy availability to supply load at critical hours. This method is well-suited to account for the ISO balancing authority area's diverse resource mix, historical reliability risks, and anticipated future trends.

Incorporating the development of values based on these default qualifying capacity criteria into the annual process described above will enable local regulatory authorities to adopt class-average and resource-specific qualifying capacity values (as well as the ISO default planning reserve margin) as a part of their capacity accreditation programs, if they choose to do so. If requested, these values will be shared with local regulatory authorities each year to facilitate their integration into the local regulatory authorities' annual participation in the ISO's existing resource adequacy accounting processes.

[1] Local regulatory authorities may elect to use these resource-specific values to provide incentives for individual resource owners to ensure that their unit is available to generate during times of system need.

Table 1: Overview of the Current and Proposed CAISO Default Qualifying Capacity Criteria

Resource type	Current CAISO Default QC Criteria	Proposed Default QC Criteria and resource specific adjustments
Wind & solar resources	Based on monthly historic performance over a three-year rolling average from noon to 6pm. These hours were intended to represent gross peak hours, i.e., the peak energy demand in the ISO balancing authority area. Today, these hours of the day do not correspond with the system's net peak hours	Average effective load carrying capability (ELCC) and based on unit's generation during net peak periods.
Energy storage resources	Based on CAISO testing of a resource's sustained output over a four-hour period (and not to exceed that resource's maximum instantaneous discharge capability)	Average ELCC and based on unit's forced outage rate.
Pumped storage hydroelectric, nuclear, and dispatchable thermal resources	Based on "net dependable capacity" defined by NERC Generating Availability Data System information (GADS)	Unforced Capacity (UCAP): Resource-specific based on three years of historic outage data, one each for Winter (November – April) and Summer (May– October) seasons.
Hydro resources	Based on net dependable capacity defined by NERC GADS minus variable head derated based on an average dry year reservoir level	Average ELCC for dispatchable hydro and based on unit's forced outage rates. Average ELCC for run-of-river hydro and based on unit's generation during critical periods.
Demand response resources	Based on a resource's average monthly historic demand reduction performance during that same month during the Resource Adequacy Availability Incentive Mechanism (RAAIM) Availability Assessment Hours	For each demand response (DR) provider, the ISO will issue an annual performance factor, which will be applied to the provider's claimed capacity value for its DR resources.
Participating Load	Average reduction in demand over a three-year period on a per-dispatch basis	Average demand reduction per dispatch event, calculated over a three-year historical period, consistent with the current default qualifying capacity criteria in the ISO tariff.

Average Effective Load Carrying Capability (ELCC)

Management proposes using average effective load carrying capability (ELCC) methodology as the default qualifying capacity criteria for wind, solar, run-of-river hydroelectric, dispatchable hydroelectric, and energy storage resources. ELCC incorporates both capacity and energy contributions by quantifying the effectiveness of a resource type to meet system needs through probabilistic modeling that accounts for the capabilities of those resources. Average ELCC quantifies the reliability contribution of a class of resources to the grid. It expresses a resource's reliability contribution as a percentage of its maximum capacity and the actual values vary depending on system conditions. This approach is particularly appropriate for availability-limited and energy-limited resources because their reliability value depends on dynamic system-wide interactions, which ELCC captures effectively. Also, availability and energy-limited resources' ability to serve load during times of system need is dependent on the makeup of the rest of the generation fleet. This dependency could be due to variable, non-dispatchable energy production capabilities (in the case of wind, solar, and run-of-river hydro) or the need to manage energy within an operational timeframe (in the case of dispatchable hydro and storage). Average ELCC represents how effective that resource is compared to a fleet of perfect, fully reliable resources. For example, solar resources contribute to reliability only when their generation aligns with unmet system demand or when energy can be stored and shifted to periods of need.

Unforced Capacity (UCAP)

Management proposes to use unforced capacity (UCAP) as the default qualifying capacity criteria for dispatchable thermal, nuclear, and pumped storage hydroelectric resources. UCAP reflects a resource's contribution to system reliability, adjusted for its historical forced outage rate. The resources' qualifying capacity is determined by calculating their historic forced outage rates during the at-risk hours for the system over the past three years. This method offers a direct, transparent, and accurate way to assess individual resource performance. Applying an average ELCC to these types of resources can misrepresent their true reliability contribution, especially during critical hours. Unlike availability and energy limited resources, the availability of thermal, nuclear and pumped storage hydro resources is generally independent of the composition of the fleet or system conditions. Therefore, average ELCC fails to reflect the actual value of thermal resources in maintaining system reliability. In addition, UCAP is more appropriate for these types of resources because their availability is not significantly restricted by energy limitations and they exhibit outage rates that are less correlated with extreme system events.

This also aligns with other regional programs such as the Western Resource Adequacy Program's UCAP qualifying capacity criteria for thermal resources and the CPUC's proposed new UCAP methodology, providing the jurisdictional consistency requested by stakeholders.

Average Generation

For non-dispatchable thermal units (excluding nuclear), Management proposes using the average monthly generation over the past three years as the default qualifying capacity methodology. These resources are self-reported to the ISO as non-dispatchable, and the ISO has limited ability to control their output to meet system needs. Given these constraints, it is appropriate to base their qualifying capacity on actual historical generation, as neither ELCC nor UCAP methodologies adequately capture the unique operational characteristics of these resources.

Performance Factor Based on the Average Actual Load Curtailment

For supply-side demand response resources, Management proposes a performance-based default qualifying capacity criteria. Demand response providers would receive a performance factor based on the average actual load curtailment compared to the dispatched curtailment across all their resources. This factor, applied to the demand response provider's claimed load curtailment capability, would determine the qualifying capacity.

Given the demand response registration process, aggregating at the demand response provider level ensures a greater availability of an accurate historic performance record.

Average Demand Reduction Per Dispatch Event

Management also recommends maintaining the current default methodology in the tariff for participating load, which is based on the average demand reduction per dispatch event, calculated over a three-year historical period.

STAKEHOLDER FEEDBACK

Following the working group's scoping and prioritization process, which concluded in summer 2024, the ISO published the Resource Adequacy Modeling and Program Design issue paper and held a series of meetings through late 2024 and early 2025 to explore policy solutions. In June 2025, the ISO released a Track 1 straw proposal to revise the default qualifying capacity methodology and planning reserve margin.

Stakeholders provided extensive feedback throughout the summer, offering feedback on proposed default qualifying capacity criteria, the portfolio modeling process, and coordination with local regulatory authorities. Local regulatory authorities -- including the CPUC, Northern California Power Agency, and the Six Cities -- consistently reaffirmed their authority to set their own methodologies. While the ISO's current default resource adequacy rules have never had to be called on, stakeholders indicated that they use them as reference points. The proposed rules, based on transparent modeling inputs, will continue to serve as a reference for local regulatory authorities developing their own resource adequacy rules and are valuable tools for assessing reliability across the ISO balancing authority area, which is consistent with the working group's objectives.

Local regulatory authorities' representatives raised concerns about the proposed annual process timelines, suggesting that frequent changes to default planning reserve margins and qualifying capacity values could create uncertainty. Local regulatory authorities are not required to adopt these default values and may continue setting their own values under their own approaches. Though the actual values may change over time, the proposed approach provides more accurate assessments of reliability requirements on the system, consistent with industry accepted methodologies. How local regulatory authorities factor this information into their resource adequacy program design will be a separate issue that will be addressed by each local regulatory authority.

Stakeholders encouraged alignment of the ISO's default methodologies with the UCAP framework the CPUC is currently considering for 2028 implementation in its pending proceeding. The California Community Choice Association suggested revisiting the ISO's default UCAP design once the CPUC finalizes its process. PG&E and the CPUC Energy Division also indicated concerns regarding the timing of the approval of the ISO proposal and questioned whether seeking board approval would effectively limit the opportunity for continued collaboration on UCAP design. While Management's proposed UCAP design provides an effective framework for establishing default resource qualifying capacity values, we recognize that continued coordination will remain important both to ensure the CPUC develops an effective UCAP structure for its jurisdictional LSEs and the ISO is utilizing best practices in our calculations. Management remains committed to collaboration and will seek opportunities to align inputs and assumptions where appropriate. In addition, the ISO will continue to evaluate industry best practices in reliability modeling and qualifying capacity criteria as the ISO develops the details of the UCAP methodology, which will be transparent to stakeholders and memorialized in the Business Practice Manuals.

The California Energy Storage Alliance, San Diego Gas & Electric, and other stakeholders debated which kinds of forced outages should be included in the forced-outage rate that is a basis for the UCAP methodology and questioned alignment with the CPUC's approach. Management's proposed approach for UCAP includes a broad set of forced outages and is based on the principle that first, it should reflect the relative contribution of different resources to meet the ISO's reliability needs and second, a resource's forced outage rate is a proxy for its unavailability to serve load. The exception, which was supported by stakeholders, is the transmission-induced generation outage nature of work. This outage type is excluded because it does not represent the generator's unavailability directly since the generator is available, but the transmission line is out of service.

Numerous stakeholders, including the California Energy Storage Alliance and Middle River Power, also expressed concerns about a previous version of the proposed default UCAP qualifying capacity criteria. The previous design utilized a methodology called the "supply cushion equation" to determine the historic periods when resources' forced outage rates should be assessed to determine times of system need. Management's proposal replaces this part of the design with a methodology to determine system need that is informed by the ISO's reliability modeling. Stakeholders supported the revised design.

Finally, Pacific Gas & Electric, Middle River Power, and the CPUC Energy Division have raised several issues they see as interconnected with this proposal, namely the ISO's current processes including the existing resource adequacy availability incentive mechanism. CPUC Energy Division staff emphasized that the ISO processes need to consider highest hours at risk, not just the peak hour, as the resource mix and demand shapes continue to evolve.

While changes to these provisions are not in the scope of Track 1, they are being considered in the ISO's concurrent Track 2 and 3 efforts of the Resource Adequacy Modeling and Program Design initiative. We recognize that the Track 2 reforms to our resource adequacy availability incentives design will need to work in harmony with the evolving local regulatory authority programs, including the CPUC's UCAP design. While the default rules (planning reserve margin and qualifying capacity criteria) are critical in the event local regulatory authorities do not adopt their own resource adequacy rules, not all entities actually adopt these default rules. As stakeholders and the ISO proceed with changes to the availability and performance rules, they should do so with these proposed default rules in mind and the recognition that not all local regulatory authorities have uniform rules, nor choose the ISO's default rules. The revised performance and availability rules will have to take this into consideration. We agree with the CPUC Energy Division that future reforms to our programs should examine holistically whether we have the right set of program requirements based on the evolving reliability needs, and can consider, for example, whether an evaluation of net-peak sufficiency and energy sufficiency is needed as those tracks proceed.

CONCLUSION

Management recommends that the ISO Board of Governors approve the proposed updates to the ISO's default qualifying capacity criteria and default planning reserve margin. These updates will improve the accuracy of ISO balancing authority area reliability assessments and provide a reliable resource adequacy reference without altering the autonomy of local regulatory authorities to set their own resource adequacy rules.