

Comments on Resource Adequacy Modeling and Program Design Issue Paper

Department of Market Monitoring

December 6, 2024

Overview

The Department of Market Monitoring (DMM) appreciates the opportunity to comment on the *Resource Adequacy Modeling and Program Design Issue Paper* dated November 7, 2024.¹ DMM supports resource adequacy (RA) enhancements as the generation mix evolves on the CAISO system. Resource planning frameworks in California and the West must meet the needs of variable supply conditions and new technologies, while improving the economic incentives for market participants to procure sufficient and operationally available capacity for the ISO markets.

In these comments, DMM adds to our previous comments from the ISO's Resource Adequacy Modeling and Program Design *Revised Discussion Paper and Final Recommendation Plan*.² DMM includes additional comments on the following five issues:

- **Unforced capacity mechanism (UCAP).** DMM recommends the UCAP design follow the ISO's proposed "supply cushion" approach to increase market fungibility and transparency.
- **Capability testing.** Capability testing for ambient temperature derates should be self-reported by the scheduling coordinators, but allow for the ISO to test the resources with penalties in the case of a failure.
- **Planned outage substitution.** DMM suggests that outage substitution requirements be relaxed and that an outage substitution pool be established that operates as an auction and reduces search and coordination problems with finding substitute RA for planned outages.
- **Performance and availability incentives.** DMM suggests the ISO develop a performance mechanism rather than enhancing the existing resource adequacy availability incentive mechanism (RAAIM) framework.
- **Resource visibility and backstop procurement.** DMM supports resource sufficiency tests for the gross and net peak hours, and sees value in an energy sufficiency test.

Interdependencies between these different issues and policies are discussed through these comments.

¹ *Resource Adequacy Working Group: Issue Paper*, CAISO, November 7, 2024:

<https://stakeholdercenter.caiso.com/InitiativeDocuments/Issue-Paper-Resource-Adequacy-Modeling-and-Program-Design-Nov-07-2024.pdf>

² *Comments on Resource Adequacy Modeling and Program Design*, CAISO DMM, August 12, 2024:

<https://www.caiso.com/documents/dmm-comments-on-resource-adequacy-modeling-and-program-design-revised-discussion-paper-and-final-recommendation-plan-aug-12-2024.pdf>

Resource adequacy modeling and default rules

DMM supports the ISO developing the common North American Electric Reliability Council (NERC) requirement of a 1-in-10 loss of load reliability standard. Such a requirement appears to be recommended in California Assembly Bill 2368 (AB 2368) to support reliability planning.³ Foundational to meeting this reliability requirement is a clear and consistent modeling methodology describing resource counting rules and reserve margins to meet reliability requirements.

The 1-in-10 loss of load expectation (LOLE) is a standard the ISO ought to model and meet, with the support of their RA policies and programs. DMM continues to support the ISO's efforts to increase reliability transparency on the system through modeling. Furthermore, this transparency will facilitate better visibility into system operations and market participant contribution to meeting the reliability criteria laid out in AB 2368.

From the modeled results, the ISO should create default standards to ensure the 1-in-10 reliability standards are met across all of the local regulatory authorities (LRAs). The default values should be regularly updated (every one to two years) to ensure the changing resource mix is meeting the reliability standard set in AB 2368. DMM understands changing values creates less regulatory certainty, and recommends the stakeholder process establish a regular period for updating that optimally balances accuracy with certainty.

DMM sees the modelling effort as a required step forward and continues to recommend the ISO consider the interdependencies of unforced capacity (UCAP), outage substitution, the resource adequacy availability incentive mechanism (RAAIM), and capacity procurement mechanism (CPM).^{4,5} These policies are important as inputs and assumptions to the modeling effort.

Unforced capacity (UCAP) mechanism

DMM supports the supply cushion approach to UCAP, as described in the Issue Paper. This approach is a seasonal, unit-level UCAP assessed ex-post on the top 20 percent of constrained hours. A UCAP mechanism will more accurately account for resource availability after derates and outages, to ensure that all resources during constrained hours will be able to provide for system reliability. A UCAP mechanism levelizes the capacity valuation process across resource types to ensure a more fungible market, and reduces concerns for "like-for-like" substitution resource adequacy capacity. The increased transparency from UCAP will promote procurement of better performing resources, and allow buyers of RA more information in the bilateral RA market.

DMM prefers UCAP assessments at the unit-level because it will send accurate signals for each unit and their performance. This will (1) make RA more fungible by creating an apples-to-apples comparison

³ *System reliability and outages*, A.B.2368, 2023-2024 Reg. Sess. (Cal. 2024) (enacted):
https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202320240AB2368

⁴ *Comments on Resource Adequacy Modeling and Program Design*, CAISO DMM, May 21, 2024:
<https://stakeholdercenter.caiso.com/Common/DownloadFile/9fc0d2a4-f615-41f0-812d-707c14f12ae4>

⁵ *Comments on Resource Adequacy Modeling and Program Design*, CAISO DMM, August 12, 2024:
<https://www.caiso.com/documents/dmm-comments-on-resource-adequacy-modeling-and-program-design-revised-discussion-paper-and-final-recommendation-plan-aug-12-2024.pdf>

across all units, and (2) avoid any of the free-rider problem from using class averages. The free rider problem arises whereby some resources increase the class average for more poorly performing resources, and the poorly performing resources benefit from other resources exceeding their performance. There was a suggestion, if class averages were used, to implement a program to test a unit to receive an individual UCAP. DMM recommends against this because it will create an adverse selection problem. The issue arises because only the well performing resources will test, leaving the class average pool to be operating below the accredited NQC of the class.

The UCAP design should incorporate all forced (and urgent) outages that are under the control of the scheduling coordinator (SC) for the particular unit. This would include most outages, but exclude outages such as transmission induced, market software limitations, or environmental restriction outages that are beyond the control of the SC. DMM continues to recommend the ISO implement the UCAP mechanism using the ISO's outage management system (OMS), as the data is posted publically, increasing transparency, and allows for unit-level accounting.

DMM supports the proposed use of three years of data to calculate UCAP, and weighting to attenuate the further off years. Ensuring the weighting favors more recent years will encourage the resource to improve recent performance and increase their net qualifying capacity (NQC). The use of retrospective accounting for the top 20 percent of constrained hours further sends accurate market signals to discourage unplanned outages, and encourages good outage management throughout the whole season.

UCAP will likely reduce the number of reported outages to increase a resource's accredited NQC. To the extent this reduction in outages accurately reflects increased resource availability, the reduction in forced outages will increase the reliability of the system. This is a benefit, as increased reliability and resource availability is the goal of UCAP. However, DMM is concerned that in some instances where capacity is not fully available, the UCAP mechanism may incentivize resources to economically bid themselves out of the market to avoid taking a forced outage. This incentive currently exists to avoid RAAIM payments, but would be further increased with UCAP.

DMM does not believe this should deter the adoption of UCAP, but should be considered in the design of the mechanism. To attenuate this concern, below DMM recommends increasing the availability or performance penalties to encourage performance. The design of the policy should consider that if the resource is scheduled and cannot perform, the penalty for non-performance ought to make the scheduling coordinator (SC) indifferent to any increase in NQC that a resource could acquire in the bilateral RA market through outage avoidance. An example of the indifference calculation is below when pay-for-performance is discussed.

DMM does not recommend using the equivalent forced outage rate of demand (EFORd) methodology for UCAP. The concern with the EFORd approach lies in the complicated calculation of a counterfactual. The counterfactual requires an estimate of whether a resource would have been dispatched had it not been on outage, requiring a number of assumptions about the unit and market conditions. Furthermore, the EFORd approach does not consider tight conditions, when the system is reliant on resource availability. DMM finds the supply cushion approach more transparent and superior, as it avoids the assumptions of the EFORd approach and focuses on tight conditions. Additionally, as western markets expand, the supply cushion approach is more akin to the Western Resource Adequacy Program (WRAP), and will allow for increased fungibility between markets.

DMM further recommends particular attention be given to storage resources and their state-of-charge (SOC) limitations.^{6,7,8} Limitations that prevent a storage resource from accessing its full SOC range may lead the resource to not have the requisite four-hours of deliverability to provide their shown resource adequacy. UCAP adoption and SOC limitations will have important interactions with outage reporting and availability or performance incentives, which are discussed below.

Accounting for seasonal resource availability

The ISO is contemplating a UCAP-like framework to account for ambient derates. DMM supports this market improvement, and suggests that the ISO require resources to self-report their available capacity after accounting for ambient derates. All power plants are provided with an ambient temperature performance curve from the manufacturer. This curve is a relationship between temperature and power production that could be used to submit seasonal ambient derates to the ISO. The ISO would simply need to provide expected ambient temperature data to the resource, and then the operator could return their peak power performance from the ambient temperature performance curve. These values may change as the resource ages, is modified, or is in different maintenance cycles, but the operating characteristics of the plant are well known to the owners and operators.

If the ISO were to suspect a resource was not accurately reflecting their seasonal ambient availability, then they could use CAISO tariff Section 40.4.4, “Reductions for Testing” to test the resource and readjust the resource’s true maximum ambient operating limit. If this were needed, the ISO could also include a penalty for misrepresentation of the resource’s availability.

As a part of the interdependencies in RAMPD, if the resource has misrepresented their maximum operating limit, and cannot reach their true maximum output, the resource would owe availability or performance payments. Sufficiently strong availability or performance penalties would dissuade resources from misrepresenting their available capacity. Self-reporting with the opportunity of testing would reduce the administrative burden to the ISO, and the interdependent outage policies from a well-designed UCAP mechanism and performance incentives would discipline the SCs in their self-reporting.

Planned outage substitution

Outage substitution rules

DMM appreciates the thorough analysis and discussion the ISO presents to resolve issues around planned outage substitution. DMM understands there is tightness in the RA market, and this has led to the inability of resources to find substitution capacity for planned outages from either true scarcity or an

⁶ *Comments on Resource Adequacy Enhancements Sixth Revised Straw Proposal – Phase 2A*, CAISO DMM, February 1, 2021: <https://www.caiso.com/Documents/DMMCommentsOnResourceAdequacyEnhancements-SixthRevisedStrawProposal-Feb12021.pdf>

⁷ *Comments on Resource Adequacy Modeling and Program Design*, CAISO DMM, January 30, 2024: <https://www.caiso.com/Documents/DMM-Comments-on-the-Resource-Adequacy-Modeling-and-Program-Design-Jan-16-2024-Working-Group-Jan-30-2024.pdf>

⁸ *2022 Annual Report on Market Issues and Performance*, CAISO DMM, July 11, 2023, p 253: <https://www.caiso.com/Documents/2022-Annual-Report-on-Market-Issues-and-Performance-Jul-11-2023.pdf>

unwillingness to pay for the expensive substitute capacity. Following the implementation of enhanced outage substitution capacity rules in 2021, DMM has observed that current tariff rules are not sufficient to prevent a transferring of outages from the planned timeframe into the forced timeframe, where outage substitution capacity is not required.⁹

The ISO could consider relaxing the outage substitution rules for approval of a planned outage, and only requiring outage substitution for planned outages when there is a clear and significant reliability implication. A clear and significant reliability concern may be, for example, akin to periods discussed above with UCAP, where net demand is in the top 20 percent of tight load conditions. Other conditions could apply, too, such as restricted maintenance operations (RMO) or energy emergency alert (EEA) conditions. The precise definition of significant reliability conditions that would necessitate substitution capacity would need further discussion in future iterations of RAMPD policy papers.

Outage substitution pool

To aid in the relaxation of the outage substitution requirement, DMM suggests the ISO continue to explore the development of an outage substitution pool for scheduling coordinators looking for substitution RA capacity. Relaxing the outage substitution requirement, accompanied by the outage substitution pool, could provide for improved operations by reducing search and coordination problems with finding substitute RA for planned outages. Further, the interdependent policies of UCAP and performance penalties will result in increased market efficiency by incentivizing scheduling coordinators to plan outages to the best of their ability. The outage substitution pool was well formulated in the Issue Paper.¹⁰ DMM agrees the benefits of the approach will increase visibility of capacity that is not shown to the market, increase capacity available for substitution, lower RA costs, and send direct incentives to minimize outages and procure the requisite substitution capacity.

DMM suggests the outage substitution pool operate as an auction, specifically as a reverse second price auction, whereby the buyers of the capacity submit their reservation price to purchase substitution capacity. The sellers would submit offers, and the auction clears where the seller with the lowest bid wins, but receives the payment of the second-lowest bid. The process repeats until the market has cleared. Economic theory supports this form of auction as optimal because it leads to market participants revealing their true willingness to pay and accept.^{11,12}

⁹ *Presentation at the Resource Adequacy Modeling and Program Design Working Group*, CAISO DMM, March 13, 2024: <https://stakeholdercenter.caiso.com/InitiativeDocuments/Presentation-Resource-Adequacy-Modeling-and-Program-Design-Working-Group-March13-2024.pdf>

¹⁰ *Resource Adequacy Modeling and Program Design Issue Paper*, CAISO, November 7, 2024: <https://stakeholdercenter.caiso.com/InitiativeDocuments/Issue-Paper-Resource-Adequacy-Modeling-and-Program-Design-Nov-07-2024.pdf>

¹¹ Vickrey, William. "Counterspeculation, Auctions, and Competitive Sealed Tenders." *Journal of Finance*, col. 16, no. 1, pp 8-37.

¹² In concept this auction is similar to an eBay auction, but instead of one seller and multiple buyers, there are multiple sellers. The auction would function as though the auction sequentially clears, so it is as if there is one seller and multiple buyers, but the auction repeats until the market clears. After the market has cleared it will resolve with one clearing price as the last available MW(s) clear to meet the substitution needs. The clearing

The Issue Paper discussed requiring substitute capacity to have a “like-for-like” quality that would provide similar hourly production or ability. Since outage substitutions are for RA capacity, this highlights the need to ensure that RA capacity accounting is treated on a like-for-like basis across resource types. This requirement shouldn’t be unique to outage substitution. RA capacity should possess a like-for-like quality in its overall valuation.

There were three other options proposed as solutions for planned outage substitution. DMM finds the outage buffer system, which would increase the planning reserve margin (PRM), and would shift the burden of planned outages to the load serving entities (LSEs) through the increased PRM. First, this would require full LRA support, and second, it is the generators that have the information about the wellbeing of their resources. That generators know their resources, but the policy would increase the LSE requirement, creates an information asymmetry that would likely increase LSE costs with less clear reliability improvements.

Another proposal suggested to have the RA showings binding on an annual timeframe, which beyond also needing LRA support, would provide less flexibility for LSE procurement.

The last option is to rollback the 2021 Planned Outage Substitution Obligation (POSO) enhancements. DMM believes it is clear the planned outage substitution rules need improvements, and rolling them back is not the solution. The proposals to relax the planned outage substitution rules and provide an outage substitution pool provide an efficient, incentive aligned, reliable process that improves on existing rules.

DMM has continued to recommend the ISO enhance outage reporting requirements to more clearly require the resource scheduling coordinator to identify if a forced outage is necessary immediately for plant operation, or if the forced outage is for discretionary plant maintenance that could be postponed in the case of imminent system reliability concerns.^{13,14} DMM agrees with the ISO that there should be inclusion of a new outage category for “urgent” outages that align with the Reliability Coordinator procedures. The new outage category would indicate the plant is operable if the system operators need the plant during tight grid conditions. The urgent outage category would reduce the ambiguity of a forced outage, while increasing system reliability by allowing the operators the ability to delay an outage if the resource is needed for reliability.

Availability and performance incentives

As mentioned in the Issue Paper, the Federal Energy Regulatory Commission (FERC) has recognized that both a capacity performance/availability derate, and availability or performance incentives are not

price will be for the “second price” which is not the bid of the winning bidder, but the second-highest bid on the demand side.

¹³ *Comments on Resource Adequacy Modeling and Program Design*, CAISO DMM, May 21, 2024:

<https://stakeholdercenter.caiso.com/Common/DownloadFile/9fc0d2a4-f615-41f0-812d-707c14f12ae4>

¹⁴ *Comments on Resource Adequacy Modeling and Program Design*, CAISO DMM, August 12, 2024:

<https://www.caiso.com/documents/dmm-comments-on-resource-adequacy-modeling-and-program-design-revised-discussion-paper-and-final-recommendation-plan-aug-12-2024.pdf>

double penalties.¹⁵ DMM sees capacity performance derate policies (e.g., UCAP), and availability or performance mechanisms as complements, and not substitutes. The performance derate is a planning mechanism, whereas a performance mechanism is an operational mechanism to incentivize performance in the day-ahead and real-time markets.

DMM appreciates that the ISO is considering a performance incentive over an availability incentive. DMM has long recommended creating performance standards in place of availability standards, and believes this would further enhance planning and grid operations.^{16,17,18,19,20} Incentivizing both availability and performance of resource adequacy capacity is becoming increasingly important as resource adequacy payments increase compared to the magnitude of potential resource adequacy availability incentive mechanism (RAAIM) charges.

Since the existing RAAIM penalty is not performance based, a supplier has the potential to avoid current availability penalties by offering capacity into the market, even though this capacity fails to perform when called upon. Implementing a performance mechanism could result in potentially very high penalties that claw back a large portion of capacity payments when resources do not deliver on critical days, and could also better incentivize suppliers to sell highly available, and dependable, capacity up front. DMM recommends the ISO further detail a pay-for-performance proposal in the forthcoming Straw Proposal.

A pay-for-performance mechanism should only be triggered during salient periods. Such periods could include for example, RMO, EEA Watch, and EEA 1-3 periods. Alerts of this fashion are highly visible, and constitute tightening market conditions. The ISO nicely summarized why all resources should be included in the Issue Paper, and DMM is in support of applying the performance mechanism to all

¹⁵ *Resource Adequacy Modeling and Program Design Issue Paper*, CAISO, November 7, 2024, p 51: <https://stakeholdercenter.caiso.com/InitiativeDocuments/Issue-Paper-Resource-Adequacy-Modeling-and-Program-Design-Nov-07-2024.pdf>

¹⁶ *2022 Annual Report on Market Issues and Performance*, CAISO DMM, July 11, 2023, p 249: <https://www.caiso.com/Documents/2022-Annual-Report-on-Market-Issues-and-Performance-Jul-11-2023.pdf>

¹⁷ *2023 Annual Report on Market Issues and Performance*, CAISO DMM, July 29, 2024, p 308: <https://www.caiso.com/documents/2023-annual-report-on-market-issues-and-performance.pdf>

¹⁸ *Comments by Department of Market Monitoring on Resource Adequacy Enhancements Issue Paper*, CAISO DMM, November 30, 2018: <http://www.caiso.com/InitiativeDocuments/DMMComments-ResourceAdequacyEnhancements-IssuePaper.pdf>

¹⁹ *Comments by Department of Market Monitoring on Resource Adequacy Enhancements*, CAISO DMM, October 20, 2023: <https://stakeholdercenter.caiso.com/Comments/AllComments/5860a092-9299-4cf2-a3f7-60efa5105b32-org-bde68f42-bf0e-4842-b152-d0cc02a2140e>

²⁰ *Comments on Resource Adequacy Modeling and Program Design*, CAISO DMM, January 30, 2024: <https://www.caiso.com/Documents/DMM-Comments-on-the-Resource-Adequacy-Modeling-and-Program-Design-Jan-16-2024-Working-Group-Jan-30-2024.pdf>

resources.²¹ DMM believes if the incentives are aligned across the interdependent policies, resources will show RA on their supply plans, and be appropriately situated to provide their capacity during tight conditions.

The penalty for the performance mechanism should be commensurate with current capacity costs, or outside sales opportunities such as regional bilateral hub prices. Enhancements to an availability or performance mechanism are required because the current incentive is incommensurate with capacity prices, and therefore resources are not proving a level of certainty in their operations to meet planning standards. This point is highlighted in the Issue Paper in figures 10 and 11.²² To align incentives between planning and operations, the penalties for performance should provide incentives to participate in bilateral RA markets, but not over-incentivize selling unavailable RA.

Take for example, a 100 MW resource that can sell capacity for \$10/kW-month. This resource is only able to provide 90 MW due to ambient temperature conditions, but under the current NQC framework could have sold the extra 10 MW without consideration of ambient limitations. Suppose there are five days of scarce conditions that each last five hours. To disincentivize over selling RA, the penalty price would need to be \$4,800 to make the resource indifferent to appropriately showing 90 MW versus 100 MW. DMM understands the ISO does not have visibility of bilateral RA prices, but it should be discussed how to approximate these prices in the working group leading up to the Straw Proposal.

Resource adequacy availability incentive mechanism enhancements

DMM suggests the ISO develop a performance mechanism rather than enhancing the existing RAAIM.²³ If the ISO chooses to pursue RAAIM enhancements, DMM agrees with the suggested RAAIM improvements in the Issue Paper.²⁴

DMM does not think it appropriate to remove RAAIM and rely only on scarcity pricing to incentivize resource availability. Scarcity pricing design that does not account for all available capacity can encourage withholding of supply to induce the scarcity mechanism, and would not serve as an appropriate incentive to maintain resources on the system for reliability.²⁵

²¹ *Resource Adequacy Modeling and Program Design Issue Paper*, CAISO, November 7, 2024, p 51:
<https://stakeholdercenter.caiso.com/InitiativeDocuments/Issue-Paper-Resource-Adequacy-Modeling-and-Program-Design-Nov-07-2024.pdf>

²² *Resource Adequacy Modeling and Program Design Issue Paper*, CAISO, November 7, 2024, p 55-56:
<https://stakeholdercenter.caiso.com/InitiativeDocuments/Issue-Paper-Resource-Adequacy-Modeling-and-Program-Design-Nov-07-2024.pdf>

²³ *2023 Annual Report on Market Issues and Performance*, CAISO DMM, July 29, 2024, p 308:
<https://www.caiso.com/documents/2023-annual-report-on-market-issues-and-performance.pdf>

²⁴ *Resource Adequacy Modeling and Program Design Issue Paper*, CAISO, November 7, 2024, p 50:
<https://stakeholdercenter.caiso.com/InitiativeDocuments/Issue-Paper-Resource-Adequacy-Modeling-and-Program-Design-Nov-07-2024.pdf>

²⁵ *2023 Annual Report on Market Issues and Performance*, CAISO DMM, July 29, 2024, p 304:
<https://www.caiso.com/documents/2023-annual-report-on-market-issues-and-performance.pdf>

DMM does agree that the existing RAIM penalty is insufficient, and DMM supports the ISO working with stakeholders to develop a penalty that is in line with capacity prices to incentivize availability, and discourage selling capacity that is known or likely to be unavailable. This could include decoupling RAIM penalty with the capacity procurement mechanism soft-offer cap price.²⁶

DMM has recommended modifying RAIM such that it is assessed to incentivize resource performance on days of tight conditions when availability is needed for system stability.²⁷ DMM supports the ISO enhancing RAIM to be assessed daily, or target days with tight conditions, e.g., RMO+. The primary consideration with limiting RAIM assessment days is the interaction with planned outage substitution assessment, and urgent/forced outages. If outages with no penalties were to induce an RMO+ day, or an EDAM RSE failure, this would lead the system into a condition the policy process is looking to avoid. Within the stakeholder process, it should be discussed as to how to incentivize resource availability that does not lead to tight conditions.

Resource visibility and backstop procurement

For backstop procurement decisions, DMM agrees it would be valuable to system reliability to include resource sufficiency tests for the gross and net peak hours for capacity. With the changing resource mix, it would also be valuable to include an energy sufficiency test that FERChas already authorized for local areas, and the test would only need to be expanded to the system.

DMM understands that under the extended day-ahead market (EDAM) design, costs associated with failing the resource sufficiency evaluation (RSE) will be allocated to metered demand. DMM continues to recommend that, to the extent possible, RSE failure costs should be allocated on a principle of cost causation.²⁸ Costs associated with failing the RSE should be allocated to those who can act to avoid the cost by preventing RSE failures.

²⁶ *Comments on Resource Adequacy Modeling and Program Design*, CAISO DMM, May 21, 2024:
<https://stakeholdercenter.caiso.com/Common/DownloadFile/9fc0d2a4-f615-41f0-812d-707c14f12ae4>

²⁷ *Comments on Resource Adequacy Modeling and Program Design*, CAISO DMM, August 12, 2024:
<https://www.caiso.com/documents/dmm-comments-on-resource-adequacy-modeling-and-program-design-revised-discussion-paper-and-final-recommendation-plan-aug-12-2024.pdf>

²⁸ *Comments on Day-Ahead Sufficiency Issue Paper*, CAISO DMM, January 5, 2024:
<https://www.caiso.com/Documents/DMM-Comments-on-EDAM-Resource-Sufficiency-Evaluation-Issue-Paper-Jan-5-2024.pdf>