Comments on Resource Adequacy Modeling and Program Design Track 2 – RAAIM Reform Presentation

Department of Market Monitoring

March 23, 2026

Overview

The Department of Market Monitoring (DMM) appreciates the opportunity to comment on the *Resource Adequacy Modeling and Program Design Track 2 – RAAIM Reform: Input Session Ahead of Straw Proposal* dated March 2, 2026.[1] In these comments, DMM adds to our previous comments dated March 13, 2025,[2] and includes additional comments on the following six issues:

- **Availability and performance incentive mechanism principles.** DMM supports reform of availability incentives and recommends adding a performance incentive so that resources are both offered and delivered when needed.
- **Temporal assessment to preserve reliability.** Emergency events and resource sufficiency evaluation (RSE) failures are too infrequent to sustain baseline availability incentives. Assessments should occur regularly to maintain reliability. Aligning any performance incentive with existing policies (e.g., EDAM RSE) reduces policy complexity.
- **Penalty incentive prices.** Penalty prices should be calibrated with interrelated policies. Availability penalties should reference an RA price benchmark to prevent cross-market arbitrage, while performance prices should align with indicators of stressed conditions (e.g., EDAM RSE) to produce clear signals during tight grid conditions.
- **Must-offer obligations.** The must-offer obligation (MOO) should continue to ensure the resource's shown RA is fully available to the market, and maintain alignment with availability and performance assessments to ensure consistent benchmarking. The MOO should ensure full market availability of expected capacity determined under unforced capacity (UCAP) and non-UCAP methodologies.
- **Storage availability and discharge feasibility.** Incentives should incorporate state-of-charge (SOC) by assessing either current SOC sufficiency or the feasibility of charging to meet discharge obligations during assessment periods.

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[1] *Resource Adequacy Modeling and Program Design Track 2 – RAAIM Reform*, California ISO, March 2, 2026: https://stakeholdercenter.caiso.com/InitiativeDocuments/Presentation-Resource-Adequacy-Modeling-and-Program-Design-Track-2-Options-for-RAAIM-Reform-Mar-2-2026.pdf

[2] *Comments on Resource Adequacy Modeling and Program Design Working Group*, Department of Market Monitoring, March 13, 2025: https://www.caiso.com/documents/dmm-comments-on-resource-adequacy-modeling-and-program-design-working-group-mar-13-2025.pdf

- **Outage definitions.** DMM supports creating an "urgent but discretionary" outage category and requests clarification on removal of the short-notice opportunity outage to preserve reliable substitution pathways and avoid unnecessary penalties.

Comments

Design principles for performance and availability incentives

DMM supports reform of the resource adequacy availability incentive mechanism (RAAIM) and continues to recommend pairing an *availability incentive* with a *performance incentive* to better align incentives with system needs during stressed grid conditions. Availability incentives motivate offers into the market, while performance incentives motivate delivery to meet schedules. This combination is more likely to achieve the policy objective of ensuring RA is available, and performs when and where needed.

In March 2025, the ISO proposed a new mechanism called Measuring Unavailable RA (MURA) that would assess unavailability during stressed grid conditions and allocate penalties for under-performance to load. The proposal introduced new designs for the definition and periods of availability assessment, the must-offer obligation, penalty prices, and cost allocation.[3] At that time, DMM supported the development of a new incentive mechanism and reiterated its recommendation for a performance incentive in addition to an availability incentive.[4]

The ISO has since revised its straw proposals and, in March 2026, presented two bookends for RAAIM reform: (1) enhancing the existing incentive mechanism, or (2) applying EDAM RSE failure surcharges and payments from the day-ahead and real-time markets. These proposals highlight the need for RAAIM reform to incent availability for RA when and where it is needed, and to ensure incentive levels and measurement are aligned with policy goals.

Availability incentives provide financial motivation for resources to bid into the market, but do not provide a financial motivation to perform, i.e., meet the resource's schedule. As a result, DMM continues to recommend that the ISO consider a performance incentive mechanism that measures a resource's schedule against its metered contribution to the system. A performance mechanism and an availability incentive are complementary and can be considered as a package to meet the operational needs of the system.

Historical experience indicates that resource availability does not necessarily result in resource performance. DMM routinely publishes metrics on RA availability and performance during tight grid conditions. The most recent report found average availability of 92 percent and 91 percent of capacity

[3] *RA Modeling and Program Design Straw Proposal Options – Track 2: Availability and Incentive Mechanisms*, California ISO, March 4, 2025: https://stakeholdercenter.caiso.com/InitiativeDocuments/Presentation-Resource-Adequacy-Modeling-and-Program-Design-Mar-03-2025.pdf

[4] *Comments on Resource Adequacy Modeling and Program Design Working Group*, Department of Market Monitoring, March 13, 2025: https://www.caiso.com/documents/dmm-comments-on-resource-adequacy-modeling-and-program-design-working-group-mar-13-2025.pdf

bid in or self-scheduled in the day-ahead and real-time, respectively. For performance, in real-time an average of 71 percent of RA capacity was scheduled, but only 66 percent responded.[5] The difference in performance is approximately seven percent of resource schedules—about 2,600 MW—that did not perform during stressed grid conditions. On the margin, this amount of capacity can be critical under stressed conditions. With the current and proposed availability incentives, this non-performing RA capacity would not be assessed penalties.

Market design should create adequate incentives while avoiding over-penalization. It is important to ensure policy goals are met without over-penalizing resources for normal maintenance and unforeseen circumstances. Under the current RA paradigm, RA should be available to ensure reliability, however in cases of physical limitations, resources can derate availability or take an outage with replacement capacity. An availability incentive and a performance incentive could be assessed at different levels of grid stress, allowing increasing penalties commensurate with system needs while maintaining reasonable treatment of maintenance and unforeseen outages.

Temporal coverage of incentives

The ISO suggested aligning availability incentive assessments with tight grid conditions, such as restricted maintenance operations (RMO) and energy emergency alert (EEA) hours, or intervals when the CAISO balancing authority area (BAA) fails the resource sufficiency evaluation (RSE).[6] DMM has previously recommended assessing RAAIM daily, targeting days of tight grid conditions (or EDAM RSE failures). However, DMM has cautioned that this approach may create capacity shortfalls if non-penalized outages were to create tight system conditions.[7] Therefore, it may be more appropriate to continue assessing the potential application of any availability incentive mechanism more frequently than only during stressed system conditions.

Over the last six years, failures of the RSE in the Western Energy Imbalance Market (WEIM) by the CAISO balancing authority area have been increasingly rare, and the CAISO BAA has experienced fewer instances of grid tightness. Figure 1 shows data on the frequency of tight grid conditions and the percentage of intervals in which the CAISO BAA failed the WEIM RSE. The left side of Figure 1 presents the percentage of intervals the CAISO BAA failed the WEIM RSE. There were no test failures in 2023 and 2025, and for 2020–2022 and 2024, the percentage of intervals was a maximum of 0.5 percent, or around 44 hours in August 2020.

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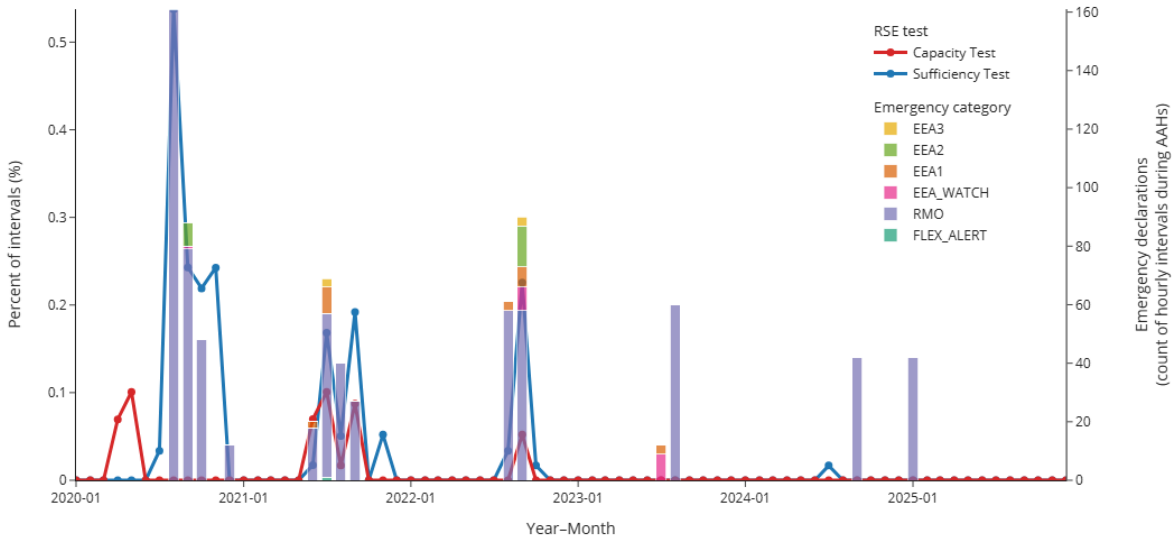
[5] *2024 Annual Report on Market Issues and Performance*, Department of Market Monitoring, August 7, 2025, p 300, table 15.6: https://www.caiso.com/documents/2024-annual-report-on-market-issues-and-performance-aug-07-2025.pdf

[6] *Resource Adequacy Modeling and Program Design Track 2 – RAAIM Reform*, California ISO, March 2, 2026: https://stakeholdercenter.caiso.com/InitiativeDocuments/Presentation-Resource-Adequacy-Modeling-and-Program-Design-Track-2-Options-for-RAAIM-Reform-Mar-2-2026.pdf

[7] *Comments on Resource Adequacy Modeling and Program Design Issue Paper*, Department of Market Monitoring, December 6, 2024: https://www.caiso.com/documents/dmm-comments-on-resource-adequacy-modeling-and-program-design-issue-paper-dec-06-2024.pdf

Under the current market design, this would be equivalent to assessing RAAIM for generic RA for roughly nine days. The right side of Figure 1 shows the number of hourly periods during the availability assessment hours where the ISO has had Flex Alerts, Restricted Maintenance Operations (RMO), or any Energy Emergency Alert (EEA)—called RMO+ intervals.[8] From 2023 to 2025, there were only 42–72 hourly intervals with RMO+ conditions in the CAISO BAA each year. Figure 1 illustrates the infrequency of tight grid conditions and supports DMM's recommendation that the ISO assess the availability incentive mechanism(s) more frequently than only during stressed grid conditions.

Figure 1. RMO+ and RSE failures from 2020-2025



DMM continues to recommend both an availability and performance incentive. The limited number of WEIM RSE failures and RMO+ conditions is due to a variety of reasons. However, DMM notes that the current must-offer obligation and RAAIM structure have likely led to an endogenous process that yields relatively few tight grid conditions. Removing or weakening regular incentives for availability could increase the frequency of tight conditions. As a result, DMM recommends against an availability incentive design that substantially reduces current incentives to provide resource availability to the market.

The 24-hour must-offer obligation (MOO) for resource adequacy capacity already provides a tacit incentive for resource availability. DMM recommends a timing approach for the availability incentive

[8] The definition of stressed grid conditions changed in April 2022, and the descriptions are presented in the Department of Market Monitoring *2022 Annual Report on Market Issues and Performance*, July 11, 2023, pp 216-219: https://www.caiso.com/documents/2022-annual-report-on-market-issues-and-performance-jul-11-2023.pdf

mechanism that is regular and formalizes the requirement to provide RA capacity during crucial hours throughout the month beyond just RMO+ or EDAM RSE failure hours. For example, the availability mechanism could be assessed in a manner similar to the supply cushion UCAP proposal by the ISO, and could carry penalties and payments for the top 20 percent of tight hours during a month.[9,10,11] The availability mechanism should ensure capacity is operationally capable throughout the market, and the incentive timing and price should reflect that in a manner commensurate with RA requirements and prices. A properly designed net qualifying capacity (NQC) accounting framework should make meeting resource availability requirements straightforward, and the availability incentive mechanism will not be unjust or punitive if the resource accurately reflects its true operational capability.

The assessment periods for availability and performance mechanisms do not need to be the same. As noted, regular availability incentives have likely contributed to the CAISO BAA avoiding tight grid conditions over the past few years. Further, resource availability does not ensure performance. DMM recommends the ISO consider a performance incentive that is assessed during tight grid conditions or EDAM RSE failures, and is aligned with current market policies, such as the EDAM RSE. Aligning a performance mechanism with existing policy reduces complexity and clarifies the incentive process.

Incentive prices

Availability and performance mechanisms should be designed to ensure that resources do not have an incentive to sell RA capacity beyond what they can reasonably expect to make available. To achieve this objective, the pricing of these mechanisms should be grounded in market conditions, such that expected penalties for non-availability exceed any potential gains from selling RA capacity that cannot reliably perform. This approach helps ensure that resources offer RA that is consistent with their expected operational capabilities, rather than making commitments that create reliability risks.

When RA capacity is shown but is unavailable or unable to perform, penalties should be sufficiently strong to discourage arbitraging the RA market and the ISO's incentive mechanisms to promote an efficient RA market. Because load-serving entities bear the cost of RA procurement, it is reasonable that penalties collected under these mechanisms be returned to load. The incentive prices must therefore be calibrated to avoid creating opportunities for resources to benefit from RA sales in bilateral markets when they lack a credible expectation of availability and performance.

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[9] *Resource Adequacy Modeling and Program Design: Modeling Improvements and Straw Proposal Leanings and Options*, California ISO, February 10-11, 2025: https://stakeholdercenter.caiso.com/InitiativeDocuments/Presentation-Resource-Adequacy-Modeling-and-Program-Design-Feb-10-2025.pdf

[10] *Resource Adequacy Modeling and Program Design: Straw Proposal Options: Track 2 Availability and Incentive Mechanisms*, California ISO, March 4, 2025: https://stakeholdercenter.caiso.com/InitiativeDocuments/Presentation-Resource-Adequacy-Modeling-and-Program-Design-Mar-03-2025.pdf

[11] *Comments on Resource Adequacy Modeling and Program Design Working Group*, Department of Market Monitoring, March 13, 2025: https://www.caiso.com/documents/dmm-comments-on-resource-adequacy-modeling-and-program-design-working-group-mar-13-2025.pdf

Several pricing methodologies have been discussed, including scaled real-time prices and RA price benchmarks.[12] Among these, DMM recommends the use of RA price benchmarks for the availability mechanism. RA price benchmarks reflect the value of bilateral RA transactions and therefore provide a penalty signal that is directly comparable to the market that the policy is designed to influence. Real-time energy prices, by contrast, reflect short-term energy market conditions and do not provide an accurate estimate of capacity value. As a result, they would not provide a stable or meaningful incentive for long-term RA availability.

DMM also supports a complementary performance incentive mechanism to ensure that resources perform when system conditions are stressed. While the availability incentive should be based on RA price benchmarks to align with bilateral RA market valuations, the performance incentive should reflect operational costs borne by the CAISO BAA during stressed grid conditions. These costs could include, for example, expenditures associated with the RSE or power balance constraints. Deriving performance incentive prices from CAISO BAA operational costs ensures that the mechanism reflects the actual system impacts of non-performance and provides a clear signal for resources to deliver capacity when it is most needed.

Taken together, the availability and performance mechanisms establish a consistent, transparent, and market-aligned incentive structure. Availability penalties based on RA price benchmarks discourage resources from offering RA capacity they cannot reliably provide, while performance incentives based on CAISO BAA costs ensure that resources are motivated to deliver operational capacity during critical system conditions. Although RA benchmark data may be available only with a lag, this issue can be addressed through stakeholder discussions to determine acceptable estimation procedures. When appropriately calibrated, both mechanisms will enhance RA market efficiency and support reliable system operations.

Lastly, DMM continues to recommend that incentive mechanisms not be netted across a month but instead be assessed on a daily basis.[13] Consider, for example, a resource that is completely unavailable for two extreme load days in a month but otherwise fully available. Under the current monthly RAAIM framework, this resource would face an approximately 1.2 percent penalty—an amount that provides little incentive to ensure availability on the most critical days. These are precisely the days when the system most needs RA capacity. A daily RAAIM assessment ensures that penalties are tied to performance on rare, stressed system-condition days, rather than being diluted through monthly averaging, thereby improving the alignment of incentives with system needs.

Must-offer obligations and performance benchmarks

[12] *Resource Adequacy Modeling and Program Design Track 2 – RAAIM Reform*, California ISO, March 2, 2026: https://stakeholdercenter.caiso.com/InitiativeDocuments/Presentation-Resource-Adequacy-Modeling-and-Program-Design-Track-2-Options-for-RAAIM-Reform-Mar-2-2026.pdf

[13] *Comments on Resource Adequacy Modeling and Program Design Revised Discussion Paper and Final Recommendation Plan*, Department of Market Monitoring, 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

Currently, ISO resources have a 24-hour MOO for RA resources up to their shown RA, or in the case of variable energy resources (VERs), the MOO matches their most recent forecast. The ISO is revisiting the MOO for a number of reasons, but importantly as it relates to RAAIM reform and the performance benchmark to assess an incentive mechanism. RAAIM is presently assessed against the RA supplied to the market, and the ISO seeks to ensure consistent treatment as these reforms progress.

DMM recommends that the ISO ensure the MOO and performance benchmark are not punitive and are aligned with the incentives built into related policies. Local regulatory authorities (LRAs) already define net qualifying capacity accounting frameworks (e.g., UCAP), and the ISO operationalizes RA obligations through the MOO and RAAIM. The MOO was originally established to ensure RA capacity is made available to the market up to the supplied RA of the resource, and DMM continues to view this as an important market design element.

The UCAP framework will establish RA capacity based on a statistical average of the availability of a resource after accounting for its forced outage rate. However, some resources under the jurisdiction of different LRAs will continue to have RA capacity determined using an installed capacity framework. The MOO should be compatible with both approaches to ensure the full expected value of RA capacity is available to the market regardless of the accounting framework used to determine capacity value.

The proposed performance benchmark would define the value against which resources are assessed under availability and performance mechanisms. DMM requests further clarity from the ISO regarding how this benchmark would be set and in what circumstances it might deviate from the current RAAIM assessment values based on supplied RA. If the benchmark simply reflects the supplied RA quantity, DMM does not see a need for changes. The existing market design already incentivizes resources to provide their supplied RA (or more) through avoided RAAIM penalties, potential over-performance payments, and opportunities to earn revenues in energy and ancillary service markets.

In reassessing the MOO, DMM also recommends that the ISO revisit the RAAIM exemption for small resources. Currently, resources below 1 MW are exempt from RAAIM. DMM recommends removing this exemption. Demand response (DR) is one of the primary categories where individual resources frequently fall below 1 MW. DMM's regular reporting on DR performance has shown that, on average, DR resources would be subject to RAAIM during tight system conditions if they were not exempt. For example, in 2024, roughly 85 percent of DR resources bid in their RA obligation, while only 70 percent of total DR capacity performed as scheduled.[14] This disparity leads DMM to recommend eliminating exemptions from any availability or performance incentive mechanism.

Lastly, when considering the balance between availability and performance mechanisms, an additional option is to maintain the MOO while using bid insertion. DMM has previously noted that requiring all resources to bid into the market—either explicitly or through bid insertion—could effectively substitute

[14] *Demand response issues and performance 2024*, Department of Market Monitoring, March 14, 2025, p 4: https://www.caiso.com/documents/demand-response-issues-and-performance-2024-mar-14-2025.pdf

for an availability incentive mechanism.[15] While DMM recommends continuing RAAIM reform, it also acknowledges the usefulness of bid insertion as a tool for ensuring availability when resources are not on outage or otherwise derated.

Battery must-offer obligations, charging, and incentive mechanisms

DMM continues to recommend that the ISO subject battery storage resources to RAAIM in a manner that reflects the state-of-charge (SOC) of the resource.[16] Some SOC-related limitations can be addressed through a UCAP accounting methodology by limiting storage resources to operational ranges that avoid reduced power output due to nonlinearities. However, there may remain cases in which a storage resource indicates availability to the market through discharge bids but lacks sufficient stored energy or charging capability to provide the offered capacity. Combined with the proposal to remove the flexible RA framework—which, in some cases, includes a charging MOO—it becomes increasingly important to determine an incentive mechanism and establish other market design elements that ensure storage resources' ability to discharge when needed.[17]

DMM recommends that the ISO develop an availability mechanism that incorporates SOC to ensure storage resources can feasibly meet their discharging obligations during assessment periods. For RA, discharging capability is the relevant operational contribution needed for system reliability, and charging is the means through which that capability is maintained. DMM recommends that the ISO work with stakeholders to formulate an incentive mechanism that evaluates whether a storage resource either has sufficient SOC or has the ability to obtain the SOC necessary to meet its discharging obligation.

An incentive mechanism could use a two-step framework to determine whether a storage resource can meet its performance benchmark. First, the mechanism could determine whether the resource currently has the SOC needed to satisfy the obligation. If not, the mechanism could then determine whether the resource has feasible charging bids in place such that it could procure SOC if required. In advisory intervals, if the market identified a need for a depleted storage resource during stressed conditions, feasible charging bids would be required for the system to rely on that resource. If the resource had such bids, it would be considered available and therefore not subject to an availability or performance penalty.

This proposed approach would remove the need for a charging MOO, including for flexible RA. However, to the extent the ISO is not able to implement a more complex approach to determining storage

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[15] *Comments on Resource Adequacy Modeling and Program Design Working Group*, Department of Market Monitoring, March 13, 2025: https://www.caiso.com/documents/dmm-comments-on-resource-adequacy-modeling-and-program-design-working-group-mar-13-2025.pdf

[16] *Comments on Resource Adequacy Modeling and Program Design Revised Discussion Paper and Final Recommendation Plan*, Department of Market Monitoring, 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

[17] *Regional Issues Forum,* WEM Regional Issues Forum, March 16, 2026, p 40: https://www.westernenergymarkets.com/documents/presentation-wem-regional-issues-forum-mar-16-2026.pdf

availability based on SOC, a charging MOO could play a similar role in supporting availability of storage capacity. DMM recommends that the ISO continue stakeholder engagement to develop an availability incentive mechanism for storage that incorporates both the SOC during the assessment period and the potential ability of the resource to obtain SOC through feasible bids.

Outage types

DMM continues to recommend introducing an additional outage type that identifies outages that are urgently required but discretionary during stressed system conditions.[18] Forced outages, as currently defined, are requested within seven days of the start of the outage and may lead to local or system reliability concerns. Given these implications, DMM recommends that the ISO enhance outage reporting requirements so that scheduling coordinators clearly indicate whether a forced outage is immediately necessary for plant operation or is discretionary maintenance that could be postponed in the event of imminent system reliability concerns.

DMM also seeks further clarification regarding the proposed removal of short-notice opportunity outages. During the March 2026 workshop, the ISO indicated that substitution capacity is not being used and therefore may no longer be offered within the forced outage timeframe. Given the potential for increased penalties under revised incentive mechanisms, DMM finds it prudent to continue allowing resources to provide substitute capacity. Such a provision would support system reliability while allowing the outage and avoiding unnecessary penalties. DMM requests additional information from the ISO regarding this proposal, and the implications for outage management and substitute capacity provisions.

[18] *Comments on Resource Adequacy Modeling and Program Design January 16, 2024 Working Group*, Department of Market Monitoring, 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