

Comments on Resource Adequacy Modeling and Program Design Track 2 – Straw Proposal

Department of Market Monitoring

June 4, 2026

Overview

The Department of Market Monitoring (DMM) appreciates the opportunity to comment on the *Resource Adequacy Modeling and Program Design Track 2 Straw Proposal* and May 15, 2026 stakeholder presentation.^{1,2} In these comments, DMM adds to our previous comments dated March 23, 2026, and includes additional comments on the following seven issues:³

- **RAAIM assessment timing.** DMM recommends resource adequacy availability incentive mechanism (RAAIM) assessments occur with enough frequency to enforce the must-offer obligation and maintain system reliability. The selection of the buffer when calculating the tier 1 framework should be clearly detailed.
- **Penalty incentive prices.** Penalty prices should be calibrated with interrelated policies. Availability penalties should create a penalty price that is commensurate with bilateral resource adequacy (RA) prices. The proposed penalty price structure does not empirically create a strong enough financial penalty to disincentivize selling RA capacity in the bilateral markets that may be unavailable.
- **Must-offer obligations and categorical exemptions.** 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. DMM supports the removal of the categorical RAAIM exemptions.
- **Storage availability and discharge feasibility.** The ISO should assess RAAIM under the proposed modeled solution for resource nonlinearity. 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.

¹ *Resource Adequacy Modeling and Program Design – RAAIM and Outage Substitution (Track 2) – Straw Proposal*, California ISO, May 11, 2026: <https://stakeholdercenter.caiso.com/InitiativeDocuments/Straw-Proposal-Resource-Adequacy-Modeling-and-Program-Design-Track-2-May-12-2026.pdf>

² *Resource Adequacy Modeling & Program Design Track 2: RAAIM & Outage Substitution Straw Proposal*, California ISO, May 15, 2026: <https://stakeholdercenter.caiso.com/InitiativeDocuments/Presentation-Resource-Adequacy-Modeling-and-Program-Design-Track-2-May-15-2026.pdf>

³ *Comments on Resource Adequacy Modeling and Program Design Track 2 – RAAIM Reform Presentation*, Department of Market Monitoring, March 23, 2026: <https://www.caiso.com/documents/dmm-comments-on-rampd-track-2-raaim-reform-mar-02-2026-input-session-ahead-of-straw-proposal-mar-23-2026.pdf>

- **Outage substitution.** DMM recommends the ISO more thoroughly explain how the “shopping cart” solution will increase outage substitution, given that it will take time and resources to develop.
- **Performance incentive mechanism design.** DMM continues to recommend the ISO develop a performance incentive to complement the availability incentive.

Comments

DMM supports the tiered RAAIM assessment framework, and recommends the ISO ensure there is sufficient frequency of RAAIM assessment periods to ensure system reliability

DMM supports a RAAIM assessment approach that increases the frequency of assessment periods beyond the previously proposed approach of assessing only during tight grid conditions, such as Energy Emergency Alerts (EEAs) and EDAM resource sufficiency evaluation (RSE) failures. DMM’s prior comments show that tight system conditions are relatively infrequent, and note that the current must-offer obligation and RAAIM structure may endogenously improve system reliability. As a result, increasing the frequency of RAAIM assessment periods may be necessary to ensure system reliability.⁴

As a design principle, the availability mechanism should ensure capacity is operationally capable throughout the market, with incentive timing and price aligned with system needs, and commensurate with RA requirements and prices. Any RAAIM assessment design should approximate a financial incentive mechanism tied to the must-offer obligation (MOO) to ensure that RA capacity is made available to the market.

Under the ISO’s latest proposal, RAAIM would be triggered on a two-tiered assessment framework. The first tier would be activated during periods of elevated reliability risk, and the second tier during critical capacity insufficiencies. The first tier remains undefined but is proposed to estimate elevated reliability risk from load forecasts, shown RA, outage rates, and uncertainty buffers. DMM provides comments on this aspect of the proposal below. The second tier is specified as periods when the CAISO balancing authority area (BAA) fails the EDAM RSE.

DMM supports the clarity of the tier 2 trigger, but requests the ISO define the method in which this information will be communicated to the market. EDAM RSE failures are not known until approximately 9 a.m. on the prior day, providing limited time for generators to adjust forward operating decisions to increase availability. This limitation is further compounded by the fact that the tier 2 trigger provides less advance notice than the tier 1 proposal, while being associated with higher penalties.

The tier 1 assessment period is proposed as a daily framework to identify significant levels of resource inadequacy risk several days in advance of expected scarcity. The operational assessment would occur daily from T-8 days through the operating day, and once triggered, the tier 1 condition would remain in effect.

⁴ *Ibid.*

DMM recommends the ISO clearly define the tier 1 trigger framework to ensure the RAAIM framework produces the desired incentive for availability

DMM supports the general structure and advance-notice approach of the tier 1 RAAIM assessment period. DMM continues to emphasize that the availability mechanism should ensure capacity is operationally capable throughout the market, with incentive timing and price aligned with system needs and commensurate with RA requirements and prices. Accordingly, DMM recommends the ISO design a method to ensure RAAIM is assessed with sufficient frequency to approximate a commensurate RA price signal.

Under the current proposal, the ISO specifies the energy-based prices to be applied during RAAIM assessment periods. Therefore, the resulting incentive strength will depend primarily on the design and calibration of the assessment trigger timing because prices are independent of the assessment trigger itself. Because the incentive strength is a function of price and frequency of RAAIM assessment, and the tier 1 formulation treats price as exogenous, the availability incentive effectiveness will be reliant on the frequency of the tier 1 trigger.

To determine the days on which RAAIM would be assessed, the ISO must define the input variables that trigger an elevated reliability risk under the tier 1 framework. Based on the proposed inputs—load, supplied RA, and outages—available resources on the CAISO system were sufficient to meet system requirements in 2025 and would not have triggered a RAAIM assessment period. Therefore, activation of the assessment trigger in 2025 would depend on the inclusion and calibration of an uncertainty buffer.

Figure 1 examines how different buffer levels affect the frequency with which the RAAIM trigger would be met. For this analysis, each day's load and ancillary service requirements are referred to as the "market requirement". This market requirement is then compared to RA capacity offered to the market, accounting for outages and demonstration of unavailability reflected in bids. To evaluate potential trigger frequencies, results are shown after applying a range of different multipliers to the market requirement, increasing up to 50 percent to represent varying the uncertainty buffer level. Results of these different scenarios are shown in Figure 1.

Figure 1 indicates that relatively low multipliers—values from zero to 20 percent—would have resulted in few RAAIM assessment days in 2025.⁵ A 10 percent buffer would have one RAAIM assessment day, while a 20 percent buffer would have resulted in five days over the year. In contrast, higher buffer levels increase the frequency materially, with a 30 percent buffer leading to 46 days, and 40 and 50 percent buffers yielding 180 and 274 days, respectively.

⁵ DMM acknowledges 2025 was a mild year, and loads were lower than other potential comparison years such as 2020 or 2022. This is an illustrative exercise to demonstrate how a potential formulation of the buffer maps onto potentially triggering RAAIM assessment days.

Figure 1. Insufficient RA bid into the real-time market to meet market requirements under different potential buffer percentages

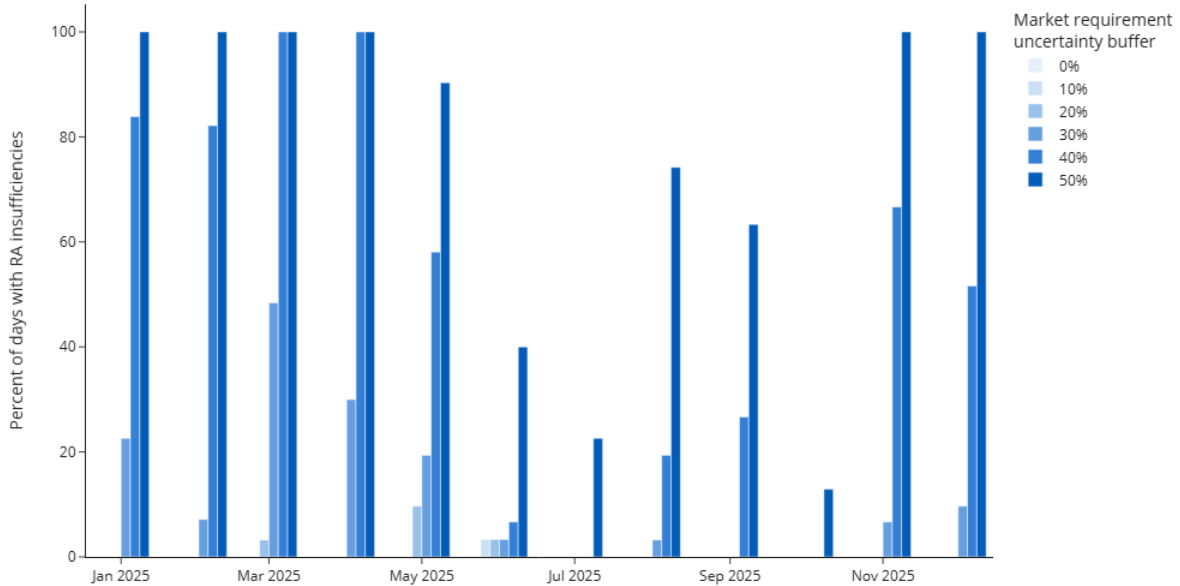


Figure 1 also shows a seasonal pattern in the risk of insufficient RA being bid into the real-time market to meet requirements. The local regulatory authorities (LRAs) and ISO focus much of their reliability planning for the summer months and bring surplus supply to meet potentially large system demand in these months as a result of high loads and the planning reserve margin. This results in greater RA supply and the capability of the system to meet higher values of the buffer, resulting in the RAIM assessment being triggered less often during these periods. DMM does not recommend adopting the specific framework used in Figure 1 to determine the appropriate buffer, but highlights the magnitude of the buffer required to trigger RAIM assessment days, as well as the seasonality in trigger frequency.

Given that summer months typically are the most constrained, DMM recommends that the ISO consider seasonal adjustments for the trigger. Further, DMM recommends the ISO maintain the ability to update the buffer on an annual basis. Because the buffer will play a central role in determining RAIM assessment frequency, the ISO could leverage existing processes, such as the Summer Loads and Resources Assessment, to inform calibration of the elevated reliability risk buffer level.⁶

Lastly, because RAIM functions as a financial incentive mechanism for MOO compliance, and the MOO applies across all hours of the day, DMM finds it reasonable that the RAIM assessment period apply over the full day. With evolving load shapes and system needs, tight grid conditions may not be limited

⁶ 2026 Summer Loads and Resources Assessment, California ISO, May 4, 2026: <https://www.caiso.com/documents/2026-summer-loads-and-resources-assessment.pdf>

to the evening hours, as assumed in the current RAAIM design. Therefore, when a RAAIM assessment day is triggered, the associated penalty framework should apply across all hours of the day.

RAAIM incentive prices should lead to penalties for unavailable RA that are commensurate with RA prices

RAAIM incentive prices should be designed to ensure that resources do not have an incentive to sell RA capacity in excess of what they can reasonably expect to make available. RAAIM penalty pricing should be tied to market conditions such that expected penalties for non-availability exceed any potential gains from selling RA capacity that cannot reliably perform. This would help align RA supply with expected operational capabilities.

Under the proposed two-tiered RAAIM assessment framework, the ISO has proposed penalties be tied to day-ahead locational marginal price (LMP) for tier 1 and the hard bid cap of \$2,000/MWh for tier 2. To contextualize these values relative to current RA prices, consider an illustrative price of \$1,000/MWh. If a resource is one MW short for one hour, that translates to a RAAIM penalty of \$1/kW-month.⁷ Based on the 2023 California Public Utilities Commission Resource Adequacy Report, system RA capacity prices for 2025 averaged at \$14.60/kW-month, with the 85th percentile at \$25.00/kW-month.⁸ Under these assumptions, a resource providing unavailable RA capacity would need to be assessed penalties for approximately 15 to 25 hours for the total penalty to be commensurate with the RA payment received at this price level.⁹

Figure 2 presents DMM’s estimate of the average day-ahead system marginal energy cost (SMEC) in 2025 during intervals when the hypothetical RAAIM assessment trigger identified in Figure 1 would be met. DMM identifies these intervals as those in which available RA capacity is insufficient to meet the market requirement, inclusive of the applied uncertainty buffer at different potential levels. For these intervals, DMM calculates the average day-ahead SMEC to approximate the expected cost of RAAIM penalties under the proposal. This analysis shows that average prices varied from \$31/MWh to \$80/MWh, with a mean and median of approximately \$51/MWh.

With the tier 1 penalties currently proposed by the ISO, a resource supplying unavailable RA capacity would need to be assessed RAAIM for approximately 300 to 500 hours within that month, at the average day-ahead SMEC, for the total penalties to be commensurate with the RA prices cited above. This estimate excludes the potential impact of tier 2 penalties. However as noted previously, the CAISO BAA

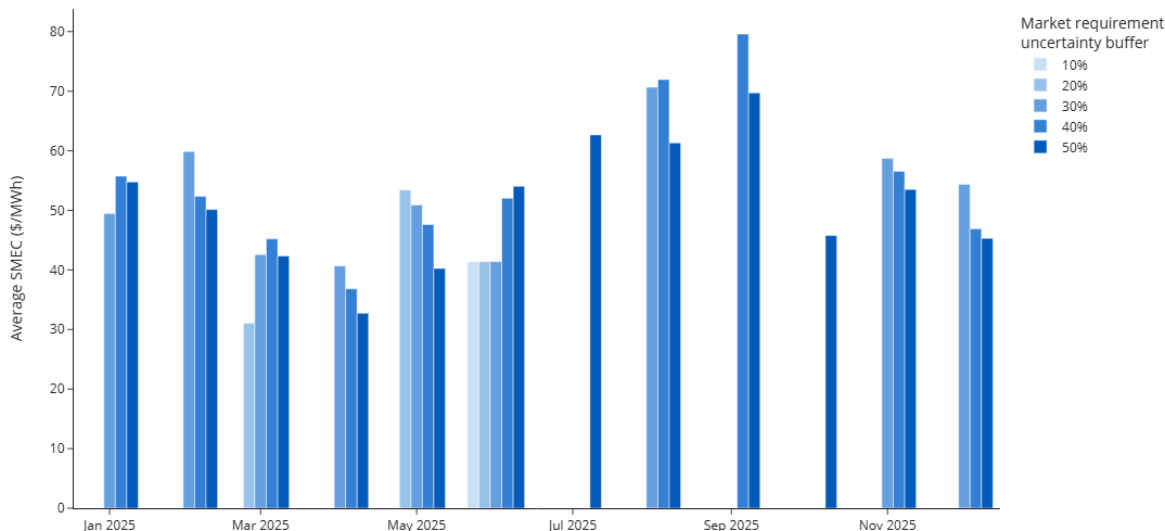
⁷ This value was calculated as: $\frac{\$1,000}{MWh} \times \frac{1MWh}{1,000kWh} \times \frac{1hour}{month} = \frac{\$1}{kW-month}$

⁸ 2023 Resource Adequacy Report, California Public Utilities Commission, August 2025, p 25: <https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/resource-adequacy-homepage/2023-resource-adequacy-reportv2.pdf>

⁹ These values are calculated taking the average prices from the report, and dividing them by the \$1/kW-month calculation to result in the number of hours per month a resource would need to be assessed a RAAIM payment.

rarely fails the WEIM RSE, and thus there is a low expectation of the CAISO BAA failing the EDAM BAA and triggering the tier 2 penalties.¹⁰

Figure 2. Average day-ahead prices for intervals available RA is insufficient to meet the market requirement



Based on this analysis of 2025 conditions, DMM recommends the ISO work with stakeholders to refine the appropriate timing and magnitude of the RAIM assessment to ensure it provides incentives for resources to be available during tight grid conditions and maintain a reliable system. As proposed, it does not appear that the tier 1 penalties would exceed the potential bilateral RA cost in some cases, and therefore may not be sufficient disincentive to selling RA capacity that an entity expects may be unavailable. DMM has long recommended RAIM reform because if RAIM penalties become insignificant compared to potential resource adequacy payments, suppliers may be willing to sell resource adequacy capacity that is more likely to be unavailable, or to incur forced outages for a significant portion of the month.¹¹

DMM continues to recommend 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

¹⁰ *Comments on Resource Adequacy Modeling and Program Design Track 2 – RAIM Reform Presentation*, Department of Market Monitoring, March 23, 2026: <https://www.caiso.com/documents/dmm-comments-on-rampd-track-2-raim-reform-mar-02-2026-input-session-ahead-of-straw-proposal-mar-23-2026.pdf>

¹¹ *2024 Annual Report on Market Performance & Issues*, Department of Market Monitoring, August 7, 2025, p 35: <https://www.caiso.com/documents/2024-annual-report-on-market-issues-and-performance-aug-07-2025.pdf>

directly comparable to the market that the policy is designed to influence.¹² 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. 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.

DMM requests the ISO further detail the interactions of RAAIM payments to load and the interplay with the EDAM RSE

In the straw proposal, the ISO has proposed that some of the excess revenues from RAAIM penalties may be returned to load, or load serving entities (LSEs). DMM requests the ISO further detail this design element as it plays an important role in incentive compatibility.

The proposal maintains the revenue-neutrality of RAAIM, and returns non-availability charges to resources or scheduling coordinators (SCs) that are eligible for incentive payments, as well as load. However, the proposal has minimal detail, and the proposed design interacts closely with the EDAM RSE. Under the tier 2 design, RAAIM penalties are triggered by EDAM RSE failures, and the EDAM RSE framework allocates failure costs to SCs and LSEs. Specifically, EDAM RSE penalties are first allocated to any SC or LSE deficient in their RA supply, and remaining costs are allocated *pro rata* to metered demand and exports.

Due to the cost allocation and incentive payment interplay, DMM recommends the ISO more clearly specify how RAAIM revenues will be distributed across SCs, LSEs, and resources to ensure transparent and consistent incentives. Here are a few categories worth considering, but not an exhaustive list:¹³

1. No RA deficiencies but an EDAM RSE failure with costs allocated to LSEs. If costs are allocated broadly to LSEs, DMM recommends clarifying whether RAAIM revenues would be returned to those same LSEs responsible for an EDAM RSE failure, and whether such returns would be *pro rata* or targeted based on contribution to reliability.
2. RA-deficient LSE that had unavailable RA in the EDAM RSE causing the deficiency. If an LSE contributes to both an RA deficiency and an EDAM RSE failure, DMM recommends clarifying whether that entity would remain eligible for RAAIM-related payments under a *pro rata* allocation. The design should ensure that entities are not effectively insulated from the consequences of non-performance through offsetting payments.

¹² *Comments on Resource Adequacy Modeling and Program Design Track 2 – RAAIM Reform Presentation*, Department of Market Monitoring, March 23, 2026: <https://www.caiso.com/documents/dmm-comments-on-rampd-track-2-raaim-reform-mar-02-2026-input-session-ahead-of-straw-proposal-mar-23-2026.pdf>

¹³ This is a 2-by-2 matrix of LSEs that are RA sufficient and deficient, and passing and not-passing the EDAM RSE. There are additional cases to consider, however these are salient cases to ensure that the incentive compatibility is aligned. The case of there being RA sufficiency and passing the EDAM RSE is not contemplated.

3. RA-deficient LSEs and the CAISO BAA passes the EDAM RSE (tier 1 RAAIM assessment). If the CAISO BAA passes the EDAM RSE despite the LSEs being RA-deficient, DMM recommends clarifying whether RAAIM revenues would prioritize those entities that met their obligations, rather than being broadly distributed.

DMM recommends these interactions be explicitly addressed for both tier 1 and 2 RAAIM frameworks, with particular attention paid to the tier 2 framework. Considering the differences between SCs and LSEs, DMM recommends the ISO carefully consider the incentives shared across these entities to ensure the interplay between the EDAM RSE and RAAIM are incentive compatible.

Finally, DMM recommends the ISO consider how the payment allocations interact with the fact that the resources have received RA payments. Ensuring that RAAIM revenue does not dilute or offset the intended incentive structure will be important to maintaining appropriate availability incentives.

DMM supports the must-offer obligation approach and the removal of the categorical exemptions

In the straw proposal, the ISO proposes the MOO for system RA resources should be set to reflect the operational capacity of the resource. DMM supports the proposal as it will ensure the MOO and performance benchmark 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 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. Aligning the MOO with the operational capability of the resource, accounting for any UCAP deration, would be compatible with both approaches because it will ensure the full expected value of RA capacity is available to the market regardless of the accounting framework used to determine capacity value.

The ISO further extends the proposal to cover cases in which resources are partially shown and have partial capacity deliverability status (PCDS). The proposal defines the MOO for these resources as shown RA scaled by the ratio of the Pmax (or full operational capability) to the net-qualifying capacity of the resource. This is consistent with DMM's prior recommendations, and ensures the MOO reflects the full expected value of RA capacity. Aligning the MOO in this manner helps prevent resources from selling RA of the resource beyond their expected operational capability, while maintaining consistency with the resource's expected reliability contribution.

In reassessing the MOO, DMM agrees with the proposal to remove the RAAIM exemption for small resources and instead allow management of RAAIM exposure with exempt outage natures of work cards in the Outage Management System. Further, DMM agrees with the reduction in categorical RAAIM exemptions to full resource categories, such as variable energy resources (VERs). The proposal will assess RAAIM to VERs when there are outages, but allow an exemption when the resource is limited due to the variable nature of the resource generating technology.

DMM recommends the ISO further develop an availability incentive structure for battery storage beyond the modeled solution for nonlinearity

The ISO proposes that storage resources remain subject to RAAIM based on their MW of supplied RA, while indicating that a forthcoming modeled solution from the Storage Design and Modeling initiative will address resource nonlinearity (i.e., foldback). The ISO states that this modeled solution will allow storage resources to submit their full MOO, with the market ensuring bid feasibility despite nonlinearity. Under this approach, the ISO does not expect interactions with RAAIM, as resources would be able to meet their MOO without submitting outage cards.

DMM continues to recommend the ISO subject resources to RAAIM with the modeled nonlinearity solution.¹⁴ Storage resources experiencing foldback have a reduced power output in the extremes of the resource's state-of-charge (SOC), and should be subject to RAAIM for those power output limitations. Excluding such limitations will create the incentive to optimize resource configurations to minimal energy-to-power ratios. Furthermore, storage degradation over time can further reduce effective SOC and available output capability. Without appropriate performance incentives, resources may face diminished incentives to maintain operational capability consistent with their RA obligations.

Finally, 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.^{15,16} DMM has observed instances where storage resources indicate availability to the market through discharge bids but lack sufficient stored energy or charging capability to provide the offered capacity. DMM recommends that the ISO develop an availability mechanism that considers SOC to ensure storage resources can feasibly meet their discharging obligations through either having sufficient SOC or the charging ability to obtain the SOC necessary to meet its discharging obligation.

¹⁴ *Comments on Storage Design and Modeling Working Group Presentation on January 22, 2026*, Department of Market Monitoring, February 17, 2026: <https://www.caiso.com/documents/dmm-comments-on-storage-design-and-modeling-jan-22-2026-working-group-presentation-feb-17-2026.pdf>

¹⁵ *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>

¹⁶ *Comments on Resource Adequacy Modeling and Program Design Track 2 – RAAIM Reform Presentation*, Department of Market Monitoring, March 23, 2026: <https://www.caiso.com/documents/dmm-comments-on-rampd-track-2-raaim-reform-mar-02-2026-input-session-ahead-of-straw-proposal-mar-23-2026.pdf>

DMM requests the ISO demonstrate the need for the “shopping cart” outage substitution solution

DMM continues to recommend developing an outage substitution solution that will reduce search and coordination frictions, reduce market power concerns, and be designed to disincentivize strategic interactions between market participants.¹⁷ DMM’s recommendation is for a reverse second price auction, however the ISO has indicated the design of the auction would be exceedingly complicated and proposed an alternative design for a “shopping cart” approach.

DMM requests the ISO further detail their recommended approach, and given it will take time and resources to develop, how it will be a useful improvement on the current bilateral outage substitution procedures. DMM believes increasing RAIM penalties to be commensurate with RA costs will further incentivize resources to procure outage substitution. DMM recommends the ISO carefully consider costs and benefits of the shopping cart, taking into account that the primary benefit would be if the shopping cart directly addresses some of the stated reasons entities don’t procure replacement capacity today.

DMM recommends the ISO work with stakeholders to develop a performance-based incentive structure

DMM continues to recommend the introduction of a performance incentive, as pairing an availability incentive with a performance incentive will better align incentives with system needs during stressed grid conditions.¹⁸ 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.

DMM understands the ISO has decided to delay the development of a performance-based incentive mechanism. However, DMM recommends the ISO work with stakeholders to develop an appropriate performance mechanism.

¹⁷ *Comments on Resource Adequacy Modeling and Program Design Track 2: Outage and Substitution Straw Proposal*, Department of Market Monitoring, September 19, 2026: <https://www.caiso.com/documents/comments-on-resource-adequacy-modeling-and-program-design-track-2-outage-and-substitution-straw-proposal-sep-19-2025.pdf>

¹⁸ *Comments on Resource Adequacy Modeling and Program Design Track 2 – RAIM Reform Presentation*, Department of Market Monitoring, March 23, 2026: <https://www.caiso.com/documents/dmm-comments-on-rampd-track-2-raim-reform-mar-02-2026-input-session-ahead-of-straw-proposal-mar-23-2026.pdf>