January 29, 2018

The Honorable Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Re: California Independent System Operator Corporation Docket No. ER18-___-000

Tariff Amendment to Modify Resource Adequacy Availability Incentive Mechanism Methodology

Dear Secretary Bose:

The California Independent System Operator Corporation (CAISO) submits this tariff amendment to modify the methodology used to evaluate the availability of resource adequacy resources and to calculate the resulting charges and payments under the Resource Adequacy Availability Incentive Mechanism (RAAIM).[1]

In assessing RAAIM performance and settlement after RAAIM became financially binding on April 1, 2017, the CAISO identified issues with, and problematic outcomes resulting from, the approved RAAIM availability methodology. The existing RAAIM methodology over-weights the availability of flexible resource adequacy (RA) capacity, compared to generic RA capacity, and assesses performance in a manner that skews performance incentives and inadvertently incentivizes resources to act contrary to the best interests of maintaining grid reliability at a just and reasonable cost. The proposed revisions to the RAAIM methodology will address the issues identified by the CAISO and measure resource availability more appropriately.

The CAISO requests that the Commission accept these tariff revisions effective April 1, 2018. Because the proposed tariff revisions include a two-month advisory period, financially binding charges and payments under the new availability methodology would start with the June 1, 2018, trading day.

[1] The CAISO submits this filing pursuant to section 205 of the Federal Power Act (FPA), 16 U.S.C. § 824d (2012).

I. Background

A. The RAAIM Tariff Provisions

The CAISO implemented RAAIM on November 1, 2016, as part of phase 1A of its reliability services initiative.[2] RAAIM is a bid-based mechanism to incent resources providing RA capacity to meet their must-offer obligations and provide substitute capacity if they go on forced outage.[3]

Section 40.9 of the CAISO tariff sets forth the terms and conditions for RAAIM. Through its settlements process, the CAISO assesses charges (called non-availability charges) and makes payments (called availability incentive payments) to resources providing RA capacity, based on the average of their availability (called an availability assessment) over each calendar month.[4] RAAIM evaluates availability based on the extent to which resources providing RA meet their must-offer obligations in each availability assessment hour of the day to bid three types of capacity into the CAISO markets: (1) local and/or system (also sometimes called generic) RA capacity; (2) flexible RA capacity;[5]

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[2] On October 1, 2015, the Commission approved RAAIM as part of its approval of the CAISO's Phase 1A reliability services initiative tariff amendment filing (Phase 1A Tariff Amendment). *Cal. Indep. Sys. Operator Corp.*, 153 FERC ¶ 61,002 (2015) (Phase 1A Order). In the Phase 1A Order, the Commission also directed the CAISO to make several tariff modifications on compliance. The Commission accepted the CAISO's compliance filing by letter order issued in Docket No. ER15-1825-002 on March 30, 2016. On October 2, 2017, the CAISO filed a tariff amendment in Docket No. ER18-1-000 to implement phase 1B and phase 2 of the reliability services initiative, including revisions to the RAAIM tariff provisions (Phase 1B and Phase 2 Tariff Amendment). The Commission accepted the Phase 1B and Phase 2 tariff amendment effective February 15, 2018, as requested by the CAISO. *Cal. Indep. Sys. Operator Corp.*, 162 FERC ¶ 61,042 (2018).

[3] RAAIM replaced the standard capacity product, which was a tariff mechanism that assessed the performance of resources providing RA capacity based on whether they were on forced outage. *See* Transmittal letter for Phase 1A Tariff Amendment at 6-7, 29. The purpose of substitute capacity is to provide capacity needed due to outages of RA resources. *See* tariff appendix A, existing definition of "RA Substitute Capacity." For the sake of clarity, this filing distinguishes between existing tariff sections (*i.e.*, sections in the existing CAISO tariff), revised tariff sections (*i.e.*, sections in the existing tariff that the CAISO proposes to revise in this filing), proposed tariff sections (*i.e.*, new tariff sections that the CAISO proposes to add in this filing), and deleted tariff sections (*i.e.*, sections in the existing CAISO tariff that the CAISO proposes to delete in this filing).

[4] Existing tariff section 40.9.1. Certain RA capacity is exempt from RAAIM under existing tariff section 40.9.2.

[5] The tariff defines flexible RA capacity as the capacity of a resource that is operationally able to respond to dispatch instructions to manage variations in load and variable energy resource output. Tariff appendix A, existing definition of "Flexible Capacity." The tariff defines flexible RA capacity as the flexible capacity of a resource listed on a load-serving entity's flexible RA capacity plan and a resource flexible RA capacity plan. Tariff appendix A, existing definition

and (3) overlapping RA capacity, *i.e.*, megawatts of capacity counted as both of capacity.[6] The current RAAIM combines all three types of capacity in a single availability evaluation according to the processes described below.

The RAAIM availability assessment hours differ for generic RA capacity and for the three categories of flexible RA capacity:

- For generic RA capacity, the availability assessment hours are a pre-defined set of five consecutive hours that apply to each trading day that is a weekday and is not a federal holiday.[7] The five assessment hours must "correspond to the operating period when high demand conditions typically occur and when the availability of Resource Adequacy capacity is most critical to maintaining system reliability" and "vary by season as necessary so that the coincident peak load hour typically falls within the five-hour range each day during the month."[8] Prior to each resource adequacy compliance year, the CAISO establishes the RAAIM assessment hours for generic RA capacity for that year.[9]

- For category 1 flexible RA capacity, the availability assessment hours are 17 consecutive hours (from 5:00 a.m. through 10:00 p.m.) that apply every day.[10]

- For category 2 flexible RA capacity, the availability assessment hours are five consecutive hours that apply every day.[11] The CAISO determines the five assessment hours on a seasonal

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of "Flexible RA Capacity". There are three categories of flexible RA capacity: capacity from base ramping resources (also sometimes called category 1), capacity from peak ramping resources (also sometimes called category 2), and capacity from super-peak ramping resources (also sometimes called category 3). Existing tariff section 40.10.3.

6 Existing tariff sections 40.9.3-40.9.5. Resources with generic RA capacity can also meet their must-offer obligations by submitting self-schedules. Existing tariff section 40.9.3.1(b). In this transmittal letter, references to bidding of capacity also encompass self-scheduling of generic RA capacity. The must-offer obligation is subject to specified exceptions related to approved maintenance outages and forced outages. Existing tariff sections 40.9.3.4-40.9.3.6.4.

7 Existing tariff section 40.9.3.1(a). For both generic RA capacity and flexible RA capacity, the referenced existing tariff sections also include other requirements that are not relevant to this tariff amendment.

8 Existing tariff section 40.9.3.1(a)(2).

9 Existing tariff section 40.9.3.1(a)(1).

10 Existing tariff sections 40.9.3.2(a) and 40.10.3.2(a).

11 Existing tariff sections 40.9.3.2(a) and 40.10.3.3(a).

basis.[12]

- For category 3 flexible RA capacity, the availability assessment hours are five consecutive hours that apply to each weekday and is not a federal holiday.[13] The CAISO determines the five assessment hours on a seasonal basis.[14]

- Where a resource provides both generic and flexible RA capacity and the capacity types for which that resource is shown have an availability assessment hour during the same hour (*i.e.*, there is an overlapping obligation), the CAISO assesses availability based on the type of capacity with the more restrictive must-offer obligation.

Through RAAIM, the CAISO translates the availability of capacity during the availability assessment hours into a resource-specific monthly availability percentage. If a resource falls below 94.5 percent of its must-offer obligation regarding the three types of capacity, it pays a non-availability charge for the month; if the resource exceeds 98.5 percent (up to a ceiling of 100 percent) of its must-offer obligation, it is eligible for an availability incentive payment for the month; and if the resource meets between 94.5 and 98.5 percent of its must-offer obligation, it neither receives an availability incentive payment nor pays a non-availability charge for the month.[15]

The greater the deviation above or below those percentage levels, the larger the availability incentive payment or non-availability charge, respectively, will be.[16] The assessment of non-availability charges fund the availability incentive payments entirely.[17] If non-availability charges exceed availability incentive payments in a month, the excess amount rolls over to the next month, and the CAISO can use them to make availability incentive payments for that next month. The CAISO allocates any non-availability charges left over at the end of an RA compliance year to load-serving entities based on their load ratio share for that year.[18] Because of the self-funding approach, a resource may not receive an availability incentive payment in a month when few or no resources pay a non-availability charge and there are no excess undistributed charges from prior months available.

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[12] Existing tariff section 40.10.3.3(a)(1).

[13] Existing tariff sections 40.9.3.2(a) and 40.10.3.4(a). On a given day, the five consecutive availability assessment hours for category 2 or category 3 flexible RA capacity can be, but need not be, the same as the five consecutive availability assessment hours for generic RA capacity.

[14] Existing tariff section 40.10.3.4(a)(1).

[15] Existing tariff section 40.9.6.

[16] Existing tariff sections 40.9.6.1-40.9.6.2.

[17] Existing tariff section 40.9.6.2(a).

[18] Existing tariff section 40.9.6.2(d).

In the Phase 1A Order, the Commission found that "replacing the standard capacity product with RAAIM will enhance the incentives for resource adequacy resources to fulfill their must-offer obligations, thereby improving CAISO's ability to efficiently and reliably operate the grid."[19] The Commission also found that, "by assessing availability incentive payments and non-availability charges as proposed, the RAAIM will provide clear incentives for these resources to bid economically into CAISO's markets."[20] Further, the Commission found that the CAISO's proposal "encourages the acquisition of adequate substitute capacity."[21]

Although RAAIM went into effect on November 1, 2016, for five months thereafter (*i.e.*, until April 1, 2017), the CAISO calculated non-availability charges and availability incentive payments for advisory purposes only.[22] During that period, the CAISO published the calculated charges and payments but did not include them on invoices for financial settlement.

B. Need for Filing

Shortly after the April 1, 2017, start of binding RAAIM settlements, some market participants raised questions about the validity of their non-availability charges and availability incentive payments. After reviewing their settlement statements, they advised the CAISO that the RAAIM formula was producing unexpected results. In response, the CAISO undertook a comprehensive review of the methodology for performing RAAIM settlement calculations. After additional examination and scenario testing of the RAAIM calculation spreadsheet developed during the Phase 1A policy development process,[23] the CAISO realized that the approved RAAIM methodology was over-weighting category 1 flexible RA capacity and devaluing generic RA capacity in a manner that skewed the results of the RAAIM assessment and produced financial settlement outcomes that were inconsistent with the overarching goals of RAAIM and the reliability services initiative. The CAISO further realized that this suboptimal measurement approach degraded RA resource's incentives to meet their generic RA capacity offer obligations and to provide substitute capacity.

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19 Phase 1A Order at P 29.

20 *Id.* at P 88.

21 *Id.* at P 93.

22 Existing tariff section 40.9.1 states that the advisory period will be two months (*i.e.*, would last until January 1, 2017, given implementation of RAAIM on November 1, 2016). The Commission later granted a CAISO petition for limited tariff waiver that extended the advisory period by an additional three months. *Cal. Indep. Sys. Operator Corp.*, 158 FERC ¶ 61,108 (2017).

23 The spreadsheet is available at http://www.caiso.com/Documents/ResourceAdequacyAvailabilityIncentiveMechanismCalculationCalculator.xls. This is the same spreadsheet that was provided in the Phase 1A tariff process, but a hidden tab in the original is now unhidden.

These issues were not identified during testing or the RAAIM advisory period.

The existing methodology has two inter-related problems that result in imprecisely measuring RA capacity's availability. The methodology: (1) weights all hours with a must-offer obligation equally in assessing availability even though different categories of RA capacity are assessed over a different (and often significant) number of hours; and (2) assesses availability (for practical terms) in megawatt-hours (MWh) even though RA is a capacity product measured in megawatts (MW).

The first issue reflects that RAAIM assesses the availability of RA capacity in different hours and a different number of hours, depending on which type of RA capacity it provides. For example (and as detailed above), RAAIM assesses generic RA capacity during five hours of each non-holiday weekday; whereas, category 1 flexible RA capacity is assessed for RAAIM in 17 hours every day. On a day when a given resource is providing a MW of category 1 flexible RA capacity and a MW of generic RA capacity, the current RAAIM calculation considers whether the resource met its must-offer obligation in the 17 category 1 flexible availability assessment hours and the whether the resource met its must-offer obligation in the five generic availability assessment hours.[24] The resource's overall availability under RAAIM on that day will be assessed for 22 hours. Consider, however, the case where that unit is completely unavailable in the five generic availability assessment hours (which are subsumed within the 17 category 1 flexible availability assessment hours). For purposes of evaluating generic availability, that unit will be unavailable for all five hours. For purposes of evaluating category 1 flexible availability, that unit will be unavailable for five of its 17 required hours. For that day, the unit's overall availability will show as 54.5 percent available [12/22], even though its one MW of generic RA capacity completely failed to materialize. In this example, RAAIM currently over-weights the performance of flexible RA capacity relative to generic RA capacity in the sense that the availability was measured at anything over 50 percent.

A second example showing the discrepancy is where a resource provides 1 MW of flexible RA capacity on a day and 1 MW of generic RA capacity on a different day. If the resource meets the must-offer obligation for the 17 hours of flexible RA capacity on one day but fails to provide any generic RA capacity on the other, the resulting assessment would produce an availability percentage of 77 percent [17/22] even though the resource failed to provide any MW of capacity for an entire day. This approach not only places significantly greater weight on a day with 1 MW of flexible RA capacity than it does on a day with 1

[24] In this example the five generic availability assessment hours are subsumed within the 17 category 1 availability assessment hours, although it is not always the case that generic RA capacity hours overlap with the flexible RA category 2 or category 3 availability assessment hours.

MW of generic RA capacity, it dilutes a resource's incentive to procure substitute capacity if there is an outage on the day the resource is providing generic RA capacity because that day will have a materially smaller impact on the RAAIM assessment. Generic RA capacity is intended to be available to meet peak load needs. Any reduced incentive for an RA resource to be available during the peak is problematic.

The second issue, inter-related with the first, is that the existing availability assessment is essentially a function of the number of hours or MWh, not MWs. The resource-specific monthly average availability percentage calculated under the existing RAAIM methodology scales the MWs available to capture the relative availability of capacity (*i.e.*, the percentage available) rather than the absolute availability of capacity (*i.e.*, the MWs available). Specifically, the current calculation scales the availability requirement and performance based on the average MW with a must-offer obligation in a given availability assessment hour. This is significant because RA is a capacity product measured in terms of MWs not MWhs.

The following example provides a concrete example of the problematic outcomes under the current methodology.[25] A resource shown for 100 MW of generic RA capacity and zero MW of flexible RA capacity that has a five-day outage in a month will face a RAAIM non-availability charge of $69,393. If that resource, however, simply adds one MW of category 1 flexible RA capacity to its supply plan,[26] then that same five-day outage would result in a RAAIM non-availability charge of $14,567. By adding that single MW of flexible RA capacity, the resource's RAAIM penalty falls by 79 percent of the generic-only penalty.

The primary objectives of RAAIM are to ensure resources have the proper incentives to: (1) be available to the CAISO consistent with their applicable must-offer obligations; and (2) provide replacement capacity if the resource goes on a forced outage.[27] By measuring availability based on the principles described above, the existing RAAIM formula does not fully achieve these objectives. A resource's availability should reflect its ability to provide a given product on a given day. The availability or number of hours required of one product should not

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[25] This example is drawn from a memorandum provided to the CAISO Governing Board (Board) prior to their approval of this initiative. The memorandum is included in attachment D to this filing.

[26] The scheduling coordinator for a supplier can add this single MW of flexible RA capacity unilaterally because where a RA plan and supply plan have a discrepancy, the CAISO defaults to the supply plan. Existing tariff section 40.7(b) (in case of an unresolved mismatch, "the CAISO will use the information contained in the Supply Plan").

[27] *See generally* Transmittal letter for Phase 1A Tariff Amendment at 29-34 (providing rationale for key elements of RAAIM design).

directly affect the incentive to be available for another product. Meeting these important principles requires an assessment of compliance for a day for that product, not for an hour for all products.

The examples above demonstrate that the current methodology inadvertently undermines RAAIM's primary objectives and establishes incentives for resources to act contrary to the best interests of maintaining grid reliability at a just and reasonable cost. The examples herein and the CAISO's draft final proposal reflect how the existing methodology can skew performance incentives dramatically.[28] The current RAAIM methodology allows a resource providing a significant quantity of generic RA to reduce its RAAIM exposure by providing a minimal quantity of category 1 flexible RA capacity.[29] This can reduce a resource's incentive to procure substitute capacity for generic RA capacity outages during peak periods because the cost impact of such outage would be muted by the availability of any flexible RA capacity at other times during the month. Stated differently, the existing formula devalues generic RA capacity availability. More importantly, by over-weighting the performance of flexible RA capacity, the approved formula essentially discounts the performance of system capacity during peak weekday periods, *i.e.,* periods when capacity "is most critical to maintaining system reliability."[30]

If resources are not sufficiently incentivized to provide substitute capacity, the CAISO may be forced to resort to backstop procurement through its capacity procurement mechanism (CPM) to make up for the capacity not provided by the resource and to operate the grid reliably, especially during peak load conditions or when resource outages occur. CPM costs are allocated to load instead of to suppliers that either are on outage or otherwise do not follow their must-offer obligations. Thus, it is imperative that RAAIM fully and effectively incent resource owners to provide substitute capacity for all of their capacity that is unavailable.

C. Stakeholder Process

To address the issues identified with the current RAAIM methodology, in September 2017 the CAISO initiated the stakeholder process that led to this tariff amendment.[31] The stakeholder process included several opportunities for

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[28] The CAISO's Draft Final Proposal is included as Attachment C to this filing.

[29] Alternatively, a resource can disproportionately increase its availability incentive payments by providing incremental quantities of flexible RA capacity.

[30] *See* existing tariff section 40.9.3.1(a)(2)(A).

[31] Materials issued and submitted in the stakeholder process are available at http://www.caiso.com/informed/Pages/StakeholderProcesses/ResourceAdequacyAvailabilityIncentiveMechanism.aspx. Separately, in August 2017 the CAISO filed a petition for limited waiver of

stakeholder involvement:

- The CAISO issued two papers – an initial white paper followed by the Draft Final Proposal – and accompanying Excel spreadsheets that provided hypothetical calculations to illustrate the proposed changes;

- The CAISO held three stakeholder conference calls to discuss the CAISO papers and provided opportunities for stakeholders to submit comments on the papers;[32]

- The CAISO issued draft tariff revisions;

- The CAISO held a conference call and provided an opportunity for stakeholders to submit written comments on the draft tariff revisions; and

- The CAISO issued a modified version of the draft tariff revisions.[33]

The CAISO Governing Board (Board) voted unanimously to authorize this filing at its public meeting held on November 2, 2017.[34]

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existing tariff section 40.9.3.1(a)(2)(B) to allow the CAISO to continue to assess the availability of resources providing generic RA capacity using the same availability assessment hours for 2018 as it does for 2017, in order to avoid creating problems for demand response resources and other resources that had already committed to provide RA capacity for 2018. On October 24, 2017, the Commission issued an order denying the waiver request "without prejudice to CAISO presenting the Commission with a limited waiver request that directly addresses the problem of demand response participation without creating undesirable consequences for the resource adequacy program." *Cal. Indep. Sys. Operator Corp.*, 161 FERC ¶ 61,088, at P 35 (2017). That issue is beyond the scope of, and unrelated to, the instant tariff amendment.

[32] Section III of this transmittal letter describes comments the CAISO received in the stakeholder process and the CAISO's responses.

[33] A list of key dates in the stakeholder process is provided in attachment F to this filing.

[34] Materials related to the Board's authorization are available at http://www.caiso.com/Pages/documentsbygroup.aspx?GroupID=251DF9F2-80FF-4373-A96F-76A3727D845F. These materials included a memorandum to the Board from Keith Casey, Vice President, Market & Infrastructure Development (Board Memorandum), and a presentation to the Board by Karl Meeusen, Senior Advisor – Infrastructure and Regulatory Policy (Board Presentation), both of which are provided in attachment D to this filing. In addition, during the stakeholder process, DMM provided comments on the CAISO's White Paper and Draft Final Proposal. DMM also provided feedback to the Board regarding the initiative, as well as other initiatives the Board considered at its November 2017 meeting. These DMM materials are provided in attachment E to this filing.

II. Proposed Tariff Revisions

A. Key Revisions to RAAIM Methodology

The CAISO proposes to resolve the issues identified above by making three modifications to the RAAIM calculation: (1) calculate availability as a MW value each day, and for each product, instead of MW by hour;[35] (2) calculate availability for system RA and flexible RA separately as opposed to combining them into a single assessment as is done today;[36] and (3) scale RAAIM penalty and incentive payments based on the number of days the resource was shown for system RA and flexible RA separately relative to how many days it could have been shown.[37]

The CAISO will determine a resource's average monthly availability percentage using separately calculated availability assessments for (1) generic RA capacity and (2) flexible RA capacity, with availability in an hour that includes overlaps of both types of capacity being accounted for as flexible RA capacity. [38] The average monthly availability percentage will consider the relative daily proportion of capacity provided as generic RA capacity and as flexible RA capacity, including both overlapping and non-overlapping commitments based on the availability assessment hours.[39]

For purposes of evaluating generic RA availability, the CAISO will determine the extent to which each resource providing generic RA capacity provided that capacity to the CAISO each day only during the availability assessment hours specific to generic RA capacity. The availability assessment for overlapping capacity will apply to the MWs – not to the hours as is the case currently – that are subject to the overlapping capacity's must-offer obligations.

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35 Revised tariff section 40.9.3.1(b).

36 Revised tariff section 40.9.4(a)(2).

37 Revised tariff section 40.9.4(a)(3).

38 For example, a day on which a MW has been shown for both generic and flexible RA capacity, the CAISO will first consider MW availability based on the most stringent must-offer obligation. Because flexible RA capacity must be economically bid and cannot be self-scheduled, it has the most stringent must-offer obligation. Thus, the CAISO will first assess flexible RA capacity and then assess compliance with the resource's generic must-offer obligation for any MW in excess of the resource's flexible RA capacity showing. For example, if a resource is shown as 25 MW generic and 5 MW of category 1 flexible RA capacity on the same day, the CAISO will assess compliance with 20 MW generic and 5 MW flexible.

39 The CAISO will assess the availability of each product by calculating the performance of the resource relative to the must-offer obligation for the product, divided by obligation to provide the product. This percentage is then multiplied by the MW value that the resource was supposed to provide to meet its obligation. This calculation yields a daily availability value for generic or flexible RA capacity.

Following the separate availability assessments, the CAISO will separately calculate the non-availability charges and availability incentive payments for generic RA capacity and for flexible RA capacity. The CAISO likewise will collect non-availability charges separately for each type of capacity, and the availability incentive payments for each type of capacity will be funded exclusively by its separately collected non-availability charges. The CAISO will maintain separate pools of any excess non-availability charges that can be used to make availability incentive payments for the next month and distributed pro rata to load-serving entities at the end of the RA compliance year. Creating separate pools of funds ensures that the charges and incentives for generic RA capacity and flexible RA capacity are disaggregated fully. Without separate pools, there is potential for cross-subsidization between the two separate RA capacity products, which would undermine the purpose of this filing.

The Draft Final Proposal provides numerous hypothetical examples showing how the CAISO will apply the new RAAIM methodology and explaining how these tariff revisions will address the two issues with the existing formula.[40] The examples include scenarios with generic RA capacity and category 1 flexible RA capacity and scenarios with generic RA capacity and category 2 and 3 flexible RA capacity.

Applying the new methodology to the above example of a unit providing 100 MW of capacity demonstrates how the CAISO proposal improves upon the status quo. Under the new approach, a resource shown for 100 MW of generic RA capacity and zero MW of flexible RA capacity that has a five-day outage in a month will face a RAAIM non-availability charge of $69,319. If that resource adds one MW of category 1 flexible RA capacity to its supply plan, then the total RAAIM non-availability charge for the system and flexible RA capacity that was not provided is $69,049. Adding the single MW of category 1 flexible RA capacity now results in a virtually identical non-availability charge (four-tenths of a percent lower), as compared to a 79 percent lower charge under the status quo. This example reflects that the proposed improvements to the RAAIM methodology will increase incentives for RA resources to meet their must-offer obligations and provide substitute capacity, consistent with the Commission's findings in the Phase 1A Order.[41] Resources can no longer rely on the performance of minimal amounts of flexible RA capacity to offset the non-performance of large amounts of generic RA capacity.

This revised approach marks an improvement over the existing methodology because it addresses the two key shortcomings of the current

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[40] Draft Final Proposal at 12-30.

[41] *See* Phase 1A Order at PP 29, 88, & 93 (discussed above).

RAAIM methodology. First, it reflects that RA involves the provision of capacity (*i.e.*, MWs) and can be a daily product but not an hourly product. Second, the revised formula will scale the non-availability charges and availability incentive payments separately based on the number of days the resource was available as generic RA capacity and as flexible RA capacity, relative to how many days it could have been available as those separate types of capacity. Thus, flexible RA capacity will no longer be given greater weight in the availability calculation and will not affect the incentive to provide generic RA capacity. These changes will recognize the importance and value of each type of capacity and ensure that capacity is neither over-valued nor devalued. Also, the changes will prevent resources from exploiting the heavier weighting of category 1 flexible RA capacity as compared with generic RA capacity. In turn, this should better incent resource substitution, thus promoting grid reliability and reducing the potential for CAISO backstop procurement, such as CPM.

B. Miscellaneous Revisions

The CAISO also proposes several minor revisions to clarify the existing RAAIM tariff language. First, the existing tariff language states that if a resource is committed to provide generic RA capacity and flexible RA capacity in a month but does not provide both for the full month, the CAISO will prorate those amounts of capacity for the month.[42] The CAISO proposes to replace the phrase "does not" with "is not committed to" in order to clarify that proration provision.[43] The existing tariff language is ambiguous as to whether the trigger for proration is: (1) the failure to provide committed RA capacity; or (2) the resource being committed to provide one type of capacity for the month and another type for other parts of the month. This change clarifies it is the latter. Second, the CAISO proposes to delete outdated tariff language regarding the initial RAAIM advisory period, which expired April 1, 2017.[44]

C. Two-Month RAAIM Advisory Period

In addition, the CAISO proposes to implement a new RAAIM advisory period beginning on April 1, 2018 (*i.e.*, the proposed effective date of the tariff revisions in this filing), and ending on May 30, 2018. During this two-month advisory period, as was the case with the advisory period that expired April 1, 2017, the CAISO will calculate and publish non-availability charges and availability incentive payments on settlement statements, but will not include those charges and invoices on invoices for financial settlement.[45] The advisory

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42 Existing tariff section 40.9.4(c).

43 Revised tariff section 40.9.4(c).

44 Deleted tariff section 40.9.6(e).

45 Revised tariff section 40.9.6(d).

period will affect all of the RAAIM tariff provisions, as modified by this filing.

The advisory period will facilitate implementation for both market participants and the CAISO. For market participants, the advisory period will serve as a helpful adjunct to the CAISO's market simulation process and allow them to witness first-hand application of the revised RAAIM formula, so they will be fully prepared when the advisory period terminates. This approach of having an advisory period can be particularly beneficial for highly complex RAAIM settlements issues. For the CAISO, the advisory period is necessary because without it, the software application for resource adequacy, the Customer Interface for Resource Adequacy (CIRA), would have to conduct parallel runs of multiple availability calculation formulae, even though it is not configured to conduct such parallel calculations. The issue of parallel calculations arises because even once the new RAAIM availability methodology is effective prospectively, the CAISO still would need to apply the old methodology on a time lag to trading days that already occurred before the new effective date. Finally, given the difficulties and issues the CAISO and market participants encountered with the initial RAAIM implementation, the CAISO believes it is prudent to provide an advisory period for the revised calculation formula.

III. Responses to Stakeholder Comments

Stakeholders generally supported revising the RAAIM methodology to address the problems the CAISO identified regarding the existing RAAIM formula. The CAISO Department of Market Monitoring (DMM), and some other stakeholders, offered alternative approaches they asserted were superior. DMM, however, recognized that the CAISO proposal intends to fix issues with the current RAAIM design and emphasized that "[u]nder the current design, a market participant can significantly and disproportionately reduce its RAAIM penalties for non-performance of system RA obligations by showing a small amount of flexible RA capacity."[46] Other stakeholders that recommended additional modifications or sought additional time to review the proposal still acknowledged shortcomings of the current approach and the effort the CAISO was making to address them.

Although it was helpful to the CAISO to consider these alternative proposals, the CAISO concluded that its proposed tariff revisions were more supportable, less complex, and/or more aligned with the incentives RAAIM is intended to provide. Most significantly, none of these other suggestions raise questions as to the justness and reasonableness of the CAISO proposal. The Commission thus should accept the CAISO's just and reasonable proposal,

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[46] Department of Market Monitoring Comments on the Resource Adequacy Availability Incentive Mechanism Modification White Paper, Sept. 19, 2017, included as Attachment E to this filing.

rather than any potential alternatives intervenors might suggest.[47]

A. Department of Market Monitoring Comments

1. The CAISO Appropriately Retains a Single Penalty Price

In its initial comments during the stakeholder process, DMM suggested that each RA product should have its own RAAIM penalty price, rather than a single penalty price for all products, as is reflected in the existing RAAIM methodology.[48] DMM recognized in its subsequent comments on the Draft Final Proposal that a single penalty price may not be ideal, but that it was probably the only currently feasible method because the CAISO cannot use RA data to determine what a reasonable separate penalty price would be.[49]

The CAISO considered the concept of setting separate RAAIM penalty prices for generic and flexible RA capacity during the stakeholder process. It determined, however, that doing so was not advisable or warranted and thus does not propose in this filing to change the single price for determining RAAIM availability charges.[50]

The use of a single penalty price was addressed when the CAISO first proposed RAAIM to the Commission. In its Phase 1A Order, the Commission found that the proposed single non-availability price, "which is a high-average of resource adequacy capacity prices, reflects an appropriate balance of two competing goals: that the non-availability charge be high enough to incent good performance, but not be so high as to disrupt the resource adequacy market or unduly penalize those receiving resource adequacy payments."[51] There is no

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[47] The matter before the Commission is to determine if the CAISO's proposal – and not any alternative proposal that might be suggested – is just and reasonable. "Pursuant to section 205 of the [Federal Power Act], the Commission limits its evaluation of a utility's proposed tariff revisions to an inquiry into 'whether the rates proposed by a utility are reasonable – and not to extend to determining whether a proposed rate schedule is more or less reasonable to alternative rate designs.'" *Cal. Indep. Sys. Operator Corp.*, 141 FERC ¶ 61,135, at P 44 n.43 (2012), quoting *City of Bethany v. FERC*, 727 F.2d 1131, 1136 (D.C. 1984). Therefore, "[u]pon finding that CAISO's proposal is just and reasonable, [the Commission] need not consider the merits of alternative proposals." *Cal. Indep. Sys. Operator Corp.*, 141 FERC ¶ 61,135, at P 44. That is the case here.

[48] Attachment E to this filing.

[49] Department of Market Monitoring Comments on Resource Adequacy Availability Incentive Mechanism Modification Draft Final Proposal, Oct. 3, 2017, included as Attachment E to this filing (DMM Comments on Draft Final Proposal).

[50] Existing tariff section 43.9.6.1(b).

[51] Phase 1A Order at P 50.

basis in this proceeding to change the existing non-availability price and the CAISO does not propose to change it. Further, establishing separate prices is not practicable. Load-serving entities procure the RA products pursuant to bilateral contracts outside of the CAISO markets. The CAISO does not have sufficient information regarding the prices of flexible RA capacity, and thus, is unable to develop a separate price for such product that would be supported by substantial evidence. Finally, in its Phase 1A Order, the Commission directed the CAISO to submit an informational report within 12 months after implementation of the non-availability charges that analyzes the "impacts and reasonableness of the proposed RAAIM non-availability charge."[52] That report can inform whether further stakeholder processes regarding this issue are warranted.

2. *Separate Calculation of Generic and Flexible Availability is a Necessary Aspect of the CAISO Proposal*

Recognizing the practicalities of the CAISO remaining with a single penalty price, DMM proposed in its comments on the Draft Final Proposal an alternative availability calculation that would correct "inconsistencies with the ISO Proposal . . . ."[53] DMM viewed the CAISO proposal as being internally inconsistent because it evaluates generic and flexible RA capacity availability separately yet still applies the same penalty price for both products. This proposed alternative, in DMM's view, addressed the identified issues with the status quo but did so without evaluating the two types of RA capacity separately.

The DMM alternative would first sum the total MWs of capacity a resource offered across the different RA products. For example, a resource committed for 100 MW of generic RA capacity and 50 MW of flexible RA capacity, would be considered to have a total RA obligation of 150 MW.[54] Under the DMM alternative, the CAISO would then calculate the resource's percent availability for that sum of MWs of capacity types. Continuing the example, if the resource did not provide its 50 MW of flexible RA capacity but provided its 100 MW of generic RA capacity, then the resource would be considered 66.7 percent available [(100 MW + 0 MW)/(100 MW + 50 MW)]. Finally, the CAISO would consider that percent of the single highest MWs of capacity product offered to be available and the rest of that single highest product considered unavailable. In the example, because the resource offered more generic than flexible RA capacity, that availability percent would be applied to the 100 MW of generic RA capacity, so

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[52] *Id.* at P 52. The CAISO will make that report one year from the start of financially binding RAAIM, *i.e.*, by April 1, 2018.

[53] DMM Comments on Draft Final Proposal at 2.

[54] This is a summary of an example DMM offered in its comments. DMM Comments on Draft Final Proposal, at 5.

that the resource would be deemed to have delivered on 66.7 percent of its RA capacity.

During the CAISO's internal deliberations it considered, and rejected, the very approach offered in the DMM alternative before DMM proposed it. The CAISO identified two issues with the existing RAAIM methodology. The DMM alternative only addresses one of them by evaluating availability as a function of MWs, rather than MWh. By creating a single availability metric across the forms of RA capacity a resource provides, it does not address the other basic issue of over- (or under-) weighting the value of generic RA capacity, relative to flexible RA capacity. The DMM alternative creates different types of incentives in this regard than the status quo but these incentives ultimately could be distortive for overall RA objectives. Under the DMM alternative, it is possible that two resources could have very different RAAIM structures because one shows more or less flexible RA capacity. This would introduce unnecessary complexity and essentially create a unique RAAIM structure for every resource based on the ratio of shown generic and flexible RA capacity. This is suboptimal because the market would send inconsistent price signals to resources providing RA capacity.

B. The CAISO Appropriately Retains its Commission-Approved Practice of Assessing Overlapping Capacity Once Instead of Twice

In this filing, the CAISO does not propose to change the RAAIM formula's current use of a single availability assessment for generic and flexible RA capacity during periods where the two types of capacity overlap, *i.e,* where a single MW of capacity is both flexible RA capacity and generic RA capacity during the same hour. Under the CAISO's Commission-approved approach, RAAIM non-availability charges are based on the overlapping RA capacity that has the highest must-offer obligation. This ensures that a MW of RA capacity is only counted once.

One stakeholder argues that each component of overlapping capacity should be measured and compensated separately, and the CAISO should not apply a "worse of" performance metric for resources providing both generic and flexible RA capacity but rather evaluate those performances individually against the metric for the reliability service independently.

The Commission rejected this approach in its Phase 1A Order, where it "agree[d] with CAISO that using a single availability assessment for overlapping capacity is preferable to alternative methodologies involving multiple assessments."[55] Such an additive availability assessment regime could

[55] *Id.* at P 60.

inappropriately penalize a resource with overlapping RA capacity that is on forced outage twice for a single outage, once for the flexible RA capacity and once for the generic RA capacity. Further, as the Commission recognized in its Phase 1A Order, the existing approach to overlapping capacity "creates appropriate incentives for resources with flexible capacity to bid economically" without resorting to a double-penalty structure.[56] The Commission expressed concern that under other alternatives for assessing overlapping capacity, resources might not have sufficient incentives to submit economic bids for the flexible RA capacity component of the overlapping bid.[57] These concerns remain and, as such, consistent with its Phase 1A Order, the Commission should not require that the CAISO modify an unrevised aspect of its tariff and separately assess the individual components of overlapping RA capacity.

C. Changing from Hourly to Daily Assessments is a Necessary Component of the CAISO Proposal

Another stakeholder suggested that the split of generic and flexible RA capacity is a sufficient change and that the change from hourly to daily assessments is not needed. The stakeholder suggests that the daily weighting mechanism inappropriately reduces the amount of penalties and incentive when generic RA capacity overlaps with category 2 or category 3 flexible RA capacity because it limits the combined incentive or penalty to the maximum amount each attribute would have received if offered by itself. The purported concern is that, because of the divergence of availability assessment hours between generic RA capacity, on one hand, and either category 2 or category 3 flexible, on the other hand, a resource would be able to reduce its RAAIM non-availability charges by showing a token amount of category 2 or category 3 flexible RA capacity even if that flexible RA capacity is not provided.

The CAISO considered this feedback but determined that using a daily assessment is needed to prevent weighting issues where a resource has category 1 flexible RA capacity on some days in a given month and categories 2 and 3 on other days of that month. Additionally, absent the weighting mechanism, any RAAIM proposal, whether daily or hourly, would essentially penalize a resource twice for the same outage. For example, without the weighting mechanism, a resource shown as both 100 MW of generic RA capacity and 100 MW of flexible RA capacity that goes out for a day would be to be out for 40 MW of generic[58] *and* 100 MW of flexible RA capacity, for a total of 140 MW

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56 *Id.* at P 64.

57 *Id.* at P 63.

58 100 MW of generic RA capacity on outage for 2/5 of the required hours. The other three availability assessment hours for generic are assumed in this example to overlap with the flexible RA availability assessment hours.

worth of outage for a 100 MW resource. The weighting mechanism ensures that a 100 MW resource cannot be penalized for more than 100 MW of capacity.

IV. Effective Date

The CAISO requests that the Commission accept the tariff revisions in this filing effective April 1, 2018.

V. Communications

In accordance with the Commission's regulations,[59] correspondence and other communications regarding this filing should be directed to the following individuals, whose names should be placed on the official service list established by the Commission with respect to this filing:

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VI. Service

The CAISO has served copies of this filing on the California Public Utilities Commission, the California Energy Commission, and all parties with scheduling coordinator agreements under the CAISO tariff. In addition, the CAISO has posted a copy of the filing on the CAISO website.

VII. Contents of Filing

In addition to this transmittal letter, this filing includes the following attachments:

Attachment A	Clean CAISO tariff sheets incorporating this tariff amendment;
Attachment B	Red-lined document showing the revisions contained in this tariff amendment;

[59] 18 C.F.R. § 385.203(b).

Attachment C	Draft Final Proposal;
Attachment D	Board Memorandum and Board Presentation;
Attachment E	DMM Board Memorandum for November 2017 Board Meeting, DMM Comments on Draft Final Proposal and White Paper; and
Attachment F	List of Key Dates in Stakeholder Process.

VII. Conclusion

For the reasons set forth in this filing, the CAISO respectfully requests that the Commission accept the tariff revisions in this filing effective April 1, 2018.

Respectfully submitted,

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Attachment A – Clean Tariff Records

Modification to Resource Adequacy Availability Incentive Mechanism Methodology

California Independent System Operator Corporation

40.9.1 Introduction to RAAIM

The CAISO shall use RAAIM to determine the availability of resources providing local and/or system Resource Adequacy Capacity and Flexible RA Capacity during the Availability Assessment Hours each month and then assess the resultant Availability Incentive Payments and Non-Availability Charges through the CAISO's settlements process.

* * * *

40.9.3 Availability Assessment

40.9.3.1 Local and System RA Capacity Availability

(a) **Availability Assessment Hours**

(1) Prior to the start of each Resource Adequacy Compliance Year, the CAISO shall establish and publish in the Business Practice Manual the Availability Assessment Hours applicable for resources providing local and/or system Resource Adequacy Capacity for each month of that year.

(2) The Availability Assessment Hours shall be a pre-defined set of five consecutive hours for each month that –

(A) correspond to the operating periods when high demand conditions typically occur and when the availability of Resource Adequacy Capacity is most critical to maintaining system reliability:

(B) vary by season as necessary so that the coincident peak load hour typically falls within the five-hour range each day during the month, based on historical actual load data; and

(C) apply to each Trading Day that is a weekday and not a federal holiday.

(b) **Must-Offer Availability Assessment.** The CAISO shall determine the extent to which each resource providing local and/or system Resource Adequacy Capacity made that capacity available to the CAISO each day during the Availability Assessment Hours by comparing –

(1) the MWs of local and/or system Resource Adequacy Capacity for which the Scheduling Coordinator for the resource submitted Economic Bids or Self-Schedules in the Day-Ahead Market and the Real-Time Market on a given day; and

(2) the MWs of local and/or system Resource Adequacy Capacity for which the Scheduling Coordinator for the resource had a performance obligation to submit Economic Bids or Self-Schedules in the CAISO Markets under the must-offer requirements applicable under Section 40.6 on a given day.

40.9.3.2 Flexible RA Capacity Availability

(a) **Availability Assessment Hours.** The Availability Assessment Hours for a Flexible RA Resource shall be the same period as the must-offer obligation for the Flexible Capacity Category that is designated on the Resource Flexible RA Capacity Plan for that month, as set forth in Section 40.10.6.

(b) **Must-Offer Availability Assessment.** The CAISO shall determine the extent to which each Flexible RA Resource made that capacity available in each Availability Assessment Hour of the day by comparing –

(A) the MWs of Flexible RA Capacity for which the Scheduling Coordinator for the resource submitted Economic Bids in the Day-Ahead Market and the Real-Time Market on a given day; and

(B) the MWs of Flexible RA Capacity for which the Scheduling Coordinator for the resource had a performance obligation to submit Economic Bids in the CAISO Markets under the must-offer requirements applicable under Section 40.10.6 on a given day.

*** * * ***

40.9.3.3 Availability for Overlapping Local/System and Flexible RA Capacity

(a) **Overlap Determination.** The availability assessment for overlapping Resource Adequacy commitments shall apply to those MWs subject to the must-offer obligations for

local and/or system Resource Adequacy Capacity and Flexible RA Capacity in any Availability Assessment Hour. For the purpose of this Section 40.9, capacity is deemed to have an overlapping Resource Adequacy commitment if it has a must-offer obligation based on its status as local and/or system Resource Adequacy Capacity and a must-offer obligation based on its status as Flexible RA Capacity during the same Availability Assessment Hour of a day.

(b) **Must-Offer Availability Assessment.** The CAISO shall determine the extent to which each resource with overlapping Resource Adequacy commitments made that capacity available to the CAISO in each overlapping Availability Assessment Hour of the day by comparing –

(1) the MWs of local and/or system Resource Adequacy Capacity and Flexible RA Capacity for which the Scheduling Coordinator for the resource submitted Economic Bids in the Day-Ahead Market and the Real-Time Market; and

(2) the MWs of local and/or system Resource Adequacy Capacity and Flexible RA Capacity for which the Scheduling Coordinator for the resource had a performance obligation to submit Economic Bids in the CAISO Markets, in accordance with the applicable must-offer requirements in Sections 40.6 and 40.10.6.

(c) **Calculation.** The CAISO's calculation of the Availability Assessment for overlapping RA commitments shall count –

(1) any MW only once; and

(2) the total MWs of overlapping capacity as a Flexible RA Capacity commitment.

*** * * ***

40.9.4 Additional Rules on Calculating Monthly and Daily Average Availability

(a) The CAISO shall determine a resource's monthly average availability on a percentage basis, based on:

(1) the availability assessment of the resource's minimum daily availability of local and/or system Resource Adequacy Capacity under Section 40.9.3.1, Flexible RA Capacity under Section 40.9.3.2, and overlapping Resource Adequacy commitments under Section 40.9.3.3, in the Day-Ahead Market and Real-Time Market;

(2) separately-calculated availability assessments for local and/or system Resource Adequacy Capacity in one category and Flexible RA Capacity in a second category, with availability in an hour with overlapping commitments under Section 40.9.3.3 accounted for in the Flexible RA Capacity category availability assessment;

(3) The relative daily proportion of capacity as provided as local and/or system Resource Adequacy Capacity and Flexible RA Capacity, including both overlapping and non-overlapping commitments based on the Availability Assessment of Hours;

(4) the capacity, duration, and must-offer requirement for local and/or system Resource Adequacy Capacity or Flexible RA Capacity on an Outage, except to the extent the resource provides RA Substitute Capacity for the outage in accordance with Section 40.9.3.6, the Outage is approved by the CAISO without requiring RA Substitute Capacity under other authority of Section 9 or Section 40, or the Forced Outage is excluded from RAAIM under Section 40.9.3.4; and

(5) the capacity, duration, and must-offer requirement for any RA Substitute Capacity or CPM Capacity the resource is committed to provide.

(b) If the resource's minimum daily availability is the same in the Day-Ahead Market and the Real-Time Market, the CAISO will use the availability in the Real-Time Market in the calculation of the monthly average availability.

(c) If the resource is committed to provide local and/or system RA capacity and Flexible RA Capacity in a month, but is not committed to provide both for the full month, the CAISO prorates the number of days that local and/or system Resource Adequacy Capacity and Flexible RA Capacity was provided against the total number of days in the month.

*** * * ***

40.9.6 Non-Availability Charges and Availability Incentive Payments

(a) **Non-Availability Charges.** A resource providing local and/or system Resource Adequacy Capacity, Flexible RA Capacity, or CPM Capacity that is subject to the availability assessment in accordance with Section 40.9.3 and whose monthly availability calculation under Section 40.9.4 is below the lower bound of the monthly Availability Standard of 94.5 percent will be subject to a Non-Availability Charge for the month.

(b) **Availability Incentive Payments.** A resource providing local and/or system Resource Adequacy Capacity, Flexible RA Capacity, or CPM Capacity that is subject to the availability assessment under Section 40.9.3 and whose availability calculation under Section 40.9.4 is above the upper bound of the monthly Availability Standard of 98.5 percent will be eligible for an Availability Incentive Payment for the month.

(c) **No Payment or Charge.** A resource providing local and/or system Resource Adequacy Capacity, Flexible RA Capacity, or CPM Capacity that is subject to the availability assessment under Section 40.9.3 and whose monthly availability calculation under Section 40.9.4 is equal to or between the lower bound of 94.5 percent and the upper bound of 98.5 percent of the Availability Standard will not be assessed a Non-Availability Charge nor paid an Availability Incentive Payment.

(d) **Advisory Period.** During an advisory period of April 1, 2018 through May 31, 2018, the CAISO will show the Non-Availability Charges and Availability Incentive Payments on Settlement Statements but will not include those Non-Availability Charges and Availability Incentive Payments on Invoices for financial settlement.

(e) **Separate Calculation of Payments and Charges for Flexible RA Capacity.** The CAISO will calculate separate Non-Availability Charges and Availability Incentive Payments for Resource Adequacy Resources providing Flexible RA Capacity.

40.9.6.1 Determination of Non-Availability Charge

(a) **Calculation**

(1) **RA Capacity.** The Non-Availability Charge for a Resource Adequacy Resource

providing local, system, or Flexible RA Capacity shall be determined by the resource's average monthly RA and Flexible RA MWs multiplied by the difference between the lower bound of the monthly Availability Standard of 94.5 percent and the resource's monthly availability percentage, and multiplying the product by the RAAIM price.

(2) **CPM Capacity.** The Non-Availability Charge for a Resource Adequacy Resource providing CPM Capacity shall be determined by the resource's average monthly CPM MWs multiplied by the difference between the lower bound of the monthly Availability Standard of 94.5 percent and the resource's monthly availability percentage, and multiplying the product by the maximum of the resource's CPM price and the RAAIM price.

(b) **RAAIM Price.** The RAAIM price shall be 60 percent of the CPM Soft-Cap Price in Section 43A.4.1.1.

(c) **Separate Collection of Non-Availability Charges for Flexible RA Capacity.** Separately-calculated Non-Availability Charges collected for Resource Adequacy Resources providing Flexible RA Capacity will be held separate from other Non-Availability Charges assessed for Resource Adequacy Resources.

40.9.6.2 Determination of Availability Incentive Payment

(a) **Self-Funding.** The Availability Incentive Payment will be funded entirely through the monthly Non-Availability Charges assessed. Availability Incentive Payments for Resource Adequacy Resources providing Flexible RA Capacity will be funded exclusively by Non-Availability Charges assessed against Resource Adequacy Resources providing Flexible RA Capacity.

(b) **Eligible Capacity**. The capacity of a Resource Adequacy Resource providing local, system or Flexible RA Capacity that is eligible to receive an Availability Incentive Payment shall be the resource's average monthly MWs of capacity that exceed the upper bound of the Availability Standard.

(c) **Calculation.**

(1) The monthly Availability Incentive Payment rate will equal the total Non-Availability Charges assessed for the month plus any unpaid funds under Section 40.9.6.2(d),

divided by the total Resource Adequacy Capacity eligible to receive the Availability Incentive Payment that month.

(2) The Availability Incentive Payment rate shall not exceed three times the Non-Availability Charge rate.

(3) The Availability Incentive Payment the CAISO shall pay to each eligible resource shall equal the product of its eligible capacity and the Availability Incentive Payment rate.

(d) **Unpaid Funds.** Any Non-Availability Charge funds that are not distributed to Resource Adequacy Resources eligible to receive Availability Incentive Payments in a month will be added to the funds available for Availability Incentive Payments in the next month and will continue to roll over to the successive month until paid out or December 31, at which time the separate pool of undistributed Non-Availability Charge funds collected for local and/or system Resource Adequacy Capacity will be distributed to Load Serving Entities based on their load ratio share for the year. The separate pool of undistributed Non-Availability Charge funds collected for Flexible RA Capacity will be distributed to Load Serving Entities based on their overall ratio of obligation to demonstrate Flexible RA Capacity for the year.

Attachment B – Marked Tariff Records

Modification to Resource Adequacy Availability Incentive Mechanism Methodology

California Independent System Operator Corporation

40.9.1 ~~Transition~~ Introduction to RAAIM

The CAISO shall use RAAIM to determine the availability of resources providing local and/or system Resource Adequacy Capacity and Flexible RA Capacity during the Availability Assessment Hours each month and then assess the resultant Availability Incentive Payments and Non-Availability Charges through the CAISO's settlements process~~; except that, for an advisory period of two calendar months following the effective date of RAAIM, the CAISO will calculate and publish the Availability Incentive Payments and Non-Availability Charges on Settlement Statements but will not include those payments and charges on Invoices for financial settlement~~.

* * * *

40.9.3 Availability Assessment

40.9.3.1 Local and System RA Capacity Availability

(a) **Availability Assessment Hours**

(1) Prior to the start of each Resource Adequacy Compliance Year, the CAISO shall establish and publish in the Business Practice Manual the Availability Assessment Hours applicable for resources providing local and/or system Resource Adequacy Capacity for each month of that year.

(2) The Availability Assessment Hours shall be a pre-defined set of five consecutive hours for each month that –

(A) correspond to the operating periods when high demand conditions typically occur and when the availability of Resource Adequacy Capacity is most critical to maintaining system reliability:

(B) vary by season as necessary so that the coincident peak load hour typically falls within the five-hour range each day during the month, based on historical actual load data; and

(C) apply to each Trading Day that is a weekday and not a federal holiday.

(b) **Must- -Offer Availability Assessment.** The CAISO shall determine the extent to which

each resource providing local and/or system Resource Adequacy Capacity made that capacity available to the CAISO each day during the ~~in each~~ Availability Assessment Hours ~~of the day~~ by comparing –

(1) the MWs of local and/or system Resource Adequacy Capacity for which the Scheduling Coordinator for the resource submitted Economic Bids or Self-Schedules in the Day-Ahead Market and the Real-Time Market on a given day; and

(2) the MWs of local and/or system Resource Adequacy Capacity for which the Scheduling Coordinator for the resource ~~was required~~ had a performance obligation to submit Economic Bids or Self-Schedules in the CAISO Markets under the must-offer requirements applicable under Section 40.6 on a given day.

40.9.3.2 Flexible RA Capacity Availability

(a) **Availability Assessment Hours.** The Availability Assessment Hours for a Flexible RA Resource shall be the same period as the must-offer obligation for the Flexible Capacity Category that is designated on the Resource Flexible RA Capacity Plan for that month, as set forth in Section 40.10.6.

(b) **Must-Offer Availability Assessment.** The CAISO shall determine the extent to which each Flexible RA Resource made that capacity available in each Availability Assessment Hour of the day by comparing –

(A) the MWs of Flexible RA Capacity for which the Scheduling Coordinator for the resource submitted Economic Bids in the Day-Ahead Market and the Real-Time Market on a given day; and

(B) the MWs of Flexible RA Capacity for which the Scheduling Coordinator for the resource ~~was required~~ had a performance obligation to submit Economic Bids in the CAISO Markets under the must-offer requirements applicable under Section 40.10.6 on a given day.

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40.9.3.3 Availability for Overlapping Local/System and Flexible RA Capacity

(a) **Overlap Determination.** The availability assessment for overlapping Resource Adequacy commitments shall apply to those MWs ~~hours in which a resource was~~ subject to the must-offer obligations for local and/or system Resource Adequacy Capacity and Flexible RA Capacity in any Availability Assessment Hour ~~and for any portion of the same capacity~~. For the purpose of this Section 40.9, capacity is deemed to have an overlapping Resource Adequacy commitment if it has a must-offer obligation based on its status as local and/or system Resource Adequacy Capacity and a must-offer obligation based on its status as Flexible RA Capacity during the same Availability Assessment Hour of a day.

(b) **Must-Offer Availability Assessment.** The CAISO shall determine the extent to which each resource with overlapping Resource Adequacy commitments made that capacity available to the CAISO in each overlapping Availability Assessment Hour of the day by comparing –

(1) the MWs of local and/or system Resource Adequacy Capacity and Flexible RA Capacity for which the Scheduling Coordinator for the resource submitted Economic Bids in the Day-Ahead Market and the Real-Time Market; and

(2) the MWs of local and/or system Resource Adequacy Capacity and Flexible RA Capacity for which the Scheduling Coordinator for the resource ~~was required~~ had a performance obligation to submit Economic Bids in the CAISO Markets, in accordance with the applicable must-offer requirements in Sections 40.6 and 40.10.6.

(c) **Calculation.** The CAISO's calculation of the Availability Assessment for overlapping RA commitments shall count –

(1) any ~~portion of the overlapping~~ MW only once; and

(2) the total MWs of overlapping capacity as ~~at the higher of the Resource Adequacy Capacity commitment or the~~ a Flexible RA Capacity commitment.

* * * *

40.9.4 Additional Rules on Calculating Monthly and Daily Average Availability ~~Assessment~~

(a) The CAISO shall determine a resource's monthly average availability on a percentage basis, based on:~~—~~

(1) the availability assessment of the resource's minimum daily availability of local and/or system Resource Adequacy Capacity under Section 40.9.3.1, Flexible RA Capacity under Section 40.9.3.2, and overlapping Resource Adequacy commitments under Section 40.9.3.3, in the Day-Ahead Market and Real-Time Market;

(2) separately-calculated availability assessments for local and/or system Resource Adequacy Capacity in one category and Flexible RA Capacity in a second category, with availability in an hour with overlapping commitments under Section 40.9.3.3 accounted for in the Flexible RA Capacity category availability assessment;

(3) The relative daily proportion of capacity as provided as local and/or system Resource Adequacy Capacity and Flexible RA Capacity, including both overlapping and non-overlapping commitments based on the Availability Assessment of Hours;

(4) ~~including~~ the capacity, duration, and must-offer requirement for local and/or system Resource Adequacy Capacity or Flexible RA Capacity on an Outage, except to the extent the resource provides RA Substitute Capacity for the outage in accordance with Section 40.9.3.6, the Outage is approved by the CAISO without requiring RA Substitute Capacity under other authority of Section 9 or Section 40, or the Forced Outage is excluded from RAAIM under Section 40.9.3.4; and

(5~~3~~) ~~including~~ the capacity, duration, and must-offer requirement for any RA Substitute Capacity or CPM Capacity the resource is committed to provide.

(b) If the resource's minimum daily availability is the same in the Day-Ahead Market and the Real-Time Market, the CAISO will use the availability in the Real-Time Market in the calculation of the monthly average availability.

(c) If the resource is committed to provide local and/or system RA capacity and Flexible RA Capacity

in a month, but is not committed to ~~does not~~ provide both for the full month, the CAISO prorates the number of days that local and/or system Resource Adequacy Capacity and Flexible RA Capacity was provided against the total number of days in the month.

* * * *

40.9.6 Non-Availability Charges and Availability Incentive Payments

(a) **Non-Availability Charges.** A resource providing local and/or system Resource Adequacy Capacity, Flexible RA Capacity, or CPM Capacity that is subject to the availability assessment in accordance with Section 40.9.3 and whose monthly availability calculation under Section 40.9.4 is below the lower bound of the monthly Availability Standard of 94.5 percent will be subject to a Non-Availability Charge for the month.

(b) **Availability Incentive Payments.** A resource providing local and/or system Resource Adequacy Capacity, Flexible RA Capacity, or CPM Capacity that is subject to the availability assessment under Section 40.9.3 and whose availability calculation under Section 40.9.4 is above the upper bound of the monthly Availability Standard of 98.5 percent will be eligible for an Availability Incentive Payment for the month.

(c) **No Payment or Charge.** A resource providing local and/or system Resource Adequacy Capacity, Flexible RA Capacity, or CPM Capacity that is subject to the availability assessment under Section 40.9.3 and whose monthly availability calculation under Section 40.9.4 is equal to or between the lower bound of 94.5 percent and the upper bound of 98.5 percent of the Availability Standard will not be assessed a Non-Availability Charge nor paid an Availability Incentive Payment.

(d) **Advisory Period.** During ~~the~~ an advisory period of ~~March~~ April 1, 201~~86~~ through ~~April~~ May 3~~10~~, 201~~86~~, the CAISO will show the Non-Availability Charges and Availability Incentive Payments on Settlement Statements but will not include those Non-Availability Charges and Availability Incentive Payments on Invoices for financial settlement.

(e) **Separate Calculation of Payments and Charges for Flexible RA Capacity.** The CAISO will

calculate separate Non-Availability Charges and Availability Incentive Payments for Resource Adequacy Resources providing Flexible RA Capacity.

40.9.6.1 Determination of Non-Availability Charge

(a) **Calculation**

(1) **RA Capacity.** The Non-Availability Charge for a Resource Adequacy Resource providing local, system, or Flexible RA Capacity shall be determined by the resource's average monthly RA and Flexible RA MWs multiplied by the difference between the lower bound of the monthly Availability Standard of 94.5 percent and the resource's monthly availability percentage, and multiplying the product by the RAAIM price.

(2) **CPM Capacity.** The Non-Availability Charge for a Resource Adequacy Resource providing CPM Capacity shall be determined by the resource's average monthly CPM MWs multiplied by the difference between the lower bound of the monthly Availability Standard of 94.5 percent and the resource's monthly availability percentage, and multiplying the product by the maximum of the resource's CPM price and the RAAIM price.

(b) **RAAIM Price.** The RAAIM price shall be 60 percent of the CPM Soft-Cap Price in Section 43A.4.1.1.

(c) **Separate Collection of Non-Availability Charges for Flexible RA Capacity.** Separately-calculated Non-Availability Charges collected for Resource Adequacy Resources providing Flexible RA Capacity will be held separate from other Non-Availability Charges assessed for Resource Adequacy Resources.

40.9.6.2 Determination of Availability Incentive Payment

(a) **Self-Funding.** The Availability Incentive Payment will be funded entirely through the monthly Non-Availability Charges assessed. Availability Incentive Payments for Resource Adequacy Resources providing Flexible RA Capacity will be funded exclusively by Non-Availability Charges assessed against Resource Adequacy Resources providing Flexible RA Capacity.

(b) **Eligible Capacity**. The capacity of a Resource Adequacy Resource providing local, system or Flexible RA Capacity that is eligible to receive an Availability Incentive Payment shall be the

resource's average monthly MWs of capacity that exceed the upper bound of the Availability Standard.

(c) **Calculation.**

(1) The monthly Availability Incentive Payment rate will equal the total Non-Availability Charges assessed for the month plus any unpaid funds under Section 40.9.6.2(d), divided by the total Resource Adequacy Capacity eligible to receive the Availability Incentive Payment that month.

(2) The Availability Incentive Payment rate shall not exceed three times the Non-Availability Charge rate.

(3) The Availability Incentive Payment the CAISO shall pay to each eligible resource shall equal the product of its eligible capacity and the Availability Incentive Payment rate.

(d) **Unpaid Funds.** Any Non-Availability Charge funds that are not distributed to Resource Adequacy Resources eligible to receive Availability Incentive Payments in a month will be added to the funds available for Availability Incentive Payments in the next month and will continue to roll over to the successive month until paid out or December 31, at which time the ~~funds~~ separate pool of undistributed Non-Availability Charge funds collected for local and/or system Resource Adequacy Capacity will be distributed to Load Serving Entities based on their load ratio share for the year. The separate pool of undistributed Non-Availability Charge funds collected for Flexible RA Capacity will be distributed to Load Serving Entities based on their overall ratio of obligation to demonstrate Flexible RA Capacity for the year.

Attachment C – Draft Final Proposal

Modification to Resource Adequacy Availability Incentive Mechanism Methodology

California Independent System Operator Corporation

Resource Adequacy Availability Incentive Mechanism Modification: Draft Final Proposal

September 21, 2017

Table of Contents

1. Executive summary

The ISO conducted a review of its Resource Adequacy Availability Incentive Mechanism (RAAIM), including its implementation, performance, and the RAAIM tariff language. Based on this review, the ISO concluded that:

1) Following go-live on April 1, 2017, the ISO and market participants detected minor errors in implementing the RAAIM policy. The ISO will correct these defects and issue revised settlement statements effective April 1, 2017. The ISO has posted a list of these errors on its website.[1]
2) The availability calculation methodology approved in RAAIM allows a resource to reduce its exposure to RAAIM charges by merely adding flexible capacity to its showing. This reduces the incentive for a resource to follow its must offer obligations and to provide replacement capacity in the event of an outage.

In this white paper, the ISO describes the current RAAIM calculation, including its basis in the Reliability Services Initiative – Phase 1 (RSI1) policy development, how the availability calculation methodology can lead to the outcome described in item (2), above, and how the ISO is seeking to modify the availability calculation methodology in this initiative. After assessing RAAIM performance and settlement following implementation, the ISO, with the help of stakeholders, recognized the problematic outcomes and potential manipulation opportunity associated with the RAAIM calculation methodology. To address the problem, the ISO determined that modifications to the RAAIM availability assessment calculation are needed, and the ISO intends to implement such modifications on a prospective basis.

The goal of RAAIM was to improve incentives for Generic resource adequacy[2] capacity to be available consistent with the must-offer obligation and to create comparable incentives for flexible capacity. The intent was not to create incentives that favored or more-heavily weighted one type of capacity over the other (or at the expense of the other). However, the current RAAIM calculations allows a resource providing a significant quantity of Generic RA to reduce its RAAIM exposure by providing only a single MW of flexible capacity. This degrades these resources' incentive to provide replacement capacity, which can result in the need for backstop procurement and impact the ISO's ability to reliably operate the grid during peak load conditions.

The root of the problem with the current calculation can be described, at a high level, as an issue with how the current formula accounts for must offer obligation hours and MWs. The current formula drastically overweights flexible RA performance, which in turn drastically skews the performance incentives. The current RAAIM formula essentially assesses resource availability based on an hourly MW availability basis and then averages the resources' hourly MW availability for all RA products into a single monthly availability percentage (%) value. This approach does not properly account for both the overlap and variation in Generic and Flexible RA availability assessment hours and the associated assessment hours that are utilized in these calculations. This approach values flexible RA capacity much greater than system and local capacity and can essentially "discount" the performance of system

[1] https://bpmcm.caiso.com/Pages/ViewPRR.aspx?PRRID=1012&IsDlg=0
[2] Generic RA resources include both system and local RA.

and local capacity. This also creates the potential for manipulation of RAAIM assessments and associated penalties or payments. Specific examples of how this "discounting" impacts availability calculations are provided in section 3.1.

In this White Paper, the ISO also describes its proposed solution to modify the RAAIM availability assessment calculation to more appropriately assess resource availability based on the daily availability of a resource and properly align the objective of RAAIM and the availability calculations used. The ISO's proposed solution is a modified approach that evaluates resources on a daily MW availability basis for Generic and Flexible RA separately and then calculate a separate, average monthly availability for both Generic and Flexible RA. This modification will calculate daily availability values for system and flexible RA capacity separately to determine a charge or payment for each of the two RA products provided by resources. Calculating the availability of Generic RA and Flexible RA separately ensures that each one has comparable incentives and eliminates the potential interactions that could impact the incentives for each product. Given the identified shortcomings reflected in the performance of the current RAAIM formula and the potential that the Flexible RA product and associated must offer obligations could change in the future, the ISO believes this modified approach is a more appropriate, straightforward, and pragmatic approach that can be adapted to future flexible RA capacity requirements.

2. Background

The ISO's Standard Capacity Product (SCP) was the first tool the ISO developed to incentivize resource availability and encourage resources to provide replacement capacity for resource adequacy (RA) resources. The SCP charged resources with low availability measures and provided a payment to those with high availability measures. The SCP assessed availability based on forced outages. After completing the Flexible Resources Adequacy Criteria and Must Offer Obligation (FRACMOO) stakeholder process, the ISO sought to ensure there was a process to incentivize the availability of flexible RA capacity comparable to Generic RA capacity subject to SCP. As part of the RSI1 stakeholder process, "[t]he CAISO and stakeholders determined… that, although the existing [SCP] mechanism is creating incentives for local and system resource adequacy capacity to be available for service, the incentives are not sufficient, and an enhanced mechanism is necessary."[3] Further, with the introduction of flexible capacity, there was additional need to ensure that similar incentives were made available for flexible capacity. The objective was to ensure both generic and flexible RA capacity had comparable incentives to ensure their availability.

In the RSI1 initiative, the ISO developed the RAAIM tool with a goal of ensuring resources had the proper incentives to (1) be available to the ISO consistent with the must-offer obligation for the type of RA which a resource provided and (2) provide replacement capacity if the resource went on a forced outage. FERC accepted tariff revisions to implement this policy on October 1, 2015.[4] The ISO implemented the RAAIM provisions on April 1, 2017. Based on initial questions from stakeholders

[3] http://www.caiso.com/Documents/May29_2015_TariffAmendment_Implement_Phase1A_ReliabilityServicesInitiative_ER15-1825.pdf at p. 29.

[4] *California Independent System Operator Corporation,* 153 FERC ¶61,002 (2015).

regarding perceived anomalies on their settlements statements, the ISO conducted a review to determine the cause of the anomalies. Through this review, the ISO identified several ministerial errors with the implementation of the RAAIM policy and, more significantly, the ability for a resource to significantly reduce the incentive to be available consistent with its must offer obligation.

3. Schedule

Date	Milestone
Aug 31	Post White Paper and Spreadsheet
Sep 7	Hold Stakeholder call on White Paper
Sep 14	Stakeholder comments on White Paper due
Sep 21	Post Draft Final Proposal
Sep 28	Hold Stakeholder call on Draft Final Proposal
Sep 28	Stakeholder comments on Draft Final Proposal due
Nov 1-2	Present Proposal to Board of Governors

3.1. Stakeholder comments on White Paper

The ISO received six sets of comments to the proposed modifications in the white paper. Calpine and Six Cities both submitted comments generally supportive of the ISO's proposed revisions, while still reserving final judgement based on the implementation of the policy. CDWR sought additional clarifications day-ahead and real-time treatment as well as economic bidding versus self-scheduling. SDG&E raised concerns with the ISO's determination that the revisions should only apply prospectively. SCE submitted comments asserting there is a deeper issue with the penalty structure using the same price for both generic and flexible RA. PG&E asked for additional details regarding which variable impact the calculations, the steps taken in the calculation, and additional for additional time. The ISO also agrees with commenters that additional details on the formulas and the treatment of various inputs into those formulas as well as the policy will help provide clarity. As such, additional details are provided in the body of the document to address stakeholder concerns. The ISO provides the following replies in response to the comments that have been submitted by these parties.

PG&E Comments: PG&E requests additional details, including proposed tariff revisions, and examples prior to completing a draft final proposal. In response, the ISO is including the equations that will be core to the BPM development and documentation, which are included in Appendix B.[5] The

[5] These equations are intended to reflect the policy modifications contained herein and the calculations depicted in the spreadsheet at http://www.caiso.com/Documents/ProposedRAAIMCalculationModificationsModel-ForDraftFinalProposal.xlsx. Any formulaic errors detected during the implementation process will be reviewed with stakeholders and corrected to ensure consistency with this new policy.

ISO believes Board approval of these revisions prior to the end of the year are critical to ensuring the revisions can be put in place in time for spring 2018. Delay beyond the November 2017 Board meeting would delay implementation until fall 2018. The ISO further notes that the spreadsheet developed for the white paper does not capture outage replacement and exemptions. Therefore, the ISO has added a section to this draft final proposal to clarify the treatment of outage replacement and exemptions in section 0.

SCE Comments: SCE has outlined an example that shows how two resources, one providing only generic and another providing only flexible, will result in a different penalty than a single resource providing both generic and system RA. The ISO acknowledges that the penalties demonstrated in the SCE example are correct. However, RAAIM is calculated on a resource-by-resource basis, not over multiple resources. SCE brought forward similar arguments in the initial RSI1a tariff filing. FERC has opined on this matter and determined that the use of the highest MOO as the determinant of availability is just and reasonable. The ISO is not proposing to change this principle.

SDGE Comments: While the ISO believes that the proposed changes are consistent with the high level policy approved by the ISO Board of Governors and FERC, the actual calculation of the RAAIM charges and incentives is core to achieving the over-arching policy objective to provide the correct incentives to follow a must offer obligation (MOO) and provide replacement capacity. Further, the ISO believes that the division of generic and flexible RAAIM calculations is a substantive change, thus warranting a prospective treatment. SDG&E asserts that the only difference between the existing calculation and the proposed calculation is the division of the system and flexible RA. SDG&E asserts that after the division of generic and flexible, all of the other calculations in the proposed modification will ultimately result in the same outcome as the current methodology. Specifically, SDG&E asserts that the split of generic and flexible capacity is a sufficient change, that the transition from hourly calculations to daily assessments is not needed, and demonstrates that the "existing formula is consistent with the Tariff and policy and it's the implementation of the formula that's inaccurate." This assertion is incorrect. The use of daily assessments is needed to prevent weighting issues where in a given month a resource has category 1 flexible capacity on some days, and categories 2 and 3 on others. This is a similar issue to that which is described for generic and flexible in section 4.1.1, below.

Beyond these responses, the ISO continues to encourage all stakeholders to test examples and scenarios in the spread sheet provided. For example, all of the examples in this draft final proposal can be tested using the spreadsheet provided. As noted above, actual configuration for outage replacement and exemptions are described herein, but final calculations will be developed in through the implementation process.

4. Review of RAAIM Implementation and Performance

The ISO's review uncovered (1) minor implementation errors and (2) recognized that the RAAIM availability assessment greatly overvalues flexible RA capacity, may not sufficiently incentivize resources to replace capacity, and potentially can incentivize gaming. As to the first issue, the ISO will correct the implementation errors and recalculate and re-settle RAAIM charges and payments back to April 1, 2017. The ISO will address the second issue through a tariff filing at the conclusion of this

stakeholder process. The primary issue with the existing RAAIM formula arises because the availability assessment calculation allows a resource to significantly reduce its exposure to RAAIM charges by making only slight modifications to its flexible RA category 1 capacity on RA supply plans. The fundamental issue related to this rule involves treating all hours with an availability assessment hour equally and calculating monthly availability as a function of hours. This allows flexible RA to inappropriately skew the outcome of the RAAIM calculation. The flaws with the current availability assessment issue has two issues: the equal weighting of all hours and the use of all hours to scale the average monthly MWs with a requirement at the end of a month. These problems are detailed below.

The current calculation method allows resources to significantly reduce their exposure to availability charges and reduce the incentive to follow must offer obligations or provide substitute capacity during outages.[6] Determining the proper weight to place on each MW, each hour, and each day is important for purposes of fairly and effectively assessing the availability of a resource and the magnitude of any charges against or incentive payments made to the scheduling coordinator for the resource.

4.1. Equal weight for all hours with a must offer obligation

When a scheduling coordinator shows only system capacity, the problem of assessing availability is fairly straight forward. For example, if a 100 MW resource is a system only resource for one day (5 availability assessment hours) and has a one-hour outage, the resource is 100 percent available for four hours and zero percent available for the final hour. On average for that day, the resource is 80 percent available. However, if the scheduling coordinator shows 1 MW from that resource as flexible RA, there are multiple ways to calculate the availability of the resource, each potentially yielding different results. Without clarifying this calculation, scheduling coordinators could potentially reduce their exposure to availability charges and reduce the incentive to follow must offer obligations or provide substitute capacity during outages.

The RAAIM calculation developed in the RSI 1 stakeholder initiative specifies that complying with a 1 MW flexible RA capacity obligation for one hour at 7:00 a.m. is of equal weight to complying with a 1 MW system RA capacity obligation for one hour at 4:00 p.m. On the face, this may appear to be a reasonable methodology for assessing availability. However, treating all hours equally has the unintended consequence of placing far greater weight on 1 MW of flexible RA than is placed on 1 MW of system RA when all of the hours are summed together over the month. For example, 1 MW of flexible capacity must economically bid for 17 hours to meet its must offer obligation, while 1 MW of system capacity only needs to be available for five hours to meet its must offer obligation. In other words, if the CAISO were to treat all hours with a must offer obligation equally, and there are more hours of flexible RA capacity obligations, then 1 MW of flexible RA capacity will have a much larger effect on the availability calculation than 1 MW of system RA capacity. This places substantially more

[6] A slightly modified version of the spreadsheet developed in the RSI1 policy development process is available at http://www.caiso.com/Documents/ResourceAdequacyAvailabilityIncentiveMechanismCalculationCalculator.xls. Only two modifications have been made. First, for transparency, the ISO has unhidden a sheet that was hidden in the original sheet. Second, the ISO has corrected an autofill feature for flexible capacity that will be corrected as part implementation error corrections.

weight on a day with flexible RA relative to a day with only Generic RA. This allows a resource to dilute its incentive to make its capacity available to the ISO during peak load hours.

4.1.1. Examples of equal weight for all hours with a must offer obligation

The following examples show how the current availability calculation can inappropriately skew RAAIM charges and payments.

Availability Assessment Hours

System: 5 hours, non-holiday weekdays

Category 1 Flexible RA: 17 hours, everyday

Category 2 Flexible RA: 5 hours, everyday (may be different hours than system RA)

Category 3 Flexible RA: 5 hours, non-holiday weekdays (may be different hours than system RA)

Example 1:

Two day month, both weekdays. 1 MW of system RA capacity on both days, and 0 MW of Category 1 flexible RA capacity shown. Resource is fully out on the first day, and fully available on the second.
Step 1: Calculate the sum total of RA capacity obligation across all hours. 1 MW times 5 hours for the first day of system RA, and 1 MW times 5 hours for the second day, for a total of 10.
Step 2: Calculate compliance. 0 MW times 5 hours for the first day of system RA, and 1 MW times 5 hours for the second day, for a total of 5.
Step 3: Determine the percent availability. Divide 5 by 10. **The resulting availability equals 50%.**

Example 1 demonstrates an expected availability percentage of 50%, where the resource is on outage for 1/2 of the days it was shown for some type of RA.

Example 2:

Two day month, one weekday and one weekend. 1 MW of system RA capacity on the weekday and 1 MW of Category 1 flexible RA capacity weekend.[7] Resource is fully out on the weekday and fully available on the weekend.
Step 1: Calculate the sum total of RA capacity obligation across all hours 1 MW times 5 hours of system RA on the weekday, and 1 MW times 17 hours for the flexible RA capacity on the weekend, for a total of 22.
Step 2: Calculate compliance. 0 MW times 5 hours of system RA on the weekday, and 1 MW times 17 hours for the flexible RA capacity on the weekend, for a total of 17.
Step 3: Determine the percent availability. Divide 17 by 22. **The resulting availability equals 77.2%.**

Example 2 demonstrates that the resource could be on outage for 1/2 of the days it was shown for some type of RA, same as in example 1, but the availability calculation will show it as being more than 3/4 available. This shows that resource has effectively q1cut the incentive to provide replacement capacity for system RA in half. This is relative to the calculation in example 1.

Example 3:

Three day month, two weekdays and one weekend. 1 MW of system RA capacity on both weekdays and 1 MW of Category 1 flexible RA capacity weekend. Resource is fully out on both weekdays and fully available on the weekend.
Step 1: Calculate the sum total of RA capacity obligation across all hours. 1 MW times 10 hours for both days of system RA, and 1 MW times 17 hours for the flexible RA capacity, for a total of 27.
Step 2: Calculate compliance. 0 MW times 10 hours for both days of system RA, and 1 MW times 17 hours for the flexible RA capacity, for a total of 17.

[7] A weekend day is used for flexible RA in example 2 to avoid any confusion regarding generic and flexible RA, the calculation would be the same for if a weekday had been used. This is true regardless of whether the resource shows zero or one MW of system RA on that day.

Step 3: Determine the percent availability. Divide 17 by 27. **The resulting availability equals 62.9%.**

Example 3 demonstrates that the resource could be on outage for 2/3 of the days it was shown for some type of RA, but the availability calculation will show it as being almost 2/3 available.

Example 4:

Two day month, one weekday and one weekend. 2 MW of system RA capacity on the weekday, and 1 MW of Category 1 flexible RA capacity for both days. Resource is derated by 1 MW on the weekday and fully available on the weekend.
Step 1: Calculate the sum total of RA capacity obligation across all hours. 1 MW times 5 hours for the day of system RA that is beyond the flexible RA, and 1 MW times 34 hours for both days of flexible capacity, for a total of 39.
Step 2: Calculate compliance. 0 MW times 5 hours for the one day of system RA that has been derated and is beyond the flexible RA (This assumes the resource economically bids the other MW), and 2 MW times 17 hours for the weekend day of flexible capacity, for a total of 34.
Step 3: Determine the percent availability. Divide 34 by 39. **The resulting availability equals 82.2%.**

Example 4 demonstrates the impact the current availability assessment calculation can have in reducing the incentive to provide system capacity to meet peak load. In this example, the resource provides only 66 percent of the MWs it committed to provide, but receives credit for providing over 80 percent of its capacity. Specifically, the incentive to provide replacement capacity for anything above the flexible RA value is significantly diminished.

These examples demonstrate the fundamental problem with the current RAAIM calculation treating all hours. Specifically, they demonstrate that the number of hours from flexible capacity, particularly flexible RA Category 1, have a disproportionate weight on the availability calculation. The examples show that including flexible RA affects the availability changes in a disproportionate manner, weighting flexible RA MWs much more heavily. Further, they show how the current methodology reduces the incentive to provide system RA needed to address peak load conditions.

4.2. Monthly penalty comprised of a series of hourly assessments

A second issue the ISO identified is how the current policy attempts to scale capacity to assess a monthly penalty comprised of a series of hourly assessments. Specifically, the current calculation scales the availability requirement and performance based on the average MW with a MOO in a given availability assessment hour. The following example demonstrates this outcome using the current methodology. If one resource has 100 MW of system capacity, the average capacity with a MOO in a given hour would be 100 MW (i.e., (100*5)/5). However, if another similar 100 MW system capacity resource simply adds one MW of flexible capacity, then the average MWs of the resource with a MOO in a given hour changes to 30.11 MW (i.e., [(99*5)+(1*17)]/17]. This allows the resource to appear to have less MWs to assess for availability, according to the current calculation. If the two similar 100 MW resources described above were both 75 percent available, one would be subject to a penalty for a 25 MW deficiency at $3.79/kw-month, while the other would be subject to a penalty for only a 7.5 MW deficiency.[8] As a result, the first resource would face a penalty of $94,750, but the second resource would only face a penalty of $28,303.

This is significant because RA is a product of capacity measured in MWs. However, the existing availability assessment is essentially a function of the number of hours or MWh, not MWs.

A related issue is that the calculation sums all hours over the month, The RA process requires LSEs and resource to submit RA showings and supply plans, respectively, 45 days prior to the beginning of the month. While most of these showings demonstrate that a resource will provide RA for an entire month, the ISO allows for daily RA designations in the demonstrations, and replacement and substitution capacity can be provided on a daily basis. The ISO does not allow for hourly RA showings.[9] The current methodology does not recognize that RA is a daily product.

The current methodology thus creates an incentive to simply show 1 MW of flexible capacity, which can significantly reduce exposure to availability charges. The issue described above also reduces the incentive for resources to follow their MOOs and provide substitute capacity during outages.

As explained above, the ISO's review concluded that two features of the current methodology cause it to produce problematic results that allow a resource to significantly reduce its exposure to RAAIM charges by adding flexible capacity to its showing. The primary objectives of the RAAIM policy were to ensure resources have the proper incentives to: (1) be available to the ISO consistent with their applicable must-offer obligations and; (2) provide replacement capacity if the resource goes on a forced outage. These are proper policy objectives, however, the RAAIM formula that was developed to assess availability has unintended consequences and does not fully achieve these objectives.

5. Proposed Modifications to Resolve Issues

A resource's availability should reflect its ability to provide a given product on a given day. Further, the availability or the number of hours required of one product should not have a direct impact on the

[8] Actual availability calculations start at availability of 94.5 percent and less. However for simplicity of explaining the examples, the ISO is using 100 percent as the availability standard.
[9] The ISO does allow for midday outage replacement. However, that replacement must be designated through at least the end of the next day. See tariff Section 40.9.3.6(c)(2) and Section 9.3.1 of the Reliability Requirements Business Practice Manual for additional details.

incentive to be available for another product. Meeting these important principle requires an assessment of the compliance with a must offer obligation for a day for that product, not for an hour for all products.

The ISO proposes to resolve the issues identified above by making three modifications to the current RAAIM calculation.

1) Calculate availability as a MW value each day, and for each product, instead of MW by hour.
2) Calculate availability for system RA and flexible RA separately.
3) Scale RAAIM penalty and incentive based on the number of days the resource was shown for system RA and flexible RA separately relative to how many days it could have been shown.

The ISO has created a new spreadsheet designed to more clearly demonstrate how the new RAAIM availability assessment. This new spreadsheet is available at http://www.caiso.com/Documents/ProposedRAAIMCalculationModificationsModel-ForDraftFinalProposal.xlsx.

All tabs within the spreadsheet are visible and color-coded to align with the descriptors on the "Read me" tab.

A complete example of the ISO's proposed solution is described in the appendix of this paper and included in the above spreadsheet.

5.1. Calculating Daily Availability

To remedy the problems the ISO's review identified, the ISO proposes to calculate a daily availability measure for each product, system and flexible RA, separately. For example, instead of treating each MW of each hour equally as is done currently, the ISO will treat each MW equally.

5.1.1. System and Category 1 Flexible Capacity Daily Assessments

For a day on which a MW has been shown for both system and flexible RA, the ISO will first consider MW's availability based on the most stringent MOO. Because flexible capacity must economically bid and cannot self-schedule, it has the more stringent MOO the ISO will first assess flexible capacity and then assess compliance with the resource's system MOO for any MW in excess of the resource's flexible capacity showing. For example, if a resource is shown as 25 MW system and 5 MW of category 1 flexible capacity on the same day, the ISO will assess compliance with 20 MW system and 5 MW of flexible capacity.[10] There are additional complications when system RA is combined with categories 2 and 3 flexible capacity,[11] and the ISO discusses the specific issues further below in section 5.1.2. Upon further consideration, the ISO believes the calculation should be based

[10] The ISO will continue to use hourly values from the entirety of either day-ahead or real-time market, not the individual hours from each day. For example, for a given day, the ISO will use all of the day-ahead hourly values or all of the real-time hourly values, not a combination of hours from both the day-ahead and real-time markets.
[11] The ISO is not changing the existing policy of using the availability assessment hours for the highest quality flexible capacity for which a resource has been shown.

on the average compliance with each MOO for the entire day. Therefore, the ISO proposes to assess the availability of the flexible RA portion by calculating the performance of the resource relative to the MOO for the product, divided by the obligation to provide that product. This percentage is then multiplied by the MW value that the resource was supposed to provide to meet its obligations. This calculation yields a daily availability MW value for system or flexible RA.

This proposal provides the basis to resolve both of the issues identified in section 4, above. This proposed modification differs from the current methodology in two important ways. First, the number of hours for category 1 Flexible RA no longer gives flexible RA a disproportionate weight in the availability calculation. For example, if a resource shows 2 MW of capacity shown on a given day, one system[12] and one flexible, then the ISO will assess one MW as a system MW that must meet five availability assessment hours for the day and the other as one MW of flexible capacity that must meet 17 availability assessment hours for the day. Second, there is now no need to spread MWs across hours to determine the average availability across a month. This allows the availability calculation to "right size" the resource and the products it is providing, in other words, the proposal allows for resource's capacity to be considered for availability according to the correct magnitude based upon the resource's showing. The proposed methodology ensures system and flexible MWs receive the correct weight in the availability calculation. Specific examples of this calculation are provided below.

5.1.1.1. System and Category 1 Flexible Capacity Daily Assessments Examples

The following examples are intended to describe how the ISO would implement the calculation described above.[13]

Example 5 (same scenario as example 2, above):

Two day month, one weekday and one weekend, 1 MW of system RA capacity on the weekday, and 1 MW of Category 1 flexible RA capacity on the weekend. Resource is fully out on the weekday and fully available on the weekend.
Step 1: Calculate the average RA obligation for each capacity type each day 1 MW times 5 hours divided by 5 hours for the day of system RA, or 1 MW system RA on the weekday 1 MW times 17 hours divided by 17 hours for the day flexible RA capacity, or 1 MW flexible on the weekend
Step 2: Calculate average daily compliance on each capacity type each day

[12] Technically, both would be system, but the first MW would be assessed as flexible, and the second only as system in this example.

[13] The examples in this section are for illustrative purposes only. Additional scenarios are possible, but these examples are designed to represent the concepts described above. Further the examples in this section assume system and Category 1 flexible capacity.

0 MW times 5 hours divided by 5 hours for the day of system RA, or 0 MW system RA availability on the weekday 1 MW times 17 hours divided by 17 hours for the day flexible RA capacity, or 1 MW flexible RA availability on the weekend
Step 3: Determine monthly availability for each product System: 0 MW of total availability divided by 1 MW of obligation equals zero percent available Flexible: 1 MW of total availability divided by 1 MW of obligation equals 100 percent available

Example 5 demonstrates that the proposed change provides a much more logical result than the current methodology and more accurately represents the idea that capacity is a daily product. Example 6 further demonstrates this calculation.

Example 6:

Three days of RA shown for a month, two weekdays and one weekend. 1 MW of system RA capacity shown on both weekdays, and 1 MW of Category 1 flexible RA capacity shown on the weekend. Resource is fully out on the first weekday and fully available on the second weekday and the weekend.
Step 1: Calculate the average RA obligation for each capacity type each day. 1 MW times 5 hours divided by 5 hours for the each day of system RA, or 1 MW system RA on each day, for a total of 2 MWs of system RA on the weekdays. 1 MW times 17 hours divided by 17 hours for flexible RA capacity, or 1 MW flexible RA, on the weekend.
Step 2: Calculate average daily compliance on each day for each product. 0 MW times 5 hours divided by 5 hours for the first weekday of system RA or 0 MW total, 1 MW times 5 hours divided by 5 hours for the second day of system RA or 1 MW total, for a sum total 1 MW system RA availability for both weekdays. 1 MW times 17 hours divided by 17 hours for flexible RA capacity, or 1 MW flexible RA availability, on the weekend.
Step 3: Determine monthly availability percentage for each product. System: 1 MW of total availability divided by 2 MW of obligation equals 50 percent available. Flexible: 1 MW of total availability divided by 1 MW of obligation equals 100 percent available.

As a final example, the ISO demonstrates how this calculation works for a resource shown as both system and flexible on the same day, but in different quantities.

Example 7:

One day month, weekday. 2 MW of system RA capacity and 1 MW of Category 1 flexible RA capacity. Resource is fully on line, but self-schedules the entire day (*i.e*., not compliant with flexible capacity MOO to bid economically).
Step 1: Calculate the average RA obligation for each capacity type. 1 MW times 5 hours divided by 5 hours for the quantity of system RA that is beyond the flexible RA, or 1 MW system RA. 1 MW times 17 hours divided by 17 hours for flexible RA capacity, or 1 MW flexible RA capacity.
Step 2: Calculate average daily compliance on each day for each product. 1 MW times 5 hours divided by 5 hours for the quantity of system RA availability that is beyond the flexible RA, or 1 MW of system RA availability. 0 MW times 17 hours divided by 17 hours for flexible RA capacity, or 0 MW flexible RA availability.
Step 3: Determine monthly availability percentage for each product System: 1 MW of total availability divided by 1 MW of obligation equals 100 percent available. Flexible: 0 MW of total availability divided by 1 MW of obligation equals zero percent available.

These examples provide more specific details about how the ISO is proposing to modify the availability calculation. Splitting the system and flexible assessments allows for a much cleaner and precise assessment of availability for each type of RA provided;[14] although, they can lead to instances where system RA receives an incentive payment, but flexible RA pays a charge, or vise-versa. However, the ISO prefers splitting the calculations because it provides clearer incentives to be available to provide each RA product and removes the potential for a resource to manipulate its overall availability measurement by taking advantage of the differences between flexible RA and system RA,

[14] One MW of economic bid will not count towards system RA obligations unless it is in excess of the flexible RA obligation. Each MW will only go into a single bucket of RA (i.e. generic or flexible).

i.e., the fact that the assessment for system RA is five hours per day five days a week, but the assessment for Type 1 Flex RA is for 17 hours per day seven days a week.

5.1.2. Addressing the Interaction between System RA Capacity and Flexible Capacity Categories 2 and 3

As shown above, the ISO proposes that a MW of capacity will continue to be viewed as flexible capacity first, then any capacity above the flexible RA would be treated as system. This works simply when assessing system and flexible capacity category 1 and the system availability assessment hours are a subset of the flexible capacity category 1 availability assessment hours. However, for flexible categories 2 and 3, some the availability assessment hours do not overlap with the system availability assessment hours, while other hours do overlap. Take for example a resource that shows 2 MW of system RA and one MW of flexible RA category 2: the resource could be subject to the system availability assessment hours for hours 1-5 for two MW and flexible RA availability assessment hours for hours 3-8 for one MW.

The ISO's proposed modification will account for all availability assessment hour obligations. This means the ISO will account for hours in which a resource only has a system assessment. Note that for the system hours, the first 2 hours, 1-2, do not overlap with flex category 2, and the last three hours, 3-5, overlap with flex category 2. This is demonstrated in the following example.

5.1.2.1. Addressing the Interaction between System RA Capacity and Flexible Capacity Categories 2 and 3 Examples

The following examples are designed to demonstrate how the ISO calculates a resources total availability, accounting for resource availability when the category 2 and 3 flexible RA and system RA assessment hours do not completely overlap (As they do with category 1 and system RA as shown in the examples 5-8, above).

Assumed Availability Assessment Hours

System: Hours 1-5

Flexible Category 2: Hours 3-8

Example 8:

One day month, weekday, 2 MW of system RA capacity and 1 MW of Category 2 flexible RA capacity. Resource is on line, but self-schedules 1 MW the entire day (i.e. not compliant with flexible capacity MOO to bid economically).
Step 1: Calculate the average RA obligation for each capacity type.

2 MW times 2 hours for the system RA not overlapping with flexible RA, plus 1 MW times 3 hours for the system RA beyond the flexible RA. Then divide by 5 hours for 1.4 MW system RA. 1 MW times 5 hours divided by 5 hours for flexible RA capacity, or 1 MW flexible RA capacity. Divide by the maximum of the system or flexible RA shown for the day (i.e. the maximum amount of RA the resource is providing that day) by the sum MW across all products to develop a scaling factor needed to determine each products daily MW availability requirement:[15] 2/(1.4 + 1) = 2/2.4 = 0.833 This weighting factor can now be used to attribute a MW value to system and flexible RA when the availability assessment hours for system and flexible do not fully overlap.
Step 2: Apply weighting factor. Weighting factor: 2 MW/2.4MW = 0.833 System requirement: 1.4 MW x 0.833 = 1.167 MW Flexible requirement: 1 MW x 0.833 = 0.833 Note: If summed, the obligation would equal 2 MW for the day which equals the maximum amount of RA the resource is providing that day.
Step 3: Calculate average daily compliance for each product. 1 MW times 2 hours where the system RA is not overlapping with flexible RA, plus 1 MW times 3 hours where the system RA is beyond the flexible RA. Then divide by 5 hours for 1 MW system RA availability Apply weighting factor for system RA availability: 1 MW x 0.833 = 0.833 MW 0 MW times 5 hours divided by 5 hours for flexible RA availability, or 0 MW flexible RA availability. Apply weighting factor for flexible RA availability: 0 MW x 0.833 = 0 MW
Step 4: Determine monthly availability for each product. System: 0.833 MW of total availability divided by 1.167 MW of obligation equals 71.43 percent available. Flexible: 0 MW of total availability divided by 0.833 MW of obligation equals zero percent available.

[15] The weighting factor is needed because each product has five availability assessment hours, but they total seven availability assessment hours for the purposes of the availability assessment. The weighting factor allows the ISO to correctly capture each the entirety of each product's availability assessment hours, accounting for both the number of hours and MWs. This calculation can also be done for examples 5-8. The result of this calculations in all of those examples equals one.

The proposed solution demonstrated in Example 8 above ensures the complete availability and compliance with MOOs during the availability assessment hours, including all hours and MWs, are assessed for both for system and flexible RA. Further, if the category 1 flexible capacity availability assessment hours did not completely overlap the system availability assessment hours completely, this methodology can be also be applied to ensure that the relative MW weights of all products is maintained (*i.e.*, it does not over emphasize 1 MW of flexible RA over 1 MW of system or vice versa).

5.1.3. Daily outage replacement and exemptions

RA resources may go on outage and use another resource for replacement or substitute capacity. When this occurs, the RA obligation moves from the original resource to the replacing or substituting resource. The calculation to determine the average RA obligation for each capacity type, as shown in each of the preceding examples, takes this into account. If for a given day, a resource with 50 MW of system RA goes on forced outage in real-time, and uses another resource to substitute for 50 MW for the last availability assessment hour, then the resource's average system RA obligation in real-time would be 50 MW * 4/5 or 40 MW. The substituting resource's average system RA obligation in real-time would be 50 MW * 1/5 or 10 MW, assuming it originally did not have RA.

RA resources may go on outage, and due to reasons as indicated by the outage type or nature of work, would have RA capacity be eligible to be exempt from RAAIM assessment. The calculation to determine the average RA obligation for each capacity type takes this into account. If for a given day, a resource with 50 MW of Category 2 flexible RA has a planned outage to be out of service that starts in the day's last availability assessment hour, then the resource's Category 2 flexible RA obligation would be 50 MW * 4/5 or 40 MW in day-ahead and real-time. In the last availability assessment hour, the resource's obligation is 0 MW, where 50 MW was exempt. The exemption applies to both day-ahead and real-time, because the planned outage was entered before the day-ahead market of the given day.

Market participants can explore these scenarios in the spreadsheet by modifying the obligations by the hour in the Generic tab (rows 28-51) and Flex tab (rows 2-25), after inputting values in the Input tab.

5.1.4. Day-Ahead vs Real-Time compliance for each RA Type

The daily RA obligation and RA availability used in the monthly calculations will be from the lesser performing, on a percentage basis, of the day-ahead or real-time. This will be done separately for system and flexible RA. It is possible that on a given day a resource could be assessed system from DA, and flexible from RT, or vice versa.[16] Exceptions to this rule are for resources that are assessed in RT only, such as VERs, where only the real-time RA obligation and availability would be used. Or

[16] The ISO will continue to use hourly values from the entirety of either day-ahead or real-time market, not the individual hours from each day. For example, for a given day, the ISO will use all of the day-ahead hourly values or all of the real-time hourly values, not a combination of hours from both the day-ahead and real-time markets.

for resources that are assessed in day-ahead only, such as Long Start resources not committed in day-ahead or RUC, where only the day-ahead RA obligation and availability would be used.

In the substitution scenario from section 5.1.3, since the forced outage occurred in real-time, the original resource's average system RA obligation in day-ahead is 50 MW, and the substituting resource's obligation is 0 MW. The daily RA obligation and availability for the substituting resource would be from real-time only, since it did not have any RA in day-ahead. Then for the original resource, the lower performance percentage between day-ahead and real-time would determine whether 50MW from day-ahead or 40 MW from real-time is used.

The ISO acknowledges that the day-ahead vs real-time compliance check was not built into the spreadsheet. The ISO determined not do so here. Adding more inputs to distinguish between day-ahead and real-time, and to account for exceptions, added greater complexity to an already complex spreadsheet. However, the ISO is providing formulas to illustrate the check in Appendix B.

5.2. Calculating Monthly Availability

The above examples and explanations demonstrate how the ISO would calculate daily values under its proposal, and the following section will describe how it is possible to translate these daily values into monthly availability measurements. Additionally, the ISO believes it is important that each assessment reflect the number of days within a month that a resource provides a particular type of capacity. A resource that provides 1 MW of RA for one day should not have the same impact on the incentive calculation as a resource that provides 1 MW of RA every day in month. However, it must also account for the number of days that a resource could be available to provide a given product. This section provides additional details about how the ISO will scale both system and flexible RA products' daily performances in determining a monthly availability incentive charge or payment

5.2.1. Combining Daily Availability Calculations into a Monthly Availability Assessment

Section 5.1 above demonstrates how hourly and daily performance should be combined into a daily MW value. Now the assessment must convert this value into a monthly performance percentage. This formulation can be done in manner similar to what was done originally, but with one key change proposed herein by the ISO: using the methodology developed in Section 5.1, which eliminates the potential for a resource to "shrink" its MW value by increasing the hours within the assessment. As a result, monthly performance can be calculated simply as follows:

Availability percent = Sum MW performance over all days ÷ Sum MW obligation over all days

There will be a monthly availability percentage calculated for system RA, and a separate monthly availability percentage calculated for flexible RA capacity.

5.2.2. Scaling for the Number of Days a Resource is Shown as RA

The ISO's proposed solution is to calculate availability for system and flexible RA separately. One of the primary reason supporting this approach is that system and flexible RA capacity are required to

be available a different number of days in each month. This fact is particularly important when it comes to assessing availability charges and incentive payments because products with fewer days of obligation will have a different effective daily capacity prices. For example, the system RA availability assessment hours are for non-holiday weekdays, while category 1 flexible capacity availability assessment hours are seven days a week. Therefore, the ISO will calculate availability charges, or incentive payments, by accounting for the number of days a given product *could be* shown for each RA type.

The number of days a resource can be shown for each type of RA capacity is an important aspect of the availability charge calculation because it determines the equivalent daily capacity value of a given product. System RA and flexible RA have a different number of assessment days in a month. Availability is assessed based on satisfaction of a resource's availability assessment hours for a different number of days. For example, if a resource is shown as both system and flexible RA for one week in a month, should the ISO determine the availability charge based on a 21 day month (based on the fact that system RA is assessed based on an obligation to be available five days a week), a 30 day month (based on the fact that flexible RA is assessed based on an obligation to be available seven days a week), some combination of the two, or should each RA category be assessed separately. Since the ISO will calculate availability separately for system and flexible RA, the most reasonable solution is to calculate system and flexible capacity incentives based on the number of days over which a product could be provided. This will allow the ISO to calculate system RA availability based on the number of days a resource could be subject to a system availability assessment, and flexible RA availability based on the number of days a resource could be subject to a flexible RA availability assessment. The following example demonstrates this, where a monthly MW obligation is determined as a summation of weighting each daily MW obligation to the RA type's total possible assessment days in a month.

Example 9

System: There are 21 total possible system availability assessment days in a 30 day month. A resource has 10 MW of system RA capacity for 2 of the assessment days in the month. System monthly MW obligation = $\frac{10\ MW}{21} + \frac{10\ MW}{21}$ = 0.95 MW
Flex: There are 30 total possible Category 1 flex availability assessment days in a 30 day month. A resource has 10 MW of Category 1 flex RA capacity for 3 days in the month. Flex monthly MW obligation = $\frac{10\ MW}{30} + \frac{10\ MW}{30} + \frac{10\ MW}{30}$ = 1 MW

After monthly MW obligations are determined, availability charges and incentive payments are calculated for system and flexible RA separately. The availability charge is determined by the monthly MW short multiplied by the non-availability price, where the monthly MW short is determined by taking the monthly MW obligation multiplied by 94.5% less the availability percentage. The incentive payment is determined by the monthly MW incentive multiplied by the incentive price, where the monthly MW

incentive value is determined by taking the monthly MW obligation multiplied by the availability percentage less 98.5%.

This allows for a resource to be assessed based upon its performance measured over a month, instead of incurring penalties or payments based on an assessment of performance measured on single days. This is consistent with the original policy, and the ISO sees no reason to change this prospectively.

6. Next Steps

The ISO will discuss this proposal with stakeholders during a conference call on September 28, 2017. Stakeholders are welcome to submit written comments by October 3, 2017 to initaitivecomments@caiso.com.

7. Appendix A: Complete Example of ISO proposed modified solution

To illustrate the many aspects of the ISO proposal a full example has been preloaded into the spreadsheet available at http://www.caiso.com/Documents/ProposedRAAIMCalculationModificationsModel-ForDraftFinalProposal.xlsx. [17]

The example is broken into three type of showings, each covering 10 days of the month.

	Days		
Capacity Type	1-10	11-20	21-30
System	100 MW	100 MW	100 MW
Category 1		75 MW	
Category 2			
Category 3			25 MW

These capacity values are added to the input tab of the sheet in the cells highlighted in green.

Next, input the resources bidding/availability. In this instance, it is assumed that to resource will have two outages: days 6-10 and days 17-20. The bidding behavior on the days on which the resource is not on outage are shown below.

	Days						
	1-4	5	6-10	11-15	16	17-20	21-30
Self-schedule	100 MW	100 MW for hours 1-14 50 MW for hours 15-24	0	25	25 MW for hours 1-14 10 MW for hours 15-24	0	65
Economic bids*	0	0	0	75	75 MW for hours 1-14	0	25

[17] Note many values are rounded to the nearest whole number and may cause rounding error relative to spreadsheet. However, all final values should reflect those from the spreadsheet.

					65 MW for hours 15-24		

These bidding inputs are entered into the input tab of the sheet in the cells highlighted in orange and blue.

With these inputs set. It is now possible to do a full step by step calculation of the resource's availability. The process will start with an hourly review, roll all hours into a daily calculation, and then roll all days up into the final monthly assessment. As noted in the ISO proposal, the ISO will do each of these steps for both system and flexible capacity. Each step will pull from a specific entry in the spreadsheet to illustrate the proposed calculation.

All hours in these examples are input as hour ending (i.e. 1:00 p.m. is entered as hour ending 14).

Example 1a: Day 5

Hourly assessment:

Step 1: Determine hourly MOO requirements for each product

Capacity type	Hour																	
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
System										100	100	100	100	100				
Category 1																		
Category 2																		
Category 3																		

Step 2: Determine performance[18]

Capacity type	Hour																	
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
System Obligation										100	100	100	100	100				
System Performance										100	50	50	50	50				

[18] See rows 43-66 of the "Calculations MW" tab in the spreadsheet for system performance.

Category 1																		
Category 2																		
Category 3																		

System Performance = [(100*1)+(50*4)]/(100*5)= 300/500 = 60%

Step 3: Determine Daily MW available

System availability = System MW obligation * system performance

= 100 * 0.6

= 60 MW

Example 1b: Day 16

Hourly assessment:

Step 1: Determine hourly MOO requirements for each product

Capacity type	Hour																
	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
System									25	25	25	25	25				
Category 1	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
Category 2																	
Category 3																	

Step 2: Determine performance[19]

Capacity type	Hour																
	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
System Obligation									25	25	25	25	25				

[19] See rows 69-92 of the "Calculations MW" tab in the spreadsheet for flexible performance.

System Performance									25	10	10	10	10				
Category 1 Obligation	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
Category 1 Performance	75	75	75	75	75	75	75	75	75	65	65	65	65	65	65	65	65
Category 2																	
Category 3																	

System Performance = [(25*1) + (10*4)]/(25*5) = 65/125 = 52%

Flexible performance = [(75*9) + (65*8)]/(75*17) = [675 + 520]/1275 = 1,195/1,275 = 93.7%

Step 3: Determine Daily MW available

System availability = System MW obligation * System performance

= 25MW * 0.52

= 13 MW

Flexible availability = Flexible MW obligation * Flexible performance

= 75 * 0.937

= 70.3 MW

Example 1c: Day 25

Hourly assessment:

Step 1: Determine hourly MOO requirements for each product

Capacity type	Hour																
	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
System									100	100	75	75	75				
Category 1																	
Category 2																	
Category 3											25	25	25	25	25		

Step 1.1: Determine weighting factor

Weighting Factor = Max(Daily system RA showing, Daily Flexible Category 3 showing)/
Average hourly system obligation + Average hourly Category 3 obligation

= 100/(85 + 25) = 0.91

Step 1.2: Apply weighting factor to determine Daily MW Obligation

Daily system obligation = Average hourly system obligation * weighting factor

= 85 MW * 0.91 = 77.27 MW

Daily flexible obligation = Average hourly Category 3 obligation * weighting factor

= 25 MW * 0.91 = 22.73 MW

Note: System obligation + Flexible Obligation = Max of the daily system or flexible obligation

Step 2: Determine performance[20]

Capacity type	Hour																
	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
System Obligation									100	100	75	75	75				
System Performance									90	90	65	65	65				
Category 1 Obligation																	
Category 2																	
Category 3 Obligation											25	25	25	25	25		
Category 3 Performance																	

System Performance = [(90*2) + (65*3)]/[(100*2) + (75*3)] =375/425 = 88.2%

Flexible performance = [(25*5)]/(25*5) = 125/125 = 1,195/1,275 = 100%

Weighting Factor = Max(Daily system RA showing, Daily Flexible Category 3 showing)/

[20] See rows 69-92 of the "Calculations MW" tab in the spreadsheet for flexible performance.

(Average hourly system obligation + Average hourly Category 3)

= 100/(85 + 25) = 0.91

Step 3: Determine Daily MW available

Step 3.1: Determine Daily MW available, including weighting factor

System availability = Average hourly system MW obligation * System performance

= 85 MW * 0.882 * 0.91

= 68.25 MW

Flexible availability = Flexible MW obligation * Flexible performance * Weighting factor

= 25 MW * 1 * 0.91

= 22.72 MW

This completes examples of how daily performance is measured for three different days within a month. The next step of the process is to transform these daily values into a monthly availability measure for both system and flexible capacity products.

Example 2: Converting daily availability into a monthly availability measure

Calculating monthly system RA performance

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Assess Generic Daily MW Availability	0	100	100	100	60	0	0	0	0	0	25	25	25	0	0
Assess Generic Daily MW Obligation	0	100	100	100	100	100	0	0	100	100	25	25	25	0	0
Day	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
Assess Generic Daily MW Availability	13	0	0	0	0	0	0	68	68	68	68	68	0	0	68
Assess Generic Daily MW Obligation	25	25	25	25	25	0	0	77	77	77	77	77	0	0	77
Summary	Total Requirement = 1363 MW-days							Total performance = 857 MW-days							

Monthly Percent Availability = 857/1363 = 62.85%

Calculating monthly flexible RA performance

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Assess Flexible Daily MW Availability	0	0	0	0	0	0	0	0	0	0	75	75	75	75	75
Assess Flexible Daily MW Requirement	0	0	0	0	0	0	0	0	0	0	75	75	75	75	75

Day	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Assess Flexible Daily MW Availability	70	0	0	0	0	0	0	23	23	23	23	23	0	0	23
Assess Flexible Daily MW Requirement	75	75	75	75	75	0	0	23	23	23	23	23	0	0	23
Summary	Total Requirement = 886 MW-days							Total performance = 582 MW-days							

Monthly Percent Availability = 582/886 = 65.62%

These calculations are all provided on the "Calculations MW" tab of the spreadsheet and demonstrates how each of the individual days is rolled up to generate a monthly availability percentage. The next step is calculating converting the various RA values into a single monthly equivalent RA value so that a monthly MW deficiency or excess value can be calculated

Example 3: Scale MW to portion of the month

Because there are different quantities of system and flexible capacity shown on different days, it is necessary to scale MW to portion of the month for which they have been shown. This scaling accounts for the MW shown of a given product, number of days the resource is shown for a given product, and the number of days a resource could be shown for a given product

Example 3a: Day 5

The resource is shown for 100 MW of system capacity. It is assessed as a single day. However, there are 21 possible days in which a resource can be assessed for system RA. Since all of the assessments can be done on a day-by-day basis, the first step is to scale the MW by the number of days in a month to create a daily MW factor.

System daily MW factor = System obligation/Total days of system availability assessment in a month

= 100 MW / 21 days

= 4.7619

Example 3b: Day 16

The resource is shown for 25 MW of system RA and 75 MW of category 1 flexible RA. All MWs are assessed as a single day. There are 21 possible days in which a resource can be assessed for system RA and 30 days in which it can be assessed for category 1 flexible RA. Since all of the assessments can be done on a day-by-day basis, these MWs are scaled by the MW by the number of days in a month for each product to create a daily MW factor.

System Daily MW factor = System availability/Total days of system availability assessment in a month

= 25 MW / 21 days

= 1.1905

Flexible Daily MW factor = System availability/Total days of category 1 flexible RA availability assessment in a month

= 75 MW / 30 days

= 2.5

Example 3b: Day 25

The resource is shown for 75 MW of system RA and 25 MW of category 3 flexible RA. All MWs are assessed as a single day. There are 21 possible days in which a resource can be assessed for system RA and 21 days in which it can be assessed for category 3 flexible RA. Since all of the assessments can be done on a day-by-day basis, these MWs are scaled by the MW by the number of days in a month for each product to create a daily MW factor.

System Daily MW factor = System availability/Total days of system availability assessment in a month

= 77.27 MW / 21 days

= 3.6797

Flexible Daily MW factor = System availability/Total days of category 3 flexible RA availability assessment in a month

= 22.72 MW / 21 days

= 1.0823

Example 4: Calculating incentive charges/payments

The incentive payments must continue to account for the size (i.e. MW) and the duration (i.e. number of days) of a resource's RA obligation. This is done using the sum of daily MW factors for each product from examples 3a-c, above. When summed, these values equal the MW value of what the resource would have provided if shown for the same number of MWs for every day of the month. This value is then multiplied by the availability percentage (shown in Example 2) to determine the monthly MW availability and incentive payments relative to the established deadband (i.e. 94.5 percent – 98.5 percent).

System Monthly RA Value

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Daily MW Requirement / Possible	0	4.76	4.76	4.76	4.76	4.76	0	0	4.76	4.76	1.19	1.19	1.19	0	0

Assessment Days															
Day	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
Daily MW Requirement / Possible Assessment Days	1.19	1.19	1.19	1.19	1.19	0	0	3.67	3.67	3.67	3.67	3.67	0	0	3.67
Sum Total = 64.94 MW															

System RA MW subject to charges/incentive = 64.94 MW * (0.945 - 0.6285)

= 64.94 MW * 0.3165

= 20.55 MW shortage

Total system RAAIM charges = 20.55 MW * $3.786/kW-mth = $77,802

Flexible Monthly RA value

Day	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Daily MW Requirement / Possible Assessment Days	0	0	0	0	0	0	0	0	0	0	2.5	2.5	2.5	2.5	2.5
Day	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
Daily MW Requirement / Possible Assessment Days	2.5	2.5	2.5	2.5	2.5	0	0	1.08	1.08	1.08	1.08	1.08	0	0	1.08
Sum Total = 31.49 MW															

Flexible RA MW subject to charges/incentive = 31.49 MW * (0.945 - 0.6562)

= 31.49 MW * 0.2888

= 9.09 MW shortage

Total Flexible RA RAAIM charges = 9.09 MW * $3.786/kW-mth = $34,414

8. Appendix B: Formulas of ISO proposed modified solution

The following formulas illustrate the ISO's proposed solution. The formulas also takes into account exemptions and the compliance check between day-ahead and real-time.

Please note that the variable names and subscripts in the formulas may differ upon implementation of the settlements BPM.

Where
r = Resource
f = Flexible Category
m = Month
d = Day
h = Hour

Hourly RA obligations less exemptions:

$$\text{HourlyDAGenericRAObligation}_{rmdh} = \text{HourlyDAGenericRA}_{rmdh} - \text{HourlyDAGenericRAExemption}_{rmdh}$$

$$\text{HourlyRTGenericRAObligation}_{rmdh} = \text{HourlyRTGenericRA}_{rmdh} - \text{HourlyRTGenericRAExemption}_{rmdh}$$

$$\text{HourlyDAFlexibleRAObligation}_{rfmdh} = \text{HourlyDAFlexibleRA}_{rfmdh} - \text{HourlyDAFlexibleRAExemption}_{rfmdh}$$

$$\text{HourlyRTFlexibleRAObligation}_{rfmdh} = \text{HourlyRTFlexibleRA}_{rfmdh} - \text{HourlyRTFlexibleRAExemption}_{rfmdh}$$

Capping for Generic RA obligation and availability:

$$\text{HourlyDAGenericRACappedObligation}_{rmdh} = \text{Max}(0, \text{HourlyDAGenericRAObligation}_{rmdh} - \sum_{f} \text{HourlyDAFlexibleRAObligation}_{rfmdh})$$

$$\text{HourlyRTGenericRACappedObligation}_{rmdh} = \text{Max}(0, \text{HourlyDAFlexibleRAObligation}_{rfmdh} - \sum_{f} \text{HourlyRTFlexibleRAObligation}_{rfmdh})$$

$$\text{HourlyDAGenericRACappedAvailability}_{rmdh} = \text{Min}(\text{HourlyDAGenericRAAvailability}_{rmdh}, \text{HourlyDAGenericRACappedObligation}_{rmdh})$$

$$\text{HourlyRTGenericRACappedAvailability}_{rmdh} = \text{Min}(\text{HourlyRTGenericRAAvailability}_{rmdh}, \text{HourlyRTGenericRACappedObligation}_{rmdh})$$

Calculate daily performance by RA and market type:

$$DAGenericPerformance_{rmd} = \sum_{h} HourlyDAGenericRACappedAvailability_{rmdh} / \sum_{h} HourlyDAGenericRACappedObligation_{rmdh}$$

$$RTGenericPerformance_{rmd} = \sum_{h} HourlyRTGenericRACappedAvailability_{rmdh} / \sum_{h} HourlyRTGenericRACappedObligation_{rmdh}$$

$$DAFlexiblePerformance_{rfmd} = \sum_{h} HourlyDAFlexibleRAAvailability_{rfmdh} / \sum_{h} HourlyDAFlexibleRAObligation_{rfmdh}$$

$$RTFlexiblePerformance_{rfmd} = \sum_{h} HourlyRTFlexibleRAAvailaiblity_{rfmdh} / \sum_{h} HourlyRTFlexibleRAObligation_{rfmdh}$$

Calculate average daily obligation by RA and market type:

$$DailyDAGenericRAObligation_{rmd} = \sum_{h} HourlyDAGenericRACappedObligation_{rmdh} / GenericAssessmentHoursInDayCount_{md}$$

$$DailyRTGenericRAObligation_{rmd} = \sum_{h} HourlyRTGenericRACappedObligation_{rmdh} / GenericAssessmentHoursInDayCount_{md}$$

$$DailyDAFlexbileRAObligation_{rfmd} = \sum_{h} HourlyDAFlexibleRAObligation_{rfmdh} / FlexibleAssessmentHoursInDayCount_{fmd}$$

$$DailyRTFlexbileRAObligation_{rfmd} = \sum_{h} HourlyRTFlexibleRAObligation_{rfmdh} / FlexibleAssessmentHoursInDayCount_{fmd}$$

Determine DA vs RT compliance:

$$DailyGenericRAAssessDAorRT_{rmd} =$$

If (DAGenericPerformance $_{rmd}$ < RTGenericPerformance $_{rmd}$ And DailyDAGenericRAObligation $_{rmd}$ > 0)

Or (DailyDAGenericRAObligation $_{rmd}$ > 0 And DailyRTGenericRAObligation $_{rmd}$ = 0)

Then 1

Else 0

DailyFlexibleRAAssessDAorRT $_{rfmd}$ =

If (DAFlexiblePerformance $_{rfmd}$ < RTFlexiblePerformance $_{rfmd}$ And DailyDAFlexbileRAObligation $_{rfmd}$ > 0)

Or (DailyDAFlexbileRAObligation $_{rfmd}$ > 0 And DailyRTFlexbileRAObligation $_{rfmd}$ = 0)

Then 1

Else 0

Determine daily obligation by RA type:

DailyGenericRAObligation $_{rmd}$ =

If DailyGenericRAAssessDAorRT $_{rmd}$ = 1

Then DailyDAGenericRAObligation $_{rmd}$

Else DailyRTGenericRAObligation $_{rmd}$

DailyGenericRAUncappedObligation $_{rmd}$ =

If DailyGenericRAAssessDAorRT $_{rmd}$ = 1

Then $\sum_{h}$ HourlyDAGenericRAObligation $_{rmdh}$ / GenericAssessmentHoursInDayCount $_{md}$

Else $\sum_{h}$ HourlyRTGenericRAObligation $_{rmdh}$ / GenericAssessmentHoursInDayCount $_{md}$

DailyFlexbileRAObligation $_{rfmd}$ =

If DailyFlexibleRAAssessDAorRT $_{rfmd}$ = 1

Then DailyDAFlexbileRAObligation $_{rfmd}$

Else DailyRTFlexbileRAObligation $_{rfmd}$

Calculate daily availability by RA type:

DailyGenericRAAvailability $_{rmd}$ =

If DailyGenericRAAssessDAorRT $_{rmd}$ = 1

Then DAGenericPerformance $_{rmd}$ * DailyDAGenericRAObligation $_{rmd}$

Else RTGenericPerformance $_{rmd}$ * DailyRTGenericRAObligation $_{rmd}$

DailyFlexibleRAAvailability $_{rfmd}$ =

If DailyFlexibleRAAssessDAorRT $_{rfmd}$ = 1

Then DAFlexiblePerformance $_{rfmd}$ * DailyDAFlexbileRAObligation $_{rfmd}$

Else RTFlexiblePerformance $_{rfmd}$ * DailyRTFlexbileRAObligation $_{rfmd}$

Calculate daily weighting factor:

DailyWeightingFactor $_{rmd}$ = Max(DailyGenericRAUncappedObligation $_{rmd}$, $\sum_{f}$ DailyFlexbileRAObligation $_{rfmd}$) / (DailyGenericRAObligation $_{rmd}$ + $\sum_{f}$ DailyFlexbileRAObligation $_{rfmd}$)

Calculate obligation and availability by RA type with daily weighting factor applied:

DailyGenericRAObligationAssess $_{rmd}$ = DailyWeightingFactor $_{rmd}$ * DailyGenericRAObligaiton $_{rmd}$

DailyFlexbileRAObligaitonAssess $_{rfmd}$ = DailyWeightingFactor $_{rfmd}$ * DailyFlexbileRAObligation $_{rfmd}$

DailyGenericRAAvailabilityAssess $_{rmd}$ = DailyWeightingFactor $_{rmd}$ * DailyGenericRAAvailability $_{rmd}$

DailyFlexibleRAAvailabilityAssess $_{rfmd}$ = DailyWeightingFactor $_{rfmd}$ * DailyFlexibleRAAvailability $_{rfmd}$

Calculate monthly availability percentage by RA type:

$$MonthlyGenericAvailabilityPercentage_{rm} = \sum_{d} DailyGenericRAAvailabilityAssess_{rmd} / \sum_{d} DailyGenericRAObligationAssess_{rmd}$$

$$MonthlyFlexibleAvailabilityPercentage_{rfm} = \sum_{d} DailyFlexibleRAAvailabilityAssess_{rfmd} / \sum_{d} DailyFlexbileRAObligaitonAssess_{rfmd}$$

Calculate monthly obligation by RA type:

$$MonthlyGenericRAObligation_{rm} = \sum_{d} (DailyGenericRAObligaiton_{rmd} / GenericAsssementDaysInMonthCount_{md})$$

$$MonthlyFlexibleRAObligation_{rfm} = \sum_{d} (DailyFlexbileRAObligation_{rfmd} / FlexibleAsssementDaysinMonthCount_{fmd})$$

Calculate monthly non availability by RA type:

$$MonthlyGenericRANonAvailable_{rm} = MonthlyGenericRAObligation_{rm} * Max(0, 94.5\% – MonthlyGenericAvailabilityPercentage_{rm})$$

$$MonthlyFlexibleRANonAvailable_{rfm} = MonthlyFlexibleRAObligation_{rfm} * Max(0, 94.5\% – MonthlyFlexibleAvailabilityPercentage_{rfm})$$

Calculate monthly non availability amount by RA type:

$$MonthlyGenericRAAIMNonAvailableAmount_{rm} = MonthlyGenericRANonAvailable_{rm} * RAAIMNonAvailabilityRate_{m}$$

$$MonthlyFlexibleRAAIMNonAvailableAmount_{rfm} = MonthlyFlexibleRANonAvailable_{rfm} * RAAIMNonAvailabilityRate_{m}$$

Calculate monthly availability incentive by RA type:

$$MonthlyGenericRAIncentive_{rm} = MonthlyGenericRAObligation_{rm} * Max(0, MonthlyGenericAvailabilityPercentage_{rm} – 98.5\%)$$

$$MonthlyFlexibleRAIncentive_{rfm} = MonthlyFlexibleRAObligation_{rfm} * Max(0, MonthlyFlexibleAvailabilityPercentage_{rfm} – 98.5\%)$$

Calculate monthly availability incentive amount by RA type:

$MonthlyGenericRAAIMIncentiveAmount_{rm} = MonthlyGenericRAIncentive_{rm} * RAAIMAvailabilityIncentiveRate_{m}$

$MonthlyFlexibleRAAIMIncentiveAmount_{rfm} = MonthlyFlexibleRAIncentive_{rfm} * RAAIMAvailabilityIncentiveRate_{m}$

Attachment D – Board Memorandum and Board Presentation

Modification to Resource Adequacy Availability Incentive Mechanism Methodology

California Independent System Operator Corporation

Memorandum

To: ISO Board of Governors

From: Keith Casey, Vice President, Market & Infrastructure Development

Date: October 25, 2017

Re: **Decision on resource adequacy availability incentive mechanism modifications**

This memorandum requires Board action.

EXECUTIVE SUMMARY

The ISO developed the resource adequacy availability incentive mechanism (RAAIM) to ensure resource adequacy resources have the proper incentives to (1) be available to the ISO consistent with their must-offer obligation and (2) provide replacement capacity if the resource incurs a forced outage. Shortly after the RAAIM provisions were implemented on April 1, 2017, some market participants raised questions about the validity of their RAAIM settlement charges. In response, the ISO conducted a review of the RAAIM settlement calculation. Through this review, the ISO found that the current RAAIM calculation allows a resource to significantly reduce its incentive to be available consistent with its must offer obligation.

Specifically, the current RAAIM calculation allows a resource providing a large quantity of generic RA capacity to significantly reduce its RAAIM exposure by providing only a single MW of flexible RA capacity. This degrades a RA resource's incentive to provide replacement capacity for an outage of their resource, which can affect the ISO's ability to reliably operate the grid during peak load conditions and result in the need for backstop procurement.

Management proposes to resolve this issue by separately calculating the RAAIM settlement for generic (system and local) RA resources and flexible RA resources. Separating the calculations resolves the issues caused by combining the RAAIM into a single calculation.

Management believes the proposed modifications are necessary to ensure proper incentives are in place for RA resources to meet the must offer and outage replacement obligations. Management proposes to apply these modifications prospectively and will not resettle past charges caused by the existing RAAIM calculation.

Management proposes the following motion:

Moved, that the ISO Board of Governors approves the proposal to modify the resource adequacy availability incentive mechanism as described in the memorandum dated October 25, 2017; and

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 proposed tariff change, as described in the memorandum dated October 25, 2017.

DISCUSSION AND ANALYSIS

The proposed modifications to the RAAIM calculation are designed to provide clear incentives for RA resources to meet their must offer obligations and provide replacement capacity if they incur a forced outage. The current RAAIM calculation was designed as a single value based on the combined performance of a resource in meeting the must offer obligations associated with all the RA products the resource is shown to provide. For example, if a 100 MW resource was shown as having 100 MW of generic RA and 50 MW of flexible RA, the ISO would calculate RAAIM by taking a weighted average of the resource's performance. An unintended consequence of the current RAAIM calculation occurs because flexible RA capacity has 17 RAAIM assessment hours per day, but generic RA capacity has only 5 assessment hours per day. Therefore, in the current combined calculation, flexible RA performance has a much greater weight than generic RA performance. Given this, the current methodology creates an incentive for an RA resource to simply show 1 MW of flexible capacity to significantly reduce its exposure to availability charges. The reduced exposure to availability charges reduces the incentive for resources to follow their RA obligation to offer the resource into the ISO market and to provide substitute capacity during outages.

Management proposes to change the RAAIM calculation to assess availability separately for system and flexible RA. Calculating the performance of generic and flexible RA separately provides clear incentives for meeting the offer obligations of the different products. It also removes the potential for a resource to manipulate its overall availability measurement by taking advantage of the differences between flexible RA and generic RA.

The following example demonstrates the impact that adding one MW of flexible capacity can have on a resource's exposure to RAAIM using the current formula and how Management's proposal effectively mitigates a resource's ability to lower its exposure to RAAIM charges under such circumstances.

Example with current calculation					
Resources	**System**	**Flexible**	**RAAIM charge from a 5 day outage**		
Resource A	100 MW	0 MW	$69,393		
Resource B	100 MW	1 MW	$14,567		
Example using proposed modifications					
Resources	**System**	**Flexible**	**RAAIM charge from a 5 day outage**		
			System	Flexible	Total
Resource A	100 MW	0 MW	$69,049	$0	$69,319
Resource B	100 MW	1 MW	$68,626	$423	$69,049

POSITIONS OF THE PARTIES

Stakeholder comments were generally supportive of modifying the RAAIM calculation to eliminate the identified issues and inappropriate incentives. However, some stakeholders assert that the ISO should use approaches that differ from Management's current proposal.

DMM, SCE, and NRG all assert that the ISO should develop separate prices for compliance with generic RA must offer obligations and flexible RA must offer obligations. The primary challenge to reopening the door to separate prices for generic and flexible capacity would be to determine the correct prices for each. RA products are procured by load serving entities bilaterally outside of the ISO market. As a result, the ISO has limited information on the different price values of generic RA and flexible RA capacity. This issue was raised in the initial Reliability Service Initiative – Phase 1 FERC filing as well. FERC determined in its final decision that using the same price for both generic and flexible capacity was just and reasonable. Given this precedent, the challenges of determining the correct prices for each product, and the need to correct RAAIM incentives prior to summer 2018, Management has elected to maintain the single price policy in this proposal.

SDG&E opposes separating the flexible and generic availability calculations. SDG&E asserts that separating generic and flexible capacity availability calculations is a major departure from the policies developed in the reliability service initiative – phase 1 stakeholder process. Management agrees. Therefore, Management will seek additional tariff authority to reflect any necessary changes and will only apply the modified changes prospectively.

DMM offered an alternative calculation for determining availability. Management

considered DMM's alternative methodology and determined that it would reduce incentives for resources to follow flexible RA must offer obligations.

PG&E and Six Cities do not oppose the current proposal, but ask for additional stakeholder engagement through tariff and Business Practice Manual development to ensure a smooth implementation process. Management commits to working closely with stakeholders through the tariff and BPM development process.

CONCLUSION

Management requests the Board approve its proposals for the prospective modifications to the existing resource adequacy availability incentive mechanism calculations. The proposed modifications will provide enhanced incentives for resources to meet their resource adequacy availability obligations.

Decision on resource adequacy availability incentive mechanism (RAAIM) modifications

Karl Meeusen, Ph.D.
Senior Advisor – Infrastructure and Regulatory Policy

Board of Governors Meeting
General Session
November 2, 2017

A policy gap was identified in RAAIM calculation that requires modifications to eliminate adverse incentives.

Current calculation disproportionately weighs flexible capacity resulting in opportunity for resources to lower exposure to charges

- Weighting performance based on availability assessment hours
  - Flexible RA – 17 assessment hours/day
  - System and local RA – 5 assessment hours/day

- As a result, resources can take unilateral action to lower their exposure to RAAIM charges by adding 1 MW of flexible capacity to an RA showing

Resources	System Capacity	Flexible Capacity	RAAIM charge from a 5 day outage
Resource A	100 MW	0 MW	$69,393
Resource B	100 MW	1 MW	$14,567

Proposed modifications to the current RAAIM calculation appropriately weight system and flexible resource adequacy performance.

- Separately calculate the availability for generic (system and local) RA and flexible RA for each day
  - Resolves issues caused by combining the RAAIM into a single calculation
  - Ensures proper incentives are in place to meet the must offer and outage replacement obligations
- Because this is a policy change, modifications will apply prospectively

The revised RAAIM calculation eliminates opportunity for resources to reduce incentives to meet RA obligations.

- Separate assessment for generic (system/local) and flexible RA corrects gap in current RAAIM calculation

Resources	System	Flexible	RAAIM charge from a 5 day outage		
			System	Flexible	Total
Resource A	100 MW	0 MW	$69,049	$0	$69,319
Resource B	100 MW	1 MW	$68,626	$423	$69,049

- Provides more precise availability assessment for each product type provided

Stakeholders support correcting the incentives, but differ on how to achieve this objective.

- DMM, NRG, and SCE recommend creating separate prices for generic and flexible capacity
  - Primary challenge to separate prices is insufficient information available to determine the correct prices while still maintaining strong incentives for all RA products
  - Proposal consistent with existing FERC-approved policy
- CDWR, PG&E, and Six Cities do not oppose the proposal, but request additional support through implementation
  - The ISO is committed to providing this support
- DMM has suggested an alternate calculation
  - Alternate calculation reduces incentives for resources to follow flexible RA must-offer obligations

Management recommends the Board approve the proposed enhancements to the RAAIM calculation.

- Resolves concerns with the current calculation that overly weights flexible relative to generic RA capacity
- Provides a clearer and more accurate incentive for resources to follow their must offer obligation and provide replacement capacity when on outage
- Is consistent with existing FERC-approved policy
- Delay would result in the ISO relying on the current methodology through summer 2018
- The ISO will continue to work closely with stakeholders through tariff and BPM development

Attachment E – DMM Board Memorandum for November 2017 Board Meeting,

DMM Comments on Draft Final Proposal and White Paper

Modification to Resource Adequacy Availability Incentive Mechanism Methodology

California Independent System Operator Corporation

Memorandum

To: ISO Board of Governors

From: Eric Hildebrandt, Director, Market Monitoring

Date: October 25, 2017

Re: **Department of Market Monitoring Report**

This memorandum does not require Board action.

EXECUTIVE SUMMARY

This memo provides comments by the Department of Market Monitoring (DMM) on two Management proposals being presented to the Board for approval.

- **Capacity Procurement Mechanism Risk of Retirement Process Enhancements.** DMM supports Management's proposal to provide risk of retirement capacity procurement mechanism (CPM) designations earlier in the year. This change is an improvement in the current process which occurs too late in the year to be of practical use. Elements of the proposal reduce incentives for resources to seek CPM payments by feigning retirement. Concerns about CPM designations occurring before the resource adequacy process highlight the need to change the resource adequacy process timeline so that resource adequacy contracting is completed further in advance. The proposal is not designed to resolve incentives for resources to circumvent the CPM and resource adequacy processes by seeking reliability must run (RMR) contracts. Broader reforms to the CPM, resource adequacy, and RMR processes are required to address that issue.

- **Resource Adequacy Availability Incentive Mechanism.** Management's proposal is an improvement which mitigates significant problems that exist with the current resource adequacy availability incentive mechanism (RAAIM). Although DMM believes the time allowed for review and discussion of the details of the new approach provided in the final proposal has been limited, the ISO has indicated it must proceed with a proposal now in order to get a new RAAIM approach in effect before summer 2018. Given the importance of ensuring that capacity procured under the resource adequacy program is actually available to meet the ISO's operational needs, DMM recommends the ISO closely monitor the impact and effectiveness of the new RAAIM approach and be prepared to modify or enhance the methodology as needed.

Risk of Retirement Capacity Procurement Mechanism

Management's proposal allows resource owners to be notified earlier in the year whether they will receive a risk of retirement capacity procurement mechanism (CPM) designation. Providing CPM designations earlier will make the risk of retirement CPM a more viable option for resources considering retirement. This change is an improvement to the current risk of retirement CPM process which occurs too late in the year to be of practical use for generators or the CAISO.

Another feature is the proposal to allow a resource to not retire if it later receives a resource adequacy contract through a bi-lateral agreement with a load serving entity. This flexibility allows resources that were uneconomic to stay in service when conditions change, mitigating the potential for an inefficient retirement.

Several aspects of the proposal reduce the likelihood that a resource will feign retirement in order to receive risk of retirement CPM designation. Management proposes to compensate a resource who receives a risk of retirement CPM at the resource's cost-of-service. The cost-of-service compensation reduces the potential for resources to seek extra rents from risk of retirement CPM designations compared to compensation at the regular CPM soft offer cap – which DMM expects should exceed the cost of service for many resources. The resource owner must also attest in writing that they intend to retire the unit. This increases the difficulty of potential gaming aimed at obtaining CPM payments in the proposed risk of retirement process.

The proposal creates an April application window before the annual resource adequacy process is complete in the fall of each year. Concerns about the risk of retirement CPM designations occurring before the resource adequacy process highlight the need to change the resource adequacy process timeline so that resource adequacy contracting is completed further in advance.

The proposal is not designed to resolve incentives for resources to circumvent the CPM and resource adequacy processes by seeking reliability must run (RMR) contracts. A resource can currently receive an RMR contract if it applies for retirement at any time during the year. Broader reforms to the CPM, resource adequacy, and RMR processes are required to address this issue.

Resource Adequacy Availability Incentive Mechanism

Management's proposed changes to the RAAIM calculations mitigates problems with the prior approach that created the need for the RAAIM modification initiative. DMM views Management's proposal as an improvement over the current RAAIM approach.

Details of the proposal were only defined in the form of equations in the Draft Final Proposal issued on September 21. Given the unanticipated problems with the prior formation and the complexity of the proposed formulas, the time allowed for review and

discussion of the final proposal by DMM and other stakeholders has been somewhat limited. However, the ISO has indicated it must proceed with a proposal now in order to get a new RAAIM approach in effect before summer 2018.

Given the importance of ensuring that capacity procured under the resource adequacy program is actually available to meet the ISO's operational needs, DMM recommends the ISO closely monitor the impact and effectiveness of the new RAAIM approach as it is implemented, and be prepared to modify or enhance the methodology as needed.

Comments on the Resource Adequacy Availability Incentive Mechanism Modification Draft Final Proposal

Department of Market Monitoring
October 3, 2017

Summary

The California ISO Department of Market Monitoring (DMM) appreciates the opportunity to comment on the ISO's Resource Adequacy Availability Incentive Mechanism (RAAIM) Modification Draft Final Proposal (Proposal).[1]

DMM agrees with the ISO that the proposed changes to the RAAIM calculations are substantive and will need to be submitted to the ISO Board and to FERC for approval.

DMM appreciates that the ISO finished defining its proposal by using equations in the Draft Final Proposal issued on September 21. Given that the details of the ISO proposal were only clarified in the Draft Final Proposal issued on September 21, DMM has sought to review the proposal as quickly as possible and provide these comments. Now that stakeholders have a defined proposal to assess, DMM recommends that the ISO consider stakeholder feedback on that proposal and incorporate the feedback into an improved final RAAIM design.

The ISO Proposal fixes the inconsistencies that created the need for the RAAIM Modification Initiative. But the ISO's proposed RAAIM calculations still have several inconsistencies. While these inconsistencies may be mild compared to those in the current RAAIM calculation, DMM believes the proposed approach could be improved. At the end of these comments, DMM is providing an alternative potential RAAIM calculation which does not seem to have these inconsistencies.

I. Single penalty price is not ideal but may be only currently feasible method

The ISO Proposal maintains a single penalty price for multiple RA products. As DMM and SCE pointed out in previous comments, using a single penalty price will necessarily result in some logical inconsistencies.[2] However, the ISO has not been able to use the available RA data to determine what reasonable separate penalty prices would be. Calculating RAAIM charges using

[1] *Resource Adequacy Availability Incentive Mechanism Modification: Draft Final Proposal*, September 21, 2017: http://www.caiso.com/Documents/DraftFinalProposal-RAAIMCalculationModifications-clean.pdf.

[2] *SCE comments on Resource Adequacy Availability Incentive Mechanism Modification White Paper* September 15, 2017: http://www.caiso.com/Documents/SCEComments-RAAIMCalculationModifications-WhitePaper.pdf. *DMM comments on Resource Adequacy Availability Incentive Mechanism Modification White Paper* September 19, 2017: http://www.caiso.com/Documents/DMMComments-RAAIMCalculationModifications-WhitePaper.pdf.

a single penalty price may be the only currently feasible method. The RAAIM modifications should aim to reduce the effects of these inconsistencies as much as possible.

II. ISO proposal solves main concern of initiative, but creates other potential inconsistencies

The ISO Proposal fixes the inconsistencies that led to disproportionate effects from small amounts of flexible RA showings on overall RAAIM charges. But there are still some inconsistencies with the ISO Proposal. The ISO Proposal tries to maintain the concept of not separating RA products in order to maintain a single penalty price policy. However, the ISO calculates availability percentages and unavailable RA separately by RA product.

As a result of this approach, under the ISO's proposal a resource can receive both a RAAIM charge and incentive payment during the same month. Further, a resource may have a total RA availability percentage (across RA products taken together) that is above the penalty threshold. But by separating the availability calculations, one RA product may be below the penalty threshold while the other is below the incentive threshold. This resource would face a RAAIM charge even though its total RA availability is above the penalty threshold. Conversely, a resource whose total RA availability is below the threshold for an incentive payment may receive an incentive payment when availabilities are calculated separately.[3]

A third issue occurs when a resource sells both system and flexible RA (or local and flexible RA). If the resource does not provide the flexible RA it will be treated as if it also does not provide the system RA. This will occur even if the resource does provide the system RA.

Provided below is an alternative potential calculation of the RA availability for RAAIM assessment for the ISO and stakeholders to consider. DMM thinks this alternative calculation resolves some of the inconsistencies of the ISO's proposed calculation while still meeting the ISO's objectives and maintaining a single penalty price paradigm.

[3] It is unclear why a resource that provides less than what it was contracted to provide should receive additional payments, even if the resource only provides a little bit less than it was contracted to provide. However, review of the incentive payment concept does not appear to be in the scope of the RAAIM modifications initiative.

III. Alternative RAAIM penalty and incentive payment calculation

The RAAIM formulation below details a potential calculation of RAAIM penalty charges and incentive payments. We believe this potential calculation meets the ISO's goals in the RAAIM Modification initiative, which include maintaining the questionable paradigm of using a single penalty price for multiple products. The ISO's goals include:

- Products are measured at a daily level negating effects from hour differences between product definitions.
- The accounting of product obligations and availability is proportionate based on megawatts.
- Penalty charges or incentive payments are assessed on monthly measures of availability.

Description of alternative RAAIM penalty and incentive payment calculation

a: Calculate the average available RA MW for each product daily. Divide by monthly product days. This availability will not weigh RA products with more offer hours more heavily than RA products with less offer hours.

b: Add the daily availabilities for all RA products for the generator. This turns all RA product availability into a single generic RA availability weighted by product days.

c: Add average daily product obligations, divided by product days, for each product to get the total daily gross MW of RA requirements. This treats all RA products obligations as a single RA product obligation.

d: Divide the total available RA by the total RA obligations to get the daily total percent of all RA obligations that were available. This treats all RA products obligations as a single RA product obligation.

e: Find the maximum of the average daily RA product obligations, weighted by product days, across all RA products. This is the "net" RA requirement assuming all RA products overlap each other. The net requirement is used so that no output range on a generator can have multiple penalty prices applied for not delivering multiple products. The total unavailable RA megawatts cannot be greater than the maximum megawatt obligation across RA products. This also treats all RA products obligations as a single RA product obligation.

f: Calculate the monthly RA availability using daily percent available and net RA requirements.

g: RAAIM penalty charges for amount of RA not delivered below the penalty threshold.

h: RAAIM incentive payments for amount of RA delivered above the incentive threshold.

General RAAIM penalty and incentive payment formulation:

a: $$MW_{d,p}^{avail} = \frac{1}{D_p} * \sum_{h} MW_{h,d,p}^{avail} / H_p$$

b: $$MW_{d}^{avail} = \sum_{p} MW_{d,p}^{avail}$$

c: $$MW_{d}^{GrossReq} = \sum_{p} \sum_{h} \frac{1}{D_p} * \left(MW_{h,d,p}^{oblig} / H_p \right)$$

d: $$PctAvail_d = MW_{d}^{avail} / MW_{d}^{GrossReq}$$

e: $$MW_{d}^{NetReq} = \max_{p} \left(\sum_{h} \frac{1}{D_p} * \left(MW_{h,d,p}^{oblig} / H_p \right) \right)$$

f: $$PctAvail_m = \sum_{d \in m} PctAvail_d * MW_{d}^{NetReq} \Big/ \sum_{d \in m} MW_{d}^{NetReq}$$

g: $$RAAIM\_Charge_m = \max(0, T^{penalty} - PctAvail_m) * RAAIM^{penalty} * 1{,}000 * \sum_{d \in m} MW_{d}^{NetReq}$$

h: $$RAAIM\_Incentive_m = \max(0, PctAvail_m - T^{incentive}) * RAAIM^{incentive} * 1{,}000 * \sum_{d \in m} MW_{d}^{NetReq}$$

Notation:

h	Indexes hours
d	Indexes days
p	Indexes RA products
m	Indexes months
D	Total potential RA product days in month
H	Total hours per day of RA product
MW^{oblig}	Megawatts of RA obligations
MW^{avail}	Megawatts available to meet RA obligation
$PctAvail$	Percent of RA available
$MW^{GrossReq}$	Additive RA obligations across products
MW^{NetReq}	Net RA obligation assuming overlap of products
$T^{penalty}$	Threshold availability percentage for penalty charges
$T^{incentive}$	Threshold availability percentage for incentive payments
$RAAIM^{penalty}$	RAAIM penalty rate $/kW-month
$RAAIM^{incentive}$	RAAIM incentive rate $/kW-month
$RAAIM\_Charge$	Monthly RAAIM penalty charges
$RAAIM\_Incentive$	Monthly RAAIM incentive payments

Example: Treatment of multiple RA products under ISO proposal and alternative calculation

Consider a 100 MW generator with a 100 MW system RA obligation and 50 MW flexible RA obligation. The generator self-schedules its entire 100 MW. Table 1 and Table 2 below show the ISO proposed calculation and the alternative calculation of unavailable RA subject to RAAIM charges.

Under the ISO's proposed method, the flexible RA obligation would be subtracted from the system RA obligation to get a new system RA obligation of 50 MW. The flexible RA obligation remains 50 MW. This subtraction treats the RA obligations as overlapping so that the generator cannot have RAAIM charges for multiple RA products on the same output range of a generator. For the 50 MW of overlapping capacity the ISO would penalize the generator as if it had provided neither system nor flexible RA when in fact it had provided system RA. The generator would be subject to RAAIM charges on 50 MW of unavailable flexible RA. The ISO proposed method would only give the generator credit for 50 MW of available system RA even though the generator had 100 MW available.

Under the alternative method the ISO would calculate the percent of total RA obligations (system RA plus flexible RA) that were available. The generator's total RA obligations would be 150 MW (100 system plus 50 flexible). Of the total RA obligations, the generator made available 100 MW (100 system plus 0 flexible). The generator made available 66.7% of its total RA obligations. This means that 33.3% of the RA obligations were unavailable. Of the total net RA requirement of 100 MW, 33.3 MW would be deemed unavailable and subject to RAAIM charges. The alternative method would give the generator credit for 100 MW of system RA, weighted by the net RA requirement, not just 50 MW. The alternative method would also be consistent with the single price paradigm and overlapping treatment of RA obligations of the general RAAIM policy.

Table 1. RAAIM charge under ISO proposed calculation

	Avail	Oblig	Pct Avail	Unavail
System	50	100-50=50	100%	0
Flexible	0	50	0%	50
Total	50	100	50.0%	50

Table 2. RAAIM charge under alternative calculation

	Avail	Oblig	Pct Avail	Net Req	Unavail
System	100	100	100%		
Flexible	0	50	0%		
Total	100	150	66.7%	100	33.3

Comments on the Resource Adequacy Availability Incentive Mechanism Modification White Paper

Department of Market Monitoring
September 19, 2017

The California ISO Department of Market Monitoring (DMM) appreciates the opportunity to comment on the ISO's Resource Adequacy Availability Incentive Mechanism (RAAIM) Modification White Paper (White Paper).[1]

The RAAIM modification proposed by the ISO is intended to fix issues with the current RAAIM design. Under the current design, a market participant can significantly and disproportionately reduce its RAAIM penalties for non-performance of system RA obligations by showing a small amount of flexible RA capacity.

The ISO's White Paper explains a flaw in the market design defined in the ISO tariff. DMM notes that participants in the California ISO markets are expected to comply with the ISO Tariff as well as federal regulations, including *18 C.F.R. § 1c.2 Prohibition on Electric Energy Market Manipulation* and *18 C.F.R. § 35.41 Market Behavior Rules*. Actions not expressly prohibited in the ISO Tariff are still subject to federal regulations. For example, submitting a flexible RA showing with the intent to reduce RAAIM penalties related to the performance on other RA contract types could be referred for investigation to the FERC Office of Enforcement.

The ISO should fix the market design flaw as soon as it can develop an adequate policy to replace it. Monitoring and referrals to FERC should not be relied upon to address market design flaws that can be exploited by market participants. Flexible RA showings that are not intended to reduce RAAIM penalties can reduce penalties. This difficulty makes monitoring less effective and could place unnecessary concerns on participants showing flexible RA for legitimate business reasons.

As noted in DMM's 2014 comments, DMM continues to believe each RA product should have its own RAAIM penalty price.[2] The current RAAIM policy has one penalty price for all products, not one price for each product. The most significant issue described in the White Paper – that small RA showings can significantly and disproportionately reduce RAAIM penalties – is a result of using a single price for two very differently defined RA products. While the ISO can alter the RAAIM penalty calculations to reduce how disproportionate particular effects are, using a single

[1] *Resource Adequacy Availability Incentive Mechanism Modification White Paper*, August 31, 2017: http://www.caiso.com/Documents/WhitePaper-RAAIMCalculationModifications.pdf.

[2] Department of Market Monitoring, *Comments on the Straw Proposal for Reliability Services*, July 28, 2014: http://www.caiso.com/Documents/DMMComments-ReliabilityServices-StrawProposal.pdf.

price for multiple products will always require some arbitrary assumptions and result in some logical inconsistencies.

DMM cannot provide specific comments on the ISO's proposed RAAIM modifications as they are now written. This is because the ISO does not provide a formulation of the proposed new RAAIM penalty calculations in the White Paper. Stakeholders are left to back out the formulation from examples in the White Paper and an accompanying excel spreadsheet.[3] We agree with CDWR[4] and PG&E[5] that the ISO should provide explicit formulas for the proposed RAAIM calculations and with the Six Cities that "the sample calculations are complex, and stakeholders have not had a great deal of time to study the details of the calculations."[6]

Part of the problem with the original RAAIM process was that the ISO did not write out a formulation at that time and only gave stakeholders an excel spreadsheet. The problems with the current RAAIM formulas were not readily apparent when looking at that spreadsheet. The ISO should put the proposed RAAIM modifications formulation in its proposal to avoid repeating the issues that occurred after the original RAAIM policy process. A written formulation is necessary for stakeholders, including DMM, to understand the proposal and provide comments.

[3] It is not clear that the examples in the White paper and spreadsheet use the same formulation. For example, the White Paper examples use calculations that divide some hours by other hours. But the spreadsheet does not perform such a calculation. It may or may not be that both methods get the same results, but there is no way to tell without knowing what each formulation is.

[4] *CDWR Comments – RAAIM Calculation Modification White Paper*: http://www.caiso.com/Documents/CDWRComments-RAAIMCalculationModifications-WhitePaper.pdf

[5] *Comments of Pacific Gas & Electric Company Resource Adequacy Availability Incentive Mechanism Modification – White Paper*: http://www.caiso.com/Documents/PG-EComments-RAAIMCalculationModifications-WhitePaper.pdf

[6] *Comments of the Cities of Anaheim, Azusa, Banning, Colton, Pasadena, and Riverside, California on CAISO's Resource Adequacy Availability Incentive Mechanism Modification White Paper*: http://www.caiso.com/Documents/SixCitiesComments-RAAIMCalculationModifications-WhitePaper.pdf

Attachment F – List of Key Dates

Modification to Resource Adequacy Availability Incentive Mechanism Methodology

California Independent System Operator Corporation

List of Key Dates in the Stakeholder Process for this Tariff Amendment

Date	Event/Due Date
September 1, 2017	CAISO issues papers entitled “Resource Adequacy Availability Incentive Mechanism Modification White Paper” and “Proposed RAAIM Calculation Modifications Model”
September 7, 2017	CAISO hosts stakeholder conference call that includes discussion of papers issued on September 1 and presentation entitled “Resource Adequacy Availability Incentive Mechanism Calculation Modifications White Paper”
September 15, 2017	Due date for written stakeholder comments on papers issued on September 1
September 21, 2017	CAISO issues papers entitled “Resource Adequacy Availability Incentive Mechanism Modification: Draft Final Proposal” and “Proposed RAAIM Calculation Modifications Model (for Draft Final Proposal)”
September 28, 2017	CAISO hosts stakeholder conference call that includes discussion of papers issued on September 21 and presentation entitled “Resource Adequacy Availability Incentive Mechanism Calculation Modifications Draft Final Proposal”
October 3, 2017	Due date for written stakeholder comments on papers issued on September 21
December 4, 2017	CAISO issues draft tariff revisions to implement RAAIM modifications
December 13, 2017	Due date for written stakeholder comments on draft tariff revisions issued on December 4
December 18, 2017	CAISO hosts stakeholder conference call to discuss draft tariff revisions issued on December 4
January 10, 2018	CAISO issues modified version of draft tariff revisions to implement RAAIM modifications