Resource Adequacy Enhancements Phase 2

Straw Proposal

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1. Executive Summary

Objective: The key objective of the California Independent System Operator Corporation's (CAISO) multi-year effort to enhance the CAISO's Resource Adequacy (RA) tariff provisions is to ensure the CAISO's RA rules and tools remain relevant and guide the procurement of capacity that can reliably and sustainably support the rapidly evolving needs of the grid all hours of the year. In phase 2 of the initiative, the CAISO is proposing changes to its resources adequacy provisions to align with the new day-ahead market enhancements proposal that is scheduled to be implemented in the Fall of 2022.

Summary of Changes:

1. **Must Offer Obligations (MOO) and Bid Insertion:**

The RA program is designed to ensure CAISO has sufficient capacity available to serve load reliably all hours of the year. Any resource providing RA capacity to the CAISO has an obligation to offer that capacity into the CAISO market so that the CAISO can manage and dispatch the system reliably. Currently, the CAISO tariff and Business Practice Manual (BPM) for Reliability Requirements contains provisions regarding must offer obligations, bidding, and bid insertion rules.

The day-ahead market enhancements proposal includes a new imbalance reserve product to ensure that sufficient resources are scheduled in the day-ahead market to meet a range of potential real-time imbalance energy needs. The CAISO proposes the following changes to the must offer obligation and bid insertion with the objective of increasing the availability of existing resources that can meet load and imbalance reserve requirements. This is intended to ensure resource availability during all hours of the day to meet reliability needs that can occur at any time, not just during peak periods. CAISO proposes to extend the real-time must offer obligation and bid insertion rules through the Day-Ahead Market Enhancements transitionary period,[1] unless the resource is exempt.

- Resources will have a 24 hour a day and seven day a week (24 by 7) must offer obligation into the day-ahead market and a 24 by 7 must offer obligation and real-time market through the Day-Ahead Market Enhancements (DAME) transitionary period, unless exempt; and
- The CAISO market will insert bids for resources if not submitted, unless they are exempt.

[1] CAISO is proposing a transition period after the DAME initiative is initially implemented, which will maintain the existing RA must offer obligation and not allow RA resources to submit non $0/MW bids for imbalance reserves and reliability capacity. This transition period will provide an opportunity to evaluate the performance of imbalance reserves under a variety of grid conditions and to assess the viability of removing the real-time RA MOO.

The update to the must offer obligation and bid insertion policies will impact the following resource types:

Storage and Hybrid Resources: CAISO is proposing that for storage and hybrid resources, the must offer obligation should reflect both the charge and discharge capabilities of the resource so the CAISO can fully optimize the resource's full range. Bidding full charge and discharge capability would allow CAISO to ensure energy sufficiency during the optimization window.

Use-Limited and Conditionally Available Resources: The CAISO proposes to apply the standard must offer obligation and bid insertion for use-limited resources and conditionally available resources, unless the underlying technology has a different offer obligation.[2]

Eligible Intermittent Resources: While no change is being proposed, CAISO clarifies that any energy above the resources' net qualifying capacity (NQC) cannot be used to support an export from non-RA capacity. CAISO recognizes, that while the RA value produced by the effective load carrying capability (ELCC) methodology may be lower or higher than what the resource can produce in the operational timeframe (because the RA value is static and the resource capability varies), the RA capacity under offer obligation to the CAISO is for all energy necessary to derive the shown RA value. This means that the energy from these resources above the NQC value cannot be used to support an export from non-RA capacity.

Demand Response Resources: The CAISO clarifies that absent adoption of an alternative counting methodology for demand response by the local regulatory authority (LRA), the CAISO will apply the following must offer obligations for demand response. For Proxy Demand Response (PDR) resources, the CAISO will defer to program parameters established or approved by the LRA to determine the hours of the must offer obligation. The days and hours in which the demand response resources are obligated to bid into the market must be clearly communicated through LRA-approved documentation, such as contract provisions or decisions. During those hours, the resource must bid all its RA capacity not on outage. If no parameters are established by the LRA, resources must follow the standard must offer obligation. For Reliability Demand Response Resources (RDRR), the CAISO will continue to have the option to bid into day-ahead, and are required to bid into real-time consistent with the program parameters established or approved by the LRA.

[2] Tariff Definition of Use-Limited Resource and Conditionally Available Resource: http://www.caiso.com/Documents/AppendixA-MasterDefinitionSupplement-asof-Sep28-2019.pdf

2. Flexible Resource Adequacy

The CAISO proposes a three stage approach to consider modifications to the flexible RA program. In the first stage, to align with the proposed imbalance reserve product in the DAME initiative, the CAISO proposes to expand the must offer obligation for all RA resources that are capable of providing imbalance reserves (as defined by the CAISO) in the integrated forward market (IFM). Such eligible RA resources will be obligated to bid for the imbalance reserve product along with energy and ancillary services (if certified). The stages include:

- Stage 1(RA Year 2023): The Flexible RA program requirements and effective flexible capacity counting will remain as is. However, all resources with 15 or 5-minute dispatchability[3] will have an expanded must offer obligation to bid $0/MW for imbalance reserves in the day-ahead market (if and when eligible as proposed in the DAME initiative), and economically bid energy and ancillary services to allow the day-ahead market to co-optimize all products in the IFM.[4] Resources would still be allowed to self-schedule any day-ahead energy awards in real-time, but would be obligated to economically bid in any imbalance reserve awards.
- Stage 2 (RA Year 2023-2024): The CAISO is not proposing any additional changes during this period, rather the CAISO will conduct additional analysis once the CAISO has more operational experience with the new Day-Ahead Market design and products to assess whether Flex RA needs any modification to better align with the imbalance reserve product, whether we need to retain planning and procuring resources to specifically meet the three hour net load ramp, or other modifications to the flexible RA program that may be necessary to ensure reliability. The CAISO will conduct a stakeholder process to develop subsequent policy that results from this analysis.
- Stage 3 (RA Year 2025): The CAISO will implement a re-designed or sunset the Flex RA program, in coordination with the CPUC and other LRAs.

Timeline:

Elements scoped in phase 2 of this initiative include modifications to the must offer obligation and bid insertion policy as well as flexible RA, which are designed to align with changes under development in DAME.[5] The CAISO intends to take these elements to the Board of Governors in February 2022.

[3] Final resource eligibility requirements for imbalance reserves will be determined in the Day-Ahead Market Enhancements Initiative.
[4] All RA resources would also be obligated to bid $0 for RC up and down awards in the RUC run.
[5] See https://stakeholdercenter.caiso.com/StakeholderInitiatives/Day-ahead-market-enhancements for more information on the DAME initiative.

2. Introduction and Background

The focus of this phase of the RA Enhancements Initiative are clarifications to the must offer obligation of RA resources to align with changes to the day-ahead market products and processes under development through the DAME initiative.

3. Stakeholder Engagement Plan

To address timing and contingency issues, the CAISO has phased the RA Enhancement initiative. This second phase focuses on elements critical to align the RA Program with changes under development in DAME. Table 1 below outlines the timeline for RA Enhancements phase two. The CAISO obtained the CAISO board approval on phase one elements in this RA Enhancements initiative in March 2021, and plans to obtain board approval on phase two items in February 2022.

RA Phase 1

March 2021 Board of Governors (completed)

- Planned outage process enhancements – phase 1 (implementation complete)
- Operationalizing storage (implementation complete)
- Backstop capacity procurement – CPM for local energy sufficiency (Fall 2021 for RA year 2022)

RA Phase 2 (Fall 2022 for RA year 2023)

February 2022 Board of Governors

- Must offer obligations and bid insertion modifications
- Flexible resource adequacy- Stage 1

Table 1: Stakeholder Engagement Plan

Date	Milestone
Sept 2021	**Straw Proposal – Phase 2**
Oct 2021	Stakeholder Meeting and Comments Straw Proposal – Phase 2
Nov 2021	**Draft Final Proposal and Draft Tariff – Phase 2**
Nov 2021	Stakeholder meeting and comments on Draft Final Proposal – Phase 2
Dec 2021	**Final Proposal Phase 2**
Jan 2022	Stakeholder meeting and comments on Final Proposal-Phase 2
Feb 2022	**Present proposal on Phase 2 elements to CAISO Board**

4. RA Enhancements Straw Proposal – Phase 2

The following sections detail the CAISO's straw proposal on enhancements to the resource adequacy program and provide the CAISO's rationale and supporting justification.

The RA Enhancements phase 2 Straw Proposal covers the following topics.

- Must Offer Obligation and Bid Insertion
- Flexible RA Stage 1

4.1 Must Offer Obligations and Bid Insertion

A key goal of the jointly administered RA program between the CPUC and CAISO is to ensure CAISO has sufficient capacity available to serve load reliably all hours of the year. Any resource providing RA capacity to the CAISO is obligated to offer that capacity into the CAISO markets. This ensures the market has sufficient bids available to dispatch resources to serve system load reliably. RA resources will continue to have a must offer obligation under this proposal. The CAISO proposes the following must offer obligation and bid insertion modifications in this initiative:

- Resources have a 24 by 7 must offer obligation into the day-ahead market, and real-time market through the day-ahead market enhancements transitionary period, unless exempt, and;
- The CAISO market will insert bids for resources if not submitted, unless they are exempt.

Stakeholder Feedback

In Resource Adequacy Enhancements Phase 1, CAISO proposed updates to RA MOO requirements which were deferred to Phase 2 for additional vetting. Previously in Phase 1, CAISO had proposed 1.) a standard 24 x 7 day-ahead and real-time must offer obligation with bid insertion, with limited exceptions and 2.) setting the MOO as equal to the deliverable qualifying capacity (DQC) rather than the UCAP/NQC shown. While many stakeholders supported the CAISO's must offer obligations, there were divergent views on UCAP alignment and special considerations for specific resource types. CAISO has responded to the feedback as follows:

- **MOO Equal to Deliverable Qualifying Capacity:** In response to the scoping of the CPUC decisions related to Track 3B.2, as well as stakeholder feedback, particularly from Energy Division and Vistra, CAISO is pausing its update to set the MOO on the amount of DQC shown for RA. Instead, CAISO will review this capacity counting enhancement in Phase 3 to maintain alignment with the timing and decisions in the CPUC's Track 3B.2 workshops.

- **Real-Time RA Must Offer Obligation:** Energy Division, and to varying degrees the three IOUs and Shell, highlighted concern that it was premature to remove the real-time must offer obligation prior to testing DAME and the imbalance reserve product. CAISO agrees with this concern and in turn proposes to 1.) maintain the real-time must offer obligation and 2.) observe results during a transition period in which DAME is implemented and resource adequacy resources are still required to meet their real-time must offer obligations regardless if the resource has received a reliability capacity or imbalance reserve award. Specific to Energy Division's concern that it should not simply be a transition period but an evaluation period, CAISO clarifies further that the transition period does require an evaluation of DAME and its interaction with the resource adequacy program.

- **Storage and Investment Tax Credit (ITC) Considerations:** Many storage stakeholders (American Clean Power-California, Capital Dynamics, California Energy Storage Alliance (CESA), the California Community Choice Association (CalCCA), Pacific Gas & Electric Company (PG&E), and Six Cities) raised concerns on imposing a MOO for the full charging and discharging capabilities for storage. This was primarily on the basis that grid charging causes the storage resource to diminish or lose their ITC when the resource charges from the grid, i.e. when on-site solar generation is not producing. CAISO does not believe that availability should be limited due to subsidies and posits that there are various means by which a resource could reduce charging from the grid, such as: 1.) self-scheduling their resources in real-time after receiving day-ahead awards (from economically bidding their resource) to ensure the charge occurs when solar is online or utilize the minimum and maximum end-of-hour state-of-charge parameters to match day-ahead awards, which may reduce but not eliminate instances of grid charging 2.) submitting economic bids, as market prices today imply that charging could happen when solar is online. While this may not eliminate all instances of grid charging, it could greatly limit it. Relatedly, PG&E requested alignment with ESDER 4, which would allow storage to specify what the state of charge will be at the end of the hour. With the delay in the must offer requirements in RA Enhancements Phase 1, the ESDER 4 enhancements enable improved end-of-hour state of charge management to meet the RA must offer obligations proposed herein. ESDER 4 enhancements are anticipated to be implemented in November 2021.[6]

- **Details on the Bidding Requirements for Resources Providing RA Capacity:** In response to EDF-R and Vistra's request that CAISO provide a redlined version of Table 7.1.1 from the BPM for Reliability Requirements which summarizes the must offer obligations, CAISO has included a redlined table in the Appendix of this Straw Proposal.

[6] For more detailed information on ESDER 4, please see: https://stakeholdercenter.caiso.com/StakeholderInitiatives/Energy-storage-and-distributed-energy-resources

Resource Adequacy Must Offer Obligations – Updates

The CAISO performed a comprehensive review of the day-ahead RA must offer obligations for all resource types in the tariff and BPM for Reliability Requirements and clarifies the current RA must offer obligations for different resource types. To simplify the RA must offer obligations, the CAISO proposes a standard must offer obligation in the day-ahead market as well as the real-time market through the DAME transitionary period, which would apply to all resources unless specified by CAISO under a tariff exemption by resource type.[7] Pseudo-tie resources and dynamically scheduled imports must follow the same obligation as internal resources of the same technology type.

Under these must offer obligation rules, a resource should still bid into the day-ahead and real-time market for all hours the resource is not on outage.[8] If the resource is not available, it should submit outage cards in the CAISO's outage management system, consistent with current practice. Key changes include:

Storage and Hybrid Resources: The CAISO proposes that the RA must offer obligation for storage and hybrid resources must reflect both the charge and discharge capabilities of the resource. This proposal applies regardless of the point of interconnection (*i.e.* transmission or distribution), and hybrid resources with a battery component.

The CAISO recently developed policy for market participation of hybrid resources. Hybrid resources providing resource adequacy will be subject to must offer obligations, like all other resources providing resource adequacy capacity. Hybrid resources must bid their full expected capability (including charge and discharge portions) in all hours. The CAISO recognizes that hybrid resources with storage components may have multiple hours during the day when they are using on-site generation to charge storage components and that a significant portion of the resources capacity may not be available for dispatch during these times. Also, hybrid resources with variable energy resource (VER) components will be unavailable when the VER portion is not producing. Hybrids may also have conditions when storage components are completely charged or completely depleted precluding the resource from dispatch in a portion of its operating range. Finally, the resource may have ambient unavailability precluding full range of dispatch. Hybrid resources will have access to the dynamic limit tool to inform the CAISO about unavailability during these conditions. Other conditions precluding operation, such as mechanical outages, will be reported through the CAISO's outage management system.

Additionally, the CAISO has limited non-generator resources (NGR) eligibility for system RA to resources under the non-regulation energy management (non-REM) option. The CAISO cannot maintain system reliability by over-relying on resources limited to providing regulation only. REM management resources are neither required, nor capable, of providing energy needed to meet

[7] The CAISO is not proposing to change how load-following metered subsystems are treated under the existing tariff section 40.2.4.
[8] Outage refers to both planned and forced. If a resource is on outage, whether it is planned or forced, it should not be bidding that capacity into the market because it would not be able to deliver it.

the energy needs of system. Therefore, the CAISO has limited the system RA eligibility of NGRs to NGRs with the non-REM option.

Use-Limited and Conditionally Available Resources: The CAISO proposes to apply the standard RA must offer obligation to use-limited resources and conditionally available resources, unless the underlying technology has a different offer obligation.[9] Use-limited resources have access to outage cards that can be used when use limitations are met. Conditionally available resources are also able to use outage cards to manage their conditionally available outages and derates.

Eligible Intermittent Resources: While no change is being proposed, CAISO clarifies that any energy above the resources' NQC cannot be used to support an export from non-RA capacity. Currently, eligible intermittent resources are not required to bid into the day-ahead market, and are required to offer their full forecasted amount in real-time. This will continue under this proposal. However, the CAISO clarifies here that while the RA value produced by the ELCC may be lower or higher than what the resource can produce in the operational timeframe (because the RA value is static and the resource capability varies), the RA capacity under offer obligation to the CAISO is for all energy necessary to derive the shown RA value. This means that the energy from these resources above the NQC value cannot be used to support an export from non-RA capacity.

Demand Response Resources: The CAISO is not making changes to the 24 x 7 DA and RT MOO of DR. However, the CAISO is clarifying that the days and hours in which the demand response resources are obligated to bid into the market must be clearly communicated and approved via LRA-approved documentation, such as contract provisions or decisions. During those hours, the resource must bid all its RA capacity not on outage. If no parameters are established by the LRA, resources must follow the standard must offer obligation.[10] Reliability demand response will continue to have the option to bid into day-ahead, and are required to bid into real-time consistent with the program parameters established or approved by the LRA.

Standard RUC Must Offer Obligation: Changes and Clarifications

The CAISO will continue not to require residual unit commitment (RUC) availability bids from certain RA resources as defined in tariff section 40.6.4.2, with the exception of CARs for the reasons described above. These include: Pumping Load[11], Reliability Demand Response Resources, Combined Heat and Power Resources, Regulatory Must-Take Generation, Run-of-River Resources, and Eligible Intermittent Resources.

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[9] Tariff Definition of Use-Limited Resource and Conditionally Available Resource: http://www.caiso.com/Documents/AppendixA-MasterDefinitionSupplement-asof-Sep28-2019.pdf

[10] PDR bidding requirements are specified in CAISO tariff Section 30.6.1 – Bidding and Scheduling of PDRs.

[11] The CAISO is not proposing changes to the must offer obligation for participating load that is pumping load under the existing tariff section 40.6.4.3.

Bid Insertion: Changes and Clarifications

Although the CAISO currently requires RA resources to economically bid or self-schedule into the market, it also supplements those bidding obligations with bid insertion provisions for most resources. The CAISO proposes to continue applying bid insertion to all RA resources in the day-ahead market, with minimal exemptions described below. Applying bid-insertion will ensure that resources have bids in the market and that outages would be reported to avoid market dispatch, enhancing the CAISO's ability to identify forced outages.

Storage and Hybrid Resources: Currently, storage resources are not subject to bid insertion and do not have default energy bids (DEB). However, the CAISO board of governors (BOG) approved the Energy Storage and Distributed Energy Resources Phase 4 (ESDER 4) policy that included DEBs and bid insertion for storage resources. ESDER 4 enhancements are anticipated to be implemented in November 2021. Once ESDER 4 is implemented, energy storage resources will receive bid insertion as part of this proposal.

Use-Limited and Conditionally Available Resources: The CAISO proposes to apply bid insertion to use-limited resources and conditionally available resources, unless the underlying technology is exempt. The CAISO allows use-limited resources to include approved opportunity costs in their market bids. This ensures more effective and efficient use of resources in the market to facilitate regular and consistent market participation from resources with certain use limitations. Use-limited resources also have access to outage cards that can be used when use limitations are met. Conditionally available resources, which have regulatory or operational limitations that do not qualify as use-limited, will not be exempt from bid insertion. Conditionally available resources are able to use outage cards to manage their conditionally available outages and derates. The CAISO requires that conditionally available resources submit outage cards when unavailable, similar to all other resources on the system.

With the exception of use-limited resources, CARs, and energy storage, the CAISO will continue to exempt resources from bid insertion as defined in tariff section 40.6.8(e). These include Non-Generator Resources without default energy bids, Variable Energy Resources, Hydroelectric Generating Units (including Run-of-River resources), Proxy Demand Resources, Reliability Demand Response Resources, Participating Load, including Pumping Load, Combined Heat and Power Resources, Non-Dispatchable Resources, and resources providing Regulatory Must-Take Generation.

Resource Adequacy Must Offer Obligations – Crossover with CAISO's Day-Ahead Market Enhancement Initiative

As previously stated, the CAISO is proposing new capacity product, termed "imbalance reserves," in the DAME initiative.[12] The CAISO will co-optimize imbalance reserves in the integrated forward market with energy and existing ancillary services. Imbalance reserves will ensure the day-ahead market schedules sufficient real-time dispatch capability to meet net demand variation that materializes between the day-ahead and real-time markets. It will also provide ramping capability to meet ramping needs between real-time market five-minute dispatch intervals that can be much greater than scheduled in integrated forward market hourly schedules. As proposed in the DAME initiative, the CAISO will begin procuring additional resources in the day-ahead timeframe to be available in real-time to cover uncertainty between day-ahead and real-time. Imbalance reserve awards will be based on a resources 15-minute ramping capability and will be procured in both the upward and downward direction. Resources awarded imbalance reserves in the day-ahead market will have an obligation to submit economic energy bids to the real-time market corresponding to the awarded imbalance reserve capacity.

The CAISO is also enhancing the residual unit commitment (RUC) process to procure downward capacity. The RUC process runs as part of the day-ahead market following the integrated forward market. It procures capacity to account for the difference in integrated forward market scheduled physical supply and the demand forecast. Under the enhancements, these residual unit commitment process schedules will be termed "reliability capacity up" and "reliability capacity" down.

Suppliers will submit bids to provide imbalance reserves from a resource. In this proposal, the CAISO proposes that RA resources' day-ahead market must-offer obligation include offering bids for imbalance reserves, similar to the existing obligation to submit bids for energy and ancillary services.

As part of the DAME initiative, the CAISO is discussing with stakeholders whether RA resources' existing energy must offer obligation in the real-time market is needed. Imbalance reserves could potentially more efficiently determine the need for resource adequacy capacity to be available in the real-time market. This would likely be more efficient because the imbalance reserve requirement would be based on each day's conditions. Determining this amount each day could be more efficient than the existing RA must offer rules that require all resource adequacy capacity to be available in the real-time market every day. RA requirements are based on each month's peak need, which does not exist each day of the month.

Bids for imbalance reserves and reliability capacity are intended to reflect the costs to be available in real-time, such as costs to procure and schedule natural gas or costs associated with setting-up a hydro system. This allows the market optimization to consider resources' availability costs and efficiently schedule resources for this obligation. The CAISO is also

[12] For a detailed description, see https://stakeholdercenter.caiso.com/StakeholderInitiatives/Day-ahead-market-enhancements.

discussing with stakeholders whether RA resources should have the ability to submit bids greater than $0/MW for both imbalance reserves and reliability capacity. This would be a change from existing rules that require RA resources to submit $0/MW bids to the residual unit commitment process. This has the potential to more efficiently select the resources to be available in real-time as it would consider each resource's different costs to be available in real-time. For example, resources on a constrained gas system may have higher costs to ensure gas is available in real-time than resources on unconstrained systems.

Some stakeholders have questioned these proposals. They are concerned that eliminating the RA resource must offer obligation could provide less reliability than the current rules. They also believe that it is unlikely that the reduced must-offer requirement would result in resource adequacy contract cost-savings, and state, that in any case, there are existing multi-year contracts that would not be modified to reflect cost savings. Similarly, they do not believe RA resources should be able to submit non $0/MW bids for imbalance reserves and reliability capacity. They maintain compensation for these costs in the CAISO market would also not be reflected in reduced RA contract costs.

Consequently, the CAISO is proposing a transition period after DAME is initially implemented, which will maintain the existing RA must offer obligation and not allow RA resources to submit non $0/MW bids for imbalance reserves and reliability capacity. This transition period will provide an opportunity to evaluate the performance of imbalance reserves under a variety of grid conditions and to assess the viability of removing the real-time RA must offer obligation. If deemed successful, after the transition period proposed in DAME initiative, resource adequacy resources may transition to have a 24 by 7 RA must offer obligation in the day-ahead market only. Their RA must offer obligation will be extended into real-time if the resource is scheduled in day-ahead for energy, ancillary services, or imbalance reserves. After the transition period, and if a successful evaluation, other aspects of DAME that impact the RA must offer obligation include:

- **Exceptional Dispatch:** Although RA resources would not have a real-time must-offer obligation if they are not awarded in the day-ahead, RA resources must still be available for exceptional dispatch after the day-ahead market whether or not they receive a day-ahead award. This is to ensure the reliable operations during emergency operations or when the CAISO is unable to maintain System Reliability by using resources available to the market. This is also ensure CAISO is in compliance with the North American Electric Reliability Corporation (NERC) and Western Electricity Coordinating Council (WECC) Control Performance and Disturbance Control Standards. If a resource is not available for exceptional dispatch after the day-ahead market, the resource should submit an outage. If resources receive an exceptional dispatch, they will be required to provide that energy in real-time and would not qualify for an exceptional dispatch CPM designation when they respond to that exceptional dispatch.
- **System and Local Requirements to Bid or Self-Schedule Energy, A/S, and Reliability Capacity:** Resources providing system and local resource adequacy are required to bid or self-schedule for energy and ancillary service certified RA resources

must bid or self-provide ancillary services. Additionally, resources providing system and local resource adequacy will be required to economically bid for reliability capacity. The bidding obligation for imbalance reserves will be determined as part of the Flexible RA Stage 2 as described below. If a resource economically bids its entire resource adequacy obligation for energy and ancillary services, the resource must economically bid for reliability capacity.

- **Self-Scheduling:** Hourly resources and resources that are ineligible to provide imbalance reserve will be able to self-schedule for energy. If a resource self-schedules its entire resource adequacy obligation into the day-ahead market for energy or ancillary services, economic bids will not be required for any of the other products. If a portion of the resource is self-scheduled for energy or ancillary services, the resource will be required to economically bid the rest of the resource's obligation for energy, ancillary services, imbalance reserves, and reliability capacity.

  However, imbalance reserve eligible RA resources will be required to economically bid for energy, ancillary services (if certified), and imbalance reserves during the transition period. They would no longer be allowed to self-schedule energy in the day-ahead timeframe. The permanency of this change after the DAME transition period will be determined in Stage 2 of the Flexible RA proposal described below. Resource adequacy resources will have the same real-time RA must offer obligation as any other resource based upon day-ahead awards after the proposed transition period in the day-ahead market enhancement initiative expires.

The RA must offer obligations for resources providing flexible resource adequacy will be developed in the flexible resource adequacy portion of this initiative. Modifications to the real-time must offer obligations will be defined in the day-ahead market enhancements initiative.

4.2 Flexible RA

The CAISO seeks to capture the CAISO's operational needs and the predictability (or unpredictability) of ramping needs through the RA Program. Changes to the flexible capacity product and flexible capacity needs determination must closely align with CAISO's actual operational needs for various market runs (*i.e.*, day-ahead market and fifteen-minute market). The CAISO has developed a staged approach, which will allow it to implement changes needed to align the RA program with the new products and process under development in the DAME initiative and additional time to evaluate how well these new market products address operational needs, and how flexible RA may need to be modified to ensure we have resources to address these needs or whether system and local RA are sufficient.

Background

In 2014, FERC approved tariff revisions to implement CAISO's FRACMOO proposal. The CAISO developed the original FRACMOO proposal and accompanying tariff provisions through an extensive stakeholder process in collaboration with the CPUC, municipal utilities, investor-owned utilities, generators, environmental groups, and other market participants. The FRACMOO proposal was a first step toward ensuring that load serving entities procured and offered resources to the CAISO that would ensure the CAISO had sufficient flexible capacity to reliably operate the transforming grid that was growing more reliant on distributed and variable energy resources. The tariff provisions resulting from that effort provided the CAISO with a flexible capacity framework. Specifically, the FRACMOO tariff provisions established:

- A study methodology for determining flexible capacity needs and allocating those needs to local regulatory authorities;
- Rules for assessing the system-wide adequacy of flexible capacity showings;
- Backstop procurement authority to address system-wide deficiencies of flexible capacity; and
- Must offer obligations to ensure CAISO has the authority to commit and dispatch flexible resources through its markets.

When the CAISO filed the tariff revisions to implement the FRACMOO proposal with FERC, it stated:

> "This simplified initial approach provides a smooth transition to establishing durable flexible capacity requirements. CAISO has committed to re-evaluating the effectiveness of the flexible capacity requirements in 2016 to consider, among other matters, whether enhancements are needed to meet system flexibility needs or to allow resources that are dispatchable on a fifteen-minute basis to fulfill a portion of the flexible capacity needs."[13]

[13] Transmittal letter at p. 19.

The original FRACMOO proposal was a first step toward ensuring that adequate flexible capacity was available to the CAISO to address the needs of a more dynamic and rapidly transforming grid. The FRACMOO proposal also represented the first ever flexible capacity obligation in any ISO market, recognizing that a resource adequacy program should include both the size (MW) of resource needs and the attributes of the resources providing them (*e.g.*, dispatchability and ramp rate). The CAISO anticipated enhancing the original FRACMOO tariff provisions once it had experience with a flexible capacity paradigm and better understood the system's flexible capacity needs, especially in light of the CAISO's operational needs and the transforming grid.

Subsequently, the CAISO initiated the FRACMOO2 stakeholder process. The objective of that initiative was to make changes to the existing flexible capacity framework to address fundamental gaps between the CAISO's markets and operational needs. Although the FRACMOO2 initiative was placed on hold, the objectives and work from that initiative have been integrated into the present initiative.[14]

Identifying Flexible Capacity Needs and Requirements

Flexible Capacity Needs

To define a flexible RA capacity requirement, the CAISO reviewed the drivers of flexibility on the system. This assessment sought to identify reasons the CAISO would need to move resources from a fixed schedule. The goal of this assessment was not to expand the requirement definitions for flexible RA, but to more clearly identify how the CAISO can access flexibility, then determine if an identified flexibility need required forward procurement to ensure adequate capacity is available to the CAISO. Although flexibility is required in all intervals to satisfy CAISO operational needs, not all types of flexibility are required in all hours. The CAISO identified multiple drivers of its need for flexibility, including:

- Forecasts (*i.e.*, load, VER, BTMs) improve between market runs
- Timing granularity differs between market runs (1 hour, 15 min, 5 min)
- Deviations from dispatch
- Shaping around prescribed delivery of interties (Hourly blocks and industry ramp blocks)
- Net-load ramps are non-linear

The CAISO defines its flexible capacity needs into the following three categories based on automatic response, dispatch, controllability, and the response required in certain time horizons:

- Primary – Frequency Response (Impacted by secondary and tertiary)
- Secondary – Regulation and AGC (Impacted by tertiary)
- Tertiary – Market flexibility needs

[14] At this time, CAISO is closing the FRACMOO stakeholder process.

The CAISO requires all three types of flexibility, but not all are required to be procured through a RA construct. For example, primary response is a requirement embedded in the resource interconnection process and not dispatched by the CAISO. Secondary response ensures CAISO has sufficient regulation. The CAISO revised its regulation procurement in July 2020 and will continue revising its regulation procurement to mitigate increasing 5-minute net load variability as more VERs are integrated into the resource mix.

Finally, tertiary flexibility ensures the market has sufficient flexibility reserved to address day-to-day operational needs provides numerous benefits that may not be fully realized absent express procurement in the forward planning horizon. Examples of benefits from forward planning for tertiary or market flexibility needs include:

- Realization of full Energy Imbalance Market (EIM) benefits
- Predictable and economic retirement of resources
- Facilitation of state environmental policy cost effectively
- Mitigate random price spikes
- Provide for lower cost, more reliable market solutions
- Ensure CAISO can maintain reliability during highly variable weather conditions

As a result, the CAISO's flexible capacity needs are to ensure:

- Markets have sufficient economic bid range to dispatch around load and resource variability (or inflexibility), manage significant net load ramps, address uncertainty and differences in market granularity (*i.e.*, hourly vs. fifteen minute) between market runs,
- The CAISO must ensure it has sufficient flexible capacity to pass its own EIM ramp sufficiency tests
- Flexible resources have a path to economic viability relative to inflexible resources (*i.e.*, leads to more rational retirement)

The CAISO reviewed the day-to-day operational system needs pertaining to flexible capacity. The CAISO observes the need for two categories of flexible capacity:

1) Predictable: known and/or reasonably forecastable ramping needs,

2) Unpredictable: ramping needs caused by load following and forecast error, and

3) Natural variability associated with VERs production.

These types of flexible capacity needs ─ predictable and unpredictable ─ drive different forms of flexible requirements. Predictable and reasonably forecastable ramping needs require a set of resources available to the CAISO's day-ahead market to properly shape the day-ahead market to meet forecastable ramps. This allows the CAISO to create a feasible market dispatch in the day-ahead market. The current flexible RA needs determination is based on the largest

forecasted three-hour net load ramp plus 3.5 percent expected peak load.[15] The greatest net load ramps are largely driven by the sunset during the non-summer months. Numerous stakeholders questioned the need for a specific RA requirement predicated on ramps that are largely predictable. The CAISO agrees these ramps are largely forecastable on a day-to-day basis and can be addressed through day-ahead market awards. The day-ahead market will set up the resources needed to meet day-ahead net load ramps.

A greater depth of economic bids allows the CAISO to shape day-ahead commitments and maximize the benefits to load. Specifically, a deeper pool of flexible resources that submit economic bids in the day-ahead market and have sufficient ramping capabilities will improve the efficiency of CAISO dispatch and management of renewable resources. However, the CAISO relies on load serving entity (LSE) resource procurement to address these ramps. This procurement should consider the trade-off between capacity costs, ramp speeds, renewable portfolio standard (RPS) obligations, and ability to comply with NERC's real-time control performance standards. Large quantities of slow or base-loaded resources will likely result in renewable curtailment in the day-ahead time frame to ensure adequate capacity and ramping capabilities are available to CAISO to balance load and generation. Long-term, procurement of inflexible resources can put renewable energy goals at risk.

In the 3rd revised straw proposal, the CAISO had proposed a flexible capacity framework based on connecting forward procurement and market and operational needs into a single flexible RA product. The CAISO proposed to develop a flexible capacity product that will ensure it has sufficient flexible capacity to address uncertainty between the day-ahead and real-time markets. This product, including the requirements, flexible RA counting rules, and must-offer obligations would align directly with the Imbalance Reserve product.[16] The CAISO's day-ahead market would provide commitments to address forecastable ramps. Additionally, the CAISO defers to LSE procurement to ensure RPS/ greenhouse gas (GHG) goals are achieved. Therefore, the CAISO proposed to eliminate the existing three-hour net load ramping requirement and may not pursue flexible RA capacity to address predictable ramping needs depending on the capability of the CAISO to comply with NERC's real-time control performance standards. Furthermore, as long as the system RA is sufficient to meet the net load peak, the CAISO's day-ahead market can commit and schedule resources to meet the predictable ramping needs (neck of the duck).

Stakeholder Comments on third revised straw proposal

While many stakeholders supported the CAISO's efforts to simplify Flex RA, there were diverging perspectives on how this should be accomplished and whether getting rid of the three hour net load ramp requirements was the right direction. SDG&E and CESA commented that they did not think the CAISO should get rid of the three hour net load ramping requirements, and that the CAISO should get more experience with imbalance reserves before modifying the

[15] The 3.5 percent portion of this equation was originally established to address overlap between flexible RA provisions and contingency reserves. However, the basis for determining the quantity of contingency reserves needed depends on the most severe single contingency and can change from one hour to the next.

[16] See pp. 68-78 in http://www.caiso.com/InitiativeDocuments/ThirdRevisedStrawProposal-ResourceAdequacyEnhancements.pdf for more details on the specifics the CAISO original proposal.

Flex RA program to align with this new product. Other stakeholders, including the CPUC-Energy Division and SCE, wanted more data on what the new Flex RA requirements and effective flexible capacity (EFC) values of the existing RA fleet would look like under the CAISO's proposal. Whereas others, such as CalCCA and Calpine, generally supported the proposal to re-align Flex RA with imbalance reserves, but even questioned whether Flex RA was even necessary and that the CAISO should consider getting rid of the Flex RA program entirely, especially if the requirements were non-binding.

Other stakeholders had specific questions and comments on various details of the proposal, such as the specific must offer obligation, resource characteristics that would make them eligible or ineligible to provide Flex RA capacity, and upfront showing requirements.

Given this mixed stakeholder feedback, and additional concerns raised internally, the CAISO has decided to adopt a staged approached to modifying the Flex RA Program. This staged approach will allow the CAISO to meet the immediate need to develop complementary RA program requirements to align with changes under development in DAME, additional time to gain operational experience with the new imbalance reserve product. The CAISO will still retaining the three hour net load ramp requirements of the existing Flex RA program, before a final decision, in collaboration with stakeholders and the CPUC, is made on how to redesign or retire the Flex RA Program. The details of this staged approach are provided in the next section.

Staged Approached to Modifying the Flex RA Program

Stage 1: RA Year 2023- implemented in step with DAME

To ensure that the CAISO has sufficient bids to optimize the new imbalance reserve product, the CAISO proposes to modify the must offer obligation for all RA resources that are eligible to provide imbalance reserves as defined by the CAISO would now be obligated to bid this product into the day-ahead markets. As of the second revised straw proposal in DAME, only 15 and 5 minute dispatchable resources, intermittent resources that utilized the CAISO forecast would be eligible to provide imbalance reserves, and resources that can start within 15 minutes in real-time but who may not be awarded energy day-ahead would be eligible to provide imbalance reserves.[17] Eligibility for imbalance reserves is still being finalized in the DAME initiative. It is the CAISO's intent in this policy to align the must offer obligation for all resources, whether they be shown as system, local, or flex, that are determined by the CAISO to be eligible to provide imbalance reserves would be obligated to submit bids for imbalance reserves up and down at $0 to be co-optimized with energy and ancillary services in the integrated forward market. Additionally, to allow the day-ahead market to co-optimize energy and imbalance reserves, the CAISO is also requiring all imbalance reserve eligible RA resources to economically bid for energy and ancillary services (if certified), and would no longer be allowed to self-schedule energy in the day-ahead timeframe. Imbalance reserve bidding would also be subject to resource adequacy availability incentive mechanism (RAAIM).

[17] For more details on eligibility see Appendix A in http://www.caiso.com/InitiativeDocuments/SecondRevisedStrawProposal-Day-AheadMarketEnhancements.pdf

At this time the CAISO has not identified any exemptions from this new economic bidding requirement day-ahead, but seeks stakeholder feedback on what, if any, exemptions should be made to this day-ahead must offer obligation, for which resource types, and the justification for such as exemption.

As part of stage 1, the CAISO would retain the existing Flex RA program study methodology, requirements, and effective flexible capacity methodology as is. Meaning that Flex RA resources would still be obligated to economically bid for energy, AS, and imbalance reserves during the hours determined in the annual Flex RA study. Additionally, Flex RA resources will still be subject to RAAIM until the CAISO's unforced capacity evaluation (UCAP) policy is implemented.

The CAISO would continue to plan for and procure resources to meet the three hour net load ramping requirement, and imbalance reserves would be procured from all eligible resources to cover the uncertainty that may materialize between day-ahead and real-time.

At this time, the CAISO will only be seeking tariff modifications to the must offer obligations of all imbalance reserve eligible RA resources to require them to economically bid for energy, ancillary services, and submit $0 bids for imbalance reserves.[18]

Stage 2: RA Year 2023-2024- Evaluation period

The purpose of stage 2 is to allow the CAISO time to gain operational experience with imbalance reserves and additional modifications to the day-ahead market processes. For RA year 2023, the CAISO will collect data on the performance of imbalance reserves under a variety of grid conditions. The CAISO will also evaluate how well the day-ahead market optimizes the resource fleet to meet the predictable ramping needs of the system, including the morning and evening net load ramps.

Likely starting in Q4 of 2023, the CAISO will conduct a stakeholder process to share these findings with the broader stakeholder community in order to determine:

- whether a separate flex RA program and requirement is necessary to cover the 3-hour net load ramping requirement, or if the system and local RA program requirements are sufficient to cover the CAISO's predictable ramping needs, and whether there are additional enhancements needed to the existing Flex RA program, such as EFC methodologies or the study methodology
- whether a separate flex RA requirement is necessary to get sufficient imbalance reserve bids, such that the flex RA program should be redesigned to more explicitly align with the imbalance reserve product

[18] Economic bidding for imbalance reserves may be required after the end of the DAME transition period, but this policy is subject to change through the DAME initiative.

- whether there are additional operational challenges, not solved by DAME, that may require new RA requirements to help address or align with any additional market products or changes that result from this analysis

The CAISO intends to take a final proposal to the board in Q1/Q2 2024 of be implemented by Fall 2024 for RA Year 2025.[19]

Stage 3: RA Year 2025- Implement or sunset a re-designed Flex RA Program

Based on the analysis and stakeholder process conducted in stage 2, and in conjunction with the CPUC, stage 3 will lead to the implementation of the redesigned Flex RA program or the retirement of the program if the analysis reveals that system and local RA are sufficient to address all identified operational needs.

Implementation Plan

Given the comprehensive nature of this initiative, the CAISO is planning a phased implementation. The first phase included stand-alone elements that were implemented relatively quickly. The second phase includes elements that are needed to align with the day-ahead market enhancements. The CAISO will continue to assess future changes to the resources adequacy provisions in concert with changes to the CPUC resources adequacy program (i.e. system requirements and UCAP counting rules and planned outage process enhancements phase 2). These targeted dates are tentative and subject to change.

Phase One: (Completed)

- Planned outage process enhancements – phase 1
- Local studies with availability limited resources CPM clarifications (Effective RA Year 2022)
- Operationalizing storage

Phase Two: (Fall 2022 for RA year 2023)

- Must offer obligations and bid insertion rules
- Flexible RA- stage 1

[19] This schedule is tentative and subject to change, however, the CAISO intents to make final modifications to the Flex RA Program no later than RA Year 2026.

5 EIM Governing Body Role

This initiative will consider changes to must offer obligations and bid insertion rules that would go to the Board of Governors for decision in February 2022. CAISO staff believes that the EIM Governing Body would have an advisory role with respect to the following proposed changes:

- Setting the resource adequacy must offer obligation for a storage resource to its full charge and discharge capability; and
- Inserting bids for resource adequacy use-limited resources and conditionally available resources.

The role of the EIM Governing Body with respect to policy initiatives changed on September 23, 2021, when the Board of Governors adopted revisions to the corporate bylaws and the Charter for EIM Governance to implement the Governance Review Committee's Part Two Proposal. Under the new rules, the Board and the EIM Governing Body have joint authority over any proposal to change or establish any CAISO tariff rule(s) applicable to the EIM Entity balancing authority areas, EIM Entities, or other market participants within the EIM Entity balancing authority areas, in their capacity as participants in EIM. This scope excludes from joint authority, without limitation, any proposals to change or establish tariff rule(s) applicable only to the CAISO balancing authority area or to the CAISO-controlled grid.

Charter for EIM Governance § 2.2.1 None of the tariff rule changes currently contemplated in this initiative would be "applicable to EIM Entity balancing authority areas, EIM Entities, or other market participants within EIM Entity balancing authority areas, in their capacity as participants in EIM." Instead, the proposed tariff rules would be applicable "only to the CAISO balancing authority area or to the CAISO-controlled grid." Accordingly, the matters scheduled for approval in February 2022 fall outside the scope of joint authority.

However, the "EIM Governing Body may provide advisory input over proposals to change or establish tariff rules that would apply to the real-time market but are not within the scope of joint authority." Id. Because the elements of this initiative listed at the beginning of this section would apply to the real-time market, the EIM Governing Body has the option of providing advisory input to the Board about those changes.

The remaining changes fall outside the advisory role of the EIM Governing Body. This includes the proposed rules about use-limited resources, because those changes apply to the day-ahead market only. Moreover, some of the policies described in this initiative do not appear at this stage to require any amendments to the tariff, and thus would not require Board approval. They are a) use-limited resources should have the standard RA obligation, and submit outage tickets to show otherwise, b) RA resources must be available in real-time for exceptional dispatch, and c) that resource adequacy intermittent resources may not support certain exports. The EIM Governing Body would not have any decisional role with respect to these elements of the initiative.

This proposed classification reflects the current state of this initiative and may change as the stakeholder process moves ahead. Stakeholders are encouraged to submit a response to the EIM classification of this initiative as described above in their written comments, particularly if they have concerns or questions.

6 Next Steps

The CAISO will discuss this phase 2 straw proposal with stakeholders during a stakeholder meeting on October 12, 2021. Stakeholders are asked to submit written comments by October 26, 2021 through the commenting tool. A comment template will be posted on the CAISO's initiative webpage here: http://www.caiso.com/informed/Pages/StakeholderProcesses/ResourceAdequacyEnhancements.aspx

7 Appendix

7.1 Resource Adequacy Enhancements Principles and Objectives

Principles

1. **The resource adequacy framework must reflect the evolving needs of the grid**

As the fleet transitions to a decarbonized system where fuel backed resources are replaced with clean, variable, availability-limited, and/or energy-limited resources, traditional measures of resource adequacy must be revisited to include more than simply having sufficient capacity to meet peak demand. The RA products procured and the means to assess resource adequacy must be re-examined and refreshed to remain relevant. Any proposed changes must assure that RA accounting methods effectively evaluate the RA fleet's ability to meet the CAISO's operational and reliability needs all hours of the year. The evolving fleet is altering the CAISO's operational needs. As more variable supply and demand interconnects to the system, the CAISO requires resources that are more flexible and can quickly and flexibly respond to greater levels of supply and demand uncertainty. RA requirements and assessments must reflect the evolving needs of the grid and the RA framework must properly evaluate and value resources that can meet these evolving needs.

2. **RA counting rules should promote procurement of the most dependable, reliable, and effective resources**

Both RA and non-RA resources should be recognized and rewarded for being dependable and effective at supporting system reliability. If a non-RA resource has a higher availability and is more effective at relieving local constraints relative to other similar RA resources, then such information should be publicly available to enable load-serving entities (LSEs) to compare and contrast the best, most effective resources to meet their procurement needs. Having this information publicly available to load-serving entities will improve opportunities for the most

dependable and effective resources to sell their capacity. Thus, in principle, RA counting rules should incentivize and ensure procurement of the most dependable, reliable, and effective resources.

3. **The RA program should incentivize showing all RA resources**

Modifications to the existing RA structure should encourage showing as much contracted RA capacity as possible and not create disincentives or barriers to showing excess RA capacity. Although it may be appropriate to apply additional incentive mechanisms for availability, CAISO must balance the impact that such incentives may have on an LSE's willingness to show all of its contracted RA capacity.

4. **LSE's RA resources must be capable of meeting its load requirements all hours of the year**

RA targets should be clear, easily understood and based on reasonably stable criteria applied uniformly across all LSEs. For example, to date, the CAISO has relied on a planning reserve margin that is met through a simple summation of the shown RA resources' NQC values. Most Local Regulatory Authorities (LRAs) set a planning reserve margin at fifteen percent above forecasted monthly peak demand. However, some LRAs have set lower planning reserve margins. It is not possible to determine if those LSEs with lower planning reserve margins impair the CAISO system without comparing the attributes of the underlying resources in LSE's portfolios, relative to resources' attributes in other portfolios. In other words, the simple summation of NQC values in a LSE's portfolio does not does not guarantee there will be adequate resources and does not assure an LSE can satisfy its load requirements all hours of the year. As California Public Utilities Code section 380 states, "Each load-serving entity shall maintain physical generating capacity and electrical demand response adequate to meet its load requirements, including, but not limited to, peak demand and planning and operating reserves (emphasis added)."[20] In other words, resource adequacy also encompasses LSEs meeting their load requirements all hours of the year, not just meeting peak demand.

Objectives

In evaluating RA enhancements, CAISO has reviewed NQC rules, forced outage rules, adequacy assessments, and availability obligations and incentive provisions. These existing rules are inextricably linked and require a holistic review and discussion. This review includes considering assessing the reliability and dependability of resources based on forced outage rates. Incorporating forced outages into the CAISO's RA assessment will help inform which resources are most effective and reliable at helping California decarbonize its grid.

Based on the CAISO's review of best practices and the diverse stakeholder support for further exploration of these matters, CAISO is proposing a new resource adequacy framework to

[20] California Public Utilities Code Section 380: http://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=PUC&division=1.&title=&part=1.&chapter=2.3.&article=6.

assess the forced outage rates for resources and conduct RA adequacy assessments based on both the unforced capacity of resources and the RA portfolio's ability to ensure CAISO can serve load and meet reliability standards.

The CAISO's proposal seeks to remain aligned with the CPUC process. However, CAISO notes that solely relying on an installed-capacity-based planning reserve margin (PRM) as the basis for resource adequacy, as is the case today, is not sustainable into the future given the transforming grid and the new resource mix and its operational characteristics.

The CAISO must consider the express intent of the original legislated RA mandate: to ensure each load-serving entity maintains physical generating capacity and electrical demand response adequate to meet its load requirements. This is essential as California transitions to greater reliance on more variable, less predictable, and energy limited resources that may have sufficient capacity to meet a planning reserve margin, but may not have sufficient energy to meet reliability needs and load requirements all hours of the year. Given this growing concern, CAISO is proposing to develop a new resource adequacy test that will ensure there is sufficient capacity to not only meet both gross and net peak load needs, but, just as importantly, to ensure sufficient energy is available within the RA fleet to meet load requirements all hours of the year.

7.2 Updates to Reliability Requirements Table 7.1.1 "Summary of Bidding Requirements for Resources Providing RA Capacity"

Table 7.1.1 Summary of Bidding Requirements for Resources Providing RA Capacity[21]

Resource Type	Bidding Requirements			
	IFM	**RUC**	**RTM**	**ISO Inserts Required Bids[1]**
Generating Units Including Pseudo Ties (other than Use-Limited Resources)	Economic Bids or Self-Schedules are to be submitted for all RA Capacity for all hours of the month the resource is physically available (ISO Tariff 40.6.1).	$0/MW RUC Availability Bids are to be submitted for all RA Capacity for all hours of the month the resource is physically available (ISO Tariff 40.6.1).	Economic Bids or Self-Schedules are to be submitted for any remaining RA Capacity from resources scheduled in IFM or RUC. Economic Bids or Self-Schedules are to be submitted for all RA Capacity from Short-Start and Medium-Start Units not scheduled in IFM (ISO Tariff 40.6.2). No RTM obligation for Long-Start or Extremely Long-Start units if not scheduled in IFM. (ISO Tariff, Section 40.6.2(c&d)).	Yes
Dynamic, Resource-Specific System Resources (other than Use-Limited Resources)	Same bidding requirement as above (ISO Tariff 40.6.1).	Same bidding requirement as above (ISO Tariff 40.6.1).	Same bidding requirement as above (ISO Tariff 40.6.2, 40.6.5.1).	Yes
Dynamic, Non-Resource-Specific System Resources	Same bidding requirement as above (ISO Tariff 40.6.1).	Same bidding requirement as above (ISO Tariff 40.6.1).	Same bidding requirement as above (ISO Tariff 40.6.2, 40.6.5.1).	Yes
Non-Dynamic, Resource-Specific System Resources (i.e. unit-specific imports)	Same bidding requirement as above (ISO Tariff 40.6.1).	Same bidding requirement as above (ISO Tariff 40.6.1, 40.6.5).	Economic Bids or Self-Schedules are to be submitted for any remaining RA Capacity from resources scheduled in IFM or RUC. No RTM Bids or Self-Schedules are required for resources not scheduled in IFM or RUC (ISO Tariff 40.6.2).	Yes
Non-Dynamic ,	Economic Bids or Self-Schedules are to be submitted for all RA Capacity consistent with inter-temporal	Same bidding requirement as above. (ISO Tariff 40.6.1, 40.6.5).	Economic Bids or Self-Schedules are to be submitted for any remaining RA Capacity from resources	The CAISO will submit a Generated Bid in the Day-Ahead Market for a

[21] For a more detailed description of CAISO's Reliability Requirements please see the Reliability Requirements BPM: https://bpmcm.caiso.com/Pages/BPMDetails.aspx?BPM=Reliability%20Requirements

Resource Type	Bidding Requirements			
	IFM	**RUC**	**RTM**	**ISO Inserts Required Bids[1]**
Non-Resource-Specific System Resources (i.e. non-unit-specific imports)	constraints such as multi-hour run blocks or contractual limitations (e.g. 6 X 16). (ISO Tariff 40.6.1, 40.6.8.1, 40.8.1.12.2). Economic Bids or Self-Schedules must be submitted under the Resource ID registered as an RA Resource on RA Supply Plan.	RUC Availability Bids must be submitted under the Resource ID registered as an RA Resource on RA Supply Plan.	scheduled in IFM or RUC. No RTM Bids or Self-Schedules are required for resources not scheduled in IFM or RUC (ISO Tariff 40.6.2).	non-Resource Specific System Resource in each RAAIM assessment hour, to the extent that the resource provides Resource Adequacy Capacity subject to the requirements of Sections 40.6.1 or 40.6.2 and does not submit an outage request or Bid for the entire amount of that Resource Adequacy Capacity
Use-Limited Resources	Economic Bids or Self-Schedules are to be submitted for all RA Capacity for all hours of the month the resource is physically available (ISO Tariff 40.6.1).	$0/MW RUC Availability Bids are to be submitted for all RA Capacity for all hours of the month the resource is physically available (ISO Tariff 40.6.1).	Economic Bids or Self-Schedules are to be submitted for any remaining RA Capacity from resources scheduled in IFM or RUC. Economic Bids or Self-Schedules are to be submitted for all RA Capacity from Short-Start and Medium-Start Units not scheduled in IFM (ISO Tariff 40.6.2, 40.6.3).	Yes
Hydro Units (without qualifying use limits that are not Run-of-River)	Economic Bids or Self-Schedules are to be submitted for all RA Capacity for all hours of the month the resource is physically available (ISO Tariff 40.6.1).	No requirement to submit RUC Availability Bids but any bids submitted must be for $0. (ISO Tariff 40.6.4.2).	Economic Bids or Self-Schedules are to be submitted for any remaining RA Capacity from resources scheduled in IFM or RUC. Economic Bids or Self-Schedules are to be submitted for all RA Capacity from Short-Start and Medium-Start Units not scheduled in IFM (ISO Tariff 40.6.2). No RTM obligation for Long-Start or Extremely Long-Start units if not scheduled in IFM. (ISO Tariff, Section 40.6.2(c&d)).	No
Pumping Load (without qualifying use limits)	Economic Bids or Self-Schedules are to be submitted for all RA Capacity for all hours of the month the	No requirement to submit RUC Availability Bids but any bids submitted	Economic Bids or Self-Schedules are to be submitted for any remaining RA Capacity from resources scheduled in IFM or RUC. Economic Bids or Self-	No

Resource Type	Bidding Requirements			
	IFM	**RUC**	**RTM**	**ISO Inserts Required Bids[1]**
	resource is physically available (ISO Tariff 40.6.1). Participating load that is pumping load shall submit Economic Bids for Energy and/or a Submission to Self-Provide Ancillary Services in the Day-Ahead Market for its Resource Adequacy Capacity that is certified to provide Non-Spinning Reserve Ancillary Service.	must be for $0. (ISO Tariff 40.6.4.2).	Schedules are to be submitted for all RA Capacity from Short-Start and Medium-Start Units not scheduled in IFM (ISO Tariff 40.6.2). No RTM obligation for Long-Start or Extremely Long-Start units if not scheduled in IFM. (ISO Tariff, Section 40.6.2(c&d)). Participating load that is pumping load shall submit Economic Bids in the Real-Time Market for its Non-Spinning Reserve Capacity that receives an Ancillary Service Award in the Day-Ahead Market.	
Non-Dispatch able Resources (without qualifying use limits)	Economic Bids or Self-Schedules are to be submitted for all RA Capacity for all hours of the month the resource is physically available (ISO Tariff 40.6.1).	$0/MW RUC Availability Bids are to be submitted for all RA Capacity for all hours of the month the resource is physically available (ISO Tariff 40.6.1).	Economic Bids or Self-Schedules are to be submitted for any remaining RA Capacity from resources scheduled in IFM or RUC. Economic Bids or Self-Schedules are to be submitted for all RA Capacity from Short-Start and Medium-Start Units not scheduled in IFM (ISO Tariff 40.6.2). No RTM obligation for Long-Start or Extremely Long-Start units if not scheduled in IFM. (ISO Tariff, Section 40.6.2(c&d)).	No
Conditionally-Available Resources and Run-of-River Resources	Economic Bids or Self-Schedules are to be submitted for all expected available energy or their expected as-available energy up to RA Capacity quantity (ISO Tariff 40.6.4.1).	$0/MW RUC Availability Bids are to be submitted for all RA Capacity for all hours of the month the resource is physically available. ~~No requirement to submit RUC Availability Bids but any bids submitted must be for $0.~~ (ISO Tariff 40.6.4.2).	Economic Bids or Self-Schedules are to be submitted for all expected available energy or their expected as-available energy, up to remaining RA Capacity (ISO Tariff 40.6.4.1). No RTM obligation for Long-Start or Extremely Long-Start units that are also Conditionally-Available Resources. (ISO Tariff, Section 40.6.2(c&d))	Yes
Regulatory must take generation (RMT)	Economic Bids or Self-Schedules are to be submitted for all RA Capacity	No RUC Availability Bids required but any such bids submitted	Economic Bids or Self-Schedules are to be submitted for any remaining	No

Resource Type	Bidding Requirements			
	IFM	**RUC**	**RTM**	**ISO Inserts Required Bids[1]**
	for all hours of the month the resource is physically available (ISO Tariff 40.6.1).	must be $0/MW RUC Availability Bids (ISO Tariff 40.6.4.2).	RA Capacity from resources scheduled in IFM or RUC. Economic Bids or Self-Schedules are to be submitted for all RA Capacity from Short-Start Units not scheduled in IFM (ISO Tariff 40.6.2).	
Eligible intermittent resource (EIR)	Any Eligible Intermittent Resource that provides Resource Adequacy Capacity may, but is not required to, submit Bids in the Day-Ahead Market. (ISO Tariff, 40.6.4.1)	No RUC Availability Bids required but any such bids submitted must be $0/MW RUC Availability Bids (ISO Tariff 40.6.4.2).	Must be available consistent with the resources forecast for RA Capacity. The energy from these resources above the NQC value cannot be used to support an export from non-RA capacity.	No
Distributed Energy Resources (Single resource Type)	Economic Bids or Self-Schedules are to be submitted for all RA Capacity for all hours of the month the resource is physically available. If the resource is using the NGR LESR model, this includes the charge and discharge portion of the RA capacity.	Economic Bids or Self-Schedules are to be submitted for all RA Capacity for all hours of the month the resource is physically available. If the resource is using the NGR LESR model, this includes the charge and discharge portion of the RA capacity.	Economic Bids or Self-Schedules are to be submitted for any remaining RA Capacity from resources scheduled in IFM or RUC. Economic Bids or Self-Schedules are to be submitted for all RA Capacity from Short-Start Units not scheduled in IFM. If the resource is using the NGR LESR model, this includes the charge and discharge portion of the RA capacity.	Yes
Distributed Energy Resources	Same as resources type for grid connected resource.	Same as resources type for grid connected resource.	Same as resources type for grid connected resource.	Same as resource type for grid connected resource.
Non-generator resource (Non-REM)	Economic Bids or Self-Schedules are to be submitted for all RA Capacity (inclusive of the charge and discharge capacity) for all hours of the month the resource is physically available.	$0/MW RUC Availability Bids are to be submitted for all RA Capacity (inclusive of the charge and discharge capacity) for all hours of the month the resource is physically available.	Economic Bids or Self-Schedules are to be submitted for any remaining RA Capacity (inclusive of the charge and discharge capacity) from resources scheduled in IFM or RUC. Economic Bids or Self-Schedules are to be	Yes

Resource Type	Bidding Requirements			
	IFM	**RUC**	**RTM**	**ISO Inserts Required Bids[1]**
			submitted for all RA Capacity not scheduled in IFM.	
Non-generator resource (REM)	Economic Bids or Self-Schedules are to be submitted for all RA Capacity for regulation for all hours of the month the resource is physically available.	$0/MW RUC Availability Bids are to be submitted for all RA Capacity for all hours of the month the resource is physically available.	Economic Bids or Self-Schedules are to be submitted for any remaining RA Capacity from resources scheduled in IFM or RUC. Economic Bids or Self-Schedules are to be submitted for all RA Capacity not scheduled in IFM.	No
Proxy Demand Resource, Proxy Demand Response-Load Shift Resource (Curtailment Only)	Economic Bids or Self-Schedules are to be submitted for RA Capacity that the market participant expects to be available per supply plan. The days and hours in which the demand response resources are obligated to bid into the market must be clearly communicated through LRA-approved documentation, such as contract provisions or decisions.	$0/MW RUC Availability Bids are to be submitted for all short and medium start RA Capacity for all hours of the month the resource is physically available. No RUC Availability Bids required for long-start RA Capacity. The days and hours in which the demand response resources are obligated to bid into the market must be clearly communicated through LRA-approved documentation, such as contract provisions or decisions	Economic Bids or Self-Schedules are to be submitted for any remaining RA Capacity from resources scheduled in IFM or RUC. Economic Bids or Self-Schedules are to be submitted for all RA Capacity from Short-Start Units not scheduled in IFM. The days and hours in which the demand response resources are obligated to bid into the market must be clearly communicated through LRA-approved documentation, such as contract provisions or decisions	No