California Independent
System Operator Corporation

March 29, 2021

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. ER21-____-000

Tariff Amendment to Implement the Resource Adequacy Enhancements Phase 1 Initiative – Summer 2021 Provisions

Dear Secretary Bose:

Since fall 2018, the California Independent System Operator Corporation (CAISO) has been reviewing the resource adequacy (RA) program comprehensively through its RA Enhancements stakeholder initiative. The CAISO proposes four sets of tariff amendments as the first phase of the RA Enhancements initiative: (1) adopting a minimum state of charge requirement for storage resources that provide RA capacity; (2) requiring RA substitute capacity for all maintenance outages on RA resources; (3) clarifying that extending the scope or duration of an existing outage requires a new outage card; and (4) updating the local capacity technical study criteria and permitting the CAISO to designate capacity under the backstop capacity procurement mechanism (CPM) if there are deficiencies relative to the revised criteria.[1] The CAISO seeks to implement these changes for summer 2021 to ensure RA resources provide capacity needed to operate the grid reliably.

Each element of this filing is discrete, severable, and not interdependent with the other elements. The CAISO thus requests the Commission evaluate the justness and reasonableness of each element separately.

[1] The CAISO submits this filing pursuant to section 205 of the Federal Power Act (FPA), 16 U.S.C. § 824d, and Part 35 of the Commission's Regulations, 18 C.F.R. Part 35. Capitalized terms not otherwise defined herein have the meanings set forth in Appendix A to the CAISO tariff, and references herein to specific tariff sections are references to sections of the CAISO tariff unless otherwise specified.

The CAISO respectfully requests that the Commission issue an order accepting the proposed tariff revisions by May 28, 2021. The CAISO requests an effective date of June 1, 2021 for the tariff revisions other than those regarding the minimum state of charge tool, and requests that the Commission accept the minimum state of charge revisions effective no later than June 15, 2021.[2] The CAISO requests authorization to notify market participants of the effective date of the revisions related to the minimum state of charge tool at least five business days before implementation.[3]

I. Executive Summary

California's RA program, which the CAISO administers in coordination with the California Public Utilities Commission (CPUC) and other local regulatory authorities in the CAISO balancing authority area (BAA), seeks to secure sufficient capacity to support the safe and reliable operation of the CAISO grid. The Commission has recognized the RA program "is intended to ensure that there is sufficient capacity when and where needed to reliably operate the system."[4]

Conditions in the CAISO BAA are rapidly transforming into a paradigm where: (1) power needs are being served by a cleaner but more variable and energy-limited resource fleet; and (2) a proliferation of smaller and more diverse load-serving entities (LSEs) are playing a greater role in RA procurement. These factors led the CAISO to open a stakeholder initiative in 2018 to re-examine and update all aspects of its RA program. The RA Enhancements initiative has several phases and will result in multiple FPA section 205 filings.

The conditions during the West-wide August 2020 extreme heat wave that caused the CAISO to institute rotating electricity outages show reforms to the CAISO's RA tariff provisions are appropriate and necessary to ensure capacity will be available when needed. The Final Root Cause Analysis examining the August 2020 heat wave jointly undertaken by the CAISO, CPUC, and California

[2] The CAISO tentatively plans to implement the minimum state of charge tool on June 3, 2021, but has requested an effective date that allows for flexibility regarding the implementation date in case there is some delay.
[3] The CAISO has included an effective date of 12/31/9998 as part of the tariff records for the minimum state of charge tool submitted in this filing. The CAISO will notify the Commission of the actual effective date of these tariff records within five business days of implementation in an eTariff submittal using Type of Filing code 150 – Report. *See Cal. Indep. Sys. Operator Corp.,* 172 FERC ¶ 61,263, at Ordering Paragraphs (A) and (C) (2020).
[4] *West-Wide Must-Offer Requirements*, 154 FERC ¶ 61,110, at P 10 (2016).

Energy Commission (CEC) recognized: (1) demand during the heat wave exceeded RA procurement targets; and (2) the CAISO was undertaking stakeholder processes to enhance its RA rules by summer 2021 to better prepare the CAISO to address potential extreme heat waves in summer 2021 without having to resort to rotating outages. The identified stakeholder processes included the CAISO working with stakeholders to "ensure the efficient and reliable operation of battery storage resources given the significant amount of new storage that will be on the system next summer" and "pursue changes to its planned outage rules."[5]

The Phase 1 RA Enhancements tariff revisions will ensure RA resources fulfill their fundamental obligation to provide capacity when and where it is needed to maintain system reliability. Implementing these tariff amendments in a timely manner is vital so the CAISO can depend on RA capacity being available during the critical summer 2021 period. In addition to the tariff amendment implementing summer 2021 market rule enhancements the CAISO recently submitted in Docket No. ER21-1536 and efforts the CPUC and CEC are undertaking, these RA enhancements will help the CAISO meet demand on its system this summer.[6]

Each element of the filing is just and reasonable and will provide the CAISO with tools to address reliability needs under anticipated system conditions for summer 2021 and beyond.

The RA Enhancements stakeholder process produced a wide range of views regarding the Phase 1 elements. The CAISO refined its proposal, where appropriate, to address stakeholder feedback and concerns. In particular, the CAISO worked closely with the storage community to modify earlier proposals to meet the CAISO's operational and reliability needs, while minimizing the impacts on storage resources. Each element of this filing is just and reasonable and will provide the CAISO with tools to address reliability needs under anticipated system conditions for summer 2021 and beyond. The proposed tariff revisions are tailored to the specific circumstances facing the CAISO BAA, will ensure the RA tariff provisions fulfill their core function, and will provide the CAISO with the tools it needs to maintain system reliability.[7]

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[5] *Final Root Cause Analysis, Mid-August 2020 Extreme Heat Wave*, at 1-2 (January 13, 2021) (Final Root Cause Analysis). The Final Root Cause Analysis can be found on the CAISO website at: http://www.caiso.com/Documents/Final-Root-Cause-Analysis-Mid-August-2020-Extreme-Heat-Wave.pdf.

[6] The Final Root Cause Analysis describes these efforts.

[7] The Commission has "consistently rejected a one-size-fits-all approach to resource adequacy in the various RTOs/ISOs [Regional Transmission Organizations/Independent System Operators]

First, the CAISO proposes to apply a minimum state of charge requirement to storage resources providing RA capacity so that on critical hours of critical days, they will be sufficiently charged in the real-time market to meet their day-ahead discharge schedules and help the CAISO meet the evening net-load peak. This proposal will ensure RA storage resources are available when most needed during tight conditions. In response to stakeholder input, the CAISO is proposing to limit the impact of the minimum state of charge rule and apply it only in the most extreme circumstances, *i.e*., when the residual unit commitment (RUC) process results in an infeasibility. This balances the CAISO's need to manage the system reliably with RA resources and the frequency with which the CAISO would intervene in the market to manage RA storage resources. The RUC infeasibilities are infrequent and indicate very tight system conditions. Even on such critical days, the CAISO will enforce the requirement for only the most critical hours. The CAISO also proposes to sunset the minimum state of charge requirement no later than two years after implementation because it is undertaking a new stakeholder initiative, to develop a market-based model for ensuring storage resources maintain a minimum state of charge, that would obviate the need for this requirement.

Second, the CAISO proposes that scheduling coordinators for all RA resources seeking CAISO approval for planned outages must provide substitute capacity. Under current tariff rules, scheduling coordinators have the option to request an RA planned outage without substitution, but based on the CAISO's evaluation of system needs a few weeks before the start of the month the outage is scheduled, the CAISO has the authority to reject the request and require substitution for any RA planned outage. Because of reliability needs and tight system conditions, planned outages of RA resources typically require substitution. However, scheduling coordinators do not – and cannot – learn the need to provide substitute capacity until close to the start of the operating month.

The CAISO relies primarily on RA capacity to meet its reliability needs. The CAISO's proposal ensures resources voluntarily providing RA capacity are available, or provide substitute capacity, to permit the CAISO to maintain reliability. This requirement is supported by a fundamental input driving the current RA program – the planning reserve margin has been set assuming all

due, in large part, to significant differences between each region and also due to the well-established tenet that there can be more than one just and reasonable rate." *CXA La Paloma, LLC v. Cal. Indep. Sys. Operator Corp.*, 165 FERC ¶ 61,148, at P 76, *reh'g denied*, 169 FERC ¶ 61,045, at P 17 (2019). *See also Midwest Indep. Sys. Operator, Inc.*, 116 FERC ¶ 61,292, at P 53 (2006) ("We have consistently allowed for regional differences in the RTO context and have never mandated a one-size-fits-all approach for dealing with resource adequacy").

planned outages on RA resources provided substitute capacity.[8] Further, because of increasingly tighter capacity conditions, the CAISO expects that even if it retained the existing rules, it would be in the position of requiring substitution on most RA maintenance outages. The CAISO proposal (1) reduces the burdens on the CAISO of administering a process that tends to produce the same answer each time, and (2) eliminates providing what is likely to be an unrealistic assumption that the CAISO can approve RA resource planned outages without substitution. These proposed changes remove uncertainty for scheduling coordinators about whether the CAISO will rescind a provisionally authorized planned outage because a reliability assessment (many) months later shows an outage without substitution may create a reliability problem. The proposal promotes reliability and is consistent with other Commission authorizations. The CAISO notes the proposed substitution requirement is intended to be an interim measure until the CAISO develops and implements a planned outage reserve margin framework that would permit RA resources to take maintenance outages without providing substitute RA capacity under some circumstances, while still ensuring sufficient capacity is available to maintain reliability. Meanwhile, it is inappropriate to allow planned outages of RA resources to continue to have the practical effect of lowering the planning reserve margin.

The CAISO also proposes to change how it handles requests for extending planned outages. The CAISO would require a scheduling coordinator to create a new outage card when it seeks to extend or expand an existing outage. This proposal, which responds to issues raised in the Final Root Cause Analysis, will apply to all outage extensions and expansion regardless of the unit's RA status. The proposal will allow the CAISO to better manage and track outage extensions separate from the original planned outage.

Finally, the CAISO proposes tariff revisions to address a gap in its local capacity technical study requirements that has been exposed given the characteristics of the changing resource mix the CAISO must rely upon to maintain reliability. The CAISO conducts studies each year to ensure LSEs have secured adequate capacity in local capacity areas to mitigate potential local reliability issues. This requirement reflects a capacity value in MWs without fully considering resource availability, such as limits on resources' energy duration or calls. LSEs, however, are increasingly procuring availability-limited resources to meet local capacity area and sub-area needs. The CAISO proposes to modify tariff rules for local capacity technical studies to include an energy sufficiency evaluation that considers the impact of availability-limited resources on meeting

[8] Final Root Cause Analysis at 43 ("The CPUC-approved PRM does not include planned outages under the assumption that planned outages will be replaced with substitute capacity or denied during summer months"); Cal. Pub. Utils. Comm'n, D.04-01-050, at 21 (Jan. 22, 2004) ("In calculating PRM, 'Dependable Capacity' shall not be reduced to reflect Reasonably Expected Resource Outages").

local area reliability needs. The CAISO also proposes corresponding changes to its CPM backstop procurement authority so it can procure additional capacity if the RA resources LSEs procure fail to satisfy the new energy sufficiency evaluation aspect of the local capacity technical studies.

II. Background

A. California's Resource Adequacy Program

LSEs demonstrate compliance with their RA requirements through both year-ahead and month-ahead RA plans. The RA plans list the resources the LSE has procured to meet its requirements. Generators submit corresponding supply plans on the same schedule. These plans confirm the resources that will provide RA capacity. Importantly, under CAISO tariff rules, LSEs and suppliers may amend their plans between submission of the annual and the monthly plans.[9] The CAISO does not know which resources will be RA resources for a month until the month-ahead deadline, which is 45 days before the month. Even then, LSEs and suppliers may amend their monthly plans during a 15-day cure period that ends at 30 days before the month.

Through the RA program, LSEs procure two main categories of RA capacity: generic capacity and flexible capacity. Resources providing *generic RA capacity* generally must submit either an economic bid or self-schedule 24 hours a day, seven days a week,[10] although some resource types have less than a 24x7 must-offer obligation for shown RA capacity.[11] Resources providing *flexible RA capacity* must submit economic bids and may not self-schedule for designated hours and days because flexible RA capacity meets the CAISO's need for the resources' flexibility, *i.e.*, to ramp up and down as needed and start up and shut down potentially multiple times per day. If a resource submits a self-schedule during the hours the CAISO anticipates it will need such flexibility, it would cancel the benefit the resource was procured to provide. The hours and days in which a resource providing flexible capacity must submit an economic bid depend on the category of flexible capacity the resource provides. The CAISO has three categories of flexible capacity – base ramping (category 1 flexible capacity); peak ramping (category 2 flexible capacity); and super-peak ramping (category 3 flexible capacity). Category 1 has the most stringent requirements

[9] The CAISO tariff rules on the RA program are set forth in existing tariff section 40, *et seq.* For the sake of clarity, this transmittal letter distinguishes between existing tariff provisions (*i.e.*, provisions in the current CAISO tariff), new tariff provisions (*i.e.*, new provisions the CAISO proposes to add in this filing), revised tariff provisions (*i.e.*, existing tariff provisions the CAISO proposes to revise in this filing), and deleted tariff provisions (*i.e.*, existing tariff provisions the CAISO proposes to delete in this filing).

[10] LSEs must procure certain amounts of their generic capacity from resources in defined local capacity areas (*i.e.*, local capacity). The balance of their capacity can be procured from resources anywhere on the CAISO system or from imports (*i.e.*, system capacity).

[11] *See* existing tariff section 40.6.4.1.

and category 3 has the least stringent requirements, with category 2 falling between.

A resource's net qualifying capacity (NQC) value and effective flexible capacity (EFC) values are the RA capacity and flexible RA capacity a resource can provide, respectively. The starting point of both calculations is the resource's qualifying capacity (QC) value. The CPUC and other local regulatory authorities set each resource's QC value. This value represents the maximum capacity a resource theoretically can provide. For thermal resources, the QC value essentially is the unit's nameplate capacity. For other technology types, such as wind and solar, the QC value generally is based on statistical measures of the resource's performance. To derive NQC values, the CAISO performs a deliverability assessment to determine how much of a resource's QC is deliverable to the aggregate CAISO load. The NQC value is the QC value adjusted downward to reflect those deliverability limitations. The CAISO tariff provides a formula for determining EFC values that incorporates a resource's start-up time, ramp rate, and NQC.[12] The tariff also provides technology-specific EFC methodologies for hydroelectric, proxy demand response, energy storage, multi-stage generator, and combined heat and power resources, respectively, that the CAISO must use instead of the general formula.

The CAISO has two main mechanisms to ensure resources providing RA capacity meet their must-offer obligation. First, the CAISO submits cost-based bids on behalf of resources providing generic RA capacity that do not meet their RA must-offer obligation. The generated bid helps ensure the CAISO market has access to energy from an RA resource even when that RA resource fails to bid as required. Second, through the resource adequacy availability incentive mechanism (RAAIM), the CAISO assesses non-availability charges and provides availability incentive payments to both generic and flexible RA resources based on whether their performance falls below or above defined performance thresholds. The CAISO tariff exempts certain resource types from bid generation and RAAIM. The exemptions from bid generation, RAAIM, and the 24x7 generic RA must-offer obligation are not necessarily paired; a resource type can be exempt from one but still face the other two.

Under the RA tariff provisions, the CAISO performs a local capacity technical study each year.[13] The local capacity technical study criteria require the CAISO to identify transmission-constrained local capacity areas, determine the minimum local capacity area resources in MW that must be available to the

[12] Existing tariff section 40.10.4.1.
[13] Existing tariff section 40.3.1.

CAISO within each local capacity area to address contingencies, and identify the generating units within each identified local capacity area.[14] Based on the results of the study, the CAISO allocates local capacity area resource procurement obligations to scheduling coordinators for LSEs.[15] If an LSE has procured local capacity area resources that satisfy generation capacity requirements for a local capacity area, the scheduling coordinator for the LSE will include this information in its annual and monthly resource adequacy plans.[16]

The CAISO tariff also includes the CPM that serves as a backstop mechanism that allows the CAISO to "procure capacity to address a [RA showing] deficiency or supplement resource adequacy procurement by LSEs, as needed, to maintain grid reliability."[17] Resources voluntarily submit bids into CPM competitive solicitations. Resources designated under the CPM essentially are treated as RA resources and have a must-offer obligation.[18] The CAISO may designate CPM capacity only under certain circumstances specified in the tariff. These circumstances include insufficient RA resources in an LSE's annual or monthly resource adequacy plan to meet system and local capacity RA obligations.[19] The CAISO's authority to designate CPM capacity to address such a deficiency in local capacity area resources is based on whether LSEs have procured sufficient resources to comply with the local capacity technical study criteria described above.[20]

B. Issues Confronting the Resource Adequacy Program

The rapid transformation to a cleaner yet more variable and energy-limited resource fleet, the migration of load to smaller and more diverse LSEs, and the load shedding events of summer 2020, all require reexamining all aspects of the CAISO's RA program. In 2006, at the onset of the RA program in California, the predominant energy production technology types were gas-fired, nuclear, and hydroelectric resources. Although some of these resources were subject to use limitations because of environmental regulations, start limits, or air permits, they were generally available to produce energy when and where needed given they all had fairly dependable fuel sources.

[14] Existing tariff sections 40.3.1 – 40.3.1.2.
[15] Existing tariff section 40.3.2.
[16] Existing tariff section 40.3.3.
[17] *Cal. Indep. Sys. Operator Corp.*, 153 FERC ¶ 61,001, at P 2 (2015). The CPM is contained in existing tariff section 43A, *et seq.*
[18] Existing tariff section 43A.5.1.
[19] Existing tariff sections 43A.2(3) and 43A.2.1.
[20] Existing tariff sections 43A.2.1.1, 43A.2.1.2, and 43A.2.2 (each cross-referencing existing tariff section 40.3.1.1)

However, as the fleet transitions to achieve the objectives of California Senate Bill 100,[21] the CAISO must rely on a very different resource portfolio to operate the grid reliably. This transition has highlighted several particular issues with the RA program that the CAISO is addressing in the RA Enhancements initiative and other forums:

1. RA counting rules do not adequately reflect resource availability, and instead rely on complicated substitution and availability incentive mechanism rules;
2. Flexible capacity counting rules do not sufficiently align with operational needs;
3. Provisions for import resources need strengthening to ensure physical capacity and firm delivery from RA imports;
4. System and flexible RA showings assessments do not consider the overall effectiveness of the RA portfolio to meet the CAISO's operational needs;
5. Current planned outage substitution rules leave resource SCs and the CAISO unclear as to substitution needs until after monthly RA showings;
6. Increased levels of energy storage necessitate ensuring a minimum level of stored energy will be available during the evening hours when load can remain high while solar production quickly drops; and
7. Growing reliance on availability-limited resources that may not have sufficient run hours or dispatches to maintain and serve the system reliably and meet energy needs in local capacity areas and sub-areas.

The criticality of these concerns was reflected in the conditions that led to the CAISO instituting rotating electricity outages on August 14 and 15, 2020. The Final Root Cause Analysis report identified multiple issues regarding the RA program as root causes of the outages.[22] Two of the three high-level root causes were (1) the "climate change-induced extreme heat wave across the western United States resulted in the demand for electricity exceeding the existing electricity resource adequacy (RA) and planning targets," and (2) in "transitioning to a reliable, clean, and affordable resource mix, resource planning targets have not kept pace to ensure sufficient resources that can be relied upon to meet demand in the early evening hours."[23] The report also identified a host of near-, mid-, and long-term recommended actions to address the root causes. Many of these were CAISO activities, and included RA-related items such as:

[21] The objective of SB 100 is "that eligible renewable energy resources and zero-carbon resources supply 100% of retail sales of electricity to California end-use customers and 100% of electricity procured to serve all state agencies by December 31, 2045." https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180SB100
[22] *See generally* Final Root Cause Analysis at 38-64.
[23] *Id.* at 38. The third high-level root cause was that certain "practices in the day-ahead energy market exacerbated the supply challenges under highly stressed conditions.

- Analyze the need for basing RA procurement targets on meeting both the gross peak and net peak (*i.e.*, early evening hours).
- Work with stakeholders to ensure the CAISO can operate storage resources efficiently and reliably.
- Pursue changes to the CAISO planned outage rules to ensure they do not create unwarranted reliability risks.
- Refine the capacity counting rules for various resource types.
- Refine performance incentives for RA resources.[24]

C. The RA Enhancements Stakeholder Initiative

On October 22, 2018, the CAISO began the RA Enhancements stakeholder initiative by publishing its initial issue paper.[25] The purpose of the initiative is to review the existing RA tariff provisions holistically to improve and update them to address more effectively the challenges that the changing resource fleet poses to the RA program and the conditions the CAISO grid faces now and expects to face. Since the beginning of the RA Enhancements initiative, the CAISO has held multiple in-person stakeholder meetings (pre-COVID-19), coordinated numerous web conferences, and published multiple iterations of policy development papers.

As the initiative unfolded, the CAISO separated the topics into multiple phases. The CAISO completed policy development on the first phase in February 2021 by publishing the final proposal.[26] The CAISO Governing Board approved the Phase 1 policy proposals at its March 24, 2021, meeting. This first phase addresses four main topics:

1. On days grid conditions are tight, imposing a minimum state of charge requirement on RA storage resources to ensure they will be charged sufficiently to meet their day-ahead market schedules in the operating timeframe.
2. Requiring RA substitute capacity for all maintenance outages on RA resources, and terminating the existing process that requires the CAISO to wait until several weeks before an outage is scheduled to evaluate individual outage requests on RA resources in priority order to determine whether outages on individual units would cause the CAISO

[24] *Id.* at 70-75. The Final Root Cause Analysis also identified potential market rule enhancements unrelated to RA. Some of these are addressed in the CAISO's recent tariff amendment filing in Docket No. ER21-1536.
[25] Materials related to the RA Enhancements stakeholder initiative are available on the CAISO website at California ISO - Resource adequacy enhancements (caiso.com).
[26] Resource Adequacy Enhancements Phase 1 – Final Proposal (Feb. 17, 2021) (Final Proposal), available at ResourceAdequacyEnhancements-Phase1FinalProposal.pdf (caiso.com). The Final Proposal is also provided in attachment C to this tariff amendment filing.

to fall below RA requirements for days on which an outage would occur.
3. Clarifying that extending the extent or duration of an existing outage requires a new outage card.
4. Updating the CAISO's local capacity study technical criteria and the related backstop CPM provisions to ensure the CAISO has sufficient local capacity in all hours.

The second phase of the RA Enhancements initiative is still in the policy development phase and covers discrete (from the Phase 1) issues regarding:

1. Implementing unforced capacity (UCAP) counting rules based on resources' historical rate of unplanned outages to create performance incentives and eliminating RAAIM.
2. Aligning the CAISO tariff's outage nomenclature with that used by RC West, the CAISO's reliability coordinator function.
3. Setting minimum system RA requirements that local reliability areas (LRAs) must meet to avoid LRA leaning and ensure LRAs meet a minimum equitable level of reliability.
4. Creating a new portfolio sufficiency test to evaluate, at a system level, how well the RA fleet is positioned to meet reliability needs beyond just peak hours.
5. Adding backstop CPM authority to fill gaps identified by the new portfolio sufficiency test.
6. Revising the must-offer obligation of RA capacity.
7. Imposing more stringent requirements on RA imports.
8. Creating a planned outage reserve margin that would better allow RA resources to take maintenance outages without providing substitute RA capacity.
9. Modifying the flexible resource adequacy framework.

The CAISO plans to implement most of the Phase 2 items for the 2023 RA year (Phase 2A), with some elements dependent on the implementation timeline of the day-ahead market enhancements initiative (Phase 2B).[27]

Stakeholders have a variety of views on the individual elements of this tariff amendment. Stakeholders widely support the outage reporting and local RA showing clarifications. Several stakeholders object to multiple elements of the minimum state of charge and RA substitute capacity aspects of this filing.

[27] Materials related to the day-ahead market enhancements initiative are available on the CAISO website at California ISO - Day-ahead market enhancements (caiso.com).

The Market Surveillance Committee (MSC) issued an opinion on the minimum state of charge proposal. The MSC concluded that "imposing a [state of charge] constraint in the (hopefully rare) conditions when the day-ahead residual unit commitment process indicates that capacity is inadequate is a reasonable precaution to take, at least until the end-of-hour state-of-charge parameter feature is enabled and tested in operation."[28]

The CAISO addresses stakeholder comments on its proposals below in section III of this transmittal letter.

III. Proposed Tariff Revisions

A. The Minimum State of Charge Tool for Non-Generator Resources Providing Resource Adequacy Capacity

1. Challenges Posed by Growth of Storage Resources on the Grid

The CAISO has seen significant growth in the number of storage resources[29] on its grid in just the past year. In summer 2020, the CAISO had approximately 200 MW of storage resources. Today the CAISO has approximately 550 MW of storage. By summer 2021, the CAISO expects to have 1,800 MW of storage resources available for dispatch. This growth has been driven by a CPUC directive for its jurisdictional utilities to procure 3,300 MW of new resource adequacy capacity over a three-year period. Most of this incremental resource adequacy capacity will be from four-hour lithium-ion battery storage devices. The CAISO expects the vast majority of these resources will use the non-generator resource participation model with the "limited energy storage resource" selection.[30]

The need for storage to charge before discharging energy onto the grid, combined with the real-time market's time horizon being too short to manage the typical charge/discharge cycle, poses challenges for CAISO operations. Those challenges will only grow as the CAISO adds more storage resources to its RA mix. Without additional tools this summer, the CAISO faces challenges in

[28] *See* MSC Opinion on Resource Adequacy Enhancements Phase I: Minimum State of Charge Requirement, at 2 (Mar. 23, 2021). That MSC document is available at California ISO - Market Surveillance Committee (caiso.com) and is also provided in attachment D to this tariff amendment filing.

[29] The tariff defines "Non-Generator Resource" as resources "that operate as either Generation or Load and that can be dispatched to any operating level within their entire capacity range but are also constrained by a MWh limit to (1) generate Energy, (2) curtail the consumption of Energy in the case of demand response, or (3) consume Energy."

[30] A limited energy storage resource is a type of non-generator resource that has a continuous positive to negative operating range according to discharge and charge limits, respectively, and is constrained by a state of charge. The state-of-charge constraint is what distinguishes a limited energy storage resource from a generic non-generator resource.

ensuring storage resources providing RA capacity can provide the grid the reliability benefits the CAISO needs.

The CAISO market systems optimize resources' operating parameters such as minimum run times, ramp rates, and cycle times to ensure a least-cost solution to address market needs given market constraints. Like other RA resources, RA storage resources have a 24x7 must-offer obligation in the day-ahead market. Storage resources, however, have an operating parameter unique among the resources on the CAISO grid – they cannot discharge energy to the grid unless they are first charged. The CAISO's day-ahead market optimizes over 24 hours and can thus account for the charge/discharge cycle. On peak summer days, this likely means the day-ahead market will charge most of the RA storage fleet during the peak solar hours and discharge them during the evening hours over the evening ramp and net load peak. Having RA storage resources charged and ready to discharge is vital during this period when demand is still relatively high, but solar production is declining or unavailable.

The time horizon for the real-time market, however, makes it difficult for the CAISO to optimize the charge/discharge cycle to derive the greatest reliability benefits from RA storage resources. The CAISO's real-time five-minute market looks ahead 65 minutes, but most storage resources take several hours to charge, so the real-time market cannot account for a full charge/discharge cycle.[31] This relatively short time horizon does not fully allow storage resources to arbitrage market price fluctuations across the day. These price fluctuations typically track periods of lesser and greater system stress (*e.g.*, low prices reflect less system stress and vice versa). This limitation in storage resources' ability to arbitrage prices limits the value the CAISO can derive from them in managing the grid reliably.

The differences in the time horizon between the day-ahead and real-time optimizations would not be problematic if real-time market conditions matched those of the day-ahead market. By design, however, day-ahead schedules are subject to change based on the real-time market, resource outages, deviations between load forecasts and actual load, and fluctuating output from wind and solar resources. All these factors can cause the real-time market to re-optimize the day-ahead market results. The more real-time market prices differ from the day-ahead market, the greater the challenges are for storage. For example, real-time prices during what are typically the lowest-priced hours of the day may be higher than prices in the day-ahead market, resulting in storage resources not charging. Also, if high prices occur before the peak net-load hours, the real-time market may discharge the limited energy available from storage resource earlier

[31] Nearly all of the storage resources in the fleet today are four-hour-duration batteries. This means that fully charged resources can discharge in four hours, and take just over four hours to charge due to round-trip efficiencies.

than anticipated, *i.e*., before the peak net-load period, when these resources are critical for the CAISO to meet net peak loads.

These challenges are particularly noteworthy for storage resources providing RA capacity. The CAISO depends on RA capacity to ensure it has sufficient capacity where and when needed to operate the grid reliably. A MW of RA capacity from a storage resource can effectively displace a MW of RA capacity from another resource type. If the CAISO cannot confidently utilize the RA capacity from storage resources, then the overall utility of the RA program is degraded, and the CAISO's ability to maintain reliability when other supply options are unavailable may be at risk.

2. The Minimum State of Charge Tool is a Reasonable Interim Measure to Ensure Reliable Grid Operation

Developing approaches to managing the charge/discharge cycle effectively and maximizing the reliability benefits storage resources provide has been a key CAISO objective. Through this filing, the CAISO takes an interim step in that effort by proposing a minimum state of charge tool for storage resources that provide RA capacity. This tool, which addresses a need highlighted in the Final Root Cause Analysis,[32] will be in place for no more than two years, and will apply only to RA storage resources. The CAISO intends it only as a stopgap measure until the CAISO develops more comprehensive approaches to integrating storage into the grid and the CAISO markets.[33] Given the load shedding events in summer 2020, the expected tight conditions for summer 2021, and the CAISO's increasing dependence on storage, the CAISO needs a tool it can implement by summer 2021 to use RA storage effectively and maintain grid reliability during net peak-load periods when other resources are fully utilized or unavailable.

The Commission previously has accepted CAISO revisions on an interim basis to address system reliability concerns while the CAISO was considering longer-term solutions. For example, in 2016, the Commission accepted the CAISO's filing of "revisions to its tariff to address limitations in the natural gas

[32] Final Root Cause Analysis at 70-71.

[33] The possibility of developing additional compensation mechanisms for RA storage resources does not suggest the CAISO's minimum state of charge proposal is unjust and unreasonable without such supplemental compensation mechanisms. "[T]he courts and th[e] Commission have recognized that there is not a single just and reasonable rate. Instead, we evaluate [proposals under FPA section 205] to determine whether they fall into a zone of reasonableness. So long as the end result is just and reasonable, the [proposal] will satisfy the statutory standard." *Calpine Corp. v. Cal. Indep. Sys. Operator Corp.*, 128 FERC ¶ 61,271, at P 41 (2009) (citations omitted).

delivery system in southern California that could adversely impact the reliability of CAISO's electric grid and market operations during the summer of 2016."[34] The Commission explained it was accepting the tariff revisions "based on the unique set of circumstances CAISO will face this summer due to the limited operability of the Aliso Canyon natural gas storage facility in southern California."[35] The Commission allowed the CAISO to implement these tariff revisions on an interim basis, with an express sunset date, subject to the requirement the CAISO seek Commission authorization to extend their effectiveness.[36] The Commission has also accepted tariff revisions to address system reliability concerns on an interim basis in other proceedings.[37]

The Commission should accept the minimum state of charge proposal on a temporary basis for similar reasons. The CAISO can implement the tool in time for summer 2021 when an increased number of RA storage resources will be on line, and the CAISO may have to depend on them to meet maintain reliability during net peak load periods. The CAISO will commence a stakeholder initiative to consider a permanent market-based solution to resolve the issue of adequate charge for storage resources. Such a market-based solution will address the stakeholder concerns about efficient dispatch of storage resources in the real-time market.[38] However, changing compensation rules for storage resources is not a feasible solution in the short term to address reliability during summer 2021. Compensation rules are complex and must be evaluated through a comprehensive stakeholder process that cannot be completed before the summer. Until the CAISO completes that initiative and can implement any new market measures, the CAISO must apply the minimum state of charge proposal to RA storage resources to ensure reliability.

The details of how the proposed minimum state of charge tool will function are in three sub-sections of new tariff section 40.5.

- Section 40.5.1 – How the Minimum State of Charge tool will function.

[34] *Cal. Indep. Sys. Operator Corp.,* 155 FERC ¶ 61,224, at P 1 (2016).
[35] *Id.* at P 2.
[36] *Id.* at P 13.
[37] *See, e.g.*, *ISO New Eng. Inc., et al.*, 144 FERC ¶ 61,204, at P 42 (2013) (stating that "given the importance of ensuring reliability in New England this coming winter . . . we accept the [proposed Winter Reliability] Program for the limited period requested," subject to "consider[ation of] market-based solutions" in future stakeholder process); *ISO New Eng. Inc.*, 171 FERC ¶ 61,235, at PP 1, 57 (2020) (finding that implementation of proposed tariff revisions on an interim basis for winter months over upcoming two-year period "is a reasonable short-term solution to compensating in a technology-neutral manner resources that provide fuel security").
[38] The CAISO disagrees with certain stakeholders that have suggested limiting the minimum state of charge tool's application to one year. It is unreasonable to expect that the complex stakeholder process focused on permanent approaches to storage would be ready to implement in one year. A one-year sunset for the minimum state of charge tool would not be appropriate.

- Section 40.5.2 – How the CAISO will determine the days and hours on which the tool will apply.

- Section 40.5.3 – How the CAISO will notify the market that the tool will apply for a day.

New tariff section 40.5.1 defines how the tool will constrain real-time market awards. The tool will apply only to a RA resource that is a "Non-Generator Resource that has selected a primary fuel type in Master File of 'Limited Energy Storage Resource'" The CAISO limited application of the tool to this subset of resources with storage attributes for a few reasons. This categorization covers resources the CAISO anticipates will constitute most of the incremental RA capacity in the coming years. Concerns over the interaction between real-time availability and the charge/discharge cycle are most acute for these resources. Pumped hydro and hybrid resources with a storage element also have storage attributes, but the CAISO proposes not to apply the tool to them. The pumped hydro market participation model does not have the attributes that would permit the CAISO to enforce the tool with regard to such resources. Specifically, the CAISO's pumped storage hydro unit model has three operating modes in which the unit is one of the following: (1) generating as if it were any other generating unit; (2) consuming energy as if it were any other load; or (3) offline.[39] Unlike a limited energy storage resource, the CAISO does not model a state-of-charge constraint through which it could apply the minimum state of charge tool. Similarly, it is infeasible to apply the tool to hybrid resources because the market recognizes them as a single resource, and they would not have a distinct discharge schedule like a pure storage resource.

New tariff section 40.5.1 also spells out that when the minimum state of charge tool (referred to in the tariff as the MSOC Tool) is enforced, the CAISO will limit the real-time market awards to a covered resource "such that, based on its registered operating parameters, the resource will have sufficient charge to meet its discharge awards from its Day-Ahead Schedule for any Trading Hour that meets the requirements specified in Section 40.5.2." This is the key tariff provision that gives the CAISO authority to avoid needing to dispatch RA storage resources manually to charge, thereby streamlining and facilitating the CAISO's ability to respond to conditions that threaten reliable grid operation. Even when an hour otherwise would be subject to the tool based on considerations from the day-ahead market, on the operating day, CAISO staff would have the discretion "not to apply the MSOC Tool for particular Trading Hours if its assessment of projected conditions reflects that the MSOC Tool is not necessary for system reliability in those Trading Hours."

[39] CAISO business practice manual (BPM) for market operations, section 2.1.6.1.

New tariff section 40.5.2 limits the days and hours the CAISO will apply the minimum state of charge tool. This tariff section states that the tool will be triggered only if there is an hour of a day for which the RUC process "initially cannot find a feasible solution without adjusting the constraints" that were used initially. Historically, this has been a rare event. In 2018 and 2019, there was only one day per year that had such a RUC infeasibility. In 2020, an unusually hot year, 23 days had a RUC infeasibility. Notably, the CAISO will not enforce the tool for every hour on such days. Instead, the tool will only protect day-ahead discharge schedules for the most critical hours on that day. New section 40.5.2 identifies these as the hours "that the CAISO projects, at the time the Day-Ahead Market runs, will have the highest CAISO system load net of wind and solar output."

New tariff section 40.5.3 requires the CAISO to notify market participants approximately at the time of posting day-ahead market results if there were any RUC infeasibilities and, if so, what hours' day-ahead market discharge awards will be protected by the minimum state of charge tool. This will provide clear notice to the market, and particularly RA storage resources, about when the tool will be applied.

To protect day-ahead market discharge schedules for RA storage resources on days and hours when it applies, the tool will work backwards from any hour with a discharge schedule to ensure the storage resource charges in time to meet its day-ahead schedule based on its charging ramp rate and any other relevant operating parameters. For example, assume a RA storage resource must be charged to its full state of charge level by 4:00 p.m. to meet its day-ahead discharge schedule. If the resource takes four hours to charge from a depleted state, then starting at noon, the real-time market would set end-of-hour charge requirements for the next four hours to make sure the resource does not receive a discharge schedule that would interfere with its ability to be charged by 4:00 p.m.. In this simple example, the tool would ensure that the resource has at least a 25% charge by 1:00 p.m., a 50% charge by 2:00 p.m., 75% charge by 3:00 p.m., and a 100% charge by 4:00 p.m.. Within those constraints, the real-time market will honor the resource's real-time market bids.

The CAISO's intent in tying deployment of the minimum state of charge tool to critical hours on days for which there is a RUC infeasibility is to limit application of the tool. RUC is part of the day-ahead market and operates after the CAISO runs the integrated forward market. It identifies whether, based on the CAISO's forecast of demand, the bid-in demand for the day-ahead market will meet reliability criteria. If there is insufficient bid-in demand, the RUC process procures additional capacity. The tariff acknowledges that sometimes capacity bid into the RUC process cannot meet the needs based on the constraints and the CAISO may adjust the constraints to yield a feasible solution for the RUC process. The need for the CAISO to adjust the constraints to avoid

a RUC infeasibility indicates operating conditions will be tight for a day. This is an appropriate and objective way to define the days on which the CAISO will enforce the minimum state of charge tool. Application of the tool will be further limited by only applying it in the net peak load hours and also giving the CAISO discretion to turn the tool off in real-time where it has proven unnecessary on the operating day.

3. Responses to Stakeholder Comments on Minimum State of Charge Tool

The CAISO evolved the proposal significantly during the stakeholder process based on stakeholder feedback. In particular, the CAISO worked closely with the storage community to limit the tool's use, minimize the impacts on RA storage resources, and adopt a sunset date. Specifically, the CAISO substantially scaled back the applicability of the minimum state of charge tool to ensure it will only apply when system conditions are especially tight, and the CAISO must ensure RA storage resources are available with a state of charge to meet evening net loads. The CAISO also proposed a two-year sunset date for the minimum state of charge tool. While the minimum state of charge tool is in use, the CAISO will undertake a new stakeholder initiative to develop a market-oriented approach to address storage resource state of charge issues more permanently. As stakeholders requested, the CAISO also will use the data it gathers from using the minimum state of charge tool during summer 2021 to improve application of the minimum state of charge and inform future proposals.

Because of these revisions and clarifications, some stakeholders that originally opposed the minimum state of charge tool no longer oppose its application for the proposed limited term. Despite these developments, the CAISO understands that some stakeholders may still have concerns. The CAISO addresses such concerns below.

In considering these concerns, the CAISO recognizes the minimum state of charge tool is not an ideal or perfect solution. Nor must it be for the Commission to accept it. Section 205 of the FPA requires that a tariff revision be just and reasonable, not that the tariff revision be the best possible change.[40] The CAISO can implement the minimum state of charge tool in time for summer 2021, and it is critical to ensure the CAISO's RA rules reflect the evolving needs of the grid and RA resources can meet the CAISO's reliability needs on an interim basis. As the Commission knows, the CAISO faced serious reliability issues in summer 2020, and the CAISO is committed to address challenges to reliability for summer 2021 proactively. Given the sharply increasing storage

[40] *Calpine Corp. v. Cal. Indep. Sys. Operator Corp.*, 128 FERC ¶ 61,271, at P 41 ("[W]e evaluate tariff provisions to determine whether they fall into a zone of reasonableness. So long as the end result is just and reasonable, the tariff provision will satisfy the statutory standard.") (citations omitted).

resource capacity within the CAISO, even from summer 2020 to summer 2021, the minimum state of charge tool will help ensure there is sufficient RA capacity available when needed. The possibility the CAISO may adopt further refinements or new tools in the future does not mean the proposal before the Commission now is unjust and unreasonable.

a. *There is sufficient evidence supporting the need for the minimum state of charge tool*

Some stakeholders questioned the need for the minimum state of charge tool. They contend the CAISO has not demonstrated storage resources depleting their state of charge to the point they cannot meet day-ahead schedules has caused a reliability problem. They refer to the Final Root Cause Analysis of the August 2020 heat wave events, which indicates energy storage had a limited impact on those events.

The CAISO acknowledges the Final Root Cause Analysis did not identify the specific performance of storage resources in August 2020 as a root cause of the outages. That point, however, does not negate the need for the minimum state of charge tool for the next two years. The CAISO has properly considered data in addition to the Final Root Cause Analysis, including its best information on the changing resource fleet providing resource adequacy. Energy storage will play a larger role in the overall RA fleet in 2021 as compared to 2020, and an even greater role in summer 2022. It is essential this incremental RA capacity be able to meet the reliability needs for which it was procured. As the CAISO's Department of Market Monitoring (DMM) has pointed out, most batteries providing RA do not have sufficient state of charge to provide their full RA capacity across four consecutive peak net load hours.[41] Further, the Final Root Cause Analysis directly identified the need for the CAISO to work with its stakeholders "to ensure the efficient and reliable operation of battery storage resources given the significant amount of new storage that will be on the system next summer and beyond."[42] Thus, it is reasonable for the CAISO to adopt this interim measure to ensure storage resources have sufficient charge to meet their day-ahead schedules during peak net load hours when supply conditions are tight, as evidenced by RUC infeasibilities.

[41] DMM comments on Resource Adequacy Enhancements Final Proposal Phase 1, at 4 (Mar. 10, 2021), available at DMMCommentsonResourceAdequacyEnhancements-FinalProposalPhase1-Mar102021.pdf (caiso.com).
[42] Final Root Cause Analysis at 70-71.

b. *The minimum state of charge tool is not unduly discriminatory*

Certain stakeholders raised concerns the new minimum state of charge tool could unduly discriminate against storage resources by removing them from the real-time market. Commenters argued no other resources have this market restriction; instead, market incentives alone are used to ensure that other resources offer their capacity as needed.

Although the minimum state of charge tool may apply only to a subset of storage resources, its application does not constitute prohibited undue discrimination. Section 205 of the FPA prohibits a public utility from "mak[ing] or grant[ing] any *undue* preference or advantage to any person or subject[ing] any person to any *undue* prejudice or disadvantage."[43] So long as there is no undue preference or discrimination, the public utility satisfies the requirements of section 205.[44]

The Commission has recognized energy storage resources are not similarly situated with other types of resources for certain ISO/RTO rules.[45] In the context of the minimum state of charge tool, the CAISO treats electric storage resources differently than other resources because, unlike other resources, an electric storage resource must charge by taking energy from the grid before it can meet its discharge schedule when dispatched to provide energy back to the grid. This charge/discharge cycle requirement is a unique operational characteristic that distinguishes RA storage resources from other RA resources. Unlike other resources, storage resources must have an adequate state of charge before their discharge schedule to provide RA service reliably. However, divergences between day-ahead schedules and real-time conditions can lead to

[43] FPA Section 205(b), 16 U.S.C. § 824d(b) (emphasis added).
[44] *Calpine Corp. v. PJM Interconnection, L.L.C.*, 171 FERC ¶ 61,035, at P 318 (2020) ("Whether a rate or practice is unduly discriminatory depends on whether it provides different treatment to different classes of entities and turns on whether those classes of entities are similarly situated"). *See also Town of Norwood v. FERC*, 202 F.3d 392, 402 (1st Cir. 2000) ("But differential treatment does not necessarily amount to *undue* preference where the difference in treatment can be explained by some factor deemed acceptable to regulators (and the courts).") (emphasis in original).
[45] *N.Y. State Pub. Serv. Comm'n v. N.Y. Indep. Sys. Operator, Inc.*, 173 FERC ¶ 61,060, at P 26 (2020) ("[W]e continue to find electric storage resources are not similarly situated to renewable resources and that the Commission appropriately found that the Complainants had not demonstrated that application of buyer-side market mitigation rules to electric storage resources is not unjust and unreasonable, or unduly discriminatory or preferential"); *Midcontinent Indep. Sys. Operator, Inc.*, 172 FERC ¶ 61,132, at P 52 (2020) ("We find that MISO's proposed evaluation criteria establish a just and reasonable and not unduly discriminatory or preferential framework for SATOAs [storage facility as a transmission-only asset] to be evaluated in the MTEP [Midcontinent ISO Transmission Expansion Plan] using the same qualification requirements that the Commission has already approved for existing transmission project types, plus appropriate additional criteria specific to the SATOA.").

situations where RA storage resources are not charged in real-time or are discharged before peak net load hours when they are most needed.

c. *The CAISO has addressed concerns regarding the efficiency and operational impacts of the minimum state of charge tool by limiting its application*

Some stakeholders expressed concern the CAISO is departing from optimally efficient dispatch in real-time by requiring storage resources to have a state of charge based on day-ahead prices. They argue the CAISO may have to rely on more expensive and carbon-intensive resources if storage resources cannot respond in real-time due to the minimum state of charge requirement. Some stakeholders commented this perceived inefficiency inadvertently would reduce the CAISO's ability to take advantage of storage resources' flexibility or would otherwise limit opportunities for storage to participate in the real-time market.

Stakeholders also raised concerns about how the minimum state of charge mechanism will operate in the CAISO markets. For instance, one stakeholder commented the proposal does not address the interaction with ancillary services schedules for storage resources. Other stakeholders noted that by restricting dispatches of storage, the minimum state of charge tool could cause the CAISO to lean on and deplete regulation resources, or that it could force storage resources to charge at sub-optimal times.

The CAISO purposefully limited the use of the minimum state of charge procedure to ensure it posed minimal risk of creating serious inefficiencies or operational issues in the real-time market. As discussed above, the CAISO will impose the minimum state of charge requirement only on RA storage resources and only in limited hours on days for which the RUC process results in an infeasibility. These infeasibilities are infrequent and have historically been uncommon. In response to stakeholder comments, the CAISO further limited use of the minimum state of charge tool only to the specific hours immediately before discharge schedules. Thus, the CAISO will impose the requirement for the minimum number of intervals possible. With such a limited application, the tool should not systematically skew market efficiency. This limited scope also means that the CAISO is most likely to impose the minimum state of charge requirement when supply conditions are tight, and it would have to call upon less efficient resources anyway.

B. Requiring Resource Adequacy Resources to Provide Substitute Capacity for All Maintenance Outages on Resource Adequacy Capacity

1. Existing Process for Approving Maintenance Outages on Resource Adequacy Resources

Under the existing tariff rules, an RA resource that wishes to take a maintenance outage can request either a RA Maintenance Outage *With* Substitution or a RA Maintenance Outage *Without* Substitution.

Under the "with substitution" option, the resource must "provide RA Substitution Capacity in an amount no less than the amount of Resource Adequacy Capacity that would be on scheduled outage."[46] If the CAISO determines the outage would not have "a detrimental effect on the efficient use and reliable operation of the CAISO Controlled Grid" (*i.e.*, the standard that applies for all maintenance outages), then it will approve the request. The RA resource must request the outage at least eight days before the requested outage date. This option provides the RA resource with certainty it can take its desired maintenance outage, but comes at the cost of procuring RA substitute capacity upfront (*i.e*., at the time of the outage request).

Virtually all RA maintenance outage requests today are from resources using the "without substitution" option. The CAISO approves the request if the proposed outage would have no detrimental effect on using the grid efficiently and "the outage will not result in insufficient available Resource Adequacy Capacity during the outage period."[47] Scheduling coordinators can submit outage requests to the CAISO's outage management system many months before the planned outage date. However, because the CAISO has a monthly RA program, the CAISO cannot know how the proposed outage request will affect the CAISO's RA sufficiency until the RA showings process is finished for the month in which the outage would occur, and the CAISO reviews the monthly showings. Thus, although the CAISO may conditionally approve a request for an RA Maintenance Outage Without Substitution submitted far in advance, the earliest the CAISO can provide a firm answer to the scheduling coordinator is approximately twenty-two days before the start of the month in which the outage would take place. Under the existing tariff rules, by that twenty-two day deadline, the CAISO evaluates all requests for RA Maintenance Outages Without Substitution submitted twenty-five days before the start of the month.[48] At that point, the CAISO either grants or denies the requests. The CAISO evaluates requests submitted after the twenty-five day deadline on a rolling basis.

[46] Existing tariff section 9.3.1.3.3.1(b).
[47] Existing tariff section 9.3.1.3.3.2(c)(2).
[48] Existing tariff section 40.9.3.6.1.

If the CAISO denies a request under the "without substitution" option, then "the Scheduling Coordinator for the Resource Adequacy Resource may request an RA Maintenance Outage With Substitution or may request that the CAISO accommodate the outage at another time."[49] The resources with a denied request that still wish to take the outage essentially have a planned outage substitution obligation – they must provide substitute capacity for the outage to proceed. Because a resource assigned a substitution obligation formally is resubmitting their request as a RA Maintenance Outage With Substitution, per the tariff deadlines, the request must be submitted by eight days before the outage.[50] The practical result is that an RA resource that wishes to take a maintenance outage and is assigned a substitution obligation must provide its substitute capacity no later than this eight-day deadline. Otherwise, the resource is at risk of the CAISO disallowing the outage.

2. Concerns with Existing Process

The CAISO and many market participants are dissatisfied with the existing process for approving maintenance outages on RA resources.

Although scheduling coordinators can initially submit the outage request as a RA Maintenance Outage *With* Substitution, most start by trying to have the CAISO approve the outage without substitution. From their perspective, they are in limbo about whether they must provide substitution until approximately three weeks before the start of the month in the outage will take place. They then have until eight days before the outage starts to provide the substitute capacity. A scheduling coordinator may not be able to secure substitute capacity at this late juncture and thus is in the position of having the CAISO deny its long-planned (and provisionally approved) maintenance outage eight days before it was supposed to start.

The CAISO also has concerns about the existing process. The CAISO agrees that once it has provisionally approved a maintenance outage, ideally, the scheduling coordinator should face minimal risk the CAISO will subsequently cancel the outage. The CAISO wants to avoid cases where RA resources the CAISO relies upon to provide grid reliability must postpone long-term and long-planned maintenance work. The status quo also affects the liquidity of the bilateral RA market. Entities with a portfolio of resources that could provide RA capacity may hold resources in reserve (and out of the RA market) to provide substitute capacity if the RA resources in their monthly RA showings go on outage and have a substitution obligation. Providing earlier certainty about the

[49] Existing tariff section 9.3.1.3.3.1(c)(4).
[50] Existing tariff section 9.3.1.3.3.1(b) ("A request for an RA Maintenance Outage With Substitution must [] be submitted to the CAISO no less than eight (8) days prior to the start of the outage").

need to provide substitute capacity increases the likelihood such "reserve capacity" might be sold as RA capacity from the outset.

Recent trends in RA showings suggest that, even under current substitution rules, RA resources would face a substitution requirement for most maintenance outages. Table 1, below, provides data on monthly RA showings since January 2019. The table shows by month the total system RA provided through the showings process ("Shown RA"), the total system RA procurement requirements ("System RA Requirement"), the excess RA shown ("Excess RA"), and the excess RA as a percent of the monthly requirement ("Excess as % of Requirement"). From January 2019 through June 2020, on average the RA showings were 4.57% above the monthly RA requirements.[51] This is the RA headroom that, under the current rules, permits a RA maintenance outage to go forward without substitution. Since July 2020 this headroom has virtually disappeared. In those past 11 months the average RA headroom has been .39%.[52]

Given this trend, the likelihood of the CAISO approving RA maintenance outages without substitution under the current tariff rules is low. The CAISO questions the value of maintaining a complex business process and the related software for a process likely to create the same answer in almost all cases. The existing framework also raises unrealistic expectations for resources hoping to have the CAISO approve an outage approved without substitution.

[51] The total shown RA across these 18 months was 703,355 MW and total RA requirements were 672,615, reflecting a total excess of 30,739. [(703,355-672,615)/672,615] = 4.57%.
[52] [(436,221-434525)/434,525]=.39%. This figure includes January 2021 and February 2021, which had deficiencies that are likely related to a business practice manual change (Proposed Revision Request 1280) that subsequently was held in abeyance through the business practice manual appeal process. Under this change, the CAISO did not process LRA-provided RA credits for these months. These credits largely relate to the resources that are not shown on RA plans or subject to RAAIM but that a LRA determines should count against LSE RA requirements. Excluding these credits had the practical effect of raising the system RA requirement in those months in this data above what they would have been. Even excluding these two months, the headroom since July 2020 has been below 1% [(366,776-363,268)/363,268]=.97%. More information on Proposed Revision Request 1280 is available at: http://www.caiso.com/rules/Pages/BusinessPracticeManuals/Default.aspx.

Table 1

Month	Shown RA	System RA Requirement	Excess RA	Excess as % of Requirement
January-2019	34,105	31,681	2,424	7.11%
February-2019	32,349	30,307	2,042	6.31%
March-2019	31,992	29,774	2,218	6.93%
April-2019	34,646	32,285	2,361	6.81%
May-2019	39,673	37,284	2,389	6.02%
June-2019	47,490	45,070	2,420	5.10%
July-2019	48,641	47,152	1,489	3.06%
August-2019	50,068	49,821	246	0.49%
September-2019	50,111	50,242	-131	-0.26%
October-2019	41,845	40,306	1,539	3.68%
November-2019	34,425	32,177	2,248	6.53%
December-2019	35,352	34,101	1,251	3.54%
January-2020	35,159	31,645	3,515	10.00%
February-2020	33,693	32,480	1,213	3.60%
March-2020	33,294	31,653	1,641	4.93%
April-2020	35,367	34,144	1,223	3.46%
May-2020	39,930	38,673	1,258	3.15%
June-2020	45,213	43,820	1,394	3.08%
July-2020	48,680	48,434	246	0.50%
August-2020	48,952	48,926	25	0.05%
September-2020	48,973	49,135	-162	-0.33%
October-2020	40,259	40,025	235	0.58%
November-2020	34,724	34,279	445	1.28%
December-2020	35,936	35,428	507	1.41%
January-2021*	35,213	36,076	-863	-2.45%
February-2021*	34,232	35,182	-950	-2.77%
March-2021	33,755	32,804	951	2.82%
April-2021	35,840	35,097	743	2.07%
May-2021	39,658	39,140	518	1.31%

*January 2021 and February 2021 did not include LRA-approved credits in the RA showings process.

The CAISO also has increasingly questioned whether it is appropriate more generally to offer RA resources the option of requesting a RA Maintenance Outage Without Substitution. This has not always been an option. Starting with the 2013 RA year, the CAISO implemented tariff provisions requiring RA resources to provide replacement capacity whenever they took maintenance outages (*i.e.*, the so-called “replacement requirement”). Thus, the supplier always had to provide a replacement capacity regardless of the CAISO’s RA

position on the day in question.[53] The Commission found the replacement requirement was just and reasonable because it would help to ensure reliability:

> The Commission's obligation is to evaluate whether CAISO's Proposal is just, reasonable, and not unduly discriminatory. . . . We agree with CAISO that short-term outages might combine to cause reliability problems on certain days during the month, and that the Replacement Requirement is designed to avoid such problems. Reliability problems often occur unexpectedly. Thus, we find that it is appropriate for a control area operator to guard against potential reliability problems even where none have occurred in the past.[54]

When the CAISO streamlined its RA outage evaluation process effective for the May 2018 RA month, it placed the potential obligation for procuring alternative capacity entirely on the supplier and removed the LSE from the process.[55] In merging these responsibilities, the CAISO faced the choice of whether to (1) impose the substitution requirement on the supplier regardless of the CAISO's RA position (as it had done for maintenance outages submitted after the RA plan submission deadline), or (2) evaluate as an initial matter the CAISO's RA position during the outage (as it had done for maintenance outages submitted before the RA plan submission deadline). The CAISO and stakeholders pursued the latter option, which the current tariff reflects.

Based on subsequent experience, however, including the August 2020 extreme heat wave, the CAISO now believes it should implement an interim RA substitution requirement that recognizes the practical reality that even under the current rules substitution is required in the vast majority of circumstances. Revising the current rule also recognizes that when a resource provides RA capacity to the CAISO, it is committing it will be available to meet its obligations to provide capacity when and where it is needed. Meeting that commitment by providing substitute capacity should not depend on what outages other resources are taking or whether some LSE happened to procure excess capacity on that day. This is particularly so considering the CPUC planning reserve margin, which is the basis of setting individual CPUC-jurisdictional LSE RA requirements,

[53] Transmittal letter for CAISO tariff amendment to implement replacement requirement for RA maintenance outages, Docket No. ER12-2669-000, at 31-35 (Sept. 20, 2012). The CAISO only considered its overall RA position in determining whether, under the then-new replacement rule, an LSE could include a resource on its RA plans that would be on a maintenance outage for part of the RA month. This evaluation was limited to outages requested before the forty-five-day RA plan submission deadline.
[54] *Cal. Indep. Sys. Operator Corp.*, 141 FERC ¶ 61,135, at P 38 (2012).
[55] Transmittal letter for CAISO tariff amendment to implement Phase IB and Phase 2 of the Reliability Services Initiative, Docket No. ER18-1-000, at 11-13 (Sept. 29, 2017).

does not account for capacity unavailable due to planned outages.[56] Not requiring substitute capacity in all cases effectively lowers the planning reserve margin because capacity assumed to be available in setting the requirements is unavailable and does not have an alternate resource take its place. This relationship between unsubstituted maintenance outages and the planning reserve margin was noted in the Final Root Cause Analysis, which observed that on August 14, 2020 (one of the days that the CAISO ordered load shedding), "[a]dding the planned outages would increase the operational need to 2.0% higher than the PRM."[57]

3. CAISO's Proposed Revisions to the Existing RA Outage Approval Process

To address the aforementioned concerns, the CAISO proposes to amend its tariff to require, with four limited exceptions, RA substitute capacity for all maintenance outages on RA resources. This change is an interim and readily implementable change pending further development of the planned outage reserve margin approach being discussed in Phase 2 of the RA Enhancements initiative.[58]

Applying this new rule will depend on the timing of the outage request. Before the end of the RA plan cure period at 30 days before the month, the CAISO does not know for certain if a resource will provide RA capacity for that month. The CAISO proposes slightly different rules depending on whether the scheduling coordinator requests the outage before or after that final deadline. For requests submitted before the end of the cure period, scheduling coordinators will have until shortly after the cure period to submit substitute capacity.[59] Failure to do so will cause the CAISO to deny the outage even if it previously approved the outage on a tentative basis. Outages submitted after the end of the cure period will have a short window of time to provide substitute capacity. Failure to provide substitution within that window will result in the CAISO automatically denying the outage request.[60] In both cases, the CAISO proposes to establish the exact deadline in the business practice manual, but the deadline could be no more than 72 hours after the end of the cure period or the

[56] Most local regulatory authorities have adopted a planning reserve margin equal to the level the CPUC has set.
[57] Final Root Cause Analysis at 43.
[58] The CAISO proposes to redesign the planned outage process in Phase 2 to reflect the proposed system unforced capacity (UCAP)/NQC targets. This proposed change is intended to align with the counting rules and RA assessments proposal to incorporate forced outage rates in capacity valuation and assess resource adequacy on a UCAP basis.
[59] New tariff section 9.3.1.3.1.
[60] New tariff section 9.3.1.3.2.

outage submission depending on whether the outage was requested before or after the end of the 30-day RA cure period.

RA Substitute Capacity provided under these new tariff provisions is subject to all the availability, dispatch, and other applicable requirements imposed on RA resources by the CAISO tariff, including the must-offer obligation and the RAAIM provisions, for the MW amount and duration of the outage substitution period.[61] Under the new tariff provisions, the CAISO will retain its authority to deny or cancel a maintenance outage on a RA resource if the outage "is likely to have a detrimental effect on the efficient use and reliable operation of the CAISO Controlled Grid."[62]

The CAISO proposes four narrow exceptions to this more restrictive rule described above. All four reflect current practice. The first three exceptions are identified in new tariff section 9.3.1.3.3. The fourth is embedded in new tariff section 9.3.1.3.1 and 9.3.1.3.2.

The *first* exception is for Off-Peak Opportunity RA Maintenance Outages. An Off-Peak Opportunity RA Maintenance Outage is a maintenance outage that begins during an off-peak hour and completed before the next on-peak hour.[63] In Phase 2 of the RA Enhancements initiative, the CAISO intends to update the tariff's outage provisions and revise its approach for handling opportunity outages. For now, however, the CAISO maintains the status quo for opportunity outages.

The *second* exemption is for an outage on CAISO-controlled transmission facilities.[64] To the CAISO, a transmission-induced outage is an unambiguous case of an outage outside the generator's control. Further, the CAISO is uncertain how it could administer a process whereby it would cancel a transmission-induced generation outage for failure to provide substitute capacity. Presumably, this could involve the CAISO also cancelling the transmission outage. It is inappropriate to give the affected generator control over whether a previously approved transmission outage is cancelled. On the other hand, it is reasonable to excuse generators from providing substitute capacity for transmission-induced outages that occur in the planned outage timeframe.[65]

[61] New tariff section 9.3.1.3.5.
[62] New tariff section 9.3.1.3.4.
[63] New tariff section 9.3.1.3.3 and existing tariff section 9.3.1.3.3.3 (renumbered in this filing as tariff section 9.3.1.3.6).
[64] New tariff section 9.3.1.3.3.
[65] Under existing rules, a forced transmission-induced generation outage is exempt from substitution and RAAIM. The CAISO does not propose to change that treatment.

The *third* exception is for outages on RA capacity that solely provides flexible RA capacity.[66] Again, this RA capacity is not currently subject to the substitution process, and the CAISO's RA Enhancements initiative never considered changing that status.

The *fourth* exception is identified in new tariff sections 9.3.1.3.1 and 9.3.1.3.2, both of which state that if "the CAISO grants final approval for a Maintenance Outage and the Outage has commenced, the CAISO does not subsequently deny the Outage for failure to provide RA Substitute Capacity by monthly RA Substitute Capacity deadlines that occur after the Outage has begun." This exception is necessary to account for maintenance outages lasting several months and formalizes existing practice. Because of the monthly nature of the RA program, when a multi-month outage starts, the CAISO does not yet know for certain if the resource on outage will provide RA for the latter months of the outage. This means that when the outage starts, the CAISO cannot yet insist the scheduling coordinator provide substitute capacity for those latter months. This is the case now and under the proposed rule changes. Under the new rules, when the monthly substitution deadline for those latter months arrives, the CAISO expects that the resource's scheduling coordinator will provide substitute capacity. If it does not do so, however, the CAISO would not automatically cancel the outage already in progress because it is not reasonable to expect a resource to end a planned outage early solely for a lack of substitute capacity. Instead, for the period without substitution, the resource will be subject to RAAIM.[67] Under existing practice, the CAISO typically would exercise its discretion not to cancel a maintenance outage in this scenario solely because of a lack of substitute capacity. This fourth exception adds that approach to the tariff now that CAISO discretion over denying maintenance outages for lack of substitution is being removed. Both under current rules and the proposed rules, the resource would be subject to RAAIM charges if it did not provide substitute capacity. Under the proposed rules, this would be the only scenario where a maintenance outage would be subject to RAAIM. Any other maintenance outage on a RA resource that does not fall under one of the first three exceptions would be denied without substitute capacity.

To facilitate implementation of its proposal, the CAISO will establish a transition period from the existing RA substitution rules. Specifically, the CAISO will apply the existing rules in reviewing maintenance outage requests or approved maintenance outages taken in June 2021 to determine if substitute

[66] New tariff section 9.3.1.3.3.
[67] Under the CAISO's proposal this is the only case where a maintenance outage would still be subject to RAAIM.

capacity is necessary. CAISO has moved these existing rules from the main body of the tariff to an existing appendix in the tariff.[68] The CAISO will deny maintenance outage requests or approved maintenance outages on RA resources planned to start in July 2021 and for which scheduling coordinators submitted requests before June 6, 2021, if the scheduling coordinator for the RA resource does not provide RA substitute capacity. The scheduling coordinator must provide the RA substitute capacity by the deadline established in the business practice manual. The CAISO will review maintenance outage requests on RA resources planned to start in July 2021 for which scheduling coordinators submit requests after June 6, 2021, under the new RA substitution rules.[69]

4. CAISO Responses to Stakeholder Comments on RA Substitution Proposal

Several stakeholders expressed support for the proposed interim RA substitution requirement. Other stakeholders raise issues with the proposal or opposed the proposal.

The primary arguments against the CAISO proposal are that it increases RA costs and provides no incremental reliability benefit. Other stakeholders, acknowledging the proposal may provide benefits, fault the CAISO for not providing a cost-benefit analysis to justify any incremental costs resulting from the proposal. Relatedly, some stakeholders questioned why the CAISO should always require substitution outside of the peak periods of demand, particularly when there may be significant excess non-RA capacity available. Some stakeholders also argued the CAISO's proposed RA substitution requirement would incent resources to withhold capacity from the bilateral RA market, which would make an existing problem even worse. Finally, some stakeholders expressed concern that the new rules would encourage RA resources to wait to report their needed outages until the forced outage timeframe (seven days or less of notice) to avoid needing to provide substitute capacity, especially in cases where the need for a critical outage is identified shortly before the end of the planned outage timeframe but not with sufficient lead time to secure substitute capacity.

The CAISO has identified a clear reliability benefit of its proposal – it will avoid unwarranted degradation of the existing planning reserve margin. The planning reserve margin has been set assuming all planned outages on RA resources have substitute capacity. Allowing planned outages on RA resources without substitution contradicts that foundational assumption and effectively

[68] New tariff section 9.3.1.3.9; revised tariff sections 40.9.3.4(a), 40.9.3.6.2, 40.9.3.6.3, and 40.9.4(a)(4); revised tariff appendix J; deleted tariff sections 9.3.1.3.1 – 9.3.1.3.3.2 and 40.9.3.6.1; tariff appendix A, deleted definitions of "RA Maintenance Outage With Substitution" and "RA Maintenance Outage Without Substitution."
[69] New tariff section 9.3.1.3.9.

lowers the reserve margin. If the CPUC and other LRAs have set a 15 percent planning reserve margin, then the CAISO outage substitution rules should not have the inadvertent impact of lowering that margin. The CAISO's proposal helps correct that existing issue, notably by reverting to a prior approach. The Commission previously has found it was just and reasonable for the CAISO to implement a replacement requirement that obligated the supplier always to provide replacement capacity regardless of the CAISO's RA position on the day in question.[70]

The CAISO proposal has other ancillary benefits. Under the current rules, the CAISO assigns a substitution obligation to an overwhelming majority of outages on RA resources. The "without substitution" maintenance outage option largely creates false hopes for RA resources of the possibility that substitution will not be required. Providing this false hope also comes at a cost for the CAISO because it has to administer and maintain a complex business process that almost always arrives at the same answer.

The CAISO acknowledges this proposal may impose incremental costs on some RA resources. The possibility of these costs does not demonstrate a flaw in the CAISO proposal. Instead, these are reasonable costs to impose on generators that have received a capacity payment and agreed to accept an RA obligation. Providing RA is a commitment to be available to the CAISO to maintain reliable operation to customers. Therefore, whenever a RA resource cannot be available because of a planned outage, it is just and reasonable to require the RA resource find another resource to be available as substitute RA capacity, or else the resource should not be shown as RA capacity in that month. This approach follows the approach other ISOs/RTOs take. For example, PJM Interconnection, L.L.C. (PJM) prohibits planned outages for resources with capacity obligations during peak load months to ensure adequate capacity is always available.[71] Similarly, the CAISO's proposal will help ensure adequate RA capacity is always available, especially during the summer peak load months. The table above shows that even in off-peak months the amount of excess RA capacity is trending downward and can be low. This also speaks to the concern that the CAISO proposal should only apply for peak demand periods. RA requirements themselves are set based on forecasted monthly demand, so minimal excess RA provided through the RA showings process is of concern regardless of the season. The fact that there may be excess substitute RA capacity available in shoulder months does not help the CAISO unless RA resources on maintenance outages are forced to secure that capacity to account for their outage. Without such capacity secured in advance, the CAISO may need to take other measures, such as issuing CPM designations.

[70] *See supra* section III.B(2) of this transmittal letter.
[71] PJM Manual 10: Pre-Scheduling Operations, at Section 2.2 (Nov. 19, 2020), available on the PJM website at PJM Manual 10.

Some stakeholders also argued the CAISO's proposal is flawed because it would incent resources to withhold capacity from the bilateral RA market. Stakeholders acknowledge, however, that this is a problem under the existing framework, *i.e.*, the CAISO's proposal does not create this problem. In any event, the CAISO disagrees this would be an obvious consequence of the proposed rule changes. Knowing maintenance outages on RA resources will always require substitution could reduce the incentive for suppliers to withhold capacity from the bilateral market "just in case" their planned outage will require substitution. Even if that is not borne out, any marginal incentives to further keep some RA capacity out of the bilateral RA market or substitution market is outweighed by the benefits the CAISO's proposal would provide.

The CAISO has reasonably considered the benefits and potential drawbacks of its proposal and is confident the tradeoffs are worth it. The CAISO's consideration need not be grounded in a formal cost-benefit analysis. The Commission has explained that it "does not generally require the mathematical specificity of a cost-benefit analysis to find a proposal just and reasonable."[72] Instead, the Commission has found that an interim proposal is just and reasonable if it will likely provide reliability benefits that address an identified concern.[73] That is what the RA substitution proposal accomplishes.

Some stakeholders view the CAISO proposal as establishing problematic outage incentives by encouraging resources to wait until the forced timeframe to report outages or creating uncertainty about what a generator is supposed to do if it identifies the need to take a time-sensitive outage shortly before the planned outage timeframe closes but is unable to secure substitute capacity.

The CAISO initially proposed to address this issue of "planned-to-forced" outage reporting through revisions to the business practice manual for outage management stating this interpretation of the tariff.[74] Multiple stakeholders appealed this proposed business practice manual revision to the CAISO's business practice manual appeals committee. The committee found "staff's tariff interpretation is reasonable" but that it did "not believe it is necessary or appropriate for a BPM to contain ISO staff's legal opinions." The committee also directed CAISO staff to consider whether any revisions to the tariff are needed to clarify this issue any further.[75]

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[72] *ISO New Eng. Inc.*, 171 FERC ¶ 61,235, at P 58 (internal quotation marks omitted). *See also PJM Interconnection, L.L.C.*, 155 FERC ¶ 61,157, at P 30 (2016) ("[W]hile the Commission is required to consider all relevant factors and make a 'common-sense assessment' that the costs that will be incurred are consistent with the ratepayers' overall needs and interests, the Commission's finding need not be accompanied by a quantitative cost-benefit analysis.").
[73] *See ISO New Eng. Inc.*, 171 FERC ¶ 61,235, at P 58.
[74] Materials related to the proposed revisions to the BPM are available at California ISO - Documents By Group (caiso.com).
[75] See ExecutiveAppealsCommitteeDecision-PRR1122-Mar112020.pdf (caiso.com).

The CAISO and stakeholders will address the planned-to-forced outage reporting issue further in Phase 2 of the RA Enhancements stakeholder process. Specifically, the CAISO plans to clarify the tariff definitions of a planned outage and a forced outage, and to develop tariff revisions regarding unforced capacity that likely will eliminate the incentive for market participants to engage in problematic planned-to-forced outage reporting. Pending those tariff amendments, the CAISO's interpretation of the existing tariff provision, explained at length in the business practice manual appeal process, still holds. In its brief, CAISO staff stated:

> The key question is, regardless of any prior ISO denial of a maintenance outage request, when the participant submits a forced outage, does that participant have a credible basis for explaining why the outage cannot wait an additional eight days (i.e., it cannot be resubmitted as another maintenance outage request)? If the participant has such an explanation, then the ISO can feel comfortable that the outage likely meets the tariff definition of a forced outage.[76]

It is not appropriate under existing rules for a generator to wait intentionally until the forced timeframe to avoid the planned outage substitution process. Under the proposed rules, it would not be appropriate for a generator to wait intentionally until the forced outage timeframe to report an outage to avoid the new substitution requirement. However, if and when a generator reports a forced outage, it has a credible reason the outage can wait no longer, then the CAISO would be unlikely to take further action. In sum, these concerns are addressed through existing tariff provisions and the CAISO already has monitoring measures in place to review such conduct and will keep those measures in place.

C. Clarifying that Extending the Scope or Duration of an Existing Outage Requires a New Outage Card

The CAISO proposes a minor tariff clarification regarding how generators should report an extension to an existing outage. This amendment will apply both to RA and non-RA resources seeking to extend an outage.[77] The existing tariff does not provide clear direction on the actions a generator must take to extend the duration of an existing outage or increase the capacity being derated. It does not provide clear direction as to whether the generator should amend its initial outage or submit an entirely new outage. In either case, the CAISO usually approves the extension, because the extension request usually indicates the

[76] CAISO PRR 1122 Answer Brief, at 6. Available at: http://www.caiso.com/Documents/ISOAnsweringBrief-PRR1122-Jan062020.pdf.
[77] Appendix A of the tariff defines an outage as a "[d]isconnection, separation or reduction in capacity, planned or forced, of one or more elements of an electric system."

issue that caused the outage is more problematic than initially thought. Rejecting the extension in this case would not serve a constructive purpose.

For RA resources, regardless of how the extension is reported, the tariff already is clear that for substitute capacity and potential exposure to RAAIM charges, the extension will be treated as if it were a new outage.[78] But the reporting requirement, separate from how RA processes function, can confuse market participants, particularly because California law requires the CAISO to post a daily report of generation outages.[79] Sometimes, a maintenance outage approved for a shoulder month needs to be extended into the peak months. Where the extension is reported as a revision to the original outage, it can appear the CAISO approved a maintenance outage at an inappropriate time.[80] Finally, inconsistent reporting of outage extensions can blur the distinction between forced and planned outages, making analysis of outage patterns more challenging. A last-minute extension of an existing planned outage is not a planned outage; the extension period was not anticipated and the data should reflect that such portion of the outage is a forced outage.

To ensure the CAISO's outage reporting system can generate a clean and consistent dataset, the CAISO proposes to amend its tariff to clarify that, for outages extending the scheduled duration of an outage or increasing the MW amount of capacity on outage, market participants must use the outage management system to "submit a new Outage request to cover the extension or increase in the extent of the Outage."[81] The CAISO will treat new outage requests based on when submitted; if the new request is submitted at least eight days in advance, then it will be treated as a planned outage.

The CAISO received requests for clarification on this proposal through the stakeholder process, which it believes have been addressed. The CAISO does not believe that this proposal is opposed by any stakeholders.

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[78] Existing tariff sections 40.9.3.6.1 and 40.9.3.6.2 ("the CAISO will treat any request to extend the scheduled duration of an outage or increase the MW amount of capacity on outage as a new outage request and will assign a new priority date based on when the request to change the outage or derate was submitted to the CAISO.")

[79] Cal. Pub. Utils. Code, § 352.5 (the CAISO "shall make publicly available a list of all power plants located in the state that are not operational due to a planned or unplanned outage" and "update the list . . . on a daily basis"). The posted reports are available at: http://www.caiso.com/market/Pages/OutageManagement/UnitStatus.aspx.

[80] This issue of categorizing an extension of an existing planned outage was noted in the Final Root Cause Analysis. The report noted that a major outage during the relevant period was categorized as a planned outage but effectively was a forced outage because it involved an unplanned extension of a maintenance outage. Final Root Cause Analysis at 48.

[81] New tariff section 9.3.3(6).

D. Update to Local Capacity Technical Study Criteria for Designating CPM Capacity

1. Tariff Revisions

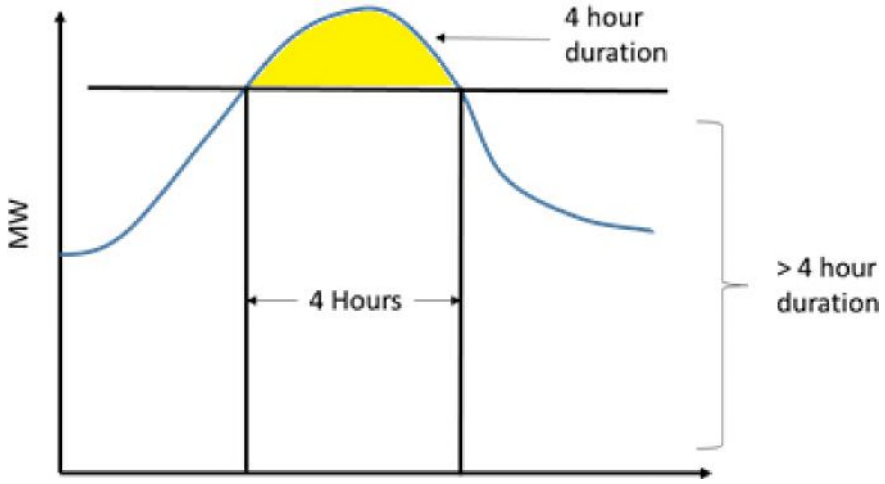
The CAISO's authority to designate CPM capacity to address a collective deficiency in local capacity area resources is based on deficiencies in the RA showings relative to the local capacity technical study.[82] The CAISO conducts this study based on tariff-defined study criteria. The specified study criteria do not, however, fully consider resource availability, *e.g.*, limitations on the duration of a resource's energy production or dispatch. The CAISO proposes to update the tariff to address this issue.

LSEs are increasingly procuring availability-limited resources[83] to meet local capacity area and sub-area needs. This necessitates that the CAISO evaluate these resources' availability limitations to determine if the procured RA capacity effectively meets the CAISO's needs in local capacity areas and sub-areas. Today, availability-limited resources have a minimum duration requirement of four hours to qualify as RA capacity.[84] A 10 MW resource capable of producing for four hours (*i.e.*, that can produce 40 MWh in that span) has the same RA capacity value as a second 10 MW resource capable of producing for eight hours (*i.e.*, that can produce 80 MWh in that span). However, if a local capacity area requires 10 MW of capacity for an eight-hour period during a contingency event, only the latter resource is capable of meeting the reliability need. Yet, for RA counting purposes, these two hypothetical resources receive the same MW value because the RA rules do not consider the resources' availability limitations when determining their capacity values.[85]

The CAISO may have sufficient capacity in MW to meet peak demand in a local capacity area but insufficient energy in MWh to meet needs across all hours of the day and year. The figure shown below demonstrates how the CAISO can use availability-limited resources to meet the peak, but may need other resources with a longer duration to meet energy needs in other hours of the day. In the figure, the black vertical lines reflect a four-hour minimum availability threshold and the black horizontal line represents load that will still need to be served with resources that have greater than four hours of availability.

[82] *See supra* section II.A of this transmittal letter.
[83] The CAISO considers availability-limited resources to be those that have significant dispatch limitations such as limited duration hours (*e.g.*, per year, season, month, or day) or event calls (*e.g.*, per year, season, month, or consecutive days) that would limit the resources' ability to respond to a contingency event within a local capacity area.
[84] *See* existing tariff section 40.8.1.13.
[85] *See* existing tariff section 40.8.1.16(b).

Hourly Load Shape with Four-Hour Minimum Availability Threshold



In recent transmission planning studies regarding the Moorpark and Santa Clara local capacity sub-areas in central California, the CAISO developed and performed detailed hourly load and resource analyses to assess binding availability limits in these local capacity sub-areas. The CAISO determined local capacity procurement needs must reflect both the capacity and energy needs in these local areas.[86] These local energy sufficiency studies demonstrated availability-limited resources with a four-hour minimum duration could not meet energy needs (*i.e.*, total MWhs) for contingency events identified under the local capacity technical study criteria in the existing tariff.

The CAISO currently cannot use its local CPM backstop authority to fulfill the energy needs identified through these local energy sufficiency studies, because the deficiencies these studies identified are not covered under the tariff-defined local capacity technical study criteria. Therefore, the CAISO proposes to update the tariff to specify the local capacity technical study will consider hourly load shapes and system limits under emergency conditions, in order to quantify minimum amounts of hourly capacity and energy that local capacity area resources must be able to provide within each identified local capacity area or sub-area to resolve identified contingencies.[87] The CAISO also proposes to clarify the CAISO's designation of local CPM capacity to ensure compliance with the expanded reliability criteria applied in the local capacity technical study.[88]

[86] Details on the CAISO's recurring local capacity requirements stakeholder initiative are available at: http://www.caiso.com/informed/Pages/StakeholderProcesses/LocalCapacityRequirementsProcess.aspx.
[87] Revised tariff section 40.3.1.1. In prior annual local capacity technical studies, the CAISO has included energy needs identified through local energy sufficient studies for informational purposes only. However, including that information did not impact any CAISO determinations regarding its local CPM backstop authority.
[88] Revised tariff section 43A.2.2.

2. Response to Stakeholder Comments

Most stakeholders commenting on this proposal supported including local energy sufficiency evaluations in the local capacity technical study requirements so the CAISO can designate CPM capacity to ensure local reliability needs are met and account for the market's increased reliance on availability-limited resources. Some stakeholders also raised questions regarding the CAISO's proposal as discussed below.

One stakeholder requested clarification whether it would be more efficient to address the issue on an area-by-area basis without undertaking local energy sufficiency evaluations for all local areas. Another stakeholder supported the approach if the local energy sufficiency evaluations identify the use limitations in each local area and sub-area in advance to facilitate procurement by LSEs and the new central procurement entities identified by the CPUC.[89]

In response, the CAISO explained it will continue to specify the requirements for all applicable local areas and sub-areas, and will clearly describe them in the local capacity technical studies using charts and graphs that show energy needs during peak and year-round conditions. The CAISO will provide this information before LSEs procure local capacity area resources to satisfy capacity requirements for each local capacity area and sub-area. These graphs will also show transmission capability during emergency conditions for the local areas and sub-areas.

Another stakeholder raised concerns about potential misalignment of the CAISO's Phase 1 proposal with the CPUC's RA requirements. Under the CAISO tariff, the CAISO is primarily responsible for maintaining local reliability and for establishing local requirements.[90] To provide reliable service in local areas during all hours, the CAISO must be transparent and provide the appropriate energy sufficiency evaluations ahead of LSE procurement. Under the CAISO's proposal, the energy sufficiency evaluation is not imposed at the LSE or LRA level; it is, however, a technical requirement that must be met by the combined procurement of all LSEs to satisfy the technical criteria during all hours of the day.

Another stakeholder expressed concern the local energy sufficiency evaluation was unclear how the CAISO or LSEs could identify resources to cure

[89] In 2020, the CPUC adopted a framework that designates a central buyer to procure local, multi-year resource adequacy in the Pacific Gas and Electric Company (PG&E) and Southern California Edison Company (SCE) distribution service areas. Beginning in 2021, PG&E and SCE serve as the central procurement entities for their respective distribution service areas and begin procuring local resource adequacy for the 2023 compliance year. *See* 340048112.PDF (ca.gov).
[90] Existing tariff section 40.3.

any local insufficiencies. The stakeholder recommended the CAISO provide information on how the capacity procured through CPM authority can cure the insufficiency compared with another equivalent or lower cost resource. The CAISO will use the RA deficiency report it publishes annually in mid-November to (1) describe both the capacity (in MW) and energy (in MWh) needs in each local area and sub-area that were not met, and (2) inform LSEs how much capacity from each resource is not shown as RA capacity and is still available to cure identified shortfalls. If local needs remain unmet after the LSE cure period ends, the CAISO will then be able to use offers into the competitive solicitation process described in existing tariff section 43A.4.2 to choose the lowest-cost option to meet the outstanding capacity need.

Finally, one stakeholder argued the CAISO's proposed methodology for evaluating local energy needs does not account for a resource's contribution during different hours of the day and could cause unnecessary resources being procured to meet the RA capacity requirement. The stakeholder claimed the CAISO should instead determine hourly capacity needs that consider the effectiveness of resources that contribute to the hourly requirements. To clarify, the CAISO will evaluate capacity needs across all 24 hours. Further, when reporting on any potential deficiencies after LSEs submit their year-ahead RA plans, the CAISO will include in its evaluation all resources in the area or sub-area that have been shown for RA and will assume maximum capacity from each available resource, throughout the day, given their known characteristics including charging requirements for batteries.

IV. Effective Date and Tariff Records

The CAISO respectfully requests that the Commission issue an order accepting the tariff revisions by May 28, 2021. The CAISO requests an effective date of June 1, 2021 for the tariff revisions other than those regarding the minimum state of charge tool, and requests that the Commission accept the minimum state of charge revisions effective no later than June 15, 2021.[91] The CAISO requests authorization to notify market participants of the effective date of the revisions related to the minimum state of charge tool at least five business days before implementation.[92]

[91] Specifically, the CAISO requests an effective date of no later than June 15, 2021 solely for the proposed addition of sections 40.5 through 40.5.3 to the tariff and the proposed addition to tariff appendix A of the new defined term "Minimum State of Charge (MSOC) Tool." The CAISO tentatively plans to implement the minimum state of charge tool on June 3, 2021, but has requested an effective date that allows for flexibility regarding the implementation date in case there is some delay.

[92] The CAISO has included an effective date of 12/31/9998 as part of the tariff records for the

V. Communications

Under Rule 203(b)(3),[93] the CAISO respectfully requests that all correspondence and other communications about this filing be served upon:

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VI. Service

The CAISO has served copies of this filing on the CPUC, the CEC, 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

Besides this transmittal letter, this filing includes these attachments:

Attachment A	Clean CAISO tariff sheets incorporating this tariff amendment
Attachment B	Red-lined document showing the revisions in this tariff amendment
Attachment C	Resource Adequacy Enhancements Final Proposal - Phase 1, dated February 17, 2021
Attachment D	Market Surveillance Committee Opinion on Resource Adequacy Enhancements Phase I: Minimum State of Charge Requirement

minimum state of charge tool submitted in this filing. The CAISO will notify the Commission of the actual effective date of these tariff records within five business days of implementation in an eTariff submittal using Type of Filing code 150 – Report. *See Cal. Indep. Sys. Operator Corp.,* 172 FERC ¶ 61,263, at Ordering Paragraphs (A) and (C) .

[93] 18 C.F.R. § 385.203(b)(3).

VIII. Conclusion

For the reasons set forth in this filing, the CAISO respectfully requests that the Commission issue an order accepting the tariff revisions in this filing by May 28, 2021, effective as of the dates specified herein.

Respectfully submitted,

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Attachment A

Clean Tariff

Tariff Amendment to Implement the Resource Adequacy Enhancements Phase 1 Initiative – Summer 2021 Provisions

California Independent System Operator Corporation

March 29, 2021

9.3.1.3 Coordinating Outages of RA Resources

9.3.1.3.1 Maintenance Outages Requested Before Cure Period

Other than Outage types identified in Section 9.3.1.3.3, the CAISO denies Maintenance Outage requests or Approved Maintenance Outages on RA Resources requested before the 30-day Supply Plan revision deadline in Section 40.4.7.1(c) for the RA month in which the outage would first take place if the Scheduling Coordinator for the RA Resource does not provide RA Substitute Capacity to cover the extent of the Outage that occurs during the period for which the resource has been shown on a monthly Supply Plan. The RA Substitute Capacity must be provided by the monthly RA Substitute Capacity deadline established in the Business Practice Manual, which cannot be more than 72 hours after the 30-day Supply Plan revision deadline in Section 40.4.7.1(c) for the RA month in which the outage would first take place.

Once the CAISO grants final approval for a Maintenance Outage and the Outage has commenced, the CAISO does not subsequently deny the Outage for failure to provide RA Substitute Capacity by monthly RA Substitute Capacity deadlines that occur after the Outage has begun. Any such period of the Maintenance Outage for which the Scheduling Coordinator does not provide RA Substitute Capacity will be treated as a Forced Outage for purposes of assessing RAAIM under Section 40.9 but the resource may not provide RA Substitute Capacity per Section 40.9.3.6.2.

9.3.1.3.2 Maintenance Outages Requested After Cure Period

Other than Outage types identified in Section 9.3.1.3.3, the CAISO denies Maintenance Outage requests on RA Resources submitted after the 30-day Supply Plan revision deadline in Section 40.4.7.1(c) for the RA month in which the outage would first take place if the Scheduling Coordinator for the RA Resource does not provide RA Substitute Capacity to cover the extent of the requested Maintenance Outage that occurs during the period for which the resource has been shown on a monthly Supply Plan. The RA Substitute Capacity must be provided by the post-monthly RA Substitute Capacity deadline established in the Business Practice Manual, which cannot be no more than 72 hours after the Outage request.

Once the CAISO grants final approval for a Maintenance Outage and the Outage has commenced, the CAISO does not subsequently deny the Outage for failure to provide RA Substitute Capacity by monthly RA Substitute Capacity deadlines that occur after the Outage has begun. Any such period of the

Maintenance Outage for which the Scheduling Coordinator does not provide RA Substitute Capacity will be treated as a Forced Outage for purposes of assessing RAAIM under Section 40.9 but the resource may not provide RA Substitute Capacity per Section 40.9.3.6.2.**9.3.1.3.3 Exceptions to Requirement to Provide RA Substitute Capacity**

The CAISO does not automatically deny an Outage pursuant to Section 9.3.1.3.1 or Section 9.3.1.3.2 if the Maintenance Outage is: (a) an Off-Peak Opportunity RA Maintenance Outage approved Pursuant to Section 9.3.1.3.6; (b) caused by an Outage on transmission facilities in the CAISO Controlled Grid; or (c) on RA Capacity that is solely Flexible RA Capacity.

9.3.1.3.4 Cancellation or Denial of Maintenance Outages for Reasons other than Lack of RA Substitute Capacity

Notwithstanding provision of RA Substitute Capacity, the CAISO may deny, reschedule or cancel a Maintenance Outage on a RA Resource if it determines that the Outage is likely to have a detrimental effect on the efficient use and reliable operation of the CAISO Controlled Grid or the facilities of a Connected Entity.

9.3.1.3.5 Obligations of RA Substitute Capacity

RA Substitute Capacity provided pursuant to Section 9.3.1.3.1 or Section 9.3.1.3.2 is subject to all of the availability, dispatch, testing, reporting, verification and any other applicable requirements imposed on Resource Adequacy Resources by the CAISO Tariff, including the must-offer obligations in Section 40.6 and the RAAIM provisions in Section 40.9, for the MW amount and duration of the outage substitution period, which includes the full day of the start date and the full day of the end date of the outage.

9.3.1.3.6 Off-Peak Opportunity RA Maintenance Outage

(a) **Option for Off-Peak Outage.** The Scheduling Coordinator for a Resource Adequacy Resource designated as Resource Adequacy Capacity during the resource adequacy month may submit a request for an Off-Peak Opportunity RA Maintenance Outage without a requirement to provide RA Substitute Capacity for the unavailable capacity for the duration of the outage to be excluded from the RAAIM calculation under Section 40.9.

(b) **Request.** A request for an Off-Peak Opportunity RA Maintenance Outage must: (i) be submitted to the CAISO no less than eight (8) days prior to the start date for the outage;

(ii) schedule the outage to begin during off-peak hours (as specified in the Business Practice Manuals) on a weekday, and to be completed prior to on-peak hours (as specified in the Business Practice Manuals) the following weekday, or to begin during off-peak hours (as specified in the Business Practice Manuals) on Friday, or on Saturday, Sunday, or a holiday, and to be completed prior to on-peak hours (as specified in the Business Practice Manual) on the next weekday; and (iii) otherwise comply with the requirements set forth in Section 9.

(c) **Approval.**

(1) The CAISO will consider requests for an Off-Peak Opportunity RA Maintenance Outage in the order the requests were received.

(2) If the request was submitted no less than eight (8) days prior to the start date for the outage, the CAISO may approve the request as an Off-Peak Opportunity RA Maintenance Outage if it determines that: (i) the request meets the requirements set forth in Section 9.3.1.3.6(b); and (ii) system conditions and the overall outage schedule provide an opportunity to take the resource out of service without a detrimental effect on the efficient use and reliable operation of the CAISO Controlled Grid.

(3) If the CAISO denies a request for an Off-Peak Opportunity RA Maintenance Outage for failing to meet the requirements in Section 9.3.1.3.6(c)(2), the Scheduling Coordinator for the Resource Adequacy Resource may request an RA Maintenance Outage With Substitution or may request that the CAISO accommodate the outage at another time.

(4) To the extent that an approved Off-Peak Opportunity RA Maintenance Outage is not completed during off-peak hours as scheduled, and extends into on-peak hours, the Scheduling Coordinator for the resource shall submit the portion of the outage that extends into on-peak hours as a new Forced Outage, which shall be subject to the RAAIM provisions in Section 40.9.

9.3.1.3.7 Short-Notice Opportunity RA Outage

(a) **Option for Short-Notice Outage.** The Scheduling Coordinator for a Resource Adequacy Resource designated as Resource Adequacy Capacity during the resource adequacy month may submit a request for a Short-Notice Opportunity RA Outage without a requirement to provide RA Substitute Capacity for the Resource Adequacy Capacity that will be on the Forced Outage to be excluded from the RAAIM calculation under Section 40.9.

(b) A Short-Notice Opportunity RA Outage shall not exceed five days in length. The request for a Short-Notice Opportunity RA Outage must: (i) be submitted no more than seven (7) days prior to the requested start date for the outage; (ii) provide the CAISO adequate time to analyze the request before the outage begins; (iii) be submitted before the outage has commenced as a Forced Outage; and (iv) otherwise comply with the requirements of Section 9.

(c) **Approval.**

(1) The CAISO will consider Short-Notice Opportunity RA Outages in the order the requests are received.

(2) If the request was submitted no more than seven days and no less than four days prior to the start date of the outage, the CAISO may approve the request as a Short Notice Opportunity RA Outage if it determines that: (i) the outage and the request meet the requirements set forth in Section 9.3.1.3.7(b); (ii) system conditions and the overall outage schedule provide an opportunity to take the resource out of service without a detrimental effect on the efficient use and reliable operation of the CAISO Controlled Grid; and (iii) the outage will not result in insufficient available Resource Adequacy Capacity during the outage period. The approved outage will be a Forced Outage and will not be subject to the RAAIM provisions in Section 40.9.

(3) If the request was submitted three days or less prior to the start date of the outage, the CAISO may approve the request as a Forced Outage if it determines

that: (i) the outage and request meet the requirements set forth in Section 9.3.1.3.7(b); (ii) system conditions and the overall outage schedule provide an opportunity to take the resource out of service without a detrimental effect on the efficient use and reliable operation of the CAISO Controlled Grid; (iii) the outage will not result in insufficient available Resource Adequacy Capacity during the outage period; and (iv) the repairs are necessary to maintain system or resource reliability and require immediate attention to prevent equipment damage or failure. A Short-Notice Opportunity RA Outage approved under this Section will be a Forced Outage and will not be subject to the RAAIM provisions in Section 40.9.

(4) To the extent that an approved Short-Notice Opportunity RA Outage is not completed during the originally approved outage schedule, the Scheduling Coordinator for the resource must submit the portion of the outage that continues from the approved completion time until the time the outage is actually completed as a new Forced Outage, which will be subject to the RAAIM provisions in Section 40.9.

9.3.1.3.8 Outage Reporting for Resource Adequacy Resources between 1 MW and 10 MW

Scheduling Coordinators for Resource Adequacy Resources with a PMax of at least one (1) MW but less than 10 MWs that do not meet the requirement to provide information on Forced Outages in accordance with Section 9.3.10 shall report Outages in accordance with the process set forth in the Business Practice Manual.

9.3.1.3.9 Transition Period for Providing RA Substitute Capacity for Maintenance Outages

Notwithstanding Sections 9.3.1.3.1 and 9.3.1.3.2, Maintenance Outages on RA Resources in the June 2021 and July 2021 RA months require RA Substitute Capacity as follows to avoid Outage denial. Maintenance Outage requests or Approved Maintenance Outages on RA Resources taken in June 2021 are reviewed for RA Substitute Capacity per the provisions of part 2 of Appendix J.

The CAISO denies Maintenance Outage requests or Approved Maintenance Outages on RA Resources planned to start or continue in July 2021 and that were requested before June 6, 2021, if the Scheduling

Coordinator for the RA Resource does not provide RA Substitute Capacity to cover the extent of the Outage that occurs during the period for which the resource has been shown on a monthly Supply Plan. The RA Substitute Capacity must be provided by the July 2021 monthly RA Substitute Capacity deadline established in the Business Practice Manual. Maintenance Outage requests on RA Resources planned to start in July 2021 that are requested on or after June 6, 2021, are reviewed for RA Substitute Capacity per Section 9.3.1.3.2.

The CAISO will not subsequently deny a Maintenance Outage on a RA Resource that it permits to commence in July 2021 for failure to provide RA Substitute Capacity by monthly RA Substitute Capacity deadlines that occur after the Outage has begun. Any such period of the Maintenance Outage for which the Scheduling Coordinator does not provide RA Substitute Capacity will be treated as a Forced Outage for purposes of assessing RAAIM under Section 40.9 but the resource may not provide RA Substitute Capacity per Section 40.9.3.6.2.

9.3.2 Requirement for Approval

An Operator or Scheduling Coordinator shall not take: (i) facilities that comprise the CAISO Controlled Grid; or (ii) Generating Units of Participating Generators out of service for the purposes of planned maintenance or for new construction or other work except as approved by the CAISO, except that final approval may not be required for a Transmission Maintenance Outage as provided in Section 9.3.9.1. The information relating to each Maintenance Outage submitted by a Participating Generator in accordance with Section 9.3.5, or by a Participating TO in accordance with Section 9.3.5, constitutes a request for a long-range Maintenance Outage and is not considered an Approved Maintenance Outage until the CAISO has notified the Participating Generator of such approval pursuant to Section 9.3.6, or the Participating TO pursuant to Section 9.3.6.

9.3.3 Request Submission and Information

The Operator or Scheduling Coordinator of facilities that comprise the CAISO Controlled Grid or of a Participating Generator, Participating Intermittent Resource, Generating Unit, System Unit, Physical Scheduling Plant, Proxy Demand Resource, Reliability Demand Response Resource, Non-Generation Resource, Participating Load, or other resource subject to the outage management requirements of Section 9, shall use the ISO's outage management system to –

(1) Submit all outage requests under Section 9.

(2) Provide the required information about the outage and work to be performed using the nature of work categories described in the Business Practice Manual.

(3) For transmission outage requests, additionally provide structured and detailed outage modeling information at the facility level and/or the breaker/switch level. If the work to be performed will require a switch position to change during the outage period, the Operator or Scheduling Coordinator must submit a separate outage request for each configuration.

(4) For resource outage requests, additionally provide the required information for the resource at the aggregate project or plant level, and also at the individual unit level for a unit de-rate greater than 50 MW, and any limitations on the resource's availability to provide each type of ancillary service for which it is certified.

(5) Notify the CAISO of temporary changes in physical characteristics specified in the Master File, including the PMax, Minimum Load, and Ramping capability of the unit, due to changes in their actual physical characteristics. Changes in the physical characteristics related to Minimum Load shall only be for temporary increases in Minimum Load due to ambient temperature, outages of mechanical equipment, or environmental regulations.

(6) For Outages that involve extending or increasing the scheduled duration of an Outage or MW amount of capacity on Outage, respectively, submit a new Outage request to cover the extension or increase in the extent of the Outage.

* * *

40.3 Local Capacity Area Resource Requirements for SCs for LSEs

40.3.1 Local Capacity Technical Study

On an annual basis, pursuant to the schedule set forth in the Business Practice Manual, the CAISO will, perform, and publish on the CAISO Website the Local Capacity Technical Study. The Local Capacity Technical Study shall identify Local Capacity Areas, determine the minimum amount of Local Capacity Area Resources in MW that must be available to the CAISO within each identified Local Capacity Area,

and identify the Generating Units within each identified Local Capacity Area. The CAISO shall collaborate with the CPUC, Local Regulatory Authorities within the CAISO Balancing Authority Area, federal agencies, and Market Participants to ensure that the Local Capacity Technical Study is performed in accordance with this Section 40.3 and to establish for inclusion in the Business Practice Manual other parameters and assumptions applicable to the Local Capacity Technical Study and a schedule that provides for: (i) reasonable time for review of a draft Local Capacity Technical Study, (ii) reasonable time for Participating TOs to propose operating solutions, and (iii) release of the final Local Capacity Technical Study no later than 120 days prior to the date annual Resource Adequacy Plans must be submitted under this Section 40.

40.3.1.1 Local Capacity Technical Study Criteria

The Local Capacity Technical Study will determine the minimum amount of Local Capacity Area Resources needed to address the Contingencies identified in Section 40.3.1.2. The Local Capacity Technical Study also will consider hourly load shapes and system limits under emergency conditions to quantify minimum amounts of hourly capacity and energy, that Local Capacity Area Resources must be able to provide within each identified Local Capacity Area in order to resolve Contingencies identified in Section 40.3.1.2. In performing the Local Capacity Technical Study, the CAISO will apply those methods for resolving Contingencies considered appropriate for the performance level that corresponds to a particular studied Contingency, as provided in NERC Reliability Standards regarding Transmission System Planning Performance Requirements (TPL-001-4 or its successor), as augmented by CAISO Reliability Criteria in accordance with the Transmission Control Agreement and Section 24.3.1. The CAISO Reliability Criteria shall include:

(1) Time Allowed for Manual Readjustment: This is the amount of time required for the Operator to take all actions necessary to prepare the system for the next Contingency. This time should not be more than thirty (30) minutes.

(2) No voltage collapse or dynamic instability shall be allowed for a Contingency in Category Extreme Events [any P1 system readjusted (Common Structure) P7], as listed in TPL-001-4 in areas with load of 250 MW or more. For areas with less than 250 MW of load, mitigation will only be proposed if there is a risk of cascading beyond the area directly

affected by the outage.

40.3.1.2 Local Capacity Technical Study Contingencies.

The Local Capacity Technical Study shall assess all the Contingencies and appropriate performance levels required by mandatory standards including, but not limited to, NERC, WECC and CAISO Planning Standards.

* * *

40.5 Minimum State of Charge Tool for Non-Generator Resources Electing Limited Energy Storage Resource Status that Provide RA Capacity

40.5.1 Operation of the MSOC Tool

Through June 1, 2023, the CAISO enforces the MSOC Tool in the RTM on any Non-Generator Resource that has selected a primary fuel type in Master File of "Limited Energy Storage Resource" and is an RA Resource for the day on which the MSOC is enforced. The MSOC Tool limits RTM awards to any covered resource in the market intervals preceding any Trading Hour that meets the requirements specified in Section 40.5.2 such that, based on its registered operating parameters, the resource will have sufficient charge to meet its discharge awards from its Day-Ahead Schedule for any Trading Hour that meets the requirements specified in Section 40.5.2. The MSOC tool does not increase the charge on a resource beyond what is necessary to ensure it can meet a discharge award from a Day-Ahead Schedule.

When reviewing market and system conditions on the Operating Day, the CAISO may choose not to apply the MSOC Tool for particular Trading Hours if its assessment of projected conditions reflects that the MSOC Tool is not necessary for system reliability in those Trading Hours.

40.5.2 Determining the Days and Hours for which the MSOC Applies

The CAISO enforces the MSOC Tool for a Trading Day if there is at least one Trading Hour on that Trading Day for which, per Section 31.5.5, the RUC process initially cannot find a feasible solution without adjusting the constraints described in Section 31.5.4. For such Trading Days, the MSOC Tool applies to discharge awards from Day-Ahead Schedules for the Trading Hours that the CAISO projects, at the time the Day-Ahead Market runs, will have the highest CAISO system load net of wind and solar output.

40.5.3 Notification of Applying the MSOC Tool At approximately the same time it publishes Day-

Ahead Market Results for a Trading Day, the CAISO provides public notice if the Trading Day will be subject to enforcement of the MSOC Tool and, if so, the Trading Hours whose discharge awards will be subject to the MSOC Tool.

40.5.4 [Not Used]

40.5.5 [Not Used]

* * *

40.9.3.4 Treatment of Outages

(a) **RA Substitute Capacity Not Required.** The RAAIM Availability Assessment for a Resource Adequacy Resource excludes the capacity, duration, and must-offer requirements for Resource Adequacy Capacity on an Outage during the Resource Adequacy month that does not require RA Substitution Capacity under Section 9.3.1.3.

(b) **RA Substitute Capacity Required and Provided.** For each Outage that requires RA Substitute Capacity under Section 40.9.3.6 to avoid imposition of RAAIM charges –

(1) the RAAIM Availability Assessment for the resource excludes the capacity, duration, and must-offer requirement for Resource Adequacy Capacity on outage to the extent the resource provides RA Substitute Capacity for that outage as required under Section 40.9.3.6; and

(2) the RAAIM Availability Assessment for the substitute resource includes the capacity, duration, and must-offer requirement for the RA Substitute Capacity commitment. For each day the substitute resource is committed to provide Flexible RA Capacity and/or RA Substitute Capacity in more than one Flexible Capacity Category, the RAAIM Availability Assessment applies the must-offer obligation for the highest quality Flexible Capacity Category to the total MWs of the flexible capacity requirement. For the purposes of this Section 40.9, base ramping resources (as defined in section 40.10.3.2) are considered to be a higher quality of Flexible Capacity Category than either peak ramping resources (as defined in section 40.10.3.3) or super-peak ramping resources (as defined in

section 40.10.3.4). Additionally, peak ramping resources (as defined in section 40.10.3.3) are considered to be a higher quality of Flexible Capacity Category than super-peak ramping resources (as defined in section 40.10.3.4).

(c) **RA Substitute Capacity Required not Provided.** For each Outage that requires RA Substitute Capacity under Section 40.9.3.6 to avoid imposition of RAAIM charges, the RAAIM Availability Assessment for the resource includes the capacity, duration, and must-offer requirement for Resource Adequacy Capacity on an outage to the extent the resource does not provide RA Substitute Capacity for the outage as required under Section 40.9.3.6.

(d) **Exclusions from RAAIM for certain Outage types.** The RAAIM Availability Assessment excludes the capacity, duration, and must-offer requirement for local and/or system Resource Adequacy Capacity or Flexible RA Capacity on an Outage in a nature of work category specified in the Business Practice Manual that relates to: (i) an administrative action by the resource owner; (ii) a cause outside of the control of the resource owner, (iii) or a short-term use limitation; or (iv) a non-Run-of-River Resource hydroelectric Generating Unit's management of water-related operational or regulatory limitations. Through the December 31, 2020, Trading Day, item (iv) of this Section 40.9.3.4(d) applies only to a hydroelectric Generating Unit that has limited the capacity it has shown on the monthly Supply Plan corresponding to the day of the Outage to reflect historical hydrological conditions or actual hydrological conditions in 2020. The limitations based on hydrological conditions must be mutually agreed upon with the unit's Scheduling Coordinator and the CAISO. Starting with the January 1, 2021, Trading Day, item (iv) of this Section 40.9.3.4(d) applies only to a hydroelectric Generating Unit whose Qualifying Capacity was established pursuant to a CPUC or Local Regulatory Authority methodology under which the Qualifying Capacity is calculated to reflect historical hydrological conditions.

(e) **Derates on Generating Units Providing system RA Capacity and Listed Local RA Capacity.** If a Generating Unit providing both system RA Capacity and Listed Local RA

Capacity is on Forced Outage, then for purposes of RAAIM and RA Substitute Capacity the quantity of the Forced Outage will be apportioned first to the system RA Capacity provided from that Generating Unit. If the quantity of the Forced Outage exceeds the quantity of system RA Capacity provided by the Generating Unit, then the remainder of the Forced Outage shall be apportioned to the Listed Local RA Capacity provided by the Generating Unit.

40.9.3.5 [Not Used]

40.9.3.6 Substitute Capacity

40.9.3.6.1 [Not Used]

40.9.3.6.2 CAISO Evaluation of Need for Substitute Capacity for Forced Outages

A Forced Outage on a RA Resource, irrespective of whether the resource is providing RA Capacity or Flexible RA Capacity, subjects the resource's Scheduling Coordinator to RAAIM unless the Scheduling Coordinator for the resource provides RA Substitute Capacity by the deadline specified in the relevant Business Practice Manual, the outage is exempt from RAAIM as set forth in Section 9 or Section 40, the outage is cancelled, or the outage is rescheduled.

40.9.3.6.3 General Provisions on Substitute Capacity

(a) **Substitution** If the Resource Adequacy Resource on Outage and the substituting resource do not have the same Scheduling Coordinator, the Scheduling Coordinator for the substituting resource must confirm and approve the proposed substitution in accordance with the process set forth in the Business Practice Manual.

(b) **Availability**

(1) RA Substitute Capacity must be operationally available to the CAISO:

(2) Capacity on, or scheduled to be on, a Forced Outage, Approved Maintenance Outage, or de-rate, is not operationally available and shall not qualify to be RA Substitute Capacity for the duration of the period that it is unavailable.

(3) RMR Capacity, including Legacy RMR Capacity, CPM Capacity, and capacity committed to be Resource Adequacy Capacity in a monthly Supply Plan shall not qualify to be RA Substitute Capacity for the duration of that commitment.

(4) RA Substitute Capacity shall not qualify to be RMR Capacity, including Legacy RMR Capacity, CPM Capacity, or Resource Adequacy Capacity in a monthly Supply Plan, for the duration of the substitution.

(5) If a resource provides RA Substitute Capacity for multiple Resource Adequacy Resources under Section 40.9.3.6.6, the same capacity committed as RA Substitute Capacity for one Resource Adequacy Resource shall not qualify as RA Substitute Capacity for a different Resource Adequacy Resource during the same substitution period.

(6) RA Substitute Capacity will be treated as Resource Adequacy Capacity during the period of substitution for purposes of a Forced Outage or de-rate allocation.

(c) **Timing of Substitution Request**

(1) **Day-Ahead Market.** Requests for substitution for Forced Outages in the Day-Ahead Market must be submitted in accordance with the timeline specified in the Business Practice Manual and be approved by the CAISO to be included in the Day-Ahead Market for the next Trading Day. Requests for substitution for Forced Outages in the Day-Ahead Market submitted at or after the timeline specified in the Business Practice Manual and that are approved by the CAISO will be included in the Day-Ahead Market for the second Trading Day.

(2) **Real-Time Market.** Requests for substitution for Forced Outages in the Real-Time Market must be submitted in accordance with the timeline in the Business Practice Manual.

40.9.3.6.4 RA Substitute Capacity from a Single Source

(a) **Option.** The Scheduling Coordinator for a Resource Adequacy Resource that is on Outage may provide RA Substitute Capacity for that capacity from a single resource.

(b) **Local Capacity Area Resource Substitution**

(1) **Pre-Qualified Substitution.**

(A) **Annual Process.** The CAISO annually will conduct a process to assess the eligibility of resources to pre-qualify as RA Substitute Capacity for

Local Capacity Resource Adequacy Resources that potentially could be Listed Local RA Capacity in the time period covered by the process. The CAISO will publish a list of the pre-qualified resources in accordance with the timeline in the Business Practice Manual.

(B) **Pre-Qualification Requirement.** The CAISO will pre-qualify a resource to provide RA Substitute Capacity that is located at the same bus as, or a compatible bus to, that of the Local Capacity Area Resource Adequacy Resource for which it could substitute.

(C) **Request.** To use a pre-qualified resource in the Day-Ahead Market or Real-Time Market as RA Substitute Capacity, the Scheduling Coordinator for the Local Capacity Area Resource Adequacy Resource on Outage must submit a timely substitution request in accordance with Section 40.9.3.6.3(c).

(D) **Approval.** The CAISO will grant a request that meets the requirements in Sections 40.9.3.6.4(b)(1)(C) and 40.9.3.6.3(b).

(2) **Non-Pre-Qualified Substitution.**

(A) **Day-Ahead Market.** The Scheduling Coordinator for Listed Local RA Capacity on Outage may submit a request to substitute a non-pre-qualified resource only in the Day-Ahead Market.

(B) **Request.** To use a non-pre-qualified resource as RA Substitute Capacity, the Scheduling Coordinator for the Listed Local RA Capacity must submit a timely substitution request in accordance with Section 40.9.3.6.3(c), and the alternate resource must be located in the same Local Capacity Area.

(C) **Approval.** The CAISO will grant a request that meets the requirements in Sections 40.9.3.6.4(b)(2)(A) and (B), and 40.9.3.6.3(b).

(c) **Non-Local Capacity Area Resource Substitution**

(1) **Request.** To use a resource as RA Substitute Capacity, the Scheduling

Coordinator for RA Capacity other than Listed Local RA Capacity that has an Outage must submit a timely substitution request in the Day-Ahead Market or Real-Time Market in accordance with Section 40.9.3.6.3(c).

(2) **Approval.** The CAISO will grant the request if the alternate resource has adequate deliverable capacity to provide the RA Substitute Capacity and meets the requirements in Sections 40.9.3.6.4(c)(1) and 40.9.3.6.3(b).

(d) **External Resources**

(1) **Request.** To use a Dynamic System Resource, Non-Dynamic System Resource, NRS-RA Resource, or Pseudo-Tie as RA Substitute Capacity, the Scheduling Coordinator for a Resource Adequacy Resource that has an Outage must submit a timely substitution request in the Day-Ahead Market in accordance with Section 40.9.3.6(c).

(2) **Approval.** The CAISO will grant the request if the alternate resource is external to the CAISO Balancing Authority Area (including Pseudo-Ties), the Scheduling Coordinator for the resource has an adequate available import allocation at the resource's Scheduling Point to provide the RA Substitute Capacity, and meets the requirements in Sections 40.9.3.6.4(d)(1) and 40.9.3.6.3(b).

(e) **Flexible RA Capacity**

(1) **Request.** To use a resource as RA Substitute Capacity, the Scheduling Coordinator for the Flexible RA Resource that has a Forced Outage must submit a timely substitution request in the Day-Ahead Market or Real-Time Market in accordance with Section 40.9.3.6.3(c) and specify the MW of RA Substitute Capacity to be provided, which may not exceed the MWs of the outage.

(2) **Approval.** The CAISO will grant the request if the alternate resource has adequate deliverable capacity to provide the RA Substitute Capacity, meets the applicable requirements in Sections 40.9.3.6.4(e) and 40.9.3.6.3(b), and is capable of meeting the must-offer obligation in Section 40.10.6 applicable to the highest quality Flexible Capacity Category for the MWs of the Flexible RA

Capacity commitments of the resource on outage and the alternate resource.

40.9.3.6.5 RA Substitute Capacity from Multiple Resources

(a) **Option.** The Scheduling Coordinator for a Resource Adequacy Resource on Outage may submit a request to substitute that capacity with RA Substitute Capacity from multiple alternate resources, including a resource already providing RA Substitute Capacity for one or more Resource Adequacy Resources.

(b) **Local Capacity Area Resource Substitution**

(1) **Request.** To use RA Substitute Capacity from multiple resources, the Scheduling Coordinator for Listed Local RA Capacity on Outage must submit a timely substitution request in the Day-Ahead Market in accordance with Section 40.9.3.6.3(c) if any of the alternate resources are not pre-qualified to substitute for the resource on the outage; however, if all of the alternate resources are pre-qualified to provide RA Substitute Capacity for that resource, the request may be submitted in the Day-Ahead Market or Real-Time Market.

(2) **Approval.** The CAISO will grant the request if it meets the requirements in Sections 40.9.3.6.5(b)(1) and 40.9.3.6.3(c) and the alternate resources are either pre-qualified, or are not pre-qualified but are located in the same Local Capacity Area as the Resource Adequacy Resource.

(c) **Non-Local Capacity Area Resources**

(1) **Request.** To use RA Substitute Capacity from multiple resources, the Scheduling Coordinator for RA Capacity other than Listed Local RA Capacity on Outage must submit a timely substitution request in the Day-Ahead Market or the Real-Time Market in accordance with Section 40.9.3.6.3(c).

(2) **Approval.** The CAISO will grant the request if all of the alternate resources meet the requirements in Sections 40.9.3.6.5(c)(1) and 40.9.3.6.3(c).

(d) **External Resources**

(1) **Request.** To use multiple Dynamic System Resources, Non-Dynamic System Resources, NRS-RA Resources, or Pseudo-Ties as RA Substitute Capacity, the

Scheduling Coordinator for a Resource Adequacy Resource that has an Outage must submit a timely substitution request in the Day-Ahead Market in accordance with Section 40.9.3.6.3(c).

(2) **Approval.** The CAISO will grant the request if the alternate resources are external to the CAISO Balancing Authority Area (including Pseudo-Ties), and the Scheduling Coordinator of each alternate resource has an adequate available import allocation at the resource's Scheduling Point to provide the RA Substitute Capacity, and meet the requirements in Sections 40.9.3.6.5(d)(1) and 40.9.3.6.3(b).

(e) **Flexible RA Capacity**

(1) **Request.** To use RA Substitute Capacity from multiple resources, the Scheduling Coordinator for a resource providing Flexible RA Capacity on a Forced Outage must submit a timely substitution request in the Day-Ahead Market or the Real-Time Market and the alternate resources must be located in the CAISO Balancing Authority Area, which does not include a Pseudo-Tie of a Generating Unit or a Resource-Specific System Resource.

(2) **Approval.** The CAISO will grant the request if the alternate resources meet the requirements in Sections 40.9.3.6.5(e)(1) and 40.9.3.6.3(c).

40.9.3.6.6 Multiple Substitution by One Resource. The Scheduling Coordinator for a resource already providing RA Substitute Capacity may provide RA Substitute Capacity for one or more additional Resource Adequacy Resources on Outage, subject to approval by the CAISO pursuant to Section 40.9.3.6.4 or 40.9.3.6.5.

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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 Outage is excluded from RAAIM under Section 40.9.3.4(d); 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.

* * *

43A.2.2 Collective Deficiency in Local Capacity Area Resources

The CAISO shall have the authority to designate CPM Capacity where the Local Capacity Area Resources (irrespective of status as Listed Local RA Capacity) specified in the annual Resource Adequacy Plans of all applicable Scheduling Coordinators, after the opportunity to cure under Section 43A.2.2.1 has been exhausted, fail to ensure compliance in one or more Local Capacity Areas with the Local Capacity Technical Study criteria provided in Section 40.3.1.1, regardless of whether such resources satisfy, for the deficient Local Capacity Area, the minimum amount of Local Capacity Area Resources identified in the Local Capacity Technical Study, and after assessing during all hours the effectiveness of Generating Units under RMR Contracts, if any, and all Resource Adequacy Resources reflected in all submitted annual Resource Adequacy Plans, whether or not such Generating Units under RMR Contracts and Resource Adequacy Resources are located in the applicable Local Capacity Area. The CAISO may, pursuant to this Section 43A.2.2, designate CPM Capacity in an amount and location sufficient to ensure compliance during all hours with the Reliability Criteria applied in the Local Capacity Technical Study.

43A.2.2.1 LSE Opportunity to Resolve Collective Deficiency in Local Capacity Area Resources

Where the CAISO determines that a need for CPM Capacity exists under Section 43A.2.2, but prior to any designation of CPM Capacity, the CAISO shall issue a Market Notice identifying the deficient Local Capacity Area and the quantity of capacity that would permit the deficient Local Capacity Area to comply with the Local Capacity Technical Study criteria provided in Section 40.3.1.1 and, where only specific resources are effective to resolve the Reliability Criteria deficiency, the CAISO shall provide the identity of such resources. Any Scheduling Coordinator may submit a revised annual Resource Adequacy Plan within thirty (30) days of the beginning of the Resource Adequacy Compliance Year demonstrating procurement of additional Local Capacity Area Resources consistent with the Market Notice issued under this Section.

Any Scheduling Coordinator that provides such additional Local Capacity Area Resources consistent with the Market Notice under this Section shall have its share of any CPM procurement costs under Section 43A. 8.3 reduced on a proportionate basis. If the full quantity of capacity is not reported to the CAISO under revised annual Resource Adequacy Plans in accordance with this Section, the CAISO may designate CPM Capacity sufficient to alleviate the deficiency.

* * *

Appendix A

- Minimum State of Charge (MSOC) Tool

A functionality in the RTM that limits awards for a Non-Generator Resource that has selected a primary fuel type in Master File of "Limited Energy Storage Resource" and is an RA Resource such that they will have sufficient charge to meet the discharge elements of their Day-Ahead Schedule.

* * *

Appendix J

LEGACY STANDARD CAPACITY PRODUCT AND RA SUBSTITUTE CAPACITY PROVISIONS

Part 1 – Legacy Standard Capacity Product Provisions

Notwithstanding any other provisions of the CAISO Tariff, the following provisions shall apply pursuant to Section 40.9.2.1(a)(1).

40.9.2 Exemptions

The following exemptions apply to the CAISO's Availability Standards program of this Section 40.9:

(1) Capacity under a resource specific power supply contract that existed prior to June 28, 2009 and Resource Adequacy Capacity that was procured under a contract that was either executed or submitted to the applicable Local Regulatory Authority for approval prior to June 28, 2009, and is associated with specific Generating Units or System Resources, will not be subject to Non-Availability Charges or Availability Incentive Payments. Such contracted Resource Adequacy Capacity, except for non-Resource-

Specific System Resources, will be included in the development of Availability Standards and will be subject to any Outage reporting requirements necessary for this purpose. The exemption will apply only for the initial term of the contract and to the MW capacity quantity and Resource Adequacy Resources specified in the contract prior to June 28, 2009. The exemption shall terminate upon the conclusion of the initial contract term. Exempt contracts may be re-assigned or undergo novation on or after June 28, 2009, but the exemption shall not apply for any extended contract term, increased capacity quantity or additional resource(s) beyond those specified in the contract prior to June 28, 2009, except as provided in Section 40.9.2(7) or 40.9.2(8). Scheduling Coordinators for Resource Adequacy Resources subject to these contracts will be required to certify the start date of the contract, the expiration date, the Resource ID(s), and the amount of Resource Adequacy Capacity associated with each Resource ID included in the contract. For Resource Adequacy Resources whose Qualifying Capacity value is determined by historical output, the capacity under a resource specific power supply contract or Resource Adequacy Capacity that was procured under a contract that was either executed or submitted to the applicable Local Regulatory Authority for approval that meets the requirements in this subsection (2) will not be subject to Non-Availability Charges or Availability Incentive Payments, except that the deadline date for either type of contract shall be August 22, 2010 instead of June 28, 2009.

(2) For a contract entered into prior to June 28, 2009 that provides for the amount of Resource Adequacy Capacity to increase during the original term of the contract, based on a ratio of the Resource Adequacy Resource's output or due to an addition of capacity, the exemption provided in subsection (2) of this Section 40.9.2 will apply to the additional capacity allowed under the contract; provided that the capacity increase (i) is expressly contained in the provisions of the contract, (ii) occurs during the primary term of the contract; and (iii) does not result from contract extensions or other amendments to the original terms and conditions of the contract, except as provided in Section 40.9.2(7) or 40.9.2(8). Scheduling Coordinators for Resource Adequacy Resources subject to

contracts that provide for such capacity increases or additions must include in their certification, in addition to the requirements of subsection (2) of this Section 40.9.2, (i) the citation to any contract provisions that might entitle them to increased exempt Resource Adequacy Capacity from the contracted resources during the primary term of the contract; (ii) the amount of additional capacity to which they might be entitled; and (iii) the actual effective date of the capacity increase. If the actual amount of capacity and/or the actual effective date of the capacity increase is not known at the time of the initial certification, the Scheduling Coordinator shall provide a supplemental certification(s) when this information becomes known. For Resource Adequacy Resources whose Qualifying Capacity value is determined by historical output the exemption provided in subsection (2) of this Section 40.9.2 will apply to an increase in the capacity under a resource specific power supply contract or Resource Adequacy Capacity that was procured under a contract that was either executed or submitted to the applicable Local Regulatory Authority for approval that meets the requirements in this subsection (3), except that the deadline date for either type of contract to be exempt shall be August 22, 2010 instead of June 28, 2009.

Part 2 – Legacy RA Substitute Capacity Provisions

Notwithstanding any other provisions of the CAISO Tariff, the following provisions apply to Outages on RA Resources taken in June 2021. In all other respects, the CAISO Tariff, including the provisions of Sections 9 and 40 not covered in this Appendix J, apply to Outages on RA Resources taken in June 2021.

9.3.1.3 Coordinating Outages of RA Resources

In performing outage coordination management under Section 9, and this Section 9.3.1.3, the CAISO may take into consideration the status of a Generating Unit as a Resource Adequacy Resource, including whether it is Listed Local RA Capacity. The CAISO may deny, reschedule or cancel an Approved Maintenance Outage for facilities that comprise the CAISO Controlled Grid or Generating Units of Participating Generators if it determines that the outage is likely to have a detrimental effect on the availability of Resource Adequacy Capacity or the efficient use and reliable operation of the CAISO

Controlled Grid or the facilities of a Connected Entity.

9.3.1.3.1 [Not Used]

9.3.1.3.2 [Not Used]

9.3.1.3.3 Substitution Opportunity for RA Resources

To the extent that a resource is committed to provide Resource Adequacy Capacity during a month, the Scheduling Coordinator for the resource may request an RA Maintenance Outage With Substitution, RA Maintenance Outage Without Substitution, Off Peak Opportunity RA Maintenance Outage, or Short-Notice Opportunity RA Outage, or may request to reschedule an Approved Maintenance Outage, for that Resource Adequacy Capacity in accordance with the provisions of this Section. The timelines set forth in this Section for submitting an Outage request and classifying the outage as a Maintenance Outage or a Forced Outage exclude the day that the request is submitted and the day that the outage is scheduled to commence.

9.3.1.3.3.1 RA Maintenance Outage With Substitution

(a) **Substitution Option.** The Scheduling Coordinator of a Resource Adequacy Resource designated as Resource Adequacy Capacity during the resource adequacy month may request that a planned Maintenance Outage be scheduled, or an Approved Maintenance Outage be rescheduled, as an RA Maintenance Outage With Substitution during that month.

(b) **Request.** A request for an RA Maintenance Outage With Substitution must: (i) be submitted to the CAISO no less than eight (8) days prior to the start of the outage; (ii) provide RA Substitution Capacity in an amount no less than the amount of Resource Adequacy Capacity that would be on scheduled outage; and (iii) otherwise comply with the requirements set forth in Section 9.

(c) **Approval.**

(1) The CAISO will consider requests for an RA Maintenance Outage With Substitution in the order that the requests are received.

(2) The CAISO may approve the request for an RA Maintenance Outage With Substitution if it determines that: (i) the request meets the requirements in

Section 9.3.1.3.3.1(b); and (ii) system conditions and the overall outage schedule provide an opportunity to take the resource out of service without a detrimental effect on the efficient use and reliable operation of the CAISO Controlled Grid.

(3) If the request was submitted no less than eight (8) days prior to the start date for the outage, and it meets the requirements in Section 9.3.1.3.3.1(c)(2) the CAISO may approve the request as an RA Maintenance Outage With Substitution.

(4) If the CAISO denies the request for failing to meet the requirements in Section 9.3.1.3.3.1(c)(2), the Scheduling Coordinator for the Resource Adequacy Resource may request a different schedule for the RA Maintenance Outage With Substitution or may request that the CAISO accommodate the outage without RA Substitute Capacity at another time.

(d) **Resource Adequacy Obligation.** The RA Substitute Capacity for an RA Maintenance Outage With Substitution approved under Section 9.3.1.3.3.1(c)(3) shall be subject to all of the availability, dispatch, testing, reporting, verification and any other applicable requirements imposed on Resource Adequacy Resources by the CAISO Tariff, including the must-offer obligations in Section 40.6 and the RAAIM provisions in Section 40.9, for the MW amount and duration of the outage substitution period, which includes the full day of the start date and the full day of the end date of the outage.

9.3.1.3.3.2 RA Maintenance Outage Without Substitution

(a) **Option for No Substitution.** The Scheduling Coordinator for a Resource Adequacy Resource designated as Resource Adequacy Capacity during the resource adequacy month may request that a Maintenance Outage be scheduled, or an Approved Maintenance Outage be rescheduled, as an RA Maintenance Outage Without Substitution, without a requirement to provide RA Substitute Capacity for the unavailable capacity for the duration of the outage to be excluded from the RAAIM calculation under Section 40.9.

(b) **Request.** A request for an RA Maintenance Outage Without Substitution must: (i) be submitted to the CAISO no less than eight (8) days prior to the start date of the outage;

and (ii) otherwise comply with the requirements of Section 9.

(c) **Approval.**

(1) The CAISO will consider requests received for an RA Maintenance Outage Without Substitution in the order the requests were received.

(2) The CAISO may approve a request for an RA Maintenance Outage Without Substitution if it determines that: (i) the request meets the requirements in Section 9.3.1.3.3.2(b); (ii) system conditions and the overall outage schedule provide an opportunity to take the resource out of service without a detrimental effect on the efficient use and reliable operation of the CAISO Controlled Grid; and (iii) the outage will not result in insufficient available Resource Adequacy Capacity during the outage period. The analysis of system conditions and the overall outage schedule will include Approved Maintenance Outage requests that were received before and after the request for an RA Maintenance Outage Without Substitution.

(3) The CAISO will not approve a request for an RA Maintenance Outage Without Substitution earlier than seven days before the first day of the resource adequacy month, and may hold the request as pending until system conditions are sufficiently known for the CAISO to determine whether the outage meets the requirements in Section 9.3.1.3.3.2(c)(2).

(4) If the CAISO denies a request for an RA Maintenance Outage Without Substitution for failing to meet the requirements in Section 9.3.1.3.3.2(c)(2), the Scheduling Coordinator for the Resource Adequacy Resource may request an RA Maintenance Outage With Substitution or may request that the CAISO accommodate the outage at another time.

9.3.1.3.3.3 Off-Peak Opportunity RA Maintenance Outage

(a) **Option for Off-Peak Outage.** The Scheduling Coordinator for a Resource Adequacy Resource designated as Resource Adequacy Capacity during the resource adequacy month may submit a request for an Off-Peak Opportunity RA Maintenance Outage

without a requirement to provide RA Substitute Capacity for the unavailable capacity for the duration of the outage to be excluded from the RAAIM calculation under Section 40.9.

(b) **Request.** A request for an Off-Peak Opportunity RA Maintenance Outage must: (i) be submitted to the CAISO no less than eight (8) days prior to the start date for the outage; (ii) schedule the outage to begin during off-peak hours (as specified in the Business Practice Manuals) on a weekday, and to be completed prior to on-peak hours (as specified in the Business Practice Manuals) the following weekday, or to begin during off-peak hours (as specified in the Business Practice Manuals) on Friday, or on Saturday, Sunday, or a holiday, and to be completed prior to on-peak hours (as specified in the Business Practice Manual) on the next weekday; and (iii) otherwise comply with the requirements set forth in Section 9.

(c) **Approval.**

(1) The CAISO will consider requests for an Off-Peak Opportunity RA Maintenance Outage in the order the requests were received.

(2) If the request was submitted no less than eight (8) days prior to the start date for the outage, the CAISO may approve the request as an Off-Peak Opportunity RA Maintenance Outage if it determines that: (i) the request meets the requirements set forth in Section 9.3.1.3.3.3(b); and (ii) system conditions and the overall outage schedule provide an opportunity to take the resource out of service without a detrimental effect on the efficient use and reliable operation of the CAISO Controlled Grid.

(3) If the CAISO denies a request for an Off-Peak Opportunity RA Maintenance Outage for failing to meet the requirements in Section 9.3.1.3.3.3(c)(2), the Scheduling Coordinator for the Resource Adequacy Resource may request an RA Maintenance Outage With Substitution or may request that the CAISO accommodate the outage at another time.

(4) To the extent that an approved Off-Peak Opportunity RA Maintenance Outage is not completed during off-peak hours as scheduled, and extends into on-peak

hours, the Scheduling Coordinator for the resource shall submit the portion of the outage that extends into on-peak hours as a new Forced Outage, which shall be subject to the RAAIM provisions in Section 40.9.

9.3.1.3.3.4 Short-Notice Opportunity RA Outage

(a) **Option for Short-Notice Outage.** The Scheduling Coordinator for a Resource Adequacy Resource designated as Resource Adequacy Capacity during the resource adequacy month may submit a request for a Short-Notice Opportunity RA Outage without a requirement to provide RA Substitute Capacity for the Resource Adequacy Capacity that will be on the Forced Outage to be excluded from the RAAIM calculation under Section 40.9.

(b) A Short-Notice Opportunity RA Outage shall not exceed five days in length. The request for a Short-Notice Opportunity RA Outage must: (i) be submitted no more than seven (7) days prior to the requested start date for the outage; (ii) provide the CAISO adequate time to analyze the request before the outage begins; (iii) be submitted before the outage has commenced as a Forced Outage; and (iv) otherwise comply with the requirements of Section 9.

(c) **Approval.**

(1) The CAISO will consider Short-Notice Opportunity RA Outages in the order the requests are received.

(2) If the request was submitted no more than seven days and no less than four days prior to the start date of the outage, the CAISO may approve the request as a Short Notice Opportunity RA Outage if it determines that: (i) the outage and the request meet the requirements set forth in Section 9.3.1.3.3.4(b); (ii) system conditions and the overall outage schedule provide an opportunity to take the resource out of service without a detrimental effect on the efficient use and reliable operation of the CAISO Controlled Grid; and (iii) the outage will not result in insufficient available Resource Adequacy Capacity during the outage period. The approved outage will be a Forced Outage and will not be subject to the

RAAIM provisions in Section 40.9.

(3) If the request was submitted three days or less prior to the start date of the outage, the CAISO may approve the request as a Forced Outage if it determines that: (i) the outage and request meet the requirements set forth in Section 9.3.1.3.3.4(b); (ii) system conditions and the overall outage schedule provide an opportunity to take the resource out of service without a detrimental effect on the efficient use and reliable operation of the CAISO Controlled Grid; (iii) the outage will not result in insufficient available Resource Adequacy Capacity during the outage period; and (iv) the repairs are necessary to maintain system or resource reliability and require immediate attention to prevent equipment damage or failure. A Short-Notice Opportunity RA Outage approved under this Section will be a Forced Outage and will not be subject to the RAAIM provisions in Section 40.9.

(4) To the extent that an approved Short-Notice Opportunity RA Outage is not completed during the originally approved outage schedule, the Scheduling Coordinator for the resource must submit the portion of the outage that continues from the approved completion time until the time the outage is actually completed as a new Forced Outage, which will be subject to the RAAIM provisions in Section 40.9.

9.3.1.3.4 Outage Reporting for Resource Adequacy Resources between 1 MW and 10 MW

Scheduling Coordinators or Resource Adequacy Resources with a PMax of at least one (1) MW but less than 10 MWs that do not meet the requirement to provide information on Forced Outages in accordance with Section 9.3.10 shall report Outages in accordance with the process set forth in the Business Practice Manual.

40.9.3.4 Treatment of Outages

(a) **RA Substitute Capacity Not Required.** The RAAIM Availability Assessment for a Resource Adequacy Resource excludes the capacity, duration, and must-offer requirements for Resource Adequacy Capacity on an Outage during the Resource

Adequacy month that does not require RA Substitution Capacity under Section 9.3.1.3.3.

(b) **RA Substitute Capacity Required and Provided.** For each Outage that requires RA Substitute Capacity under Section 40.9.3.6 to avoid imposition of RAAIM charges –

(1) the RAAIM Availability Assessment for the resource excludes the capacity, duration, and must-offer requirement for Resource Adequacy Capacity on outage to the extent the resource provides RA Substitute Capacity for that outage as required under Section 40.9.3.6; and

(2) the RAAIM Availability Assessment for the substitute resource includes the capacity, duration, and must-offer requirement for the RA Substitute Capacity commitment. For each day the substitute resource is committed to provide Flexible RA Capacity and/or RA Substitute Capacity in more than one Flexible Capacity Category, the RAAIM Availability Assessment applies the must-offer obligation for the highest quality Flexible Capacity Category to the total MWs of the flexible capacity requirement. For the purposes of this Section 40.9, base ramping resources (as defined in section 40.10.3.2) are considered to be a higher quality of Flexible Capacity Category than either peak ramping resources (as defined in section 40.10.3.3) or super-peak ramping resources (as defined in section 40.10.3.4). Additionally, peak ramping resources (as defined in section 40.10.3.3) are considered to be a higher quality of Flexible Capacity Category than super-peak ramping resources (as defined in section 40.10.3.4).

(c) **RA Substitute Capacity Required not Provided.** For each Outage that requires RA Substitute Capacity under Section 40.9.3.6 to avoid imposition of RAAIM charges, the RAAIM Availability Assessment for the resource includes the capacity, duration, and must-offer requirement for Resource Adequacy Capacity on an outage to the extent the resource does not provide RA Substitute Capacity for the outage as required under Section 40.9.3.6.

(d) **Exclusions from RAAIM for certain Outage types.** The RAAIM Availability Assessment excludes the capacity, duration, and must-offer requirement for local and/or

system Resource Adequacy Capacity or Flexible RA Capacity on an Outage in a nature of work category specified in the Business Practice Manual that relates to: (i) an administrative action by the resource owner; (ii) a cause outside of the control of the resource owner, (iii) or a short-term use limitation; or (iv) a non-Run-of-River Resource hydroelectric Generating Unit's management of water-related operational or regulatory limitations. Through the December 31, 2020, Trading Day, item (iv) of this Section 40.9.3.4(d) applies only to a hydroelectric Generating Unit that has limited the capacity it has shown on the monthly Supply Plan corresponding to the day of the Outage to reflect historical hydrological conditions or actual hydrological conditions in 2020. The limitations based on hydrological conditions must be mutually agreed upon with the unit's Scheduling Coordinator and the CAISO. Starting with the January 1, 2021, Trading Day, item (iv) of this Section 40.9.3.4(d) applies only to a hydroelectric Generating Unit whose Qualifying Capacity was established pursuant to a CPUC or Local Regulatory Authority methodology under which the Qualifying Capacity is calculated to reflect historical hydrological conditions.

(e) **Derates on Generating Units Providing system RA Capacity and Listed Local RA Capacity.** If a Generating Unit providing both system RA Capacity and Listed Local RA Capacity is on Forced Outage, then for purposes of RAAIM and RA Substitute Capacity the quantity of the Forced Outage will be apportioned first to the system RA Capacity provided from that Generating Unit. If the quantity of the Forced Outage exceeds the quantity of system RA Capacity provided by the Generating Unit, then the remainder of the Forced Outage shall be apportioned to the Listed Local RA Capacity provided by the Generating Unit.

40.9.3.5 [Not Used]

40.9.3.6 Substitute Capacity

40.9.3.6.1 CAISO Evaluation by T-22 of Need for Substitute Capacity for Outages Submitted by T-25

No later than 22 days before the start of each month, the CAISO will determine for each day in that month

whether it will have sufficient operationally available RA Capacity from a combination of Local Capacity Area Resources and system capacity resources to meet or exceed the CAISO system RA Reliability Margin for each day. The CAISO will base this assessment on Maintenance Outages planned to be taken during the month that were submitted at least 25 days before the start of the month and any RA Substitute Capacity already provided to the CAISO for that month.

If the CAISO determines that it will have sufficient operationally available RA Capacity to meet or exceed the CAISO system RA Reliability Margin for a particular day, then no supplier with an outage submitted at least 25 days before the start of the month would be required to provide RA Substitute Capacity to be excluded from the RAAIM calculation as part of the analysis conducted no later than 22 days before the start of each month.

If the CAISO determines that it will not have sufficient operationally available RA capacity to meet the CAISO system RA Reliability Margin for a particular day, then it will determine which resources must provide RA Substitute Capacity to be excluded from the RAAIM calculation based on the reverse order of the dates on which the resources submitted the outage requests to the CAISO. The CAISO will first request the resource providing RA Capacity with the most-recently-requested outage for that day to provide RA Substitute Capacity and then will continue to assign substitution opportunities until the CAISO has sufficient operationally available RA Capacity to meet the CAISO system RA Reliability Margin for that particular day, assuming that all resources that are assigned a RA Substitute Capacity obligation actually provide RA Substitute Capacity for that day.

For purposes of this section 40.9.3.6.1, the CAISO will treat any request to extend the scheduled duration of an outage or increase the MW amount of capacity on outage as a new outage request and will assign a new priority date based on when the request to change the outage or derate was submitted to the CAISO. For the purposes of this section 40.9.3.6.1, the CAISO will not assign a new priority date where the Scheduling Coordinator requests to reduce the scheduled duration of an outage or decrease the MW amount of capacity on outage.

A resource designated to provide RA Substitute Capacity as part of the analysis conducted no later than 22 days before the start of each month must designate RA Substitute Capacity by the deadline specified in the relevant Business Practice Manual. Failure to designate the RA Substitute Capacity by the

specified deadline will subject the resource to RAAIM unless the outage is cancelled or rescheduled.

40.9.3.6.2 CAISO Rolling Evaluation of Need for Substitute Capacity for Outages Submitted after T-25

Starting at twenty-four days before the start of a month, the CAISO will consider submitted Maintenance Outages for a substitution requirement on a rolling basis, based on time of submission. Upon submission of the outage request, the CAISO will determine for each day of the outage whether the CAISO will have sufficient operationally available RA Capacity from a combination of Local Capacity Area Resources and system capacity resources to meet or exceed the CAISO system RA Reliability Margin for each day. The CAISO will base this assessment on Maintenance Outages planned to be taken for that day and any RA Substitute Capacity already provided to the CAISO for that day.

If the CAISO determines that it will have sufficient operationally available RA Capacity to meet or exceed the CAISO system RA Reliability Margin for a particular day, then the supplier will not be required to provide RA Substitute Capacity for that day to avoid imposition of RAAIM.

If the CAISO determines that it will not have sufficient operationally available RA capacity to meet the CAISO system RA Reliability Margin for a particular day, then it will request substitution for the resource for that day. Failure to designate RA Substitute Capacity by the deadline specified in the relevant Business Practice Manual will subject the resource to RAAIM unless the outage is cancelled or rescheduled.

The CAISO will not conduct an assessment to determine the need to provide RA Substitute Capacity for Forced Outages. Any such outage, irrespective of whether the resource is providing RA Capacity or Flexible RA Capacity, will be subject to applicable RAAIM unless the Scheduling Coordinator for the resource provides Substitute Capacity by the deadline specified in the relevant Business Practice Manual, the outage is exempt from RAAIM as set forth in Section 9 or Section 40, the outage is cancelled, or the outage is rescheduled.

For purposes of this section 40.9.3.6.2, the CAISO will treat any request to extend the scheduled duration of an outage or increase the MW amount of capacity on outage as a new outage request and will assign a new priority date based on when the request to change the outage or derate was submitted to the CAISO.

For purposes of this section 40.9.3.6.2, the CAISO will reevaluate the need for a Scheduling Coordinator

to provide RA Substitute Capacity where the Scheduling Coordinator requests to reduce the scheduled duration of an outage or decrease the MW amount of capacity on outage but will not assign a new priority date.

40.9.3.6.3 General Provisions on Substitute Capacity

(a) **Substitution**

(1) The Scheduling Coordinator for a Resource Adequacy Resource may provide RA Substitute Capacity for its local and/or system Resource Adequacy Capacity or Flexible RA Capacity on Outage. Certain types of Outages, as defined elsewhere in Section 9 or Section 40, will not subject the Scheduling Coordinator for a Resource Adequacy Resource to RAAIM if it declines to provide RA Substitute Capacity.

(2) If the Resource Adequacy Resource on Outage and the substituting resource do not have the same Scheduling Coordinator, the Scheduling Coordinator for the substituting resource must confirm and approve the proposed substitution in accordance with the process set forth in the Business Practice Manual.

(b) **Availability**

(1) RA Substitute Capacity must be operationally available to the CAISO:

(2) Capacity on, or scheduled to be on, a Forced Outage, Approved Maintenance Outage, or de-rate, is not operationally available and shall not qualify to be RA Substitute Capacity for the duration of the period that it is unavailable.

(3) RMR Capacity, including Legacy RMR Capacity, CPM Capacity, and capacity committed to be Resource Adequacy Capacity in a monthly Supply Plan shall not qualify to be RA Substitute Capacity for the duration of that commitment.

(4) RA Substitute Capacity shall not qualify to be RMR Capacity, including Legacy RMR Capacity, CPM Capacity, or Resource Adequacy Capacity in a monthly Supply Plan, for the duration of the substitution.

(5) If a resource provides RA Substitute Capacity for multiple Resource Adequacy Resources under Section 40.9.3.6.6, the same capacity committed as RA

Substitute Capacity for one Resource Adequacy Resource shall not qualify as RA Substitute Capacity for a different Resource Adequacy Resource during the same substitution period.

(6) RA Substitute Capacity will be treated as Resource Adequacy Capacity during the period of substitution for purposes of a Forced Outage or de-rate allocation.

(c) **Timing of Substitution Request**

(1) **Day-Ahead Market.** Requests for substitution for Forced Outages in the Day-Ahead Market must be submitted in accordance with the timeline specified in the Business Practice Manual and be approved by the CAISO to be included in the Day-Ahead Market for the next Trading Day. Requests for substitution for Forced Outages in the Day-Ahead Market submitted at or after the timeline specified in the Business Practice Manual and that are approved by the CAISO will be included in the Day-Ahead Market for the second Trading Day.

(2) **Real-Time Market.** Requests for substitution for Forced Outages in the Real-Time Market must be submitted in accordance with the timeline in the Business Practice Manual.

40.9.3.6.4 RA Substitute Capacity from a Single Source

(a) **Option.** The Scheduling Coordinator for a Resource Adequacy Resource that is on Outage may provide RA Substitute Capacity for that capacity from a single resource.

(b) **Local Capacity Area Resource Substitution**

(1) **Pre-Qualified Substitution.**

(A) **Annual Process.** The CAISO annually will conduct a process to assess the eligibility of resources to pre-qualify as RA Substitute Capacity for Local Capacity Resource Adequacy Resources that potentially could be Listed Local RA Capacity in the time period covered by the process. The CAISO will publish a list of the pre-qualified resources in accordance with the timeline in the Business Practice Manual.

(B) **Pre-Qualification Requirement.** The CAISO will pre-qualify a resource

to provide RA Substitute Capacity that is located at the same bus as, or a compatible bus to, that of the Local Capacity Area Resource Adequacy Resource for which it could substitute.

(C) **Request.** To use a pre-qualified resource in the Day-Ahead Market or Real-Time Market as RA Substitute Capacity, the Scheduling Coordinator for the Local Capacity Area Resource Adequacy Resource on Outage must submit a timely substitution request in accordance with Section 40.9.3.6.3(c).

(D) **Approval.** The CAISO will grant a request that meets the requirements in Sections 40.9.3.6.4(b)(1)(C) and 40.9.3.6.3(b).

(2) **Non-Pre-Qualified Substitution.**

(A) **Day-Ahead Market.** The Scheduling Coordinator for Listed Local RA Capacity on Outage may submit a request to substitute a non-pre-qualified resource only in the Day-Ahead Market.

(B) **Request.** To use a non-pre-qualified resource as RA Substitute Capacity, the Scheduling Coordinator for the Listed Local RA Capacity must submit a timely substitution request in accordance with Section 40.9.3.6.3(c), and the alternate resource must be located in the same Local Capacity Area.

(C) **Approval.** The CAISO will grant a request that meets the requirements in Sections 40.9.3.6.4(b)(2)(A) and (B), and 40.9.3.6.3(b).

(c) **Non-Local Capacity Area Resource Substitution**

(1) **Request.** To use a resource as RA Substitute Capacity, the Scheduling Coordinator for RA Capacity other than Listed Local RA Capacity that has an Outage must submit a timely substitution request in the Day-Ahead Market or Real-Time Market in accordance with Section 40.9.3.6.3(c).

(2) **Approval.** The CAISO will grant the request if the alternate resource has adequate deliverable capacity to provide the RA Substitute Capacity and meets

the requirements in Sections 40.9.3.6.4(c)(1) and 40.9.3.6.3(b).

(d) **External Resources**

(1) **Request.** To use a Dynamic System Resource, Non-Dynamic System Resource, NRS-RA Resource, or Pseudo-Tie as RA Substitute Capacity, the Scheduling Coordinator for a Resource Adequacy Resource that has an Outage must submit a timely substitution request in the Day-Ahead Market in accordance with Section 40.9.3.6.3(c).

(2) **Approval.** The CAISO will grant the request if the alternate resource is external to the CAISO Balancing Authority Area (including Pseudo-Ties), the Scheduling Coordinator for the resource has an adequate available import allocation at the resource's Scheduling Point to provide the RA Substitute Capacity, and meets the requirements in Sections 40.9.3.6.4(d)(1) and 40.9.3.6.3(b).

(e) **Flexible RA Capacity**

(1) **Request.** To use a resource as RA Substitute Capacity, the Scheduling Coordinator for the Flexible RA Resource that has a Forced Outage must submit a timely substitution request in the Day-Ahead Market or Real-Time Market in accordance with Section 40.9.3.6.3(c) and specify the MW of RA Substitute Capacity to be provided, which may not exceed the MWs of the outage.

(2) **Approval.** The CAISO will grant the request if the alternate resource has adequate deliverable capacity to provide the RA Substitute Capacity, meets the applicable requirements in Sections 40.9.3.6.4(e) and 40.9.3.6.3(b), and is capable of meeting the must-offer obligation in Section 40.10.6 applicable to the highest quality Flexible Capacity Category for the MWs of the Flexible RA Capacity commitments of the resource on outage and the alternate resource.

40.9.3.6.5 RA Substitute Capacity from Multiple Resources

(a) **Option.** The Scheduling Coordinator for a Resource Adequacy Resource on Outage may submit a request to substitute that capacity with RA Substitute Capacity from multiple alternate resources, including a resource already providing RA Substitute

Capacity for one or more Resource Adequacy Resources.

(b) **Local Capacity Area Resource Substitution**

(1) **Request.** To use RA Substitute Capacity from multiple resources, the Scheduling Coordinator for Listed Local RA Capacity on Outage must submit a timely substitution request in the Day-Ahead Market in accordance with Section 40.9.3.6.3(c) if any of the alternate resources are not pre-qualified to substitute for the resource on the outage; however, if all of the alternate resources are pre-qualified to provide RA Substitute Capacity for that resource, the request may be submitted in the Day-Ahead Market or Real-Time Market.

(2) **Approval.** The CAISO will grant the request if it meets the requirements in Sections 40.9.3.6.5(b)(1) and 40.9.3.6.3(c) and the alternate resources are either pre-qualified, or are not pre-qualified but are located in the same Local Capacity Area as the Resource Adequacy Resource.

(c) **Non-Local Capacity Area Resources**

(1) **Request.** To use RA Substitute Capacity from multiple resources, the Scheduling Coordinator for RA Capacity other than Listed Local RA Capacity on Outage must submit a timely substitution request in the Day-Ahead Market or the Real-Time Market in accordance with Section 40.9.3.6.3(c).

(2) **Approval.** The CAISO will grant the request if all of the alternate resources meet the requirements in Sections 40.9.3.6.5(c)(1) and 40.9.3.6.3(c).

(d) **External Resources**

(1) **Request.** To use multiple Dynamic System Resources, Non-Dynamic System Resources, NRS-RA Resources, or Pseudo-Ties as RA Substitute Capacity, the Scheduling Coordinator for a Resource Adequacy Resource that has an Outage must submit a timely substitution request in the Day-Ahead Market in accordance with Section 40.9.3.6.3(c).

(2) **Approval.** The CAISO will grant the request if the alternate resources are external to the CAISO Balancing Authority Area (including Pseudo-Ties), and the

Scheduling Coordinator of each alternate resource has an adequate available import allocation at the resource's Scheduling Point to provide the RA Substitute Capacity, and meet the requirements in Sections 40.9.3.6.5(d)(1) and 40.9.3.6.3(b).

(e) **Flexible RA Capacity**

(1) **Request.** To use RA Substitute Capacity from multiple resources, the Scheduling Coordinator for a resource providing Flexible RA Capacity on a Forced Outage must submit a timely substitution request in the Day-Ahead Market or the Real-Time Market and the alternate resources must be located in the CAISO Balancing Authority Area, which does not include a Pseudo-Tie of a Generating Unit or a Resource-Specific System Resource.

(2) **Approval.** The CAISO will grant the request if the alternate resources meet the requirements in Sections 40.9.3.6.5(e)(1) and 40.9.3.6.3(c).

40.9.3.6.6 Multiple Substitution by One Resource. The Scheduling Coordinator for a resource already providing RA Substitute Capacity may provide RA Substitute Capacity for one or more additional Resource Adequacy Resources on Outage, subject to approval by the CAISO pursuant to Section 40.9.3.6.4 or 40.9.3.6.5.

40.9.3.6.7 Resource Adequacy Obligation

To the extent a resource provides RA Substitute Capacity, the resource must meet and comply with all requirements in Section 40 applicable to RA Substitute Capacity for the duration of the substitution; except that RA Substitute Capacity shall be released from this obligation and the substitution requirements in Section 40.9 –

(a) at the end of the approved substitution period; or

(b) upon request by either the Scheduling Coordinator for the resource on Outage or the Scheduling Coordinator for the substitute resource, and approval by the other Scheduling Coordinator, in accordance with the process set forth in the Business Practice Manual.

40.9.3.6.8 Treatment of Unbid Capacity

If the Scheduling Coordinator for RA Substitute Capacity does not submit Bids or Self-Schedules for all or

a portion of that capacity in accordance with Section 40.6 or 40.10.6, the CAISO –

(1) will treat the unbid capacity as unavailable for purposes of Section 40.9; and

(2) will reflect that unavailability in the RAAIM availability calculation for the Resource Adequacy Resource providing the RA Substitute Capacity.

40.9.3.6.9 Substitution Opportunity Information

In order to make information available to Market Participants pertinent to the provisions of this Section 40.9.3.6, the CAISO will:

(a) Annually post on the CAISO Website the due dates for each month of the following Resource Adequacy compliance year the various submissions the CAISO requires under the Resource Adequacy program; and

(b) Provide the opportunity for Market Participants to post and view information on an electronic bulletin board about non-Resource Adequacy Capacity that may be needed or available as RA Substitute Capacity in the bilateral market. Use of the bulletin board is voluntary and is for informational purposes only.

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.

- RA Maintenance Outage With Substitution

A Maintenance Outage, or change to an Approved Maintenance Outage, at a Resource Adequacy Resource that the CAISO receives no less than eight (8) days prior to the start of the outage and that includes RA Substitute Capacity for the Resource Adequacy Capacity on Outage.

- RA Maintenance Outage Without Substitution

A Maintenance Outage, or change to an Approved Maintenance Outage at a Resource Adequacy Resource that the CAISO receives no less than eight (8) days prior to the start of the outage without RA Substitute Capacity for the Resource Adequacy Capacity on Outage.

Attachment B

Marked Tariff

Tariff Amendment to Implement the Resource Adequacy Enhancements Phase 1 Initiative – Summer 2021 Provisions

California Independent System Operator Corporation

March 29, 2021

9.3.1.3 Coordinating Outages of RA Resources

9.3.1.3.1 Maintenance Outages Requested Before Cure Period

Other than Outage types identified in Section 9.3.1.3.3, the CAISO denies Maintenance Outage requests or Approved Maintenance Outages on RA Resources requested before the 30-day Supply Plan revision deadline in Section 40.4.7.1(c) for the RA month in which the outage would first take place if the Scheduling Coordinator for the RA Resource does not provide RA Substitute Capacity to cover the extent of the Outage that occurs during the period for which the resource has been shown on a monthly Supply Plan. The RA Substitute Capacity must be provided by the monthly RA Substitute Capacity deadline established in the Business Practice Manual, which cannot be more than 72 hours after the 30-day Supply Plan revision deadline in Section 40.4.7.1(c) for the RA month in which the outage would first take place.

Once the CAISO grants final approval for a Maintenance Outage and the Outage has commenced, the CAISO does not subsequently deny the Outage for failure to provide RA Substitute Capacity by monthly RA Substitute Capacity deadlines that occur after the Outage has begun. Any such period of the Maintenance Outage for which the Scheduling Coordinator does not provide RA Substitute Capacity will be treated as a Forced Outage for purposes of assessing RAAIM under Section 40.9 but the resource may not provide RA Substitute Capacity per Section 40.9.3.6.2.

9.3.1.3.2 Maintenance Outages Requested After Cure Period

Other than Outage types identified in Section 9.3.1.3.3, the CAISO denies Maintenance Outage requests on RA Resources submitted after the 30-day Supply Plan revision deadline in Section 40.4.7.1(c) for the RA month in which the outage would first take place if the Scheduling Coordinator for the RA Resource does not provide RA Substitute Capacity to cover the extent of the requested Maintenance Outage that occurs during the period for which the resource has been shown on a monthly Supply Plan. The RA Substitute Capacity must be provided by the post-monthly RA Substitute Capacity deadline established in the Business Practice Manual, which cannot be no more than 72 hours after the Outage request.

Once the CAISO grants final approval for a Maintenance Outage and the Outage has commenced, the CAISO does not subsequently deny the Outage for failure to provide RA Substitute Capacity by monthly RA Substitute Capacity deadlines that occur after the Outage has begun. Any such period of the

Maintenance Outage for which the Scheduling Coordinator does not provide RA Substitute Capacity will be treated as a Forced Outage for purposes of assessing RAAIM under Section 40.9 but the resource may not provide RA Substitute Capacity per Section 40.9.3.6.2.

9.3.1.3.3 Exceptions to Requirement to Provide RA Substitute Capacity

The CAISO does not automatically deny an Outage pursuant to Section 9.3.1.3.1 or Section 9.3.1.3.2 if the Maintenance Outage is: (a) an Off-Peak Opportunity RA Maintenance Outage approved Pursuant to Section 9.3.1.3.6; (b) caused by an Outage on transmission facilities in the CAISO Controlled Grid; or (c) on RA Capacity that is solely Flexible RA Capacity.

9.3.1.3.4 Cancellation or Denial of Maintenance Outages for Reasons other than Lack of RA Substitute Capacity

Notwithstanding provision of RA Substitute Capacity, the CAISO may deny, reschedule or cancel a Maintenance Outage on a RA Resource if it determines that the Outage is likely to have a detrimental effect on the efficient use and reliable operation of the CAISO Controlled Grid or the facilities of a Connected Entity.

9.3.1.3.5 Obligations of RA Substitute Capacity

RA Substitute Capacity provided pursuant to Section 9.3.1.3.1 or Section 9.3.1.3.2 is subject to all of the availability, dispatch, testing, reporting, verification and any other applicable requirements imposed on Resource Adequacy Resources by the CAISO Tariff, including the must-offer obligations in Section 40.6 and the RAAIM provisions in Section 40.9, for the MW amount and duration of the outage substitution period, which includes the full day of the start date and the full day of the end date of the outage.

~~In performing outage coordination management under Section 9, and this Section 9.3.1.3, the CAISO may take into consideration the status of a Generating Unit as a Resource Adequacy Resource, including whether it is Listed Local RA Capacity. The CAISO may deny, reschedule or cancel an Approved Maintenance Outage for facilities that comprise the CAISO Controlled Grid or Generating Units of Participating Generators if it determines that the outage is likely to have a detrimental effect on the availability of Resource Adequacy Capacity or the efficient use and reliable operation of the CAISO Controlled Grid or the facilities of a Connected Entity.~~

9.3.1.3.1 [Not Used]

9.3.1.3.2 [Not Used]

9.3.1.3.3 Substitution Opportunity for RA Resources

To the extent that a resource is committed to provide Resource Adequacy Capacity during a month, the Scheduling Coordinator for the resource may request an RA Maintenance Outage With Substitution, RA Maintenance Outage Without Substitution, Off-Peak Opportunity RA Maintenance Outage, or Short-Notice Opportunity RA Outage, or may request to reschedule an Approved Maintenance Outage, for that Resource Adequacy Capacity in accordance with the provisions of this Section. The timelines set forth in this Section for submitting an Outage request and classifying the outage as a Maintenance Outage or a Forced Outage exclude the day that the request is submitted and the day that the outage is scheduled to commence.

9.3.1.3.3.1 RA Maintenance Outage With Substitution

(a) **Substitution Option.** The Scheduling Coordinator of a Resource Adequacy Resource designated as Resource Adequacy Capacity during the resource adequacy month may request that a planned Maintenance Outage be scheduled, or an Approved Maintenance Outage be rescheduled, as an RA Maintenance Outage With Substitution during that month.

(b) **Request.** A request for an RA Maintenance Outage With Substitution must: (i) be submitted to the CAISO no less than eight (8) days prior to the start of the outage; (ii) provide RA Substitution Capacity in an amount no less than the amount of Resource Adequacy Capacity that would be on scheduled outage; and (iii) otherwise comply with the requirements set forth in Section 9.

(c) **Approval.**

(1) The CAISO will consider requests for an RA Maintenance Outage With Substitution in the order that the requests are received.

(2) The CAISO may approve the request for an RA Maintenance Outage With Substitution if it determines that: (i) the request meets the requirements in

Section 9.3.1.3.3.1(b); and (ii) system conditions and the overall outage schedule provide an opportunity to take the resource out of service without a detrimental effect on the efficient use and reliable operation of the CAISO Controlled Grid.

(3) If the request was submitted no less than eight (8) days prior to the start date for the outage, and it meets the requirements in Section 9.3.1.3.3.1(c)(2) the CAISO may approve the request as an RA Maintenance Outage With Substitution.

(4) If the CAISO denies the request for failing to meet the requirements in Section 9.3.1.3.3.1(c)(2), the Scheduling Coordinator for the Resource Adequacy Resource may request a different schedule for the RA Maintenance Outage With Substitution or may request that the CAISO accommodate the outage without RA Substitute Capacity at another time.

(d) **Resource Adequacy Obligation.** The RA Substitute Capacity for an RA Maintenance Outage With Substitution approved under Section 9.3.1.3.3.1(c)(3) shall be subject to all of the availability, dispatch, testing, reporting, verification and any other applicable requirements imposed on Resource Adequacy Resources by the CAISO Tariff, including the must-offer obligations in Section 40.6 and the RAAIM provisions in Section 40.9, for the MW amount and duration of the outage substitution period, which includes the full day of the start date and the full day of the end date of the outage.

9.3.1.3.3.2 RA Maintenance Outage Without Substitution

(a) **Option for No Substitution.** The Scheduling Coordinator for a Resource Adequacy Resource designated as Resource Adequacy Capacity during the resource adequacy month may request that a Maintenance Outage be scheduled, or an Approved Maintenance Outage be rescheduled, as an RA Maintenance Outage Without Substitution, without a requirement to provide RA Substitute Capacity for the unavailable capacity for the duration of the outage to be excluded from the RAAIM calculation under Section 40.9.

~~(b) **Request.** A request for an RA Maintenance Outage Without Substitution must: (i) be submitted to the CAISO no less than eight (8) days prior to the start date of the outage; and (ii) otherwise comply with the requirements of Section 9.~~

~~(c) **Approval.**~~

~~(1) The CAISO will consider requests received for an RA Maintenance Outage Without Substitution in the order the requests were received.~~

~~(2) The CAISO may approve a request for an RA Maintenance Outage Without Substitution if it determines that: (i) the request meets the requirements in Section 9.3.1.3.3.2(b); (ii) system conditions and the overall outage schedule provide an opportunity to take the resource out of service without a detrimental effect on the efficient use and reliable operation of the CAISO Controlled Grid; and (iii) the outage will not result in insufficient available Resource Adequacy Capacity during the outage period. The analysis of system conditions and the overall outage schedule will include Approved Maintenance Outage requests that were received before and after the request for an RA Maintenance Outage Without Substitution.~~

~~(3) The CAISO will not approve a request for an RA Maintenance Outage Without Substitution earlier than seven days before the first day of the resource adequacy month, and may hold the request as pending until system conditions are sufficiently known for the CAISO to determine whether the outage meets the requirements in Section 9.3.1.3.3.2(c)(2).~~

~~(4) If the CAISO denies a request for an RA Maintenance Outage Without Substitution for failing to meet the requirements in Section 9.3.1.3.3.2(c)(2), the Scheduling Coordinator for the Resource Adequacy Resource may request an RA Maintenance Outage With Substitution or may request that the CAISO accommodate the outage at another time.~~

9.3.1.3.~~3.3~~6 Off-Peak Opportunity RA Maintenance Outage

(a) **Option for Off-Peak Outage.** The Scheduling Coordinator for a Resource Adequacy Resource designated as Resource Adequacy Capacity during the resource adequacy month may submit a request for an Off-Peak Opportunity RA Maintenance Outage

without a requirement to provide RA Substitute Capacity for the unavailable capacity for the duration of the outage to be excluded from the RAAIM calculation under Section 40.9.

(b) **Request.** A request for an Off-Peak Opportunity RA Maintenance Outage must: (i) be submitted to the CAISO no less than eight (8) days prior to the start date for the outage; (ii) schedule the outage to begin during off-peak hours (as specified in the Business Practice Manuals) on a weekday, and to be completed prior to on-peak hours (as specified in the Business Practice Manuals) the following weekday, or to begin during off-peak hours (as specified in the Business Practice Manuals) on Friday, or on Saturday, Sunday, or a holiday, and to be completed prior to on-peak hours (as specified in the Business Practice Manual) on the next weekday; and (iii) otherwise comply with the requirements set forth in Section 9.

(c) **Approval.**

(1) The CAISO will consider requests for an Off-Peak Opportunity RA Maintenance Outage in the order the requests were received.

(2) If the request was submitted no less than eight (8) days prior to the start date for the outage, the CAISO may approve the request as an Off-Peak Opportunity RA Maintenance Outage if it determines that: (i) the request meets the requirements set forth in Section 9.3.1.3.~~3.3~~6(b); and (ii) system conditions and the overall outage schedule provide an opportunity to take the resource out of service without a detrimental effect on the efficient use and reliable operation of the CAISO Controlled Grid.

(3) If the CAISO denies a request for an Off-Peak Opportunity RA Maintenance Outage for failing to meet the requirements in Section 9.3.1.3.~~3.3~~6(c)(2), the Scheduling Coordinator for the Resource Adequacy Resource may request an RA Maintenance Outage With Substitution or may request that the CAISO accommodate the outage at another time.

(4) To the extent that an approved Off-Peak Opportunity RA Maintenance Outage is not completed during off-peak hours as scheduled, and extends into on-peak

hours, the Scheduling Coordinator for the resource shall submit the portion of the outage that extends into on-peak hours as a new Forced Outage, which shall be subject to the RAAIM provisions in Section 40.9.

9.3.1.3.~~3.~~47 Short-Notice Opportunity RA Outage

(a) **Option for Short-Notice Outage.** The Scheduling Coordinator for a Resource Adequacy Resource designated as Resource Adequacy Capacity during the resource adequacy month may submit a request for a Short-Notice Opportunity RA Outage without a requirement to provide RA Substitute Capacity for the Resource Adequacy Capacity that will be on the Forced Outage to be excluded from the RAAIM calculation under Section 40.9.

(b) A Short-Notice Opportunity RA Outage shall not exceed five days in length. The request for a Short-Notice Opportunity RA Outage must: (i) be submitted no more than seven (7) days prior to the requested start date for the outage; (ii) provide the CAISO adequate time to analyze the request before the outage begins; (iii) be submitted before the outage has commenced as a Forced Outage; and (iv) otherwise comply with the requirements of Section 9.

(c) **Approval.**

(1) The CAISO will consider Short-Notice Opportunity RA Outages in the order the requests are received.

(2) If the request was submitted no more than seven days and no less than four days prior to the start date of the outage, the CAISO may approve the request as a Short Notice Opportunity RA Outage if it determines that: (i) the outage and the request meet the requirements set forth in Section 9.3.1.3.~~3.~~47(b); (ii) system conditions and the overall outage schedule provide an opportunity to take the resource out of service without a detrimental effect on the efficient use and reliable operation of the CAISO Controlled Grid; and (iii) the outage will not result in insufficient available Resource Adequacy Capacity during the outage period.

The approved outage will be a Forced Outage and will not be subject to the RAAIM provisions in Section 40.9.

(3) If the request was submitted three days or less prior to the start date of the outage, the CAISO may approve the request as a Forced Outage if it determines that: (i) the outage and request meet the requirements set forth in Section 9.3.1.3.~~3.4~~7(b); (ii) system conditions and the overall outage schedule provide an opportunity to take the resource out of service without a detrimental effect on the efficient use and reliable operation of the CAISO Controlled Grid; (iii) the outage will not result in insufficient available Resource Adequacy Capacity during the outage period; and (iv) the repairs are necessary to maintain system or resource reliability and require immediate attention to prevent equipment damage or failure. A Short-Notice Opportunity RA Outage approved under this Section will be a Forced Outage and will not be subject to the RAAIM provisions in Section 40.9.

(4) To the extent that an approved Short-Notice Opportunity RA Outage is not completed during the originally approved outage schedule, the Scheduling Coordinator for the resource must submit the portion of the outage that continues from the approved completion time until the time the outage is actually completed as a new Forced Outage, which will be subject to the RAAIM provisions in Section 40.9.

9.3.1.3.~~4~~8 Outage Reporting for Resource Adequacy Resources between 1 MW and 10 MW

Scheduling Coordinators for Resource Adequacy Resources with a PMax of at least one (1) MW but less than 10 MWs that do not meet the requirement to provide information on Forced Outages in accordance with Section 9.3.10 shall report Outages in accordance with the process set forth in the Business Practice Manual.

9.3.1.3.9 Transition Period for Providing RA Substitute Capacity for Maintenance Outages

Notwithstanding Sections 9.3.1.3.1 and 9.3.1.3.2, Maintenance Outages on RA Resources in the June 2021 and July 2021 RA months require RA Substitute Capacity as follows to avoid Outage denial.

Maintenance Outage requests or Approved Maintenance Outages on RA Resources taken in June 2021 are reviewed for RA Substitute Capacity per the provisions of part 2 of Appendix J.

The CAISO denies Maintenance Outage requests or Approved Maintenance Outages on RA Resources planned to start or continue in July 2021 and that were requested before June 6, 2021, if the Scheduling Coordinator for the RA Resource does not provide RA Substitute Capacity to cover the extent of the Outage that occurs during the period for which the resource has been shown on a monthly Supply Plan. The RA Substitute Capacity must be provided by the July 2021 monthly RA Substitute Capacity deadline established in the Business Practice Manual. Maintenance Outage requests on RA Resources planned to start in July 2021 that are requested on or after June 6, 2021, are reviewed for RA Substitute Capacity per Section 9.3.1.3.2.

The CAISO will not subsequently deny a Maintenance Outage on a RA Resource that it permits to commence in July 2021 for failure to provide RA Substitute Capacity by monthly RA Substitute Capacity deadlines that occur after the Outage has begun. Any such period of the Maintenance Outage for which the Scheduling Coordinator does not provide RA Substitute Capacity will be treated as a Forced Outage for purposes of assessing RAAIM under Section 40.9 but the resource may not provide RA Substitute Capacity per Section 40.9.3.6.2.

9.3.2 Requirement for Approval

An Operator or Scheduling Coordinator shall not take: (i) facilities that comprise the CAISO Controlled Grid; or (ii) Generating Units of Participating Generators out of service for the purposes of planned maintenance or for new construction or other work except as approved by the CAISO, except that final approval may not be required for a Transmission Maintenance Outage as provided in Section 9.3.9.1. The information relating to each Maintenance Outage submitted by a Participating Generator in accordance with Section 9.3.5, or by a Participating TO in accordance with Section 9.3.5, constitutes a request for a long-range Maintenance Outage and is not considered an Approved Maintenance Outage until the CAISO has notified the Participating Generator of such approval pursuant to Section 9.3.6, or the Participating TO pursuant to Section 9.3.6.

9.3.3 Request Submission and Information

The Operator or Scheduling Coordinator of facilities that comprise the CAISO Controlled Grid or of a

Participating Generator, Participating Intermittent Resource, Generating Unit, System Unit, Physical Scheduling Plant, Proxy Demand Resource, Reliability Demand Response Resource, Non-Generation Resource, Participating Load, or other resource subject to the outage management requirements of Section 9, shall use the ISO's outage management system to –

(1) Submit all outage requests under Section 9.

(2) Provide the required information about the outage and work to be performed using the nature of work categories described in the Business Practice Manual.

(3) For transmission outage requests, additionally provide structured and detailed outage modeling information at the facility level and/or the breaker/switch level. If the work to be performed will require a switch position to change during the outage period, the Operator or Scheduling Coordinator must submit a separate outage request for each configuration.

(4) For resource outage requests, additionally provide the required information for the resource at the aggregate project or plant level, and also at the individual unit level for a unit de-rate greater than 50 MW, and any limitations on the resource's availability to provide each type of ancillary service for which it is certified.

(5) Notify the CAISO of temporary changes in physical characteristics specified in the Master File, including the PMax, Minimum Load, and Ramping capability of the unit, due to changes in their actual physical characteristics. Changes in the physical characteristics related to Minimum Load shall only be for temporary increases in Minimum Load due to ambient temperature, outages of mechanical equipment, or environmental regulations.

(6) For Outages that involve extending or increasing the scheduled duration of an Outage or MW amount of capacity on Outage, respectively, submit a new Outage request to cover the extension or increase in the extent of the Outage.

* * *

40.3 Local Capacity Area Resource Requirements for SCs for LSEs

40.3.1 Local Capacity Technical Study

On an annual basis, pursuant to the schedule set forth in the Business Practice Manual, the CAISO will, perform, and publish on the CAISO Website the Local Capacity Technical Study. The Local Capacity Technical Study shall identify Local Capacity Areas, determine the minimum amount of Local Capacity Area Resources in MW that must be available to the CAISO within each identified Local Capacity Area, and identify the Generating Units within each identified Local Capacity Area. The CAISO shall collaborate with the CPUC, Local Regulatory Authorities within the CAISO Balancing Authority Area, federal agencies, and Market Participants to ensure that the Local Capacity Technical Study is performed in accordance with this Section 40.3 and to establish for inclusion in the Business Practice Manual other parameters and assumptions applicable to the Local Capacity Technical Study and a schedule that provides for: (i) reasonable time for review of a draft Local Capacity Technical Study, (ii) reasonable time for Participating TOs to propose operating solutions, and (iii) release of the final Local Capacity Technical Study no later than 120 days prior to the date annual Resource Adequacy Plans must be submitted under this Section 40.

40.3.1.1 Local Capacity Technical Study Criteria

The Local Capacity Technical Study will determine the minimum amount of Local Capacity Area Resources needed to address the Contingencies identified in Section 40.3.1.2. The Local Capacity Technical Study also will consider hourly load shapes and system limits under emergency conditions to quantify minimum amounts of hourly capacity and energy, that Local Capacity Area Resources must be able to provide within each identified Local Capacity Area in order to resolve Contingencies identified in Section 40.3.1.2. In performing the Local Capacity Technical Study, the CAISO will apply those methods for resolving Contingencies considered appropriate for the performance level that corresponds to a particular studied Contingency, as provided in NERC Reliability Standards regarding Transmission System Planning Performance Requirements (TPL-001-4 or its successor), as augmented by CAISO Reliability Criteria in accordance with the Transmission Control Agreement and Section 24.3.1. The CAISO Reliability Criteria shall include:

(1) Time Allowed for Manual Readjustment: This is the amount of time required for the Operator to take all actions necessary to prepare the system for the next Contingency. This time should not be more than thirty (30) minutes.

(2) No voltage collapse or dynamic instability shall be allowed for a Contingency in Category Extreme Events [any P1 system readjusted (Common Structure) P7], as listed in TPL-001-4 in areas with load of 250 MW or more. For areas with less than 250 MW of load, mitigation will only be proposed if there is a risk of cascading beyond the area directly affected by the outage.

40.3.1.2 Local Capacity Technical Study Contingencies.

The Local Capacity Technical Study shall assess all the Contingencies and appropriate performance levels required by mandatory standards including, but not limited to, NERC, WECC and CAISO Planning Standards.

* * *

40.5 ~~[Not Used]~~Minimum State of Charge Tool for Non-Generator Resources Electing Limited Energy Storage Resource Status that Provide RA Capacity

40.5.1 ~~[Not Used]~~Operation of the MSOC Tool

Through June 1, 2023, the CAISO enforces the MSOC Tool in the RTM on any Non-Generator Resource that has selected a primary fuel type in Master File of "Limited Energy Storage Resource" and is an RA Resource for the day on which the MSOC is enforced. The MSOC Tool limits RTM awards to any covered resource in the market intervals preceding any Trading Hour that meets the requirements specified in Section 40.5.2 such that, based on its registered operating parameters, the resource will have sufficient charge to meet its discharge awards from its Day-Ahead Schedule for any Trading Hour that meets the requirements specified in Section 40.5.2. The MSOC tool does not increase the charge on a resource beyond what is necessary to ensure it can meet a discharge award from a Day-Ahead Schedule.

When reviewing market and system conditions on the Operating Day, the CAISO may choose not to apply the MSOC Tool for particular Trading Hours if its assessment of projected conditions reflects that the MSOC Tool is not necessary for system reliability in those Trading Hours.

40.5.2 ~~[Not Used]~~Determining the Days and Hours for which the MSOC Applies

The CAISO enforces the MSOC Tool for a Trading Day if there is at least one Trading Hour on that Trading Day for which, per Section 31.5.5, the RUC process initially cannot find a feasible solution without adjusting the constraints described in Section 31.5.4. For such Trading Days, the MSOC Tool applies to discharge awards from Day-Ahead Schedules for the Trading Hours that the CAISO projects, at the time the Day-Ahead Market runs, will have the highest CAISO system load net of wind and solar output.

40.5.3 ~~[Not Used]~~Notification of Applying the MSOC Tool

At approximately the same time it publishes Day-Ahead Market Results for a Trading Day, the CAISO provides public notice if the Trading Day will be subject to enforcement of the MSOC Tool and, if so, the Trading Hours whose discharge awards will be subject to the MSOC Tool.

40.5.4 [Not Used]

40.5.5 [Not Used]

* * *

40.9.3.4 Treatment of Outages

(a) **RA Substitute Capacity Not Required.** The RAAIM Availability Assessment for a Resource Adequacy Resource excludes the capacity, duration, and must-offer requirements for Resource Adequacy Capacity on an Outage during the Resource Adequacy month that does not require RA Substitution Capacity under Section 9.3.1.3~~.3~~.

(b) **RA Substitute Capacity Required and Provided.** For each Outage that requires RA Substitute Capacity under Section 40.9.3.6 to avoid imposition of RAAIM charges –

(1) the RAAIM Availability Assessment for the resource excludes the capacity, duration, and must-offer requirement for Resource Adequacy Capacity on outage to the extent the resource provides RA Substitute Capacity for that outage as required under Section 40.9.3.6; and

(2) the RAAIM Availability Assessment for the substitute resource includes the capacity, duration, and must-offer requirement for the RA Substitute Capacity commitment. For each day the substitute resource is committed to provide

Flexible RA Capacity and/or RA Substitute Capacity in more than one Flexible Capacity Category, the RAAIM Availability Assessment applies the must-offer obligation for the highest quality Flexible Capacity Category to the total MWs of the flexible capacity requirement. For the purposes of this Section 40.9, base ramping resources (as defined in section 40.10.3.2) are considered to be a higher quality of Flexible Capacity Category than either peak ramping resources (as defined in section 40.10.3.3) or super-peak ramping resources (as defined in section 40.10.3.4). Additionally, peak ramping resources (as defined in section 40.10.3.3) are considered to be a higher quality of Flexible Capacity Category than super-peak ramping resources (as defined in section 40.10.3.4).

(c) **RA Substitute Capacity Required not Provided.** For each Outage that requires RA Substitute Capacity under Section 40.9.3.6 to avoid imposition of RAAIM charges, the RAAIM Availability Assessment for the resource includes the capacity, duration, and must-offer requirement for Resource Adequacy Capacity on an outage to the extent the resource does not provide RA Substitute Capacity for the outage as required under Section 40.9.3.6.

(d) **Exclusions from RAAIM for certain Outage types.** The RAAIM Availability Assessment excludes the capacity, duration, and must-offer requirement for local and/or system Resource Adequacy Capacity or Flexible RA Capacity on an Outage in a nature of work category specified in the Business Practice Manual that relates to: (i) an administrative action by the resource owner; (ii) a cause outside of the control of the resource owner, (iii) or a short-term use limitation; or (iv) a non-Run-of-River Resource hydroelectric Generating Unit's management of water-related operational or regulatory limitations. Through the December 31, 2020, Trading Day, item (iv) of this Section 40.9.3.4(d) applies only to a hydroelectric Generating Unit that has limited the capacity it has shown on the monthly Supply Plan corresponding to the day of the Outage to reflect historical hydrological conditions or actual hydrological conditions in 2020. The limitations based on hydrological conditions must be mutually agreed upon with the unit's

Scheduling Coordinator and the CAISO. Starting with the January 1, 2021, Trading Day, item (iv) of this Section 40.9.3.4(d) applies only to a hydroelectric Generating Unit whose Qualifying Capacity was established pursuant to a CPUC or Local Regulatory Authority methodology under which the Qualifying Capacity is calculated to reflect historical hydrological conditions.

(e) **Derates on Generating Units Providing system RA Capacity and Listed Local RA Capacity.** If a Generating Unit providing both system RA Capacity and Listed Local RA Capacity is on Forced Outage, then for purposes of RAAIM and RA Substitute Capacity the quantity of the Forced Outage will be apportioned first to the system RA Capacity provided from that Generating Unit. If the quantity of the Forced Outage exceeds the quantity of system RA Capacity provided by the Generating Unit, then the remainder of the Forced Outage shall be apportioned to the Listed Local RA Capacity provided by the Generating Unit.

40.9.3.5 [Not Used]

40.9.3.6 Substitute Capacity

40.9.3.6.1 ~~CAISO Evaluation by T-22 of Need for Substitute Capacity for Outages Submitted by T-25~~[Not Used]

~~No later than 22 days before the start of each month, the CAISO will determine for each day in that month whether it will have sufficient operationally available RA Capacity from a combination of Local Capacity Area Resources and system capacity resources to meet or exceed the CAISO system RA Reliability Margin for each day. The CAISO will base this assessment on Maintenance Outages planned to be taken during the month that were submitted at least 25 days before the start of the month and any RA Substitute Capacity already provided to the CAISO for that month.~~

~~If the CAISO determines that it will have sufficient operationally available RA Capacity to meet or exceed the CAISO system RA Reliability Margin for a particular day, then no supplier with an outage submitted at least 25 days before the start of the month would be required to provide RA Substitute Capacity to be excluded from the RAAIM calculation as part of the analysis conducted no later than 22 days before the start of each month.~~

~~If the CAISO determines that it will not have sufficient operationally available RA capacity to meet the CAISO system RA Reliability Margin for a particular day, then it will determine which resources must provide RA Substitute Capacity to be excluded from the RAAIM calculation based on the reverse order of the dates on which the resources submitted the outage requests to the CAISO. The CAISO will first request the resource providing RA Capacity with the most-recently-requested outage for that day to provide RA Substitute Capacity and then will continue to assign substitution opportunities until the CAISO has sufficient operationally available RA Capacity to meet the CAISO system RA Reliability Margin for that particular day, assuming that all resources that are assigned a RA Substitute Capacity obligation actually provide RA Substitute Capacity for that day.~~

~~For purposes of this section 40.9.3.6.1, the CAISO will treat any request to extend the scheduled duration of an outage or increase the MW amount of capacity on outage as a new outage request and will assign a new priority date based on when the request to change the outage or derate was submitted to the CAISO. For the purposes of this section 40.9.3.6.1, the CAISO will not assign a new priority date where the Scheduling Coordinator requests to reduce the scheduled duration of an outage or decrease the MW amount of capacity on outage.~~

~~A resource designated to provide RA Substitute Capacity as part of the analysis conducted no later than 22 days before the start of each month must designate RA Substitute Capacity by the deadline specified in the relevant Business Practice Manual. Failure to designate the RA Substitute Capacity by the specified deadline will subject the resource to RAAIM unless the outage is cancelled or rescheduled.~~

40.9.3.6.2 CAISO ~~Rolling~~ Evaluation of Need for Substitute Capacity for ~~Outages Submitted after T-25~~Forced Outages

~~Starting at twenty-four days before the start of a month, the CAISO will consider submitted Maintenance Outages for a substitution requirement on a rolling basis, based on time of submission. Upon submission of the outage request, the CAISO will determine for each day of the outage whether the CAISO will have sufficient operationally available RA Capacity from a combination of Local Capacity Area Resources and system capacity resources to meet or exceed the CAISO system RA Reliability Margin for each day. The CAISO will base this assessment on Maintenance Outages planned to be taken for that day and any RA Substitute Capacity already provided to the CAISO for that day.~~

~~If the CAISO determines that it will have sufficient operationally available RA Capacity to meet or exceed the CAISO system RA Reliability Margin for a particular day, then the supplier will not be required to provide RA Substitute Capacity for that day to avoid imposition of RAAIM.~~

~~If the CAISO determines that it will not have sufficient operationally available RA capacity to meet the CAISO system RA Reliability Margin for a particular day, then it will request substitution for the resource for that day. Failure to designate RA Substitute Capacity by the deadline specified in the relevant Business Practice Manual will subject the resource to RAAIM unless the outage is cancelled or rescheduled.~~

~~The CAISO will not conduct an assessment to determine the need to provide RA Substitute Capacity for Forced Outages. Any such outage, irrespective of whether the resource is providing RA Capacity or Flexible RA Capacity, will be subject to applicable~~A Forced Outage on a RA Resource, irrespective of whether the resource is providing RA Capacity or Flexible RA Capacity, subjects the resource's Scheduling Coordinator to RAAIM unless the Scheduling Coordinator for the resource provides RA Substitute Capacity by the deadline specified in the relevant Business Practice Manual, the outage is exempt from RAAIM as set forth in Section 9 or Section 40, the outage is cancelled, or the outage is rescheduled.

~~For purposes of this section 40.9.3.6.2, the CAISO will treat any request to extend the scheduled duration of an outage or increase the MW amount of capacity on outage as a new outage request and will assign a new priority date based on when the request to change the outage or derate was submitted to the CAISO.~~

~~For purposes of this section 40.9.3.6.2, the CAISO will reevaluate the need for a Scheduling Coordinator to provide RA Substitute Capacity where the Scheduling Coordinator requests to reduce the scheduled duration of an outage or decrease the MW amount of capacity on outage but will not assign a new priority date.~~

40.9.3.6.3 General Provisions on Substitute Capacity

(a) **Substitution**

~~(1) The Scheduling Coordinator for a Resource Adequacy Resource may provide RA Substitute Capacity for its local and/or system Resource Adequacy Capacity or Flexible RA Capacity on Outage. Certain types of Outages, as defined elsewhere in Section 9 or Section 40, will not subject the Scheduling~~

~~Coordinator for a Resource Adequacy Resource to RAAIM if it declines to provide RA Substitute Capacity.~~

~~(2)~~ If the Resource Adequacy Resource on Outage and the substituting resource do not have the same Scheduling Coordinator, the Scheduling Coordinator for the substituting resource must confirm and approve the proposed substitution in accordance with the process set forth in the Business Practice Manual.

(b) **Availability**

(1) RA Substitute Capacity must be operationally available to the CAISO:

(2) Capacity on, or scheduled to be on, a Forced Outage, Approved Maintenance Outage, or de-rate, is not operationally available and shall not qualify to be RA Substitute Capacity for the duration of the period that it is unavailable.

(3) RMR Capacity, including Legacy RMR Capacity, CPM Capacity, and capacity committed to be Resource Adequacy Capacity in a monthly Supply Plan shall not qualify to be RA Substitute Capacity for the duration of that commitment.

(4) RA Substitute Capacity shall not qualify to be RMR Capacity, including Legacy RMR Capacity, CPM Capacity, or Resource Adequacy Capacity in a monthly Supply Plan, for the duration of the substitution.

(5) If a resource provides RA Substitute Capacity for multiple Resource Adequacy Resources under Section 40.9.3.6.6, the same capacity committed as RA Substitute Capacity for one Resource Adequacy Resource shall not qualify as RA Substitute Capacity for a different Resource Adequacy Resource during the same substitution period.

(6) RA Substitute Capacity will be treated as Resource Adequacy Capacity during the period of substitution for purposes of a Forced Outage or de-rate allocation.

(c) **Timing of Substitution Request**

(1) **Day-Ahead Market.** Requests for substitution for Forced Outages in the Day-Ahead Market must be submitted in accordance with the timeline specified in the Business Practice Manual and be approved by the CAISO to be included in the

Day-Ahead Market for the next Trading Day. Requests for substitution for Forced Outages in the Day-Ahead Market submitted at or after the timeline specified in the Business Practice Manual and that are approved by the CAISO will be included in the Day-Ahead Market for the second Trading Day.

(2) **Real-Time Market.** Requests for substitution for Forced Outages in the Real-Time Market must be submitted in accordance with the timeline in the Business Practice Manual.

40.9.3.6.4 RA Substitute Capacity from a Single Source

(a) **Option.** The Scheduling Coordinator for a Resource Adequacy Resource that is on Outage may provide RA Substitute Capacity for that capacity from a single resource.

(b) **Local Capacity Area Resource Substitution**

(1) **Pre-Qualified Substitution.**

(A) **Annual Process.** The CAISO annually will conduct a process to assess the eligibility of resources to pre-qualify as RA Substitute Capacity for Local Capacity Resource Adequacy Resources that potentially could be Listed Local RA Capacity in the time period covered by the process. The CAISO will publish a list of the pre-qualified resources in accordance with the timeline in the Business Practice Manual.

(B) **Pre-Qualification Requirement.** The CAISO will pre-qualify a resource to provide RA Substitute Capacity that is located at the same bus as, or a compatible bus to, that of the Local Capacity Area Resource Adequacy Resource for which it could substitute.

(C) **Request.** To use a pre-qualified resource in the Day-Ahead Market or Real-Time Market as RA Substitute Capacity, the Scheduling Coordinator for the Local Capacity Area Resource Adequacy Resource on Outage must submit a timely substitution request in accordance with Section 40.9.3.6.3(c).

(D) **Approval.** The CAISO will grant a request that meets the requirements

in Sections 40.9.3.6.4(b)(1)(C) and 40.9.3.6.3(b).

(2) **Non-Pre-Qualified Substitution.**

(A) **Day-Ahead Market.** The Scheduling Coordinator for Listed Local RA Capacity on Outage may submit a request to substitute a non-pre-qualified resource only in the Day-Ahead Market.

(B) **Request.** To use a non-pre-qualified resource as RA Substitute Capacity, the Scheduling Coordinator for the Listed Local RA Capacity must submit a timely substitution request in accordance with Section 40.9.3.6.3(c), and the alternate resource must be located in the same Local Capacity Area.

(C) **Approval.** The CAISO will grant a request that meets the requirements in Sections 40.9.3.6.4(b)(2)(A) and (B), and 40.9.3.6.3(b).

(c) **Non-Local Capacity Area Resource Substitution**

(1) **Request.** To use a resource as RA Substitute Capacity, the Scheduling Coordinator for RA Capacity other than Listed Local RA Capacity that has an Outage must submit a timely substitution request in the Day-Ahead Market or Real-Time Market in accordance with Section 40.9.3.6.3(c).

(2) **Approval.** The CAISO will grant the request if the alternate resource has adequate deliverable capacity to provide the RA Substitute Capacity and meets the requirements in Sections 40.9.3.6.4(c)(1) and 40.9.3.6.3(b).

(d) **External Resources**

(1) **Request.** To use a Dynamic System Resource, Non-Dynamic System Resource, NRS-RA Resource, or Pseudo-Tie as RA Substitute Capacity, the Scheduling Coordinator for a Resource Adequacy Resource that has an Outage must submit a timely substitution request in the Day-Ahead Market in accordance with Section 40.9.3.6(c).

(2) **Approval.** The CAISO will grant the request if the alternate resource is external to the CAISO Balancing Authority Area (including Pseudo-Ties), the Scheduling

Coordinator for the resource has an adequate available import allocation at the resource's Scheduling Point to provide the RA Substitute Capacity, and meets the requirements in Sections 40.9.3.6.4(d)(1) and 40.9.3.6.3(b).

(e) **Flexible RA Capacity**

(1) **Request.** To use a resource as RA Substitute Capacity, the Scheduling Coordinator for the Flexible RA Resource that has a Forced Outage must submit a timely substitution request in the Day-Ahead Market or Real-Time Market in accordance with Section 40.9.3.6.3(c) and specify the MW of RA Substitute Capacity to be provided, which may not exceed the MWs of the outage.

(2) **Approval.** The CAISO will grant the request if the alternate resource has adequate deliverable capacity to provide the RA Substitute Capacity, meets the applicable requirements in Sections 40.9.3.6.4(e) and 40.9.3.6.3(b), and is capable of meeting the must-offer obligation in Section 40.10.6 applicable to the highest quality Flexible Capacity Category for the MWs of the Flexible RA Capacity commitments of the resource on outage and the alternate resource.

40.9.3.6.5 RA Substitute Capacity from Multiple Resources

(a) **Option.** The Scheduling Coordinator for a Resource Adequacy Resource on Outage may submit a request to substitute that capacity with RA Substitute Capacity from multiple alternate resources, including a resource already providing RA Substitute Capacity for one or more Resource Adequacy Resources.

(b) **Local Capacity Area Resource Substitution**

(1) **Request.** To use RA Substitute Capacity from multiple resources, the Scheduling Coordinator for Listed Local RA Capacity on Outage must submit a timely substitution request in the Day-Ahead Market in accordance with Section 40.9.3.6.3(c) if any of the alternate resources are not pre-qualified to substitute for the resource on the outage; however, if all of the alternate resources are pre-qualified to provide RA Substitute Capacity for that resource, the request may be submitted in the Day-Ahead Market or Real-Time Market.

(2) **Approval.** The CAISO will grant the request if it meets the requirements in Sections 40.9.3.6.5(b)(1) and 40.9.3.6.3(c) and the alternate resources are either pre-qualified, or are not pre-qualified but are located in the same Local Capacity Area as the Resource Adequacy Resource.

(c) **Non-Local Capacity Area Resources**

(1) **Request.** To use RA Substitute Capacity from multiple resources, the Scheduling Coordinator for RA Capacity other than Listed Local RA Capacity on Outage must submit a timely substitution request in the Day-Ahead Market or the Real-Time Market in accordance with Section 40.9.3.6.3(c).

(2) **Approval.** The CAISO will grant the request if all of the alternate resources meet the requirements in Sections 40.9.3.6.5(c)(1) and 40.9.3.6.3(c).

(d) **External Resources**

(1) **Request.** To use multiple Dynamic System Resources, Non-Dynamic System Resources, NRS-RA Resources, or Pseudo-Ties as RA Substitute Capacity, the Scheduling Coordinator for a Resource Adequacy Resource that has an Outage must submit a timely substitution request in the Day-Ahead Market in accordance with Section 40.9.3.6.3(c).

(2) **Approval.** The CAISO will grant the request if the alternate resources are external to the CAISO Balancing Authority Area (including Pseudo-Ties), and the Scheduling Coordinator of each alternate resource has an adequate available import allocation at the resource's Scheduling Point to provide the RA Substitute Capacity, and meet the requirements in Sections 40.9.3.6.5(d)(1) and 40.9.3.6.3(b).

(e) **Flexible RA Capacity**

(1) **Request.** To use RA Substitute Capacity from multiple resources, the Scheduling Coordinator for a resource providing Flexible RA Capacity on a Forced Outage must submit a timely substitution request in the Day-Ahead Market or the Real-Time Market and the alternate resources must be located in

the CAISO Balancing Authority Area, which does not include a Pseudo-Tie of a Generating Unit or a Resource-Specific System Resource.

(2) **Approval.** The CAISO will grant the request if the alternate resources meet the requirements in Sections 40.9.3.6.5(e)(1) and 40.9.3.6.3(c).

40.9.3.6.6 Multiple Substitution by One Resource. The Scheduling Coordinator for a resource already providing RA Substitute Capacity may provide RA Substitute Capacity for one or more additional Resource Adequacy Resources on Outage, subject to approval by the CAISO pursuant to Section 40.9.3.6.4 or 40.9.3.6.5.

*** * * ***

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(d); 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.

* * *

43A.2.2 Collective Deficiency in Local Capacity Area Resources

The CAISO shall have the authority to designate CPM Capacity where the Local Capacity Area Resources (irrespective of status as Listed Local RA Capacity) specified in the annual Resource Adequacy Plans of all applicable Scheduling Coordinators, after the opportunity to cure under Section 43A.2.2.1 has been exhausted, fail to ensure compliance in one or more Local Capacity Areas with the Local Capacity Technical Study criteria provided in Section 40.3.1.1, regardless of whether such resources satisfy, for the deficient Local Capacity Area, the minimum amount of Local Capacity Area Resources identified in the Local Capacity Technical Study, and after assessing during all hours the effectiveness of Generating Units under RMR Contracts, if any, and all Resource Adequacy Resources reflected in all submitted annual Resource Adequacy Plans, whether or not such Generating Units under

RMR Contracts and Resource Adequacy Resources are located in the applicable Local Capacity Area. The CAISO may, pursuant to this Section 43A.2.2, designate CPM Capacity in an amount and location sufficient to ensure compliance during all hours with the Reliability Criteria applied in the Local Capacity Technical Study.

43A.2.2.1 LSE Opportunity to Resolve Collective Deficiency in Local Capacity Area Resources

Where the CAISO determines that a need for CPM Capacity exists under Section 43A.2.2, but prior to any designation of CPM Capacity, the CAISO shall issue a Market Notice identifying the deficient Local Capacity Area and the quantity of capacity that would permit the deficient Local Capacity Area to comply with the Local Capacity Technical Study criteria provided in Section 40.3.1.1 and, where only specific resources are effective to resolve the Reliability Criteria deficiency, the CAISO shall provide the identity of such resources. Any Scheduling Coordinator may submit a revised annual Resource Adequacy Plan within thirty (30) days of the beginning of the Resource Adequacy Compliance Year demonstrating procurement of additional Local Capacity Area Resources consistent with the Market Notice issued under this Section.

Any Scheduling Coordinator that provides such additional Local Capacity Area Resources consistent with the Market Notice under this Section shall have its share of any CPM procurement costs under Section 43A. 8.3 reduced on a proportionate basis. If the full quantity of capacity is not reported to the CAISO under revised annual Resource Adequacy Plans in accordance with this Section, the CAISO may designate CPM Capacity sufficient to alleviate the deficiency.

* * *

Appendix A

- Minimum State of Charge (MSOC) Tool

A functionality in the RTM that limits awards for a Non-Generator Resource that has selected a primary fuel type in Master File of “Limited Energy Storage Resource” and is an RA Resource such that they will have sufficient charge to meet the discharge elements of their Day-Ahead Schedule.

~~- RA Maintenance Outage With Substitution~~

~~A Maintenance Outage, or change to an Approved Maintenance Outage, at a Resource Adequacy Resource that the CAISO receives no less than eight (8) days prior to the start of the outage and that includes RA Substitute Capacity for the Resource Adequacy Capacity on Outage.~~

~~- RA Maintenance Outage Without Substitution~~

~~A Maintenance Outage, or change to an Approved Maintenance Outage at a Resource Adequacy Resource that the CAISO receives no less than eight (8) days prior to the start of the outage without RA Substitute Capacity for the Resource Adequacy Capacity on Outage.~~

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Appendix J

~~GRANDFATHERED~~ LEGACY STANDARD CAPACITY PRODUCT AND RA SUBSTITUTE CAPACITY PROVISIONS

Part 1 – ~~Grandfathering of~~Legacy Standard Capacity Product Provisions

Notwithstanding any other provisions of the CAISO Tariff, the following provisions shall apply pursuant to Section 40.9.2.1(a)(1).

40.9.2 Exemptions

The following exemptions apply to the CAISO's Availability Standards program of this Section 40.9:

(1) Capacity under a resource specific power supply contract that existed prior to June 28, 2009 and Resource Adequacy Capacity that was procured under a contract that was either executed or submitted to the applicable Local Regulatory Authority for approval prior to June 28, 2009, and is associated with specific Generating Units or System Resources, will not be subject to Non-Availability Charges or Availability Incentive Payments. Such contracted Resource Adequacy Capacity, except for non-Resource-Specific System Resources, will be included in the development of Availability Standards and will be subject to any Outage reporting requirements necessary for this purpose. The exemption will apply only for the initial term of the contract and to the MW capacity

quantity and Resource Adequacy Resources specified in the contract prior to June 28, 2009. The exemption shall terminate upon the conclusion of the initial contract term. Exempt contracts may be re-assigned or undergo novation on or after June 28, 2009, but the exemption shall not apply for any extended contract term, increased capacity quantity or additional resource(s) beyond those specified in the contract prior to June 28, 2009, except as provided in Section 40.9.2(7) or 40.9.2(8). Scheduling Coordinators for Resource Adequacy Resources subject to these contracts will be required to certify the start date of the contract, the expiration date, the Resource ID(s), and the amount of Resource Adequacy Capacity associated with each Resource ID included in the contract. For Resource Adequacy Resources whose Qualifying Capacity value is determined by historical output, the capacity under a resource specific power supply contract or Resource Adequacy Capacity that was procured under a contract that was either executed or submitted to the applicable Local Regulatory Authority for approval that meets the requirements in this subsection (2) will not be subject to Non-Availability Charges or Availability Incentive Payments, except that the deadline date for either type of contract shall be August 22, 2010 instead of June 28, 2009.

(2) For a contract entered into prior to June 28, 2009 that provides for the amount of Resource Adequacy Capacity to increase during the original term of the contract, based on a ratio of the Resource Adequacy Resource's output or due to an addition of capacity, the exemption provided in subsection (2) of this Section 40.9.2 will apply to the additional capacity allowed under the contract; provided that the capacity increase (i) is expressly contained in the provisions of the contract, (ii) occurs during the primary term of the contract; and (iii) does not result from contract extensions or other amendments to the original terms and conditions of the contract, except as provided in Section 40.9.2(7) or 40.9.2(8). Scheduling Coordinators for Resource Adequacy Resources subject to contracts that provide for such capacity increases or additions must include in their certification, in addition to the requirements of subsection (2) of this Section 40.9.2, (i) the citation to any contract provisions that might entitle them to increased exempt Resource

Adequacy Capacity from the contracted resources during the primary term of the contract; (ii) the amount of additional capacity to which they might be entitled; and (iii) the actual effective date of the capacity increase. If the actual amount of capacity and/or the actual effective date of the capacity increase is not known at the time of the initial certification, the Scheduling Coordinator shall provide a supplemental certification(s) when this information becomes known. For Resource Adequacy Resources whose Qualifying Capacity value is determined by historical output the exemption provided in subsection (2) of this Section 40.9.2 will apply to an increase in the capacity under a resource specific power supply contract or Resource Adequacy Capacity that was procured under a contract that was either executed or submitted to the applicable Local Regulatory Authority for approval that meets the requirements in this subsection (3), except that the deadline date for either type of contract to be exempt shall be August 22, 2010 instead of June 28, 2009.

Part 2 – Legacy RA Substitute Capacity Provisions

Notwithstanding any other provisions of the CAISO Tariff, the following provisions apply to Outages on RA Resources taken in June 2021. In all other respects, the CAISO Tariff, including the provisions of Sections 9 and 40 not covered in this Appendix J, apply to Outages on RA Resources taken in June 2021.

9.3.1.3 Coordinating Outages of RA Resources

In performing outage coordination management under Section 9, and this Section 9.3.1.3, the CAISO may take into consideration the status of a Generating Unit as a Resource Adequacy Resource, including whether it is Listed Local RA Capacity. The CAISO may deny, reschedule or cancel an Approved Maintenance Outage for facilities that comprise the CAISO Controlled Grid or Generating Units of Participating Generators if it determines that the outage is likely to have a detrimental effect on the availability of Resource Adequacy Capacity or the efficient use and reliable operation of the CAISO Controlled Grid or the facilities of a Connected Entity.

9.3.1.3.1 [Not Used]

9.3.1.3.2 [Not Used]

9.3.1.3.3 Substitution Opportunity for RA Resources

To the extent that a resource is committed to provide Resource Adequacy Capacity during a month, the Scheduling Coordinator for the resource may request an RA Maintenance Outage With Substitution, RA Maintenance Outage Without Substitution, Off Peak Opportunity RA Maintenance Outage, or Short-Notice Opportunity RA Outage, or may request to reschedule an Approved Maintenance Outage, for that Resource Adequacy Capacity in accordance with the provisions of this Section. The timelines set forth in this Section for submitting an Outage request and classifying the outage as a Maintenance Outage or a Forced Outage exclude the day that the request is submitted and the day that the outage is scheduled to commence.

9.3.1.3.3.1 RA Maintenance Outage With Substitution

(a) **Substitution Option.** The Scheduling Coordinator of a Resource Adequacy Resource designated as Resource Adequacy Capacity during the resource adequacy month may request that a planned Maintenance Outage be scheduled, or an Approved Maintenance Outage be rescheduled, as an RA Maintenance Outage With Substitution during that month.

(b) **Request.** A request for an RA Maintenance Outage With Substitution must: (i) be submitted to the CAISO no less than eight (8) days prior to the start of the outage; (ii) provide RA Substitution Capacity in an amount no less than the amount of Resource Adequacy Capacity that would be on scheduled outage; and (iii) otherwise comply with the requirements set forth in Section 9.

(c) **Approval.**

(1) The CAISO will consider requests for an RA Maintenance Outage With Substitution in the order that the requests are received.

(2) The CAISO may approve the request for an RA Maintenance Outage With Substitution if it determines that: (i) the request meets the requirements in Section 9.3.1.3.3.1(b); and (ii) system conditions and the overall outage schedule provide an opportunity to take the resource out of service without a detrimental

effect on the efficient use and reliable operation of the CAISO Controlled Grid.

(3) If the request was submitted no less than eight (8) days prior to the start date for the outage, and it meets the requirements in Section 9.3.1.3.3.1(c)(2) the CAISO may approve the request as an RA Maintenance Outage With Substitution.

(4) If the CAISO denies the request for failing to meet the requirements in Section 9.3.1.3.3.1(c)(2), the Scheduling Coordinator for the Resource Adequacy Resource may request a different schedule for the RA Maintenance Outage With Substitution or may request that the CAISO accommodate the outage without RA Substitute Capacity at another time.

(d) **Resource Adequacy Obligation.** The RA Substitute Capacity for an RA Maintenance Outage With Substitution approved under Section 9.3.1.3.3.1(c)(3) shall be subject to all of the availability, dispatch, testing, reporting, verification and any other applicable requirements imposed on Resource Adequacy Resources by the CAISO Tariff, including the must-offer obligations in Section 40.6 and the RAAIM provisions in Section 40.9, for the MW amount and duration of the outage substitution period, which includes the full day of the start date and the full day of the end date of the outage.

9.3.1.3.3.2 RA Maintenance Outage Without Substitution

(a) **Option for No Substitution.** The Scheduling Coordinator for a Resource Adequacy Resource designated as Resource Adequacy Capacity during the resource adequacy month may request that a Maintenance Outage be scheduled, or an Approved Maintenance Outage be rescheduled, as an RA Maintenance Outage Without Substitution, without a requirement to provide RA Substitute Capacity for the unavailable capacity for the duration of the outage to be excluded from the RAAIM calculation under Section 40.9.

(b) **Request.** A request for an RA Maintenance Outage Without Substitution must: (i) be submitted to the CAISO no less than eight (8) days prior to the start date of the outage; and (ii) otherwise comply with the requirements of Section 9.

(c) **Approval.**

(1) The CAISO will consider requests received for an RA Maintenance Outage Without Substitution in the order the requests were received.

(2) The CAISO may approve a request for an RA Maintenance Outage Without Substitution if it determines that: (i) the request meets the requirements in Section 9.3.1.3.3.2(b); (ii) system conditions and the overall outage schedule provide an opportunity to take the resource out of service without a detrimental effect on the efficient use and reliable operation of the CAISO Controlled Grid; and (iii) the outage will not result in insufficient available Resource Adequacy Capacity during the outage period. The analysis of system conditions and the overall outage schedule will include Approved Maintenance Outage requests that were received before and after the request for an RA Maintenance Outage Without Substitution.

(3) The CAISO will not approve a request for an RA Maintenance Outage Without Substitution earlier than seven days before the first day of the resource adequacy month, and may hold the request as pending until system conditions are sufficiently known for the CAISO to determine whether the outage meets the requirements in Section 9.3.1.3.3.2(c)(2).

(4) If the CAISO denies a request for an RA Maintenance Outage Without Substitution for failing to meet the requirements in Section 9.3.1.3.3.2(c)(2), the Scheduling Coordinator for the Resource Adequacy Resource may request an RA Maintenance Outage With Substitution or may request that the CAISO accommodate the outage at another time.

9.3.1.3.3.3 Off-Peak Opportunity RA Maintenance Outage

(a) **Option for Off-Peak Outage.** The Scheduling Coordinator for a Resource Adequacy Resource designated as Resource Adequacy Capacity during the resource adequacy month may submit a request for an Off-Peak Opportunity RA Maintenance Outage without a requirement to provide RA Substitute Capacity for the unavailable capacity for

the duration of the outage to be excluded from the RAAIM calculation under Section 40.9.

(b) **Request.** A request for an Off-Peak Opportunity RA Maintenance Outage must: (i) be submitted to the CAISO no less than eight (8) days prior to the start date for the outage; (ii) schedule the outage to begin during off-peak hours (as specified in the Business Practice Manuals) on a weekday, and to be completed prior to on-peak hours (as specified in the Business Practice Manuals) the following weekday, or to begin during off-peak hours (as specified in the Business Practice Manuals) on Friday, or on Saturday, Sunday, or a holiday, and to be completed prior to on-peak hours (as specified in the Business Practice Manual) on the next weekday; and (iii) otherwise comply with the requirements set forth in Section 9.

(c) **Approval.**

(1) The CAISO will consider requests for an Off-Peak Opportunity RA Maintenance Outage in the order the requests were received.

(2) If the request was submitted no less than eight (8) days prior to the start date for the outage, the CAISO may approve the request as an Off-Peak Opportunity RA Maintenance Outage if it determines that: (i) the request meets the requirements set forth in Section 9.3.1.3.3.3(b); and (ii) system conditions and the overall outage schedule provide an opportunity to take the resource out of service without a detrimental effect on the efficient use and reliable operation of the CAISO Controlled Grid.

(3) If the CAISO denies a request for an Off-Peak Opportunity RA Maintenance Outage for failing to meet the requirements in Section 9.3.1.3.3.3(c)(2), the Scheduling Coordinator for the Resource Adequacy Resource may request an RA Maintenance Outage With Substitution or may request that the CAISO accommodate the outage at another time.

(4) To the extent that an approved Off-Peak Opportunity RA Maintenance Outage is not completed during off-peak hours as scheduled, and extends into on-peak hours, the Scheduling Coordinator for the resource shall submit the portion of the

outage that extends into on-peak hours as a new Forced Outage, which shall be subject to the RAAIM provisions in Section 40.9.

9.3.1.3.3.4 Short-Notice Opportunity RA Outage

(a) **Option for Short-Notice Outage.** The Scheduling Coordinator for a Resource Adequacy Resource designated as Resource Adequacy Capacity during the resource adequacy month may submit a request for a Short-Notice Opportunity RA Outage without a requirement to provide RA Substitute Capacity for the Resource Adequacy Capacity that will be on the Forced Outage to be excluded from the RAAIM calculation under Section 40.9.

(b) A Short-Notice Opportunity RA Outage shall not exceed five days in length. The request for a Short-Notice Opportunity RA Outage must: (i) be submitted no more than seven (7) days prior to the requested start date for the outage; (ii) provide the CAISO adequate time to analyze the request before the outage begins; (iii) be submitted before the outage has commenced as a Forced Outage; and (iv) otherwise comply with the requirements of Section 9.

(c) **Approval.**

(1) The CAISO will consider Short-Notice Opportunity RA Outages in the order the requests are received.

(2) If the request was submitted no more than seven days and no less than four days prior to the start date of the outage, the CAISO may approve the request as a Short Notice Opportunity RA Outage if it determines that: (i) the outage and the request meet the requirements set forth in Section 9.3.1.3.3.4(b); (ii) system conditions and the overall outage schedule provide an opportunity to take the resource out of service without a detrimental effect on the efficient use and reliable operation of the CAISO Controlled Grid; and (iii) the outage will not result in insufficient available Resource Adequacy Capacity during the outage period. The approved outage will be a Forced Outage and will not be subject to the

RAAIM provisions in Section 40.9.

(3) If the request was submitted three days or less prior to the start date of the outage, the CAISO may approve the request as a Forced Outage if it determines that: (i) the outage and request meet the requirements set forth in Section 9.3.1.3.3.4(b); (ii) system conditions and the overall outage schedule provide an opportunity to take the resource out of service without a detrimental effect on the efficient use and reliable operation of the CAISO Controlled Grid; (iii) the outage will not result in insufficient available Resource Adequacy Capacity during the outage period; and (iv) the repairs are necessary to maintain system or resource reliability and require immediate attention to prevent equipment damage or failure. A Short-Notice Opportunity RA Outage approved under this Section will be a Forced Outage and will not be subject to the RAAIM provisions in Section 40.9.

(4) To the extent that an approved Short-Notice Opportunity RA Outage is not completed during the originally approved outage schedule, the Scheduling Coordinator for the resource must submit the portion of the outage that continues from the approved completion time until the time the outage is actually completed as a new Forced Outage, which will be subject to the RAAIM provisions in Section 40.9.

9.3.1.3.4 Outage Reporting for Resource Adequacy Resources between 1 MW and 10 MW

Scheduling Coordinators or Resource Adequacy Resources with a PMax of at least one (1) MW but less than 10 MWs that do not meet the requirement to provide information on Forced Outages in accordance with Section 9.3.10 shall report Outages in accordance with the process set forth in the Business Practice Manual.

40.9.3.4 Treatment of Outages

(a) **RA Substitute Capacity Not Required.** The RAAIM Availability Assessment for a Resource Adequacy Resource excludes the capacity, duration, and must-offer requirements for Resource Adequacy Capacity on an Outage during the Resource

Adequacy month that does not require RA Substitution Capacity under Section 9.3.1.3.3.

(b) **RA Substitute Capacity Required and Provided.** For each Outage that requires RA Substitute Capacity under Section 40.9.3.6 to avoid imposition of RAAIM charges –

(1) the RAAIM Availability Assessment for the resource excludes the capacity, duration, and must-offer requirement for Resource Adequacy Capacity on outage to the extent the resource provides RA Substitute Capacity for that outage as required under Section 40.9.3.6; and

(2) the RAAIM Availability Assessment for the substitute resource includes the capacity, duration, and must-offer requirement for the RA Substitute Capacity commitment. For each day the substitute resource is committed to provide Flexible RA Capacity and/or RA Substitute Capacity in more than one Flexible Capacity Category, the RAAIM Availability Assessment applies the must-offer obligation for the highest quality Flexible Capacity Category to the total MWs of the flexible capacity requirement. For the purposes of this Section 40.9, base ramping resources (as defined in section 40.10.3.2) are considered to be a higher quality of Flexible Capacity Category than either peak ramping resources (as defined in section 40.10.3.3) or super-peak ramping resources (as defined in section 40.10.3.4). Additionally, peak ramping resources (as defined in section 40.10.3.3) are considered to be a higher quality of Flexible Capacity Category than super-peak ramping resources (as defined in section 40.10.3.4).

(c) **RA Substitute Capacity Required not Provided.** For each Outage that requires RA Substitute Capacity under Section 40.9.3.6 to avoid imposition of RAAIM charges, the RAAIM Availability Assessment for the resource includes the capacity, duration, and must-offer requirement for Resource Adequacy Capacity on an outage to the extent the resource does not provide RA Substitute Capacity for the outage as required under Section 40.9.3.6.

(d) **Exclusions from RAAIM for certain Outage types.** The RAAIM Availability Assessment excludes the capacity, duration, and must-offer requirement for local and/or

system Resource Adequacy Capacity or Flexible RA Capacity on an Outage in a nature of work category specified in the Business Practice Manual that relates to: (i) an administrative action by the resource owner; (ii) a cause outside of the control of the resource owner, (iii) or a short-term use limitation; or (iv) a non-Run-of-River Resource hydroelectric Generating Unit's management of water-related operational or regulatory limitations. Through the December 31, 2020, Trading Day, item (iv) of this Section 40.9.3.4(d) applies only to a hydroelectric Generating Unit that has limited the capacity it has shown on the monthly Supply Plan corresponding to the day of the Outage to reflect historical hydrological conditions or actual hydrological conditions in 2020. The limitations based on hydrological conditions must be mutually agreed upon with the unit's Scheduling Coordinator and the CAISO. Starting with the January 1, 2021, Trading Day, item (iv) of this Section 40.9.3.4(d) applies only to a hydroelectric Generating Unit whose Qualifying Capacity was established pursuant to a CPUC or Local Regulatory Authority methodology under which the Qualifying Capacity is calculated to reflect historical hydrological conditions.

(e) **Derates on Generating Units Providing system RA Capacity and Listed Local RA Capacity.** If a Generating Unit providing both system RA Capacity and Listed Local RA Capacity is on Forced Outage, then for purposes of RAAIM and RA Substitute Capacity the quantity of the Forced Outage will be apportioned first to the system RA Capacity provided from that Generating Unit. If the quantity of the Forced Outage exceeds the quantity of system RA Capacity provided by the Generating Unit, then the remainder of the Forced Outage shall be apportioned to the Listed Local RA Capacity provided by the Generating Unit.

40.9.3.5 [Not Used]

40.9.3.6 Substitute Capacity

40.9.3.6.1 CAISO Evaluation by T-22 of Need for Substitute Capacity for Outages Submitted by T-25

No later than 22 days before the start of each month, the CAISO will determine for each day in that month

whether it will have sufficient operationally available RA Capacity from a combination of Local Capacity Area Resources and system capacity resources to meet or exceed the CAISO system RA Reliability Margin for each day. The CAISO will base this assessment on Maintenance Outages planned to be taken during the month that were submitted at least 25 days before the start of the month and any RA Substitute Capacity already provided to the CAISO for that month.

If the CAISO determines that it will have sufficient operationally available RA Capacity to meet or exceed the CAISO system RA Reliability Margin for a particular day, then no supplier with an outage submitted at least 25 days before the start of the month would be required to provide RA Substitute Capacity to be excluded from the RAAIM calculation as part of the analysis conducted no later than 22 days before the start of each month.

If the CAISO determines that it will not have sufficient operationally available RA capacity to meet the CAISO system RA Reliability Margin for a particular day, then it will determine which resources must provide RA Substitute Capacity to be excluded from the RAAIM calculation based on the reverse order of the dates on which the resources submitted the outage requests to the CAISO. The CAISO will first request the resource providing RA Capacity with the most-recently-requested outage for that day to provide RA Substitute Capacity and then will continue to assign substitution opportunities until the CAISO has sufficient operationally available RA Capacity to meet the CAISO system RA Reliability Margin for that particular day, assuming that all resources that are assigned a RA Substitute Capacity obligation actually provide RA Substitute Capacity for that day.

For purposes of this section 40.9.3.6.1, the CAISO will treat any request to extend the scheduled duration of an outage or increase the MW amount of capacity on outage as a new outage request and will assign a new priority date based on when the request to change the outage or derate was submitted to the CAISO. For the purposes of this section 40.9.3.6.1, the CAISO will not assign a new priority date where the Scheduling Coordinator requests to reduce the scheduled duration of an outage or decrease the MW amount of capacity on outage.

A resource designated to provide RA Substitute Capacity as part of the analysis conducted no later than 22 days before the start of each month must designate RA Substitute Capacity by the deadline specified in the relevant Business Practice Manual. Failure to designate the RA Substitute Capacity by the

specified deadline will subject the resource to RAAIM unless the outage is cancelled or rescheduled.

40.9.3.6.2 CAISO Rolling Evaluation of Need for Substitute Capacity for Outages Submitted after T-25

Starting at twenty-four days before the start of a month, the CAISO will consider submitted Maintenance Outages for a substitution requirement on a rolling basis, based on time of submission. Upon submission of the outage request, the CAISO will determine for each day of the outage whether the CAISO will have sufficient operationally available RA Capacity from a combination of Local Capacity Area Resources and system capacity resources to meet or exceed the CAISO system RA Reliability Margin for each day. The CAISO will base this assessment on Maintenance Outages planned to be taken for that day and any RA Substitute Capacity already provided to the CAISO for that day.

If the CAISO determines that it will have sufficient operationally available RA Capacity to meet or exceed the CAISO system RA Reliability Margin for a particular day, then the supplier will not be required to provide RA Substitute Capacity for that day to avoid imposition of RAAIM.

If the CAISO determines that it will not have sufficient operationally available RA capacity to meet the CAISO system RA Reliability Margin for a particular day, then it will request substitution for the resource for that day. Failure to designate RA Substitute Capacity by the deadline specified in the relevant Business Practice Manual will subject the resource to RAAIM unless the outage is cancelled or rescheduled.

The CAISO will not conduct an assessment to determine the need to provide RA Substitute Capacity for Forced Outages. Any such outage, irrespective of whether the resource is providing RA Capacity or Flexible RA Capacity, will be subject to applicable RAAIM unless the Scheduling Coordinator for the resource provides Substitute Capacity by the deadline specified in the relevant Business Practice Manual, the outage is exempt from RAAIM as set forth in Section 9 or Section 40, the outage is cancelled, or the outage is rescheduled.

For purposes of this section 40.9.3.6.2, the CAISO will treat any request to extend the scheduled duration of an outage or increase the MW amount of capacity on outage as a new outage request and will assign a new priority date based on when the request to change the outage or derate was submitted to the CAISO.

For purposes of this section 40.9.3.6.2, the CAISO will reevaluate the need for a Scheduling Coordinator

to provide RA Substitute Capacity where the Scheduling Coordinator requests to reduce the scheduled duration of an outage or decrease the MW amount of capacity on outage but will not assign a new priority date.

40.9.3.6.3 General Provisions on Substitute Capacity

(a) **Substitution**

(1) The Scheduling Coordinator for a Resource Adequacy Resource may provide RA Substitute Capacity for its local and/or system Resource Adequacy Capacity or Flexible RA Capacity on Outage. Certain types of Outages, as defined elsewhere in Section 9 or Section 40, will not subject the Scheduling Coordinator for a Resource Adequacy Resource to RAAIM if it declines to provide RA Substitute Capacity.

(2) If the Resource Adequacy Resource on Outage and the substituting resource do not have the same Scheduling Coordinator, the Scheduling Coordinator for the substituting resource must confirm and approve the proposed substitution in accordance with the process set forth in the Business Practice Manual.

(b) **Availability**

(1) RA Substitute Capacity must be operationally available to the CAISO:

(2) Capacity on, or scheduled to be on, a Forced Outage, Approved Maintenance Outage, or de-rate, is not operationally available and shall not qualify to be RA Substitute Capacity for the duration of the period that it is unavailable.

(3) RMR Capacity, including Legacy RMR Capacity, CPM Capacity, and capacity committed to be Resource Adequacy Capacity in a monthly Supply Plan shall not qualify to be RA Substitute Capacity for the duration of that commitment.

(4) RA Substitute Capacity shall not qualify to be RMR Capacity, including Legacy RMR Capacity, CPM Capacity, or Resource Adequacy Capacity in a monthly Supply Plan, for the duration of the substitution.

(5) If a resource provides RA Substitute Capacity for multiple Resource Adequacy Resources under Section 40.9.3.6.6, the same capacity committed as RA Substitute Capacity for one Resource Adequacy Resource shall not qualify as RA Substitute Capacity for a different Resource Adequacy Resource during the same substitution period.

(6) RA Substitute Capacity will be treated as Resource Adequacy Capacity during the period of substitution for purposes of a Forced Outage or de-rate allocation.

(c) **Timing of Substitution Request**

(1) **Day-Ahead Market.** Requests for substitution for Forced Outages in the Day-Ahead Market must be submitted in accordance with the timeline specified in the Business Practice Manual and be approved by the CAISO to be included in the Day-Ahead Market for the next Trading Day. Requests for substitution for Forced Outages in the Day-Ahead Market submitted at or after the timeline specified in the Business Practice Manual and that are approved by the CAISO will be included in the Day-Ahead Market for the second Trading Day.

(2) **Real-Time Market.** Requests for substitution for Forced Outages in the Real-Time Market must be submitted in accordance with the timeline in the Business Practice Manual.

40.9.3.6.4 RA Substitute Capacity from a Single Source

(a) **Option.** The Scheduling Coordinator for a Resource Adequacy Resource that is on Outage may provide RA Substitute Capacity for that capacity from a single resource.

(b) **Local Capacity Area Resource Substitution**

(1) **Pre-Qualified Substitution.**

(A) **Annual Process.** The CAISO annually will conduct a process to assess the eligibility of resources to pre-qualify as RA Substitute Capacity for Local Capacity Resource Adequacy Resources that potentially could be Listed Local RA Capacity in the time period covered by the process. The CAISO will publish a list of the pre-qualified resources in accordance with

the timeline in the Business Practice Manual.

(B) **Pre-Qualification Requirement.** The CAISO will pre-qualify a resource to provide RA Substitute Capacity that is located at the same bus as, or a compatible bus to, that of the Local Capacity Area Resource Adequacy Resource for which it could substitute.

(C) **Request.** To use a pre-qualified resource in the Day-Ahead Market or Real-Time Market as RA Substitute Capacity, the Scheduling Coordinator for the Local Capacity Area Resource Adequacy Resource on Outage must submit a timely substitution request in accordance with Section 40.9.3.6.3(c).

(D) **Approval.** The CAISO will grant a request that meets the requirements in Sections 40.9.3.6.4(b)(1)(C) and 40.9.3.6.3(b).

(2) **Non-Pre-Qualified Substitution.**

(A) **Day-Ahead Market.** The Scheduling Coordinator for Listed Local RA Capacity on Outage may submit a request to substitute a non-pre-qualified resource only in the Day-Ahead Market.

(B) **Request.** To use a non-pre-qualified resource as RA Substitute Capacity, the Scheduling Coordinator for the Listed Local RA Capacity must submit a timely substitution request in accordance with Section 40.9.3.6.3(c), and the alternate resource must be located in the same Local Capacity Area.

(C) **Approval.** The CAISO will grant a request that meets the requirements in Sections 40.9.3.6.4(b)(2)(A) and (B), and 40.9.3.6.3(b).

(c) **Non-Local Capacity Area Resource Substitution**

(1) **Request.** To use a resource as RA Substitute Capacity, the Scheduling Coordinator for RA Capacity other than Listed Local RA Capacity that has an Outage must submit a timely substitution request in the Day-Ahead Market or Real-Time Market in accordance with Section 40.9.3.6.3(c).

(2) **Approval.** The CAISO will grant the request if the alternate resource has adequate deliverable capacity to provide the RA Substitute Capacity and meets the requirements in Sections 40.9.3.6.4(c)(1) and 40.9.3.6.3(b).

(d) **External Resources**

(1) **Request.** To use a Dynamic System Resource, Non-Dynamic System Resource, NRS-RA Resource, or Pseudo-Tie as RA Substitute Capacity, the Scheduling Coordinator for a Resource Adequacy Resource that has an Outage must submit a timely substitution request in the Day-Ahead Market in accordance with Section 40.9.3.6.3(c).

(2) **Approval.** The CAISO will grant the request if the alternate resource is external to the CAISO Balancing Authority Area (including Pseudo-Ties), the Scheduling Coordinator for the resource has an adequate available import allocation at the resource's Scheduling Point to provide the RA Substitute Capacity, and meets the requirements in Sections 40.9.3.6.4(d)(1) and 40.9.3.6.3(b).

(e) **Flexible RA Capacity**

(1) **Request.** To use a resource as RA Substitute Capacity, the Scheduling Coordinator for the Flexible RA Resource that has a Forced Outage must submit a timely substitution request in the Day-Ahead Market or Real-Time Market in accordance with Section 40.9.3.6.3(c) and specify the MW of RA Substitute Capacity to be provided, which may not exceed the MWs of the outage.

(2) **Approval.** The CAISO will grant the request if the alternate resource has adequate deliverable capacity to provide the RA Substitute Capacity, meets the applicable requirements in Sections 40.9.3.6.4(e) and 40.9.3.6.3(b), and is capable of meeting the must-offer obligation in Section 40.10.6 applicable to the highest quality Flexible Capacity Category for the MWs of the Flexible RA Capacity commitments of the resource on outage and the alternate resource.

40.9.3.6.5 RA Substitute Capacity from Multiple Resources

(a) **Option.** The Scheduling Coordinator for a Resource Adequacy Resource on Outage

may submit a request to substitute that capacity with RA Substitute Capacity from multiple alternate resources, including a resource already providing RA Substitute Capacity for one or more Resource Adequacy Resources.

(b) **Local Capacity Area Resource Substitution**

(1) **Request.** To use RA Substitute Capacity from multiple resources, the Scheduling Coordinator for Listed Local RA Capacity on Outage must submit a timely substitution request in the Day-Ahead Market in accordance with Section 40.9.3.6.3(c) if any of the alternate resources are not pre-qualified to substitute for the resource on the outage; however, if all of the alternate resources are pre-qualified to provide RA Substitute Capacity for that resource, the request may be submitted in the Day-Ahead Market or Real-Time Market.

(2) **Approval.** The CAISO will grant the request if it meets the requirements in Sections 40.9.3.6.5(b)(1) and 40.9.3.6.3(c) and the alternate resources are either pre-qualified, or are not pre-qualified but are located in the same Local Capacity Area as the Resource Adequacy Resource.

(c) **Non-Local Capacity Area Resources**

(1) **Request.** To use RA Substitute Capacity from multiple resources, the Scheduling Coordinator for RA Capacity other than Listed Local RA Capacity on Outage must submit a timely substitution request in the Day-Ahead Market or the Real-Time Market in accordance with Section 40.9.3.6.3(c).

(2) **Approval.** The CAISO will grant the request if all of the alternate resources meet the requirements in Sections 40.9.3.6.5(c)(1) and 40.9.3.6.3(c).

(d) **External Resources**

(1) **Request.** To use multiple Dynamic System Resources, Non-Dynamic System Resources, NRS-RA Resources, or Pseudo-Ties as RA Substitute Capacity, the Scheduling Coordinator for a Resource Adequacy Resource that has an Outage must submit a timely substitution request in the Day-Ahead Market in accordance with Section 40.9.3.6.3(c).

(2) **Approval.** The CAISO will grant the request if the alternate resources are external to the CAISO Balancing Authority Area (including Pseudo-Ties), and the Scheduling Coordinator of each alternate resource has an adequate available import allocation at the resource's Scheduling Point to provide the RA Substitute Capacity, and meet the requirements in Sections 40.9.3.6.5(d)(1) and 40.9.3.6.3(b).

(e) **Flexible RA Capacity**

(1) **Request.** To use RA Substitute Capacity from multiple resources, the Scheduling Coordinator for a resource providing Flexible RA Capacity on a Forced Outage must submit a timely substitution request in the Day-Ahead Market or the Real-Time Market and the alternate resources must be located in the CAISO Balancing Authority Area, which does not include a Pseudo-Tie of a Generating Unit or a Resource-Specific System Resource.

(2) **Approval.** The CAISO will grant the request if the alternate resources meet the requirements in Sections 40.9.3.6.5(e)(1) and 40.9.3.6.3(c).

40.9.3.6.6 Multiple Substitution by One Resource. The Scheduling Coordinator for a resource already providing RA Substitute Capacity may provide RA Substitute Capacity for one or more additional Resource Adequacy Resources on Outage, subject to approval by the CAISO pursuant to Section 40.9.3.6.4 or 40.9.3.6.5.

40.9.3.6.7 Resource Adequacy Obligation

To the extent a resource provides RA Substitute Capacity, the resource must meet and comply with all requirements in Section 40 applicable to RA Substitute Capacity for the duration of the substitution; except that RA Substitute Capacity shall be released from this obligation and the substitution requirements in Section 40.9 –

(a) at the end of the approved substitution period; or

(b) upon request by either the Scheduling Coordinator for the resource on Outage or the Scheduling Coordinator for the substitute resource, and approval by the other Scheduling Coordinator, in accordance with the process set forth in the Business Practice Manual.

40.9.3.6.8 Treatment of Unbid Capacity

If the Scheduling Coordinator for RA Substitute Capacity does not submit Bids or Self-Schedules for all or a portion of that capacity in accordance with Section 40.6 or 40.10.6, the CAISO –

(1) will treat the unbid capacity as unavailable for purposes of Section 40.9; and

(2) will reflect that unavailability in the RAAIM availability calculation for the Resource Adequacy Resource providing the RA Substitute Capacity.

40.9.3.6.9 Substitution Opportunity Information

In order to make information available to Market Participants pertinent to the provisions of this Section 40.9.3.6, the CAISO will:

(a) Annually post on the CAISO Website the due dates for each month of the following Resource Adequacy compliance year the various submissions the CAISO requires under the Resource Adequacy program; and

(b) Provide the opportunity for Market Participants to post and view information on an electronic bulletin board about non-Resource Adequacy Capacity that may be needed or available as RA Substitute Capacity in the bilateral market. Use of the bulletin board is voluntary and is for informational purposes only.

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.

- RA Maintenance Outage With Substitution

A Maintenance Outage, or change to an Approved Maintenance Outage, at a Resource Adequacy Resource that the CAISO receives no less than eight (8) days prior to the start of the outage and that includes RA Substitute Capacity for the Resource Adequacy Capacity on Outage.

- RA Maintenance Outage Without Substitution

A Maintenance Outage, or change to an Approved Maintenance Outage at a Resource Adequacy Resource that the CAISO receives no less than eight (8) days prior to the start of the outage without RA

Substitute Capacity for the Resource Adequacy Capacity on Outage.

Attachment C

Resource Adequacy Enhancements Final Proposal – Phase 1

Tariff Amendment to Implement the Resource Adequacy Enhancements Phase 1 Initiative – Summer 2021 Provisions

California Independent System Operator Corporation

March 29, 2021

Resource Adequacy Enhancements
Final Proposal - Phase 1

February 17, 2021

Updated March 23, 2021, to reflect changes to the Minimum State of Charge proposal

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1. Executive Summary

Since October 2018, the California Independent System Operator Corporation (CAISO) has been reviewing the CAISO's Resource Adequacy (RA) tariff provisions comprehensively through the RA Enhancements stakeholder initiative. The objective of this on-going effort is to ensure the CAISO's resource adequacy 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. This comprehensive review has identified the need for several significant modifications to the CAISO's RA tariff provisions that affect System, Local, and Flexible RA needs, obligations, and requirements.

Throughout this initiative, the CAISO has highlighted key RA program features and elements that should change or be refined given the evolving needs of grid. The load-shed events of August 2020 illuminated these challenges and support the CAISO's on-going comprehensive review of the resource adequacy program. To this end, the CAISO believes the set of elements in this initiative will help address these growing challenges and close important gaps in the existing RA program, and, once implemented, will help ensure a more stable and reliable transition to a decarbonized grid.

This final proposal includes phase 1 elements of the resource adequacy enhancements initiative.[1] The final proposal represents those key elements that are finalized and scheduled for Board approval in March 2021. The final proposal includes refinements to the existing planned outage process, a minimum state of charge requirement for storage resources, and backstop procurement authority for local energy sufficiency. Other RA enhancements elements require additional vetting, including proposals on unforced capacity (UCAP) evaluations, minimum system RA requirements, system RA showings and sufficiency testing, must offer obligations, RA import provisions, local RA under a UCAP construct, and other backstop capacity procurement provisions. These elements are not included in this final proposal and will be advanced in future iterations.

Final Proposal- Phase 1

The CAISO is proposing several changes to the existing planned outage provisions and the planned outage process. Throughout this stakeholder process, the CAISO considered various proposals for modifying the planned outage process that had varying degrees of stakeholder support. In response to stakeholder feedback, the CAISO proposes several changes intended to provide higher assurance that planned outages scheduled by 45 days prior to the month actually can be taken when scheduled. This final proposal includes an interim planned outage process that requires substitution for all planned outages. Under this proposal, the CAISO retains its full discretion to grant or deny all opportunity outages. Future enhancements to the resource adequacy rules will consider a longer term solution that accounts for the need for planned outages in the upfront procurement and eliminates the need for all planned outage substitution. Based on feedback from stakeholders on the Draft Final Proposal, the CAISO has

[1] Follow on draft final proposal for Phase 2 elements are forthcoming as the policy elements in the sixth revised straw proposal are finalized.

provided specific responses to several stakeholder objections and provided additional clarity to the proposal as requested.

The CAISO also includes a proposal for a minimum state of charge requirement, which will ensure that on critical days, storage resources providing RA capacity are sufficiently charged in the real-time market to meet day-ahead discharge schedules when storage resources are needed to meet the evening net-load peak.

Finally, the CAISO is adding an element to its local capacity technical study criteria to capture local area energy sufficiency needs and expanding its backstop capacity procurement authority to fill any identified uncured deficiencies in meeting that new criterion.

2. Introduction and Background

The rapid transformation to a cleaner, yet more variable and energy limited resource fleet, and the migration of load to smaller and more diverse load serving entities requires re-examining all aspects of the CAISO's Resource Adequacy program. In 2006, at the onset of the RA program in California, the predominant energy production technology types were gas fired, nuclear, and hydroelectric resources. While some of these resources were subject to use-limitations because of environmental regulations, start limits, or air permits, they were generally available to produce energy when and where needed given they all had fairly dependable fuel sources. However, as the fleet transitions to achieve the objectives of SB 100,[2] the CAISO must rely on a very different resource portfolio to reliably operate the grid.

Further, grid conditions during the August 2020 heat wave demonstrate the RA program must be reformed to ensure capacity is available during the net demand peak period when solar resources are absent. In this stakeholder initiative, the CAISO, in collaboration with the California Public Utilities Commission (CPUC) and stakeholders, explored reforms needed to the CAISO's resource adequacy rules, requirements, and processes to ensure continued reliability and operability under the transforming grid.

The CAISO has identified certain aspects within the CAISO's current RA tariff authority that, among other things, require refinement to ensure effective procurement, help simplify overly complex rules, and ensure resources are available when and where needed all hours of the year. The following issues are of growing concern to the CAISO:

- Current RA counting rules do not adequately reflect resource availability, and instead rely on complicated substitution and availability incentive mechanism rules;
- Flexible capacity counting rules do not sufficiently align with operational needs;

[2] The objective of SB 100 is "that eligible renewable energy resources and zero-carbon resources supply 100% of retail sales of electricity to California end-use customers and 100% of electricity procured to serve all state agencies by December 31, 2045."
https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180SB100

- Provisions for import resource adequacy resources should ensure physical capacity and firm delivery from such resources;
- Current system and flexible RA showings assessments do not consider the overall effectiveness of the RA portfolio to meet the CAISO's operational needs;
- Current planned outage substitution rules leave resource SCs and the CAISO unclear of substitution needs until after monthly RA showings;
- Increased levels of energy storage necessitate assurance of a minimum level of stored energy available during the net load evening peak to meet operational needs; and
- Growing reliance on availability-limited resources when these resources may not have sufficient run hours or dispatches to maintain and serve the system reliably and meet energy needs in local capacity areas and sub-areas.

The CAISO has conducted a holistic review of its existing RA tariff provisions to make necessary changes to ensure CAISO's RA tariff authority adequately supports reliable grid operations into the future. Through the RA enhancements stakeholder process, the CAISO developed the proposals within this final proposal to address some of these concerns and ensure the CAISO's resource adequacy rules guide the procurement of capacity that can reliably meet system needs. Other elements within the RA enhancements initiative to be finalized in future iterations address the remaining concerns.

3. Resource Adequacy Enhancements Principles and Objectives

3.1 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, 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 effective. 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' Net Qualifying Capacity (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 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)."[3] In other words, resource adequacy also encompasses LSEs meeting their load requirements all hours of the year, not just meeting peak demand.

3.2 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

[3] 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.

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 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 seeks to remain aligned with the CPUC process. However, CAISO notes that solely relying on an installed-capacity-based PRM as the basis for resource adequacy, as is the case today, is not sustainable into the future given the transforming grid and the operational characteristics of the new resource mix.

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.

4. Stakeholder Engagement Plan

Table 1 outlines the schedule for this stakeholder initiative below. The CAISO plans to seek CAISO board approval on phase one elements in this RA Enhancements initiative in March 2021, and phase two elements in September and November 2021. This schedule has been modified from the last iteration to provide additional time to engage with stakeholders and the CPUC and to align the schedule with the upcoming Maximum Import Capability Enhancements initiative for the RA import topic and provide additional analysis to support UCAP and the UCAP-related topics.

Phase 1

March 2021 Board of Governors

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

Phase 2 (Fall 2022 for RA year 2023)

September 2021 Board of Governors (Phase 2A)

- Unforced capacity evaluations
- Determining system RA requirements
- System RA showings and sufficiency testing – individual assessments
- Must offer obligations and bid insertion modifications
- UCAP for local studies
- Backstop capacity procurement – CPM modifications and availability penalty structure for RMR resources
- Planned outage process enhancements – phase 2
- System RA showings and sufficiency testing - portfolio assessment
- Flexible resource adequacy

November 2021 Board of Governors (Phase 2B)

- RA Import requirements -The timeline for this element of the RA Enhancements initiative will be aligned with the upcoming Maximum Import Capability (MIC) Enhancements initiative.

Table 1: Stakeholder Engagement Plan

Date	Milestone
Feb 17 2021	**Final Proposal – Phase 1**
Feb 23 2021	Stakeholder meeting on Final Proposal – Phase 1
Mar 9 2021	Stakeholder comments on Final Proposal
Mar 24 – 25 2021	**Present proposal on Phase 1 elements to CAISO Board**
Apr 2021	**Seventh Revised Straw Proposal - Phase 2A & B**
Apr 2021	Stakeholder meeting on Seventh Revised Straw Proposal Phase 2 A & B
Apr 2021	Stakeholder comments on Seventh Revised Straw Proposal – Phase 2 A & B
June 2021	**Draft Final Proposal – Phase 2A**
June 2021	Stakeholder Meeting on Draft Final Proposal – Phase 2A
June 2021	Stakeholder Comments on Draft Final Proposal – Phase 2A
Aug 2021	**Final Proposal – Phase 2A**

Aug 2021	Stakeholder meeting on Final Proposal – Phase 2A
Aug 2021	Stakeholder comments on Final Proposal
Sept 2021	**Present proposal on Phase 2A elements to CAISO Board**
Sept 2021	**Draft Final Proposal – Phase 2B**
Sept 2021	Stakeholder Meeting on Draft Final Proposal – Phase 2B
Oct 2021	**Final Proposal – Phase 2B**
Oct 2021	Stakeholder meeting on Final Proposal – Phase 2B
Oct 2021	Stakeholder comments on Final Proposal
Nov 2021	**Present proposal on Phase 2B elements to CAISO Board**

5. RA Enhancements Final Proposal – Phase 1

The following sections detail the CAISO's final proposal on Phase 1 enhancements to the resource adequacy program and provide the CAISO's rationale and supporting justification. The CAISO has organized the final proposal into sections covering System RA and related sub topics, and a section covering proposed modifications to the CAISO's backstop procurement provisions.

The RA Enhancements Final Proposal – Phase 1 covers the following topics. This list also includes a summary of major changes from previous proposals:

- System Resource Adequacy
    - Planned Outage Process Enhancements
        - Modifications – Provides additional detail on planned outage substitution requirements.
    - Operationalizing Storage Resources
        - Modifications – States MSOC is a temporary solution with sunset date and commitment of new stakeholder initiative to develop storage enhancements to replace MSOC. Finalizes under what conditions the CAISO will impose the minimum charge requirement on RA storage devices.
- Backstop Capacity Procurement Provisions
    - Capacity Procurement Mechanism Modifications
        - Modifications – Provides additional detail on information in the local capacity technical studies that inform local energy sufficiency evaluation.

5.1 System Resource Adequacy

5.1.1 Planned Outage Process Enhancements

The CAISO is proposing to modify its planned outage provisions. The CAISO describes proposed changes to its planned outage provisions in the following section and provides relevant background on the current provisions.

Proposed Changes from the Previous Version

The CAISO has made several modifications and clarifications from the draft final proposal. Specifically, the CAISO has provided specific responses to stakeholder objections to the planned outage substitution requirement. Additionally, the CAISO has made the additional clarifications:

- The planned and forced outage definitions are the same as those currently used today;
- It will not propose grandfathering of conditionally approved planned outages or allowance for partial substitution;

- Substitution is the obligation of the resource SC (not the LSE showing the resource), will be required only for the MWs on outage and must come from a specified resource(s) ID(s), not the whole resources;
- The proposal applies to all months, starting Summer 2021, and sunsetting once the long-term solution is in place.

Stakeholder feedback

In the fourth revised straw proposal, the CAISO put forward two new planned outage processes based on stakeholder proposals[4] to facilitate outage coordination and provide the greatest certainty regarding the timing of planned outages to both the CAISO and resource SCs. Option 1 established a planned outage reserve margin for off-peak months. Option 2 established a replacement marketplace conducted by the CAISO. Stakeholder feedback on these options was generally divided between the two options.

Many stakeholders, including SCE, Calpine, MRP, CalCCA, and Wellhead offer some level of support for Option 1.[5] The basis for support includes the simplicity offered by Option 1, the fact that this option improves capacity price transparency by removing any embedded costs to cover planned outage replacement, and that Option 1 eliminates any incentive to withhold excess capacity from the bilateral capacity market. Alternatively, SDG&E, CPUC staff, DMM, and Public Advocates Office offered some level of support for Option 2. In their view, Option 2 applies more direct cost causation for the resources taking the planned outages and offers more of a market based solution.

In the fifth revised straw proposal, the CAISO proposed to develop a planned outage reserve margin. The stakeholder community was split on this matter. On an initial review, the CAISO determined that this division was indicative of general lack of support for the planned outage reserve margin. As a result, the CAISO, in the September 17, 2020 working group meeting foreclosed this option, instead focusing on rules that require substitution for all RA resources. In comments on the workgroup, several stakeholders' clarified their comments to note that their opposition to the planned outage reserve margin was based, in part, on the CAISO's proposed prohibition on planned outages during the summer months.

Based on the CAISO research and overall stakeholder feedback, the CAISO proposed a two-phase approach to planned outage substitution in the Draft Final Proposal. First, the CAISO proposes to implement an immediate requirement for summer 2021 that all planned outages for RA resources must bring full substitute capacity for the outage to be approved. In a second phase, the CAISO will consider a longer-term proposal for a planned outage resource pool concept effective starting with RA year 2023. Also, in response to some stakeholders' concerns, the CAISO will explore the possibility of allowing planned outages during the summer

[4] In addition to these two proposals, the CAISO also explored numerous other options in prior straw proposals. However, given stakeholder feedback, the CAISO is currently only evaluating the two most recent options.
[5] SCE did not oppose the CAISO proposal, but had questions regarding the definition of a planned outage.

months, when and if operationally appropriate in phase two of this initiative.[6] The details of the CAISO's phase one proposed process changes are provided below.

With the a few exceptions, including CPUC staff, Wellhead, and LS Power, stakeholders generally opposed the CAISO's planned outage substitution requirement. The basis for these objections fell into four general headings:

1) There is sufficient excess non-RA capacity and substitution is not needed
2) There is no substitute capacity available
3) Requiring planned outage substitution incentivizes capacity withholding
4) The proposal will not incrementally improve reliability

There were minor objections/preferences with respect to the CAISO's proposed treatment of planned outage extension requests, but virtually all those objections stemmed from the same arguments as the proposed replacement obligation.

Some stakeholders sought additional clarity. Requests for clarity include questions about what entity is responsible for showing the substitute capacity and when that information must be submitted. Additionally, CDWR asks the CAISO if the substitution obligation is for 100 percent of the planned outage or if there is room for partial substitution. This additional clarity is provided in the body of the CAISO's proposal.

In response to stakeholder comments, the CAISO does not believe that the presence of non-RA capacity or the lack of substitute capacity should relieve an RA resource of its obligation to be available to the CAISO. To the contrary, to avoid leaning on and/or over-reliance on non-RA capacity, and potential CPM designations, an RA resource should provide substitute capacity when it takes a planned outage. The planning reserve margin is 15 percent above 1-in-2 forecasted peak load for all months,[7] and the current planning reserve margin does not account for capacity unavailable due to planned outages. To ensure there is sufficient capacity available to maintain adequate RA capacity in each month, substitution is necessary.

Additionally, if there is another resource available when an RA resource wants to take a planned outage, then that resource should be the one shown for RA or at least compensated for stepping in for another resource. Ultimately, providing RA is a commitment to be available to the CAISO. If a resource is unable to do so, it should have an obligation to find another resource that will, or not be shown as RA in that month. If, as many stakeholders have pointed out, there is abundant capacity available during off-peak months, then finding substitute capacity should be fairly straightforward and relatively inexpensive. Similarly, the lack of available substitute capacity suggests that the resource's SC either submitted the request after other resources had submitted planned outages or that forecasted load conditions dictate that

[6] Details regarding other options the CAISO considered, including the CAISO creating a planned outage replacement market, and the reasons the CAISO is no longer considering those options are contained in prior straw proposals.

[7] Other ISO's allow for RA resources to take planned outage in off-peak months without substitution requirements because there is excess RA capacity relative to forecasted needs due to the seasonal or annual nature of those RA programs.

the resource is needed and should try to schedule the outage at a different time. As California learned in August and September 2020, demand can change significantly between the current POSO assessment window and actual operations. Other ISO's hold to a similar principle for RA resources during peak load months. For example PJM prohibits planned outages for RA resources during peak months to ensure adequate RA capacity is always available.

The CAISO understands that both POSO and RAAIM create incentives to hold capacity out of the bilateral capacity market to mitigate potential penalties and denied planned outages. As noted in the "Objectives and Principles" section below, the CAISO's ultimate policy goal is to eliminate bad incentives. However, in the interest of immediate reliability needs, the CAISO must balance these incentives against the probability that a planned outage without substitute capacity could leave the CAISO with insufficient capacity. At this time, and on balance, the CAISO believes that ensuring adequate RA capacity is always available outweighs any potential more incremental withholding beyond that which already exists. However, the CAISO will continue developing the long term solution as part of Phase two of this stakeholder process that will eliminate these incentives.

Finally, some stakeholders have asserted that the CAISO's proposal will not provide any incremental reliability benefit for the summer of 2021. The CAISO disagrees. Even though some of the outages for summer 2021 have been requested and conditionally approved, the POSO process has not taken place. The CAISO's proposal provides significant clarity to those resources wanting to take planned outages that they should line up substitute capacity now or consider rescheduling those outages. The CAISO, through this proposal, is signaling to these resources that they now know that substitute capacity will be needed. Instead of 20 days of notice, the CAISO is providing several months of notice to find substitute capacity.

In addition to considering stakeholder feedback, the CAISO looked to other ISOs/RTOs for guidance on how they have approached this issue. Based on the CAISO's review of other ISOs/RTOs, CAISO is uniquely situated. More specifically, the CAISO's planned outage options are constrained by the monthly nature of the RA program. All other ISOs/RTOs conduct RA procurement annually, with some having seasonal differentiation. Additionally, other ISOs/RTOs can require up to two years of notice for planned outages. This allows the ISOs/RTOs to include those planned outages in its LOLE studies when conducting annual capacity procurement. Because other LSEs have much greater visibility into the RA obligations of resources, the planned outage procedures are much cleaner. In contrast, the CAISO does not know which resources will be RA resources until 45 days prior to the RA compliance month. This timeline creates a complicated overlap between the CAISO's planned outage and RA processes. To the greatest extent possible, the CAISO will attempt to mitigate this overlap.

Stakeholders continue to comment on the CAISO's view that, depending on circumstances, a generator can violate the tariff if it submits a forced outage after the CAISO has already rejected the same outage previously submitted as a maintenance outage. This topic of "planned-to-forced" outage reporting has been the subject of even more attention given the recent appeal to the CAISO executive appeals committee of a CAISO revision to the business practice manual

for outage management.[8] The committee's decision directed staff to consider the following as expeditiously as practicable:

> What amendments are necessary in the outage reporting sections of the ISO tariff to further clarify when planned-to-forced outage reporting is prohibited and when it is permitted. Such amendments to consider include, but are not limited to, amendments to the definitions of planned and forced outages, as appropriate. This process also should consider resolving any other potential ambiguities in section 9 of the tariff, as well as consideration of further illumination of the factors used in determining whether to approve or reject a planned outage, whether in the tariff or BPM, as appropriate.[9]

As a result of stakeholder feedback and the appeals committee's decision, the CAISO will address the planned-to-forced outage reporting issue within this RA Enhancements stakeholder process. Specifically, the outage definitions proposed in section 6.1.1 of the Sixth Revised Straw Proposal for Phase 2 will clarify the planned and forced outage definitions and a properly designed UCAP construct will likely eliminate the incentive for market participants to engage in problematic planned-to-forced outage reporting, which in turn, may influence the relevant outage reporting tariff provisions.[10] Due to the relationship between outage reporting and the rest of the RA Enhancements proposal, it is most appropriate to address this issue within this initiative in Phase 2 under the UCAP proposal.

Background

The CAISO's Planned Outage Substitution Obligation (POSO) process is codified in CAISO tariff sections 9.3.1.3 and 40.9.3.6 and the Outage Management BPM.[11] RA resources currently enter planned outages into the CAISO Outage Management System (OMS). The CAISO's Customer Interface for Resource Adequacy (CIRA) system runs a daily POSO report and determines the planned outage substitution need. The POSO process is currently conducted on a first-in, last-out basis.[12] Therefore, resources submitting planned outages earliest will have the greatest likelihood of taking their planned outages without substitution requirements. The POSO process compares the total amount of operational RA capacity to the total system RA requirement.

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[8] Details of that appeal, which related to proposed revision request 1122, are available at: http://www.caiso.com/Pages/documentsbygroup.aspx?GroupID=D8E40756-EA62-4851-B528-3F2D6DD04728

[9] http://www.caiso.com/Documents/ExecutiveAppealsCommitteeDecision-PRR1122-Mar112020.pdf

[10] http://www.caiso.com/InitiativeDocuments/DraftFinalProposal-SixthRevisedStrawProposal-ResourceAdequacyEnhancements.pdf

[11] Outage management BPM: https://bpmcm.caiso.com/Pages/BPMDetails.aspx?BPM=Outage%20Management

[12] CAISO will first request the resource providing RA Capacity with the most-recently-requested outage for that day to provide RA Substitute Capacity and then will continue to assign substitution opportunities until the ISO has sufficient operational RA Capacity to meet the system RA requirement for that particular day.

As noted previously, LRAs establish system RA requirements based upon CEC monthly peak forecasts, which are updated 60 days prior to the start of each delivery month. If, after removing all planned outages, available capacity is less than the RA requirement, the CAISO assigns substitution obligations for resources seeking to take planned outages.

Objectives and Principles

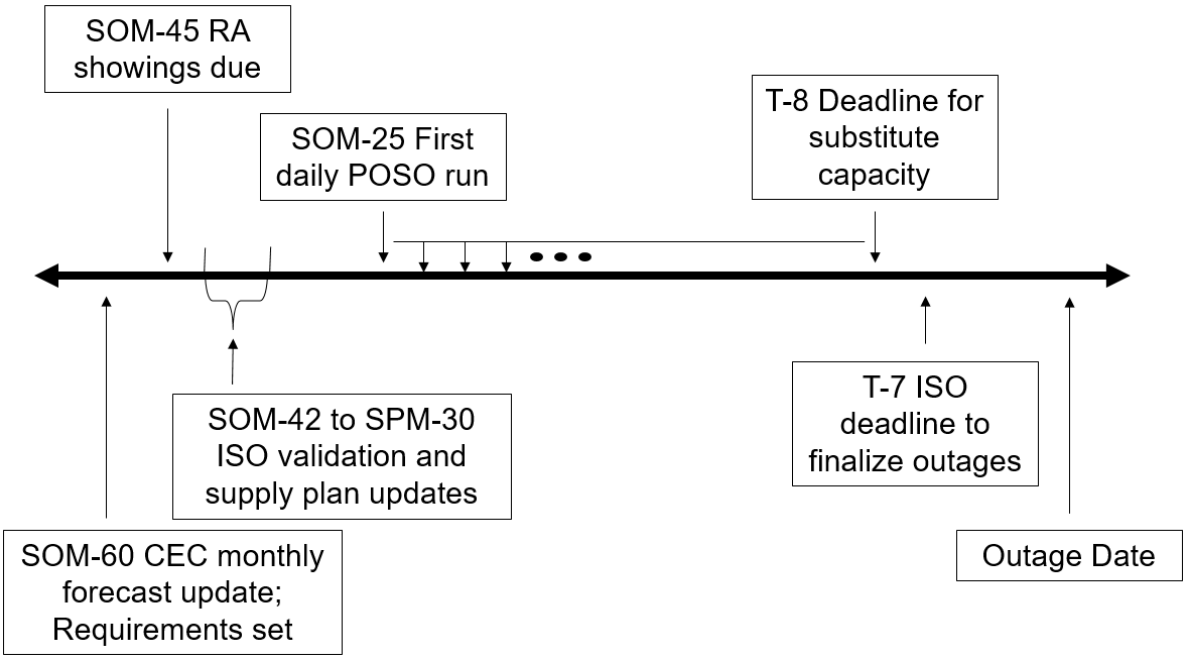
The CAISO lists the following objectives and principles that inform changes to its planned outage provisions. Modifications to the CAISO planned outage provisions should:

- Encourage resource owners to enter outages as early as possible
- Avoid cancellation of any approved planned outages to the extent possible
- Identify specific replacement requirements for resources requiring replacement
- Allow owners to self-select, or self-provide, replacement capacity
- Include development of a CAISO system for procuring replacement capacity
- Minimize or eliminate the need to require substitute capacity to greatest extent possible

Current Planned Outage Substitution Obligation Timeline

The current POSO timeline is provided in Figure 1 below. The current timeline provides the first POSO assessment at T-22, or 22 days prior to the start of the RA delivery month, for all outages submitted prior to T-25. This is the first instance when resource owners are provided with indication of any POSO replacement obligations. Resource owners are allowed to provide replacement capacity through the T-8 timeframe, and the CAISO finalizes replacements and outages at T-7.

Figure 1: Current POSO timeline



Proposed Modifications to the Planned Outage Process

Based on recent events and stakeholder comments, the CAISO is proposing a two-phase process to enhance its planned outage process. The immediate phase 1 provisions will be applicable for summer 2021 through RA year 2022, and the longer-term phase 2 enhancements will be applicable for RA year 2023 and beyond. The goal in both phases is to ensure planned outages can be taken with minimal cancellation risk after the CAISO initially approves them. Additionally, the CAISO's ultimate goal is to remove obligations for outage replacement, and the associated negative incentives, to the greatest extent possible. The CAISO proposes to redesign the planned outage process in phase 2 to reflect the proposed system UCAP/NQC targets. This proposed change will better align with the counting rules and RA assessments proposal to incorporate forced outage rates in capacity valuation and assess resource adequacy on a UCAP basis.

The first phase of the CAISO's proposed planned outage process would require all RA resources requesting planned outages to provide substitute capacity. This stage is designed to be very focused and easily implemented for summer 2021 and is included in the final proposal. The goal is to implement this policy promptly, to reduce reliability risks during the upcoming summer and all other months until phase 2 is implemented.

The second phase of this process will continue to be vetted in revised straw proposals. In the second phase, the CAISO will continue to work with stakeholders to develop a planned outage pool. The CAISO is targeting RA year 2023 to implement this "planned outage capacity pool" concept.

Phase one: Planned Outage Replacement Requirement – Summer 2021

As noted above, the current planned outage process allows RA resources to submit planned outage requests months in advance, but the CAISO does not provide its notification regarding the need for the resource to provide substitute capacity until 20 days prior to the month. During the time between the planned outage request and the CAISO's study, the resource does not know if substitution will be required. Though infrequent, the result of this process can be that a resource is required but unable to provide substitute capacity. The CAISO analyzed denied planned outages and found approved planned outages are subsequently denied less than two percent of the time. All subsequently denied planned outages were due to failure to provide substitute capacity.

In phase one, the CAISO's proposes to require all RA resources requesting planned outages to submit substitute capacity for the portion of the resource on planned outage. This requirement will be in place for all months and will sunset upon implementation of the long-term solution outlined for phase 2 of this stakeholder process. Reliability Must Run (RMR) resources under contract for 2021 will be subject to the new planned outage substitution rules like RA resources.

All resources must provide a quantity of substitute capacity equal to the amount of RA capacity that would be on outage because of the planned outage request.[13] Resources taking outages due to transmission outages and off-peak opportunity outages are exempt for this replacement obligation. The substitution must come from a specified resource ID or IDs for a given day. However, the substitution need not come from the same resource(s) for every day of the requested outage. As an example, the substitution for a two week outage can come from Resource A for the first week and Resource B for the second. Once a resource has been shown as substitute RA capacity, it will be subject to all of the same obligations as any other RA resources. This includes both planned and forced outage substitution requirements. However, if the planned outage is cancelled, the resource providing substitute capacity can be relieved of all RA-based obligations (i.e. the existing rules for cancelled planned outages still apply). The substitution will be made into CIRA by the SC for the resource taking the planned outage and will not impact the LSE SC's RA showing. LSEs with a resource taking a planned outage are not required to provide additional reporting beyond their RA showings. All obligations for substitution are on the resource SC.

The specific timing of the substitute capacity submission depends on the timing of the planned outage request relative to the RA showings. Planned outages conditionally approved prior to RA showings, will be conditionally approved subject to RA status and substitution obligation.[14] The substitution must be made at the time of the RA showing or the CAISO will automatically deny the planned outage request. Even if the resource provides substitute capacity, the outage may still be denied if the CAISO's reliability assessment shows that the requesting resource is uniquely needed for reliability. Planned outage requests made after RA showings have been

[13] The CAISO considered allowing less than 100 percent, but allowing for a range would degrade the RA showing and would be counter to the overall objective of the policy.
[14] The outage definitions have been modified from the Draft Final Proposal to mirror the current planned and forced outage definitions.

made must provide substitute capacity at the time the outage request is submitted, otherwise, the CAISO will automatically deny the outage. As with the requests made prior to the RA showings, these outage may still be denied subject to a reliability assessment. Some stakeholders requested that the CAISO provide some form of grandfathering provisions for outages that have already been conditionally approved, such that that replacement obligation would not apply. However, as these outage requests are conditionally approved subject to the POSO process, which has not yet been run for any of months for which this policy would be effective. Grandfathering resources would require the CAISO to maintain both the new and existing processes. This has the potential for causing unnecessary confusion to the planned outage process. Instead the CAISO's proposed process simply clarifies that the substitute capacity is required, which may have been the outcome of the current POSO process anyhow. Therefore, the CAISO believes there is no need for any grandfathering provisions at this time. All outage requests submitted after eight days prior to the outage will be treated as forced or opportunity outages.

The CAISO also proposes changes to how it handles requests for extending planned outages. Currently resources on planned outages that request an outage be extended are typically granted. The basis for this is that denying the outage does not change the fact that the resource will still be on outage. However, this practice does not accurately reflect the fact that the new extension needs to be restudied for reliability and reevaluated for substitution just like a new outage. Operators and engineers need time to study such changes and submitting them as new outages would provide clarity and consistency to that timeline.

The CAISO proposes that the following objectives must be achieved by the proposed policy changes:

- Objective 1: Classify planned/forced outage correctly because this classification gets posted publicly
- Objective 2: Encourage SCs to replace RA when they can still replace the RA Capacity

The CAISO reviewed two different planned outage scenarios to illustrate the potential outcomes of different requests to extend planned outages based on various options for addressing these requests.

Example: Resource 1 has a planned outage that is scheduled for 3 weeks.

> **Scenario 1**: Once the outage starts, on the beginning of that outage the SC identified that they cannot return the plant and will need extension of that outage for another 4 weeks.
>
> **Scenario 2**: The outage starts as well, however, in the last day of the outage, the SC identified that they cannot return the plant and will need extension of that outage for another 4 weeks.

To address the requested outage extensions, the CAISO considered three different options:

Option 1: Do not allow outage card extension – Require SC to always create a new outage card for extension

Consequence for Scenario 1:

- That outage extension will be classified as planned outage because they notify the CAISO ahead of time (beyond short term window)
- That outage will have an RA substitution obligation
- That outage extension will be denied if RA substitution is not provided
- There is no guarantee that SC will submit Forced outage card on-time for the CAISO's pre-day ahead processes – This will give this back to Real Time

Consequence for Scenario 2:

- That outage extension will be classified as Forced outage because they tell the CAISO at the last minute
- That outage will have an RA substitution obligation

Option 2: Do allow outage card extension (status quo)

Consequence for both Scenario 1 and 2:

- That outage extension will be classified as planned outage because the original card is a "Planned outage"
- That outage will have a substitution obligation
- That outage extension cannot be denied if RA substitution is not provided because it is one outage card

Option 3: Do allow outage card extension – But extensions are only allowed if they provide substitution

- OMS will check if the units are shown as RA
- If the units are shown as RA, it will only allow the outage extension if there is substitution
- The mechanics of this are still not certain because an outage can extend beyond the RA showing time frame.
    - i.e. SC can extend an outage for 4 weeks and it ended up extending to a month that has no RA showing timeline deadline yet.

The CAISO proposes Option 1. This option is consistent with the rest of the CAISO's proposal to require substitution and provides the CAISO and resources with clear rules regarding how extensions will be handled and ensure the CAISO has adequate capacity to maintain reliability when resources cannot return to service consistent the originally approved outage.

Opportunity Outages

The CAISO currently allows both short-term opportunity and off-peak outages. The CAISO proposes to maintain both of these options as opportunity outages.

5.1.2 Operationalizing Storage Resources

The CAISO has a rapidly growing number of storage resources operating on the grid today. This trend will continue over several more years in response to replacement capacity needed to allow gas and nuclear facilities to retire. Storage resources are different from other resources in that they do not produce energy, and they must first charge from the grid to discharge and provide energy back to the grid later. The CAISO's current real-time 5-minute market looks ahead 65 minutes, but most storage resources take several hours to fully charge. Further, this short time horizon does not allow market runs, when prices are lowest and energy availability is greatest, to account for the most stressed system market conditions that will occur during the evening net-load peak. This timing discontinuity means that the real-time market does not allow sufficient lead-time to optimize the use of storage resources over full charge and discharge cycles.[15] Thus, being unable to charge a storage resource for anticipated future discharge needs can create reliability issues for the CAISO.

Since storage resources can qualify as resource adequacy resources, it is important that the CAISO can access and confidently rely on sustainable energy output from shown resource adequacy storage devices in the real-time market to ensure reliable operations. In this initiative, the CAISO has proposed a framework that will give the CAISO this confidence. This framework includes using resource adequacy must offer obligations outlined in this paper, market power mitigation, combined with restrictions on state of charge managed through a new tool called the minimum state of charge requirement.[16]

Figure 2: Market rules for storage resources

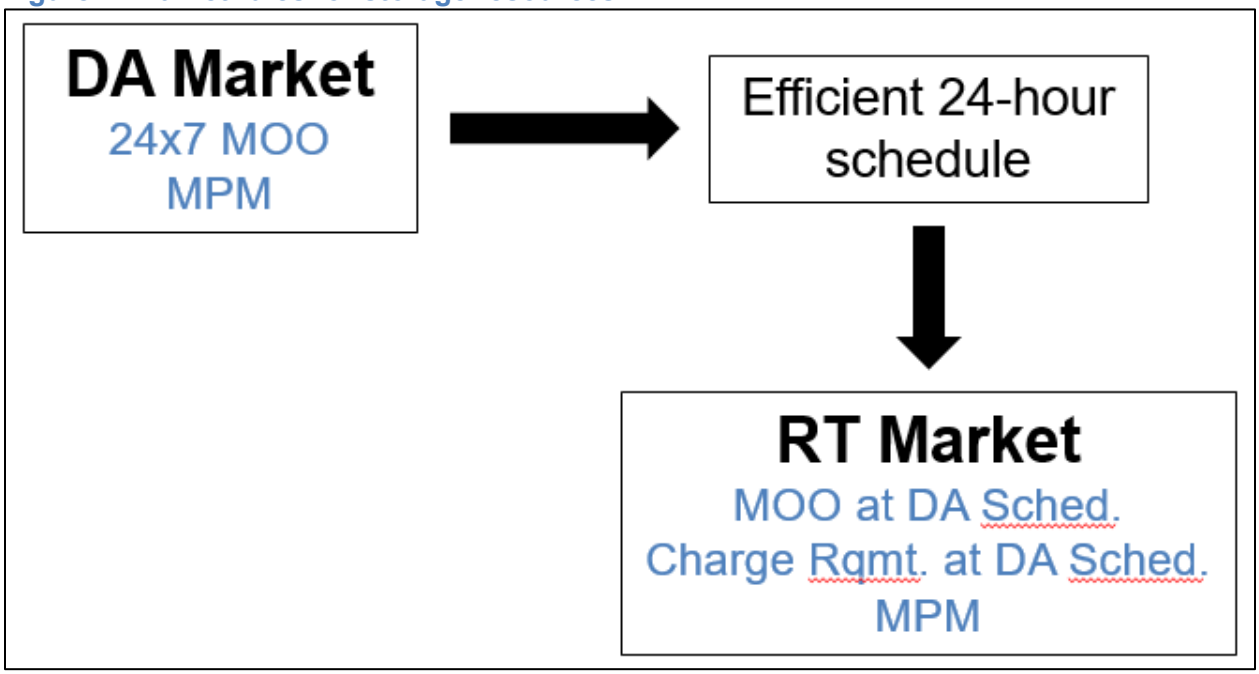


Figure 2 is a sketch of the rules that will apply to shown resource adequacy storage resources and how the CAISO will ensure that the storage resources are charged and available in the real-time market for grid reliability. Like most resource adequacy resources, storage resources have

a 24x7 must offer obligation in the day-ahead market. The resource adequacy program is designed to ensure that loads can always be met with the resource adequacy fleet in the day-ahead market. On peak summer days, this will likely include charging most of the resource adequacy storage fleet during the peak solar hours and discharging these resources during the evening hours over the evening ramp and net load peak. The day-ahead market optimizes over a 24-hour period, and will optimally schedule all resources on the grid to ensure a least cost solution to address market needs given market constraints. As described in this paper, the must offer obligation is a necessary feature so that the market software can derive a least cost solution given the bid-in resources available to meet load. For storage resources, this includes bidding both the charging or discharging components of their resource, and not restricting CAISO from charging and discharging the battery (i.e. allowing the market software to freely adjust the state of charge based on submitted bids). The CAISO also ensures that the market solution is least-cost and includes measures that preclude resources, including storage resources, from exercising market power during intervals when they are marginal and could exercise market power.

The real-time market optimization is fundamentally different than the day-ahead market, primarily in that the real-time market only looks out 65 minutes in advance of the current interval versus the day-ahead market optimizing over 24 hour period. This could lead to a number of inconsistencies between the day-market and real-time market results when optimizing resources like batteries that have energy availability constraints. For example, real-time prices during the lowest priced hours of the day may materialize at higher prices than in the day-ahead market and may result in storage resources not being charged. Another situation that could result in inconsistencies is high prices prior to the peak net-load hours causing the real-time market to discharge the limited energy available from storage earlier than anticipated. These situations can occur on the CAISO system today given ramping needs spike as solar generation wanes toward sunset. These high prices could cause storage resources to be discharged prior to the peak net-load period, when these resources are critical for the CAISO to meet system needs.

The solution to the day-ahead market results in charge and discharge schedules for storage resources and supply that meets load requirements over a 24-hour period. However, those day-ahead commitments are not immutable and can be adjusted and undone by the real-time market optimization, because the real-time market is sending dispatch instructions to resources based on prevailing market prices and resource bids and does not consider day-ahead schedules. To address this issue, the CAISO proposes that a minimum state of charge be observed in the real-time market, called a minimum state of charge requirement. This minimum state of charge requirement will set the minimum state of charge needed to preserve the amount of energy that the shown resource adequacy battery was scheduled to discharge in the day-ahead market solution. This will result in a storage resource shown for resource adequacy

[15] Nearly all of the storage resources in the fleet today are 4-hour duration batteries. This means that fully charged resources can discharge in 4-hours, and take just over 4 hours to charge due to round-trip efficiencies.
[16] Market power mitigation for storage resources is a proposal in the ESDER 4 initiative: http://www.caiso.com/StakeholderProcesses/Energy-storage-and-distributed-energy-resources.

to always have state of charge to achieve the day-ahead discharge schedule. This will aid grid reliability because day-ahead schedules may have storage online and charged to meet load that must be served by storage resources. This is an essential resource adequacy market enhancement that will allow the CAISO to operate the system reliably with a rapidly growing fleet of use and energy-limited resource adequacy qualifying storage devices.

In the future, the CAISO will look at other market enhancements to address this concern and allow for additional real-time market participation flexibility, noting that shown resource adequacy battery storage devices will still have flexibility under this proposal to re-bid in real-time any capacity not committed in the day-ahead market.

Proposed Changes from the Previous Version

To address stakeholder comments, the ISO proposes several changes from the previous proposal. First, the ISO acknowledges comments from stakeholders and recognizes that a market based solution is needed to procure energy from storage resources. At the same time it is essential that the ISO maintain grid reliability, and with the expected proliferation of storage, a tool is necessary for ensuring that resource adequacy storage resources are available with state of charge to meet evening net-loads. The ISO does not have sufficient time to deliver a market based solution, but agrees with the principle that this should be done through a market mechanism. The ISO therefore proposes the minimum state of charge (MSOC) requirement as a temporary solution to address this issue. The ISO proposes that this tool would sunset two years after implementation. Further, the ISO commits to begin a new stakeholder initiative, called the energy storage enhancements initiative, to address concerns for procuring state of charge from storage resources. A primary goal of this new initiative will be to develop a market based solution to replace the minimum state of charge requirement prior to the proposed sunset date that would be available to all storage resources including those under resource adequacy requirements.

Second, the ISO flags the urgency of this tool as it expects potentially more than 1,800 MW of storage available on the system prior to the start of summer 2021. This large influx of storage will likely require that storage be used to address peak net-loads, and a tool to ensure that storage resources are available to meet those net loads. In light of this, the ISO proposes to implement the minimum state of charge tool prior to the peak summer months, instead of during the fall 2021 software release.

The ISO continues to suggest that the minimum state of charge requirement only be used on specific days and not applied to storage resources on all days. This proposal includes a final definition of the days that the ISO will trigger the minimum state of charge requirement based on infeasibilities in the residual unit commitment process. Using this metric, the ISO estimates that during a year with weather similar to 2018 or 2019, the tool would be used as rarely as a single day per year, while during a very hot year, like 2020, it may be triggered on around 23 days. Nearly all of the days the ISO anticipates triggering the minimum state of charge would be during the summer months, when daily net peak loads are highest.

Fourth, the ISO intends to only apply the requirement in the hours immediately prior to discharge schedules. This will mean that the requirement will be applied for the minimum number of intervals possible and will not hold storage resources at very high state of charge values for prolonged periods of time.

Minimum Charge Requirement

The ISO proposes that the minimum state of charge requirement tool be implemented in the real-time market that sets a minimum threshold state of charge for each resource adequacy storage resource with a day-ahead discharge award. This requirement would be observed and maintained by the real-time market, which may optimally schedule storage resources to charge or hold state of charge to meet these requirements.

The ISO does not intend to impose the minimum state of charge requirement every day. The ISO will only impose the minimum state of charge if the residual unit commitment (RUC) process results in an infeasibility. These infeasibilities are very infrequent and an indicator of tight system conditions. In 2018, there was only a single day (July 25) when a residual unit commitment process infeasibility occurred, and only a single day in 2019 (June 7). There was very hot weather in 2020 and infeasibilities occurred during 23 days including: August 13-21, August 24, September 5-7, September 28-October 3, October 5, and October 14-16. Infeasibilities represent days when the system is stressed and there may be challenges meeting load in the real-time market.

The ISO noted in previous papers that storage could be essential to operating the grid on days outside of the ones with the most critical needs. The minimum state of charge requirement does not cover all days, and there likely will be some days when storage (and state of charge from the storage fleet) is essential to ensuring the grid operates reliably. The ISO operators will continue to have access to exceptional dispatch tools, which may be applied to storage resources on these days to ensure state of charge availability if necessary.

The charge requirements will be implemented as targets for the end of the hour, which the 5-minute market will ensure through the optimization. For example, if the minimum state of charge requirement is 12 MWh for the current hour, say hour ending 12, then the state of charge requirement for the 11:55-12:00 interval will 12 MWh for each time the optimization runs and includes this as an interval within the binding or advisory time horizons.

Operators will have the ability to cancel the minimum state of charge in the real-time market. If real-time conditions are anticipated to be milder than day-ahead conditions, the ISO operations team will have the ability to cancel the minimum state of charge requirements. If the operators take this action, they will have the ability to do so at some point between 8:00am and 11:00am.

This minimum state of charge requirement will only stipulate a threshold state of charge that a resource needs to maintain based on day-ahead market discharge schedules. These minimums will be determined at the conclusion of the day-ahead market run process and will be known to scheduling coordinators in advance of the real-time market. Knowing these minimums and how actual state of charge values develop in the real-time market may encourage resource

operators to adapt bids in the real-time market to increase state of charge for resources so that they have more availability to respond to unexpected high real-time market prices.

Minimum charge requirements will be calculated based on the discharge schedules and will be imposed on the hours immediately preceding the discharging schedules. For example, if a storage resource was scheduled to discharge during hours 18, 19, and 20, the minimum charge requirement would be applied in the hours immediately prior to these hours: 17, 16 and 15.[17]

The ISO previously expressed concern about charging storage resources during the peak ramping periods, immediately prior to the evening net-load peak. To allay these concerns the ISO will develop a parameter that will spread the charge over additional time. The parameter will initially be set at 1.0, to represent an assumed charging speed of 1.0*Pmin of the resource or essentially assuming that the resource will charge as much as possible immediately prior to discharge schedules. The parameter can be reduced if the operations team believes that charging the resources immediately prior to discharge schedules would be overly burdensome on the system.

The minimum state of charge will not be applicable for all hours of the day. The operations team will be able to specify critical hours for each day, which would generally be in the evening surrounding the peak net-load, where the minimum state of charge will be applied.[18] If the storage resource receives a discharge schedule during the hours specified, then the minimum state of charge will be set prior to hours with discharge schedules.

The ISO will report on how frequently the minimum state of charge is used, when it was triggered, and may report on the estimated impact that the requirement has on the storage resources on the system. In the event that the ISO rescinds a minimum state of charge requirement in the real-time market, the ISO will include those details in the report as well.

Examples

In the fifth revised straw proposal the ISO outlined two examples of how the minimum state of charge would work given example bids and market prices.[19] These two examples have been updated are presented here. The market prices and bids were left unchanged from the original examples and the only changes were to the minimum charge requirement and the resulting dispatch instructions to the storage resource.

[17] The charging schedule will include round trip efficiencies to ensure that the resource charges sufficiently to ensure state of charge to meet day-ahead schedules. If the storage resource has a Pmax = -1 * Pmin, and a discharge schedule at Pmax for hours 18-20, then the minimum state of charge would be imposed for hours 15-17, and for hour ending 14 because the storage resource will take more time to charge than to discharge.
[18] These hours may correspond to hours that the market is anticipated to require storage resource availability to operate.
[19] Resource adequacy enhancements, fifth revised straw proposal: https://stakeholdercenter.caiso.com/StakeholderInitiatives/Resource-adequacy-enhancements.

These examples assume a highly simplified system that includes one +/-50 MW storage resource with 200 MWh of storage capability that bids into the day-ahead and real-time markets. This resource has a perfect round-trip efficiency (no losses from charging) and has no parasitic losses while charged.

Example 1:

For this example the scheduling coordinator bids the resource to charge any time prices are below $30/MWh and discharge anytime prices are above $60/MWh. Assume that the storage resource is fully charged, either in the market or prior to the day-ahead market, prior to hour ending 9. This implies that the storage resource cannot be charged when prices are low in the morning, and only receives discharge schedules in the afternoon when prices are above the $60/MWh bid price in the market. This results in the resource discharging a total of 180 MWh in the day-ahead market and retaining 20 MWh state of charge at the end of the day-ahead market process.

If this is a critical day where there is an infeasibility in the RUC process, and the ISO assigns hours 19 through 23 as critical hours then a minimum state of charge would be imposed on this storage resource immediately prior to the charging hours, in hours ending 15 through 18. These requirements will only require that the storage resource be fully charged at 180 MWh at the end of hour ending 18, and will decrease to 130 MWh for hour ending 17, and continue back through previous hours. These requirements would then be observed by the real-time market optimization.

In the 5-minute market assume there are high prices, spiking to $1,000/MWh, in hour ending 17. In this example the minimum state of charge requirement previously proposed in the draft final proposal required that the storage resource be fully charged at 180 MWh in the real-time market for the shown morning hours and therefore would prevent the storage resource from fully discharging in the real-time during the price spike in hour ending 17. The new formulation proposed here will not require a 180 MWh state of charge from the storage resource to until hour ending 18, which allows the storage resource to discharge fully (50 MW) during hour ending 17.

The current proposed requirement still requires that the storage resource charge to 180 MWh, or the total of the discharge schedule at hour ending 18 and requires significantly less state of charge in previous hours. In this case hours 15, 16 ad 17 have a minimum state of charge of 30, 80 and 130 MWh respectively. These requirements are significantly lower than the requirements imposed from the previous proposal.

Figure 3: MSOC Example 1

Hour	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Load	190 MW	190	190	200	215	235	255	280	300	330	335	345	350	340	280	210
DA Bid ↓	$30/MWh	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30
DA Bid ↑	$60/MWh	$60	$60	$60	$60	$60	$60	$60	$60	$60	$60	$60	$60	$60	$60	$60
DA Price	$50/MWh	$50	$50	$50	$50	$52	$55	$58	$60	$60	$80	$80	$100	$100	$80	$60
DA Sched	0	0	0	0	0	0	0	0	0	0	20	30	50	50	30	0
DA SOC	200 MWh	200	200	200	200	200	200	200	200	200	180	150	100	50	20	20
RT Bid ↓	$50/MWh	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
RT Bid ↑	$100/MWh	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
RT Price	$60/MWh	$60	$60	$60	$60	$60	$60	$60	$1,000	$60	$100	$100	$100	$100	$100	$70
RT Sched	0 MW	0	0	0	0	0	0	0	50	-30	20	30	50	50	30	0
RT SOC	200 MW	200	200	200	200	200	200	200	150	180	160	130	80	30	0	0
Min Chrg	0 MW	0	0	0	0	0	30	80	130	180	160	130	80	30	0	0

Example 2:

In the second example, the storage resource is charged to 80 MWh in the morning and discharged by 30 MW and 50 MW in hours ending 20 and 21 in the day-ahead market. In the real-time market the storage resource has a minimum sate of charge requirement imposed at 50 MWh at hour ending 20, 80 MWh at hour ending 19, and 30 MWh at hour ending 18. Low prices in the real-time market result in the storage resource being charged to 130 MWh, beyond the minimum charge requirement. This resource is able to respond to high prices in hour ending 18, when prices spike to $200/MWh. Price later in the day never materialize at levels higher than the bids and the resource does not receive instructions to discharge below 80 MWh for the remainder of the day, and always has enough energy to meet state of charge requirements.

Figure 4: MSOC Example 2

Hour	9	10	11	12	...	17	18	19	20	21	22	23	24
Load	190 MW	190	190	200	...	300	330	335	345	350	340	280	210
DA Bid ↓	$30/MWh	$30	$30	$30		$30	$30	$30	$30	$30	$30	$30	$30
DA Bid ↑	$60/MWh	$60	$60	$60		$60	$60	$60	$60	$60	$60	$60	$60
DA Price	$50/MWh	$50	$25	$50		$60	$60	$60	$70	$70	$60	$60	$60
DA Sched	0	0	-50	0		0	0	0	30	50	0	0	0
DA SOC	30 MWh	30	80	80		80	80	80	50	0	0	0	0
RT Bid ↓	$25/MWh	$25	$30	$25		$25	$25	$25	$25	$25	$25	$25	$25
RT Bid ↑	$70/MWh	$70	$75	$72		$72	$72	$72	$72	$72	$72	$72	$72
RT Price	$60/MWh	$20	$27	$60		$60	$200	$60	$60	$60	$60	$60	$60
RT Sched	0 MW	-50	-50	0		0	50	0	0	0	0	0	0
RT SOC	30 MWh	80	130	130		130	80	80	80	80	80	80	80
Min Chrg	30 MWh	0	0	0		0	30	80	50	0	0	0	0

5.2 Backstop Capacity Procurement Provisions

In this final proposal, the CAISO proposes to expand existing local CPM authority to procure resources when the CAISO identifies a need for additional local RA capacity after an area or sub-area fails to meet the energy sufficiency evaluation. Stakeholder comments generally support this extension of CPM authority.

The CAISO uses its capacity procurement mechanism to backstop capacity needs under the resource adequacy provisions of its tariff. Based on year-ahead and month-ahead resource adequacy showings made by load serving entities in its balancing authority area, the CAISO may exercise this authority for system, local or flexible resource adequacy. Resource owners with additional non-RA capacity can participate in the CPM competitive solicitation process to receive a CPM designation. In making CPM designations, the CAISO considers all options for procurement and selects the least cost option that meets the reliability need. Additionally, when the CAISO makes any CPM designation, it posts information about the designation and supporting documentation outlining why the CAISO needs the resource.

As a part of the resource adequacy program, the CAISO performs studies each year to ensure load serving entities have secured adequate capacity in local areas to mitigate potential local reliability issues. This requirement currently reflects a capacity value in MWs without full consideration of resource availability needs, such as limits on energy duration or calls. Increasingly, load serving entities are procuring availability-limited resources[20] to meet local capacity area and sub-area needs, which has necessitated the need for the CAISO to evaluate these resources' availability limitations to help guide the effective procurement of local resource adequacy resources.

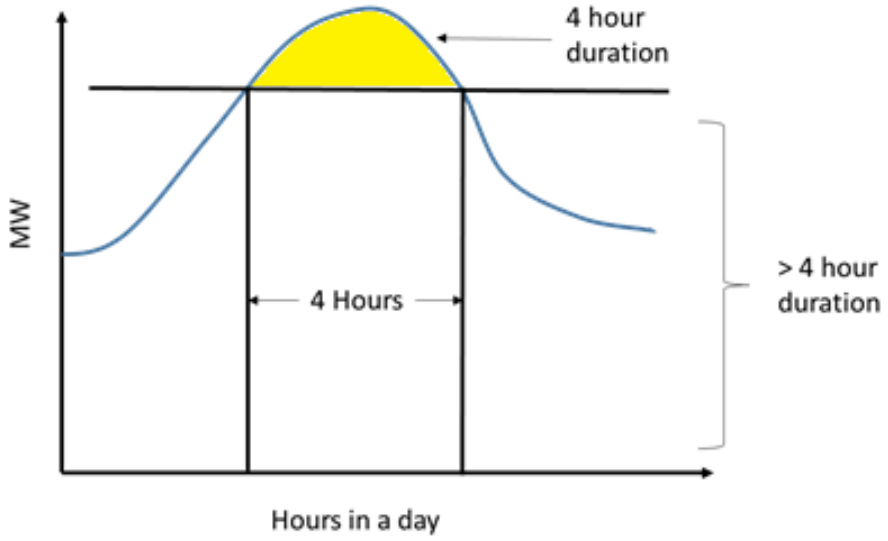
[20] CAISO considers availability-limited resources as those that have significant dispatch limitations such as limited duration hours (e.g., per year, season, month, or day) or event calls (*e.g.*, per year, season, month or consecutive days) that would limit the resources' ability to respond to a contingency event within a local capacity area

Today, availability-limited resources have a minimum duration requirement of four hours to qualify as resource adequacy capacity. A10 MW resource that is capable of producing for 4 hours, or 40 MWhs has the same resource adequacy capacity value as a 10 MW resource capable of producing for 8 hours, or 80 MWhs. However, if a local capacity area requires 10 MW of capacity for an eight-hour period during a contingency event, only the latter is capable meeting this reliability need. Yet, from a resource adequacy counting perspective, these hypothetical resources receive the same value because resource adequacy rules do not consider the availability limitations of the resources when determining their capacity values. As a result, the CAISO may have sufficient capacity in MWs to meet peak demand in a local capacity area but insufficient energy in MWhs to meet needs across all hours of the day and year. Figure 5 below demonstrates how the CAISO can use availability-limited resources to meet the peak, but may need other resources with a longer duration to meet energy needs in other hours of the day. The black vertical lines reflect a four-hour minimum availability threshold. Below the black horizontal line is load that still will need to be served with resources that have greater than four hours of availability.

In recent transmission planning studies, specifically studies related to the Moorpark and Santa Clara local capacity sub-areas in central California, the CAISO developed and performed detailed hourly load and resource analyses to assess binding availability limits in these local capacity sub-areas.[21] The CAISO determined that local capacity procurement needs must reflect both the capacity and energy needs in these local areas. These studies demonstrate that availability-limited resources with a four-hour minimum duration were insufficient to meet energy needs (*i.e.*, total MWhs) for contingency events identified in the CAISO's local capacity criteria. Currently, the CAISO does not have the tariff authority to use its local CPM backstop in order to fulfill the energy needs identified through these local energy sufficiency studies, because these studies are not covered under the tariff-defined study criteria.

[21] CAISO, Moorpark Sub-Area Local Capacity Alternative Study, August 16, 2017, http://www.caiso.com/Documents/Aug16_2017_MoorparkSub-AreaLocalCapacityRequirementStudy-PuentePowerProject_15-AFC-01.pdf; and Santa Clara Sub-Area Local Capacity Technical Analysis, June 18, 2018, http://www.caiso.com/Documents/2023LocalCapacityTechnicalAnalysisfortheSantaClaraSub-Area.pdf

Figure 5: Hourly Load Shape with Four-Hour Minimum Availability Threshold



The CAISO is proposing to modify its tariff rules for local capacity technical studies to reflect this energy sufficiency evaluation as well as its CPM authority to designate a local deficiency to procure additional capacity after a local area or sub-area fails to meet an energy sufficiency evaluation. If the CAISO identifies any capacity and/or energy shortfall, it will provide a cure period for entities to clear any deficiencies before exercising its backstop procurement authority.

The CAISO plans to request these changes take effect for the 2022 resource adequacy year.

Stakeholder Comments:

While most parties did not comment on this element in the draft final proposal, of the nine entities that did offer comments, a majority of commenters supported this policy as a common sense expansion of the CAISO's backstop authority to ensure local reliability needs in the face of increased reliance on availability limited resources. CalCCA supports the proposal and noted that any resource procured through this CPM should also be available to meet system RA requirements. DMM, Middle River Power, Six Cities were also supportive. SCE, although supportive, requested further clarity on whether ensuring sufficient energy for local areas is pertinent to all local areas, or just a smaller subset of local areas, and whether it would be more efficient to address the issue on an area-by-area basis without applying the requirement to all local areas. CPUC Energy Division staff were also supportive as long as the Local Capacity Requirement Technical Studies clearly identify what use-limitations exist in each local area and sub-area so that LSEs and the new Central Procurement Entity could utilize this information to direct procurement upfront. The CAISO will continue to outline the requirements for all applicable local areas and sub-areas, and these will be clearly described in the LCR Reports by charts and graphs with the energy needs during peak as well as year round conditions, before

LSE procurement begins. These graphs will also show transmission capability during emergency conditions for the applicable local areas and sub-areas.

PG&E requested additional details on how this energy sufficiency evaluation would be conducted to identify the need for this local CPM. The CAISO supplied additional details about this evaluation above (for additional details see footnote 19). PG&E also asked how this energy sufficiency test proposed in phase 1 differs from the System RA Showings and Sufficiency Testing proposed for phase 2B implementation. The sufficiency test proposed in phase 2B is meant to evaluate the overall portfolio of RA resources to meet the energy needs across all hours at the system level, whereas the local energy sufficiency evaluation proposed for phase 1 implementation would only apply to local area and sub-areas to ensure that local reliability needs are covered in terms of both capacity and energy, and to ensure that the procurement of availability limited resources is sufficient to cover the identified needs. PG&E also raised concerns about misalignment with CPUC requirements. The CAISO has submitted a proposal in the Track 3B.1 of the CPUC proceeding to request that the CPUC ensure central procurement entities and/or LSEs procure sufficient resource adequacy resources in each local area and sub-area accounting for availability-limited resource characteristics, and leverage the CAISO's hourly load and resource analysis from its Local Capacity Technical studies to better direct availability-limited resource procurement for it's jurisdictional LSEs.[22]

SDG&E supports the general concept of the CAISO's backstop authority to ensure grid reliability, but thought the energy sufficiency evaluation and cure period was ambiguous, and was unclear how the CAISO or LSEs would be able to identify resources to cure the deficiencies. They recommended that the CAISO provide information on how the procured resource is able to cure the deficiency vs. another equivalent or lower offer priced resource does not to increase transparency. The CAISO will continue to use the RA Deficiency report that is published in mid November to describe how each local area and sub-area capacity as well as energy needs were not met and to inform load serving entities of how much from each resource is not shown as RA capacity, as is done today.

6. Implementation Plan

Given the comprehensive nature of this initiative, the CAISO is planning a phased implementation. The first phase includes stand-alone elements that can be implemented relatively quickly. The second phase includes full implementation of foundational elements, including system requirements and UCAP counting rules, the portfolio assessment, and elements that are needed to align with the day-ahead market enhancements and the extended day-ahead market initiatives. These targeted dates are tentative and subject to change.

Phase One: (Prior to Summer 2021 or Fall 2021 for RA year 2022)

- Planned outage process enhancements – phase 1 (Prior to Summer 2021)

[22] See Track 3B.1 Proposal: 362887738.PDF (ca.gov)

- Operationalizing storage (Prior to Summer 2021)
- Local studies with availability limited resources CPM clarifications (Fall 2021 for RA year 2022)

Phase Two: (2022 for RA year 2023)

- RA import provisions
- UCAP
- Minimum System RA Requirements
- Portfolio assessment
- Planned outage process enhancements – phase 2
- Must offer obligations and bid insertion rules
- Availability Penalty Structure for RMR
- Flexible resource adequacy

7. EIM Governing Body Role

For this initiative, the CAISO will seek approval from the CAISO Board only. This initiative falls outside the scope of the EIM Governing Body's advisory role because the initiative does not propose changes to either real-time market rules or rules that govern all CAISO markets. This initiative is focused on the CAISO's RA planning, procurement, and performance obligations. This process applies only to LSEs serving load in CAISO's BAA and the resources procured to serve that load, and does not apply to LSEs outside CAISO's BAA. The CAISO received comments from CalCCA, NCPA, SCE, and the Six Cities in support of this determination.

8. Next Steps

The CAISO will discuss this final proposal with stakeholders during a stakeholder meeting on February 23, 2021. Stakeholders are asked to submit written comments by March 9, 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

Attachment D

Market Surveillance Committee Opinion on Resource Adequacy Enhancements

Phase I: Minimum State of Charge Requirement

Tariff Amendment to Implement the Resource Adequacy Enhancements Phase 1 Initiative – Summer 2021 Provisions

California Independent System Operator Corporation

March 29, 2021

Opinion on
Resource Adequacy Enhancements Phase I:
Minimum State of Charge Requirements

James Bushnell, Member
Scott M. Harvey, Member
Benjamin F. Hobbs, Chair

Members of the Market Surveillance Committee of the California ISO[1]

Final, March 23, 2021

1. Introduction and Summary

The Market Surveillance Committee has been asked to comment on one of three elements of the Resource Adequacy (RA) Enhancements Phase 1 initiative.[2] This Opinion is one of three opinions to be written by the MSC during March and April 2021 to address particular proposals that the ISO has made to prepare for the summer of 2021. The other two opinions concern the market enhancements for Summer 2021 readiness initiative. One of those opinions (adopted March 8, 2021[3]) presents our analysis of the scarcity pricing, resource sufficiency test, and block import pricing components, while the other (in preparation) is planned to address the export, load, and wheeling priorities component.

This element of the resource adequacy enhancements initiative defines a minimum state-of-charge (MSOC) requirement on certain short-term energy storage facilities that are under contract to provide resource adequacy in the CAISO market. The requirement would be imposed only under certain specified conditions indicative of system stress. A MSOC requirement was proposed as early as 2019 as part of the Resource Adequacy Enhancements initiative,[4] and was subject to considerable stakeholder discussion in 2020.[5] This element remains part of the Resource Adequacy Enhancements initiative, but has been advanced to support the summer 2021 Readiness efforts, which are scheduled for implementation on June 1, 2021 in order to help ensure grid reliability during the upcoming summer high load period.[6] During the stakeholder

[1] The opinions in this document reflect the personal views of the members of the committee and do not necessarily represent or reflect the views of any institutions with which they are affiliated.

[2] Final proposal, www.caiso.com/InitiativeDocuments/ResourceAdequacyEnhancements-Phase1FinalProposal.pdf

[3] J. Bushnell, S. Harvey, and B.F. Hobbs, Opinion on Market Enhancements for 2021 Summer Readiness, Market Surveillance Committee of the CAISO, Adopted March 8, 2021, www.caiso.com/Documents/MSCOpinionon MarketEnhancementsfor2021SummerReadiness-Mar8_2021.pdf

[4] www.caiso.com/InitiativeDocuments/SecondRevisedStrawProposal-ResourceAdequacyEnhancements.pdf, p. 83 et seq.

[5] See for instance the June 2020 comments at https://stakeholdercenter.caiso.com/StakeholderInitiatives/Resource-adequacy-enhancements

[6] See https://stakeholdercenter.caiso.com/StakeholderInitiatives/Market-enhancements-for-summer-2021-readiness

process for the summer readiness initiative, the MSOC proposal was also discussed and the subject of stakeholder comments in February and March 2021.[7]

To prepare for this Opinion, the MSC has held several public meetings whose agenda included items addressing the integration of short-term storage in the ISO markets. These include a session on hybrid energy resources on May 29, 2020, and several meetings addressing the Energy Storage and Distributed Energy Resources Phase 4 (ESDER4) initiative on June 7 and Aug. 19, 2019, and May 8, and July 30, 2020. We adopted an Opinion on the ESDER4 initiative on Sept. 8, 2020.[8] The reliability enhancements initiative was a focus of MSC meetings held on Dec. 6, 2019, and Nov. 13 and Dec. 11, 2020, including the meeting of Oct. 9, 2020 in which the MSC specifically addressed the question of MSOC requirements. Meanwhile, the heat wave events of August 2020 were the subject of meetings on Oct. 9 and Nov. 13, 2020 and Feb. 11, 2021; at the latter meeting, the MSOC requirement was discussed as well.

In the next section of this opinion, we provide some background on the challenges presented to storage management by real-time market processes that have a short time horizon, and the proposal by the ISO that a MSOC requirement be imposed under certain conditions on battery storage that is under contract to provide resource adequacy. Then in Section 3, we provide an analysis of the proposal. We conclude that that imposing a SOC constraint in the (hopefully rare) conditions when the day-ahead residual unit commitment process indicates that capacity is inadequate is a reasonable precaution to take, at least until the end-of-hour state-of-charge parameter feature is enabled and tested in operation. We advise against implementation of rigid proscriptions of possibly counterproductive charging behavior in intervals prior to or after periods in which the MSOC constraint is applied. We discuss the issue of compensating for opportunity costs that may result from the constraint; we conclude that if experience early in the summer of 2021 indicates that significant losses arise from discharge revenues failing to cover the cost of charging needed to reach the MSOC, then the ISO should consider instituting make whole payments. Finally, we enumerate several challenging issues that will need to be considered in the planned energy storage enhancements initiative, which is intended to institute a market-based process to meet an overall system-wide stored energy (state-of-charge) target in its real-time markets.

2. Background and ISO Proposal

Background. As identified in the 2020 ESDER4 proposal[9] and the Opinion we provided on that proposal,[10] the ISO's present real-time management of battery storage has too short of a time horizon to appropriately tradeoff the value of discharging energy (or cost of charging) in the next few hours against the value of that energy for use in intervals beyond the time horizon of the

[7] https://stakeholdercenter.caiso.com/StakeholderInitiatives/Resource-adequacy-enhancements

[8] J. Bushnell, S. Harvey, and B.F. Hobbs, Opinion on Energy Storage and Distributed Energy Resources Phase 4 Initiative, Market Surveillance Committee of the CAISO, Adopted Sept. 8, 2020, http://www.caiso.com/Documents/MSC-OpiniononEnergyStorageandDistributedResourcesPhase4-Sep8_2020.pdf

[9] https://stakeholdercenter.caiso.com/StakeholderInitiatives/Energy-storage-and-distributed-energy-resources

[10] Op. Cit.

software. In contrast, the day-ahead market can consider these tradeoffs over the operating day, but its schedules may be rendered highly suboptimal by rapidly changing real-time conditions.[11] A particular concern during tight system conditions is that stored energy might be discharged in response to possible high prices that occur early in the day rather than being saved for the evening net peak. Such discharge is suboptimal if expected evening prices are significantly higher than the earlier prices, and if that early discharge means that energy was unavailable for use in the evening net load peak hours.

This can occur for any of several reasons. One is that the logic of the ISO's real-time scheduling software could dispatch batteries to avoid the need to dispatch high-cost generation during mid-day price spikes and then fail to conserve energy to meet load at even higher prices later in the day beyond the time horizon of the optimization.

Another reason is that storage owners might choose to set offer prices that result in discharging energy early in the day either because of overly low forecasts of evening prices or because the current penalty prices prevent evening prices from reflecting the true value of stored energy during shortage conditions. Importantly, corrections to forecasts and offer prices are subject to delays. In particular, the significant time lag for updating bid and offer prices can result in a resource's storage capacity being depleted before the operator can update its offer price to reflect changes in market conditions or unanticipated variations in intermittent resource output that have caused the resource to be dispatched more than expected at its offer price.[12]

An additional reason is that it is also possible that if a large storage facility were owned by a large thermal generator, the generator might attempt to exercise market power by tightening market supply during the net peak period by uneconomically discharging energy early in the day.

To at least partially mitigate the inherent short-sightedness of the limited time horizon scheduling software and lags in updating bid and offer parameters, the ESDER4 initiative proposed an end-of-hour state-of-charge constraint that could be specified by battery owners, and used to reserve energy for use beyond the time horizon of the real-time market software.[13] This will be a useful tool for self-management of the resource, but this design will not be implemented until after summer 2021 and it will be even longer before the CAISO and stakeholders are able to observe how well it is performing in practice.

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[11] In our ESDER4 opinion (ibid.), we also note that both the day-ahead and real-time scheduling processes do not appropriately quantify the option value that arises due to real-time price volatility. This volatility provides short-run arbitrage opportunities in which discharging could take place in 5 minute intervals with high prices, while recharging in intervals with low prices. The price profiles over multiple intervals produced by the market models tend to be too smooth to value those opportunities. We do not discuss this issue further here.

[12] For example if a sustained drop in intermittent resource output began any time after 3:45 p.m. (or even somewhat before) and lead to unexpectedly high prices and a sustained dispatch of a storage resource, the resource operator would not be able to adjust its offer price until 4:45 p.m., which would not affect scheduling until 6 p.m..

[13] L. Carr, G. Murtaugh, J. Powers, and B. Sparks, Final Proposal, ESDER4, Version of Aug. 21,2021, www.caiso.com/InitiativeDocuments/FinalProposal-EnergyStorage-DistributedEnergyResourcesPhase4.pdf

ISO MSOC Proposal. Therefore, as part of the original Summer 2021 readiness initiative,[14] the ISO had proposed imposing a requirement that batteries that are contracted for RA attain a level of charge specified by the ISO prior to the evening peak.[15] We understand that a core driver for proposing this MSOC requirement for this summer, to be followed by the Fall 2021 implementation of the end-of-hour state-of-charge bid parameter, was a concern that, in the absence of scarcity pricing, the low prices that may occur even during tight system conditions will not incent efficient decision by storage resource operators. This concern is reasonable, but we need to recognize that the long run solution is to set prices that send an efficient signal for the decentralized operation of storage, as well as other resources. This will become particularly important as the number of small distributed energy resources rises.

Recently, the ISO announced that elements in Phase 1 of its RA enhancements initiative would be proposed for implementation on June 1, 2021 in order to have its elements in place for the summer peak season. In general, a MSOC requirement has been controversial among storage owners, who would prefer to be given more flexibility to manage storage based on their assessment of system conditions and expected market prices. Numerous comments were received in response to an earlier version of a MSOC requirement, many criticizing the inflexibility of a fixed requirement that in its original form was proposed to be imposed prior to the evening ramp in all days. Several stakeholders viewed this as antithetical to a philosophy of electricity markets that would give discretion to resource owners to operate their resource as they saw fit in response to market incentives; however, other stakeholders believed that because of the inadequate time horizons of real time markets and the primacy of the reliability objective, some sort of requirement for RA-contracted storage to be fully charged prior to the evening's net load peak intervals would be reasonable.

In response to these concerns, the ISO has recently announced that it will start an initiative for developing a competitive process in its spot markets for meeting overall storage targets, as opposed to a requirement for each RA storage facility to meet a prespecified state-of-charge target.[16] However, such an initiative cannot be completed prior to this summer, and might not prove to be either workable or desirable after a full review.

In the coming summer, it is anticipated that nearly an order-of-magnitude more battery storage will be on the ISO system than was available last summer (approximately 1800 MW of RA capacity in 2021 versus about 200 MW in 2020). The ISO believes that is necessary to ensure that the portion of this storage that is under RA contracts will be operated in such a way that the batteries will have energy to meet evening net load peaks without regard to whether this operating plan would be consistent with real-time prices. For this reason, this initiative is proposing imposition of a minimum state-of-charge on a facility-by-facility basis just for 2021 and 2022 until the end-of-hour state of charge parameter has been put into place and perhaps until a more flexible and permanent market-based system to meet system state-of-charge

[14] Op. cit.

[15] This proposal is a modification of an earlier proposal within an early version of the RA enhancements initiative to impose a MSOC for all batteries providing RA in all days, regardless of system conditions.

[16] Proposal, p. 38.

requirements is implemented. Unlike the original 2020 resource adequacy proposal, which would have imposed the requirement on all days, this requirement will be imposed on batteries providing RA only on days in which the day-ahead residual unit commitment (RUC) process (including RA battery resources) shows a deficiency in a given hour. This is a condition that occurred in 25 days over the last three years. However, since 23 of these days occurred in 2020, the requirement may be used frequently if there is another hot summer or fall.[17] Under such conditions, the ISO operators will also have discretion to relax the requirement in real-time if they judge that conditions are such that the energy is not needed. On the other hand, during days when the day-ahead RUC criterion is not met but it nevertheless turns out that conditions in real-time indicate that more storage is needed, operators will have the discretion to exceptionally dispatch batteries in order to meet SOC goals.[18]

Some other salient features of the proposal are as follows:[19]

- When the MSOC constraint is triggered due to meeting the day-ahead RUC criterion, then the MSOC requirement will be set at the level of charge needed to support the amount of energy that a RA battery was scheduled to discharge in the DA market solution. This MSOC is only a lower bound, and resources have the flexibility to implement SOC trajectories that are above the lower bound.
- The ISO states that it plans to only apply the requirement in just the hours immediately prior to hours with day-ahead discharge schedules, imposing a schedule that ramps up the required storage over those preceding hours so that the required energy is in storage at the end of the last hour before the discharging hours. The stated intention is that the requirement will be in place for as few intervals as possible, avoiding holding storage resources at very high state of charge values for prolonged periods. The goal is to provide flexibility to meet the MSOC at a minimum cost.
- The ISO shares concerns that stakeholders have expressed (see infra.) about charging storage resources during the peak ramping periods just before the evening net-load peak. The ISO plans to develop a parameter that will spread the charge over additional time.

An alternative to imposing this state-of-charge requirement would be to rely on the present system, in which the ISO depends on storage owners to rationally and accurately forecast and compare near-term versus early evening prices, and developing offers or self-schedules that would yield optimal allocation of charge and discharge over the day. As pointed out above, however, the current rules would introduce long lags into the ability of resource operators to change their offer prices in response to new information, even when they foresaw the change in market conditions as soon as the CAISO did. However, if CAISO operators believe that system

[17] California ISO, Market Enhancements for Summer 2021 Readiness, Draft Final Proposal, February 18, 2021, p. 38.

[18] During the MSC call to adopt this Opinion on March 23, 2021, ISO staff informed us that the ISO will no longer propose the provision in the Final Proposal (op. cit.) that would give the ISO the option to respond to changing real-time conditions by imposing the MSOC requirement even when the day-ahead RUC test has not been met. However, operators retain the exceptional dispatch option in real-time, which can be used if needed to alter charge and discharge schedules of batteries.

[19] Resource Adequacy Enhancements Phase I final proposal, op. cit.

conditions warrant an override of the schedules resulting from storage offer prices, the operators in theory always have the option of using exceptional dispatch (ED).[20] But monitoring the status of many small storage facilities and generating ED instructions to each would be a significant and likely unwelcome burden on operators during times of system stress, so the ISO prefers that a relatively simple MSOC tool be implemented that does not require an increasing number of operator actions in order to manage the rising number of storage resources to ensure availability of stored energy from all RA storage during the evening peak period during the targeted system conditions.

However, effective use of storage ED requires monitoring and control capabilities in the control room that do not presently exist. Thus, the ISO proposes to develop, by this summer, tools to monitor battery storage status and send ED instructions to batteries. Whether or not the ISO implements a minimum state-of-charge requirement as part of this initiative, the availability of these tools to operators will be essential to managing and monitoring the contribution of the ISO's rapidly growing battery resource to system adequacy.

3. Analysis

General Conclusion. We believe that having the capability to ED battery resources could be important for the ISO to do its job of managing the grid reliably and economically during the next two years. Once, batteries were a fringe resource whose operation had very small impact on either market prices or reliability. No longer. Indeed, they will be the major source of new RA capacity in California the next few years.

It is indeed the case that a rigid minimum SOC constraint for RA batteries has the potential for inefficient and unintended outcomes and that, all else being equal, giving operational flexibility to resource owners is desirable as long as market prices send an efficient price signal to guide the decentralized operation of generation, dispatchable loads, and storage. However, the events of last summer in California and those in Texas this month remind us that reliability is the first responsibility of the ISO.

Therefore, we believe that imposing a SOC constraint in the (hopefully rare) conditions when RUC indicates that capacity is inadequate is a reasonable precaution to take, at least until the end-of-hour state-of-charge parameter feature is enabled and tested in operation. Implementation of a more comprehensive and market-oriented solution to managing state of charge along with a scarcity pricing system that sends an efficient price signal for decentralized operation of batteries could also help eliminate the need for such as constraint. Indeed, imposing a minimum SOC constraint only in the stressed situations envisioned in the proposal should not restrict battery operations significantly, since in the absence of such a constraint under those circumstances, the operators would attempt to exceptionally dispatch batteries to achieve the same effect. However, the experiences of last August that have been pointed out with respect to uneconomic charging are a reminder that operators will have too many things to manage during these conditions to

[20] See Vistra Corp., Comments submitted March 9, 2021 https://stakeholdercenter.caiso.com/StakeholderInitiatives/AllComments/efcddc86-0919-475b-813a-21c137ae95e8

micromanage the operation of a large number of storage resources. The explicit state of charge constraint, and an explicit criterion for triggering it, is more transparent than relying entirely on exceptional dispatch, especially given the challenges that would likely be faced in exceptionally dispatching many individual storage units under stressful system conditions. A possible disadvantage is that even under the restrictive definition of the trigger for the SOC constraint proposed by the ISO, the SOC constraint might automatically be imposed more often than necessary and result in unanticipated consequences. Conceivably, exceptional dispatch might be invoked only when needed, perhaps lessening the chance of such consequences.

Preventing Counterproductive Charging Behavior Before or After the MSOC Interval. A concern that several stakeholders expressed about the MSOC proposal when it was part of the Summer 2021 readiness initiative was that imposition of the MSOC constraint for a particular hour might result in unintended consequences that could be detrimental to system reliability.[21] One such effect could be concentration of charging activities by 1800 MW of RA batteries in the intervals immediately prior to the interval when the MSOC constraint must be met, regardless of system conditions at that time, or similar rapid charges immediately after the MSOC constraint is lifted later in the evening. The stakeholders highlighted battery charging behavior during the August 2020 events and subsequently in September[22] in which batteries were charging during periods when the ISO issued a Warning, and even during a Stage 3 emergency when rotating outages were instituted. If such conditions occur prior to the interval in which the MSOC requirement is in effect, then such counterproductive charging could occur again, exacerbating reliability problems rather than helping.

Stakeholders offered alternatives to the MSOC for managing the need to provide stored energy for the evening peaks, including a "safety protocol" that would limit real-time charging dispatches to exceptional dispatches by the ISO operators.[23] Such a protocol could also be designed prevent early-in-the day real-time discharges that would result from the real-time software accepting discharge offers without recognizing the (possibly) higher value of that stored energy in intervals after the time horizon of the optimization.[24] The ISO has not proposed such a safety protocol in its MSOC proposal.

We believe that such a protocol would be unwise for at least three reasons. First, there is a high likelihood that it would be suboptimal, since the charging restriction would be imposed

[21] See https://stakeholdercenter.caiso.com/StakeholderInitiatives/AllComments/a1105b73-c668-4ba5-9858-9e183a2cd852, especially comments by Pacific Gas & Electric (PG&E) and the California Large Energy Consumers Association (CLECA). See also March 9, 2021 comments on the RA Enhancements Phase 1 initiative by PG&E, https://stakeholdercenter.caiso.com/StakeholderInitiatives/AllComments/efcddc86-0919-475b-813a-21c137ae95e8.

[22] See comments by CLECA, ibid., where they cited charging behaviors described in the Root Causes and DMM reports (CAISO, California Public Utilities Commission, and California Energy Commission, Root Cause Analysis, Mid-August 2020 Extreme Heat Wave, Final, January 13, 2021, www.caiso.com/Documents/Final-Root-Cause-Analysis-Mid-August-2020-Extreme-Heat-Wave.pdf; CAISO Department of Market Monitoring, Report on system and market conditions, issues and performance: August and September 2020, Nov. 24, 2020, www.caiso.com/Documents/ReportonMarketConditionsIssuesandPerformanceAugustandSeptember2020-Nov242020.pdf.)

[23] Proposed by CLECA and, implicitly, by PG&E, op. cit.

[24] PG&E in effect proposes this in order to preserve state-of-charge earlier in the day, ibid.

regardless of system conditions during the intervals in which is applied, obviating completely the balancing features of storage at those times. There is a distinct possibility that adverse economic and reliability consequences resulting from such inflexible operation would be greater than the benefits of such a charging restriction. Second, this protocol would require significantly more operator attention and effort to manage in real-time than the MSOC constraint, exacerbating the demands on operators rather than helping them. Third, implementation of such a protocol will be more complex; we note that many stakeholders have expressed concern in their comments on the Summer 2021 Readiness initiative over the complexities involved in implementing several changes on a very tight schedule, and implementation of a safety protocol would be more complex than a simpler MSOC requirement. Since the ISO operators always have the option of imposing exceptional dispatch restrictions on charging behavior at any time during the operating day, we do not see a great advantage to attempting prior to June 1 to formalize such restrictions as a safety protocol that are automatically implemented under certain enumerated conditions. If it turns out that operating experience in the Summer of 2021 indicates that such restrictions are useful and predictable, then development of such a protocol could be justifiable for the Summer of 2022, which is the second year of the two-year duration of the MSOC proposal.

We note that in the final proposal,[25] the ISO proposes the use of a parameter to spread out possible charging behavior over intervals immediately preceding the evening net load peak hours which could at least partially help avoid the problems that the stakeholder-proposed safety protocol would attempt to address. Choosing the parameters will require consideration of a balance between the need for flexibility and need to avoid the risk of high charge rates during intervals prior to the evening discharge periods when prices may be very high or the system is otherwise stressed.

Returning to the counter-intuitive charging of storage during system Warning and Emergency conditions noted by the stakeholders, this is indeed a serious concern. It was due to the inappropriate market pricing in which low real-time prices occurred due to the release of generation providing reserves for dispatch when it was replaced by arming load, when the system was actually highly stressed and approaching load shedding. As recognized by the Summer 2021 Readiness initiative, such prices are highly inappropriate and inconsistent with system conditions; therefore, the ISO has included in that initiative measures to prevent this from happening when load is being armed for shedding. These short-term scarcity prices should ensure that market prices would be set at more appropriate levels were the CAISO again to need to arm load to meet its WECC reserves requirements. It is very unlikely that the unintuitive charging behavior that has been noted would have occurred had RTD prices been $1000 instead of $100 or so. As we point out in our Opinion on that initiative,[26] and as the ISO fully recognizes in initiating a comprehensive scarcity pricing initiative, a thorough revisiting of price formation during times of system stress is needed so that prices reflect the probability and costs of load curtailment during times of scarcity. The ISO initiative to develop scarcity pricing reforms together with a separate initiative to develop a more market-oriented process for securing required state-of-charge from the market should together go a long way towards not only

[25] Op. cit.

[26] Op. cit.

avoiding the illogical storage charging patterns observed in August and September, but also provide improved storage incentives and tools to respond to those incentives throughout the day.

Compensation for Opportunity Costs. Some stakeholders have argued for the reimbursement of opportunity costs resulting from imposition of the MSOC constraint.[27] As discussed in our Opinion on the ESDER4 initiative,[28] there are large difficulties in quantifying the opportunity cost associated with storage charge, discharge, and state-of-charge. These difficulties arise for several reasons. Some examples of these reasons include:

- the uncertainty of future prices (the opportunity costs should ideally reflect the probability distribution of prices, which have a subjective element and which may be disagreed upon by the resource owner and the ISO);
- the difficulty of estimating counterfactual operating schedules and foregone opportunities;
- the complexities involved in calculating the option value associated with 5 minute price volatility; and
- difficulties involved in quantifying the cost of cycling batteries, considering impacts on battery lifetime.

We believe that any attempt by the ISO estimate the full opportunity cost associated with imposing the MSOC constraint would involve many arbitrary and difficult to verify assumptions, and would take significant time to develop and implement.

It is, however, reasonable to assess whether batteries lose money over the day because of the possibility of charging to reach the MSOC and then discharging at lower-than-expected evening prices, resulting in discharge revenues being less than charging costs. This calculation would have to be based on a counterfactual schedule that would have been followed in the absence of a MSOC constraint. Furthermore, losses in one day due to over-prediction of evening prices might be made up by higher profits on other days when evening prices are under-predicted, suggesting that losses should be averaged over some longer period than one day. The ISO is not able to consider alternative ways to make this calculation and implement them by this summer. The only realistic possibility would be to compare costs of charging in intervals immediately prior to imposing the MSOC with the revenues received from discharging in the evening, and compensating any loss, perhaps if above some deadband. It would be useful for the ISO to estimate and report losses and gains from enforcing the MSOC constraint. Although compensation for such losses might be appreciably less the full opportunity costs, it would provide some assurance that the MSOC will not result in negative profits.

We anticipate that if the CAISO does not modify the proposed design, then during stressful system conditions that it is unlikely that the opportunity costs of the MSOC constraint would

[27] See for instance comments by Boston Energy Trading and Marketing and Vistra Corporation on Summer 2021 Readiness Initiative, Feb. 3, 2021, https://stakeholdercenter.caiso.com/StakeholderInitiatives/AllComments/bbc85fdd-01b0-4901-b544-81791ba65481

[28] Op. cit.

frequently and on average significantly exceed the additional revenues that would be gained by storage from discharging more energy during the evening peak when prices are likely to be at their highest. If the MSOC operates as intended, then if there is no market power and if prices do not hit the price ceiling prior to the intervals in which the MSOC constraint is active, then we anticipate that correcting for the short-sightedness of the real-time market should increase storage profits, on average.[29] However, we encourage the ISO to consider implementation of such a make-whole payment scheme if experience in the early months of summer 2021 shows that such losses can be material. We also encourage the ISO to monitor storage operations and net revenues to understand whether the MSOC might result in significant uncompensated opportunity costs.

There is also the opportunity for storage owners to eventually earn compensating revenues through their RA contracts, although that is not applicable for opportunity costs that would be incurred this summer or coming winter. Since batteries enter into RA contracts voluntarily, they could choose, as the ISO notes in its proposal, not to sign such a contract, and thereby avoid the opportunity costs. RA contracts could also include some compensation for such opportunity costs, although at this late date, the opportunity to negotiate such compensation for the summer of 2021 or even the winter of 2021/2022 has likely passed.

Issues for Consideration in Developing an Auction for State-of-Charge. As mentioned above, the ISO has announced that it will consider designing an auction process in its real-time markets to acquire enough SOC to meet a daily target that might be adjusted in real-time based on improved information. Such design would involve several challenging conceptual and practical issues that we look forward to examining during the upcoming initiative. Some include: understanding the relationship of the payments to procured SOC to the compensation already provided to energy and capacity in the day-ahead and real-time markets; specifying the frequency and timing of any SOC auction, and the amount of SOC to be acquired, conditioned on system conditions; nondiscrimination between storage and non-storage resources, such that the value provided by each is equitably and efficiently rewarded; specification of the nature of the physical and financial option that the ISO will essentially be acquiring through a SOC auction; avoiding the risk of double payment to storage (paying once for SOC, which will partially reflect the value of the stored energy in terms of later energy sales revenue, and then allowing storage to receive energy revenues from discharging that energy); and possibly for some large resources owned by thermal generators, market power mitigation and estimation of opportunity costs. We look forward to interacting with stakeholders and ISO staff on this important initiative.

[29] If storage can exercise market power, then by preventing use of a possible strategy to prematurely discharge of batteries in order to raise peak period prices, storage profits may be reduced even though overall market efficiency would likely be enhanced. Or if prices hit the price cap prior to when the MSOC constraint applies, then restricting discharge or requiring charging to reach the MSOC target could lower profits because prices during the MSOC period could not be higher than that level, even if shortfalls are more severe during the latter period. In this situation, capped prices or malfunctioning scarcity pricing might result in the price signal incorrectly signaling that complying with the MSOC target is suboptimal.