



California ISO

EIM Resource Sufficiency Evaluation Enhancements

Straw Proposal

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Prepared by
Danny Johnson
Brittany Dean

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1 Introduction

The purpose of this initiative is to explore, with stakeholders, potential further improvements to the EIM resource sufficiency evaluation (RSE). The CAISO and stakeholders reviewed several potential changes in the recent *Market Enhancements for Summer 2021 Readiness* initiative. That initiative resulted in the addition of net load uncertainty to the RSE. This initiative's goal is to continue reviewing potential enhancements to ensure the RSE is administered accurately and applied equitably.

To date, the CAISO has published an issue paper and held workshops to obtain stakeholder input on refining the proposed scope of this initiative. Based on that stakeholder input the CAISO proposes to bifurcate this initiative into two phases. This will allow the CAISO to implement enhancements that improve the accuracy and transparency of the RSE more quickly. The enhancements the CAISO proposes to implement as a first phase include:

- Consideration of intertemporal constraints in the capacity test
- Consideration of import schedule reliability
- The ability for the RSE's capacity test to account for demand response that is not explicitly modeled in the real-time market
- Treatment of energy from capacity made available through energy emergency actions
- Allocation of funds resulting from failures of the RSE's balancing and subsequent under and over scheduling test
- Adjustments to the initial reference point used in the RSE's flexible ramping sufficiency test
- Increased RSE results data transparency and reporting

The improvements to the RSE made in the first phase will then serve as a baseline for the second phase of the initiative in which the CAISO and stakeholders will consider:

- RSE failure consequences
- Consideration of adjustments made to a balancing authority area's load forecast used by the real-time market

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This paper first provides background information on the RSE, including a detailed analysis on how it performed during the August 2020 events, as well as a summary of how it performed across the entire EIM footprint in 2020. It then details the policy changes intended to increase RSE accuracy and transparency that the CAISO proposes to make in the first phase. Next, it proposes a scope of the policy changes the CAISO plans to address in a second phase, detailing how the outcome of the first phase will inform the policy development in the second phase. It concludes with a proposed decisional classification and schedule.

2 RSE Background

This section reviews at a high level the purpose of each RSE component test as well as the principles under which the RSE design is intended to fill.

2.1 Resource Sufficiency Evaluation Purpose and Principles

The purpose of the resource sufficiency evaluation is to ensure each EIM entity is able to meet their demand with their own net-supply prior to engaging in transfers with other balancing authority areas through the EIM in the real-time market. The purpose is also to ensure an EIM entity submits balanced supply and demand schedules, while providing EIM entities information about potential congestion within their balancing authority areas. This is accomplished by meeting the following objectives: 1) ensuring that balancing authority areas do not lean on the real-time capacity, flexibility and transmission of other balancing authority areas in the EIM footprint, and 2) providing an incentive for EIM entities to submit base schedules that balance supply and demand as well as a means to check for internal congestion.

The RSE's capacity and flexible ramping tests address the first objective of preventing leaning. Leaning has been defined as participation in the EIM without sufficient capacity and ramping flexibility to cover expected balancing authority area demand, including net load uncertainty. The RSE's balancing test protects against strategic base schedule submissions designed to profit against differences in imbalance energy prices between supply and load. The RSE's feasibility test serves as a means for EIM participants to check whether their initial base schedules are feasible considering congestion.

The RSE's capacity and flexible ramping tests do not determine if a balancing authority area is able to meet its individual reliability requirements, rather it is a real-time test that serves as a prerequisite for EIM participation. Ensuring each EIM entity meets their reliability requirements is addressed by individual EIM entities' resource adequacy

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requirements determined by their regulatory authority, and by NERC reliability standards¹. The capacity and flexible ramping tests do not necessarily ensure a balancing authority area is resource adequate. Rather, it addresses concerns with leaning through limiting receiving and/or sending EIM energy transfers from other balancing authority areas when a balancing authority area fails the tests.

The CAISO reiterates the voluntary nature of participation that the existing EIM design allows. The RSE is not intended to set reliability requirements or a minimum amount of capacity that must be offered into the EIM. Rather with that understanding, the RSE has been generally accepted as intended to be consistent with the following principles:

- Leaning is participation in the EIM without sufficient capacity and ramping capability to meet expected load
- The resource sufficiency evaluation should accurately and transparently measure the capacity and ramping capability of a balancing authority area
- The consequences of resource sufficiency evaluation failures should not cause operational or reliability issues
- The resource sufficiency evaluation does not dictate resource adequacy or integrated resource plans in individual balancing authority areas

Stakeholders generally agreed with the CAISO's proposed design principles, but offered additional principles to be considered. The general consensus from commenters was to also incorporate the design principles of equitable application of the RSE to all balancing authority areas participating in the EIM and to ensure the RSE is accurate, effective, and routinely reviewed. The CAISO agrees that transparency is critical in allowing all EIM participants to observe the RSE's performance and accuracy. Consequently, the CAISO has updated its proposed design principles to include transparency. Additionally, Section 4.1 outlines additional measures the CAISO is seeking to ensure the performance of the RSE is accurate. The CAISO understands the equitability perspective stakeholders put forth and believes its proposals strike an appropriate balance of addressing these concerns, given the different methods available to participate in the real-time market.

Stakeholders also put forward the idea that the RSE is designed to ensure reliable operation and not to better incent more robust forward procurement. Reliability remains the obligation of each balancing authority area. Meanwhile, forward procurement remains the responsibility of each local regulatory authority's resource adequacy and

¹ [Order Conditionally Accepting Proposed Tariff Revisions to Implement Energy Imbalance Market \(ER14-1386\)](#)

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integrated resource plans. Neither of these suggestions are consistent with the voluntary premise under which the EIM is operated.

3 Stakeholder comments

In June 2021 the CAISO published an issue paper and held multiple workshops to discuss, with stakeholders, potential enhancements to the resource sufficiency evaluation. During the workshops, the CAISO and stakeholders presented on various potential test enhancements, failure consequences, and additional reporting. This section summarizes the stakeholder comments the CAISO received on the various topics addressed in the issue paper and workshop presentations.

The CAISO and stakeholders discussed several potential financial consequences for failing the RSE. Generally stakeholders supported the CAISO first focusing on making design changes to the RSE test during an initial phase of the proposal. Then, following observation of the impact of the design changes, perform further policy development on RSE failure consequences. However, a stakeholder raised the argument that it may be inappropriate altogether to have additional financial consequences due to the voluntary nature of the EIM. The CAISO agrees with the majority of stakeholders to defer additional policy development on this topic, until after enhancements to the RSE have been completed and implemented. After implementation, the CAISO with stakeholders, will review the performance of the RSE and then determine the appropriate resource sufficiency evaluation consequences. Section 5 details the scope items for the proposed second phase of this initiative.

Stakeholders expressed a need for greater transparency around the RSE test through CAISO reporting and data availability. They commented that the CAISO's recent reporting and analysis efforts have been beneficial as they provided a greater understanding of the calculation, accuracy, and performance of the RSE. Stakeholders requested the CAISO to continue to provide this information so they may continue to assess how the RSE functions, and identify the extent leaning is occurring. Additionally, stakeholders requested the CAISO increase the RSE individual balancing authority area data it routinely provides, particularly data related to the capacity test. They explained the addition of more granular data would help the base scheduling process to facilitate more accurate inputs that are used for the RSE. These stakeholders suggested establishing standardized performance and accuracy metrics to summarize each EIM balancing authority area's capacity and flexible ramping sufficiency test results. The CAISO agrees with stakeholders and proposes to expand the data it provides to each individual EIM Entity.

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Additionally, stakeholders expressed concern regarding CAISO reporting on the RSE performance given its dual role as the market operator and EIM participant. Consequently, the CAISO proposes the Department of Market Monitoring to subsume the primary role of analyzing and reporting on RSE performance. Section 4.2.1 further describes the CAISO's proposal.

As part of the comments on transparency and data availability, stakeholders also raised questions regarding the calculation of the uncertainty element of the capacity test, and put forward questions related to the upcoming enhancement to use a quantile regression methodology to calculate the uncertainty requirement. They also requested the CAISO develop performance metrics related to the quantile regression methodology to determine if it performs as intended. The footnote provides a link to the requirements document for the upcoming *Flexible Ramping Product Enhancements*.² The attachment document details the planned quantile regression methodology for the uncertainty requirement. The CAISO plans to develop metrics to assess the performance of the quantile regression methodology as part of implementing the quantile regression methodology. The methodology will be used to determine each balancing authority area's uncertainty requirement for both the capacity and flexible ramping sufficiency test, as well as for real-time markets flexible ramping product procurement.

The CAISO and stakeholders suggested enhancing the RSE's capacity test by considering intertemporal constraints as well as the reliability of CAISO import schedules. Generally, stakeholder comments were supportive of adding intertemporal considerations to ensure the supply that is tested is truly available in the real-time market. These stakeholders argued excluding capacity that is not available in the real-time market horizon will greatly improve accuracy and confidence of the test. However, these same stakeholders offered varying opinions on the appropriate time range that represents the real-time horizon. A few stakeholders cautioned excluding capacity with start times in excess of the immediate real-time horizon that may have been available. They explained that for previous economic decisions relating to more efficient, less expensive, capacity being available in other balancing authority areas, it is possible that capacity is unavailable for dispatch in the upcoming real-time horizon. One stakeholder disagreed all together with the concept of including intertemporal constraints in the capacity test because the flexible ramping test already considers resources' availability. Additionally, another stakeholder argued this enhancement would only make this test more complicated and less transparent, which was not the goal of enhancing this test. While aware of the potential for additional complication to the capacity test, the CAISO

² [Flexible Ramping Product Refinement – Attachment C:](#)

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agrees with the stakeholders and proposes to only count capacity available to the real-time market. The CAISO describes this proposal in further detail in Section 4.1.1

The stakeholders both during the workshop, and detailed in their comments, raised concerns that speculative import awards cleared by the CAISO market are being incorrectly credited as available capacity to the CAISO in the RSE. They contend that this may result in an over-representation of available import supply in the hour under evaluation. The CAISO agrees with stakeholders and is proposing to only count imports as available capacity, if there is a reasonable assurance of delivery. This proposal is further detailed in Section 4.1.2

Some stakeholders maintain the equitable treatment principle should imply the balancing test is also applied to the CAISO balancing authority area. As described in 4.1.3, the balancing test is intended to prevent potential strategic submission of under or over-scheduled supply and demand schedules, to game differences in CAISO real-time market imbalance energy prices. The balancing test has not been applied to the CAISO, nor does the CAISO propose for it to be applied, because the CAISO does not submit base schedules to the real-time market. However, the CAISO does believe the balancing test can be enhanced to ensure more equitable revenue allocations.

The capacity and flexible ramping test uses the CAISO's generated demand forecast as an input to the RSE. Stakeholders expressed concerns that the demand forecast does not account for systemic operator adjustments to the load forecast used in the real-time market. Stakeholders contend this practice under represents the CAISO's actual load needs and allows the CAISO to inappropriately pass the RSE. In their comments and during the workshop, stakeholder suggested the CAISO include operator load adjustments in the RSE. The CAISO understands stakeholders concerns, but recognizes there are many reasons operators adjust load. Load adjustment occurs to account for uncertainty between the day-ahead and real-time market horizons, the potential for real-time flexibility to be awarded behind transmission constraints, and for forecast error. The CAISO acknowledges this issue, but believes the RSE is not the appropriate venue to address these concerns. Section 5.2 describes in more detail how the CAISO will solve these existing market design issues.

In addition to operator load forecast adjustment, a few stakeholders sought additional clarity on the definition of leaning during energy emergency events. They advocated that when a balancing authority area is in an energy emergency alert and arming firm load as reserves, that balancing authority area is resource insufficient. The CAISO agrees with stakeholders and proposes to limit a balancing authority area's incremental EIM transfers in, when a declaration of emergency energy alert is in place. This proposal is detailed further in Section 4.1.4.3.

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There was unanimous stakeholder support of incorporating EIM Entities' demand response programs in the RSE. Stakeholders argued that like the CAISO, EIM entities have demand response programs. To the extent these programs are unable to be modeled directly in the EIM as resources, their current participation is limited. Therefore, EIM entities are not able to appropriately account for demand response events in their base schedules, which in turn doesn't accurately reflect their system load reduction. This may result in EIM entities having to use load bias to reflect the demand response load reduction, or to the extent the demand response program is not captured to procure additional capacity that is not needed for the purposes of passing the RSE. Consequently, the CAISO is proposing to allow demand response programs to be represented in the base scheduling process for the purpose of participating in the EIM. This proposal is further described in Section 4.1.4.1.

4 Proposal – Phase 1

This section of the paper discusses enhancements to the resource sufficiency evaluation that the CAISO plans to address in the first phase of this initiative. These proposed enhancements draw significantly from suggestions made by stakeholders in their written comments and during the workshops held on June 25th and 28th. These phase 1 enhancements are focused on improving the accuracy and transparency of the resource sufficiency evaluation.

4.1 Resource Sufficiency Evaluation Design Changes

This section reviews proposed changes unique to the capacity, flexible ramping sufficiency and balancing tests. It then details generally applicable changes that apply to multiple aspects of the resource sufficiency evaluation.

4.1.1 Capacity Test Modifications – Intertemporal Constraints

The RSE's existing capacity test assumes the availability of all supply base schedules and bids within a balancing authority area. Intertemporal constraints, such as a resource's startup time and cycling time are not considered. This design creates the potential for the capacity test to overestimate the supply in the real-time market available in each balancing authority area.

The CAISO agrees with stakeholders that capacity that the real-time market could not have used because of start-up or cycling time should not be counted as available supply

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in the capacity test. However, limiting credit base on its status as online should not preclude counting resources that are not available in the upcoming hour because they are not started, or received operating instructions, in a previous hour due to the results of the real-time market's economic optimization. As described further below, this could create adverse market incentives.

The longest real-time market horizon is the CAISO's short-term unit commitment (STUC) horizon, which extends approximately 4.5 hours.³ This market run is intended to perform a market optimization that includes the ability to issue commitment instructions across a horizon that includes medium-start resources that have start-up times between 2 and 5 hours.

Consequently, it seems reasonable that the capacity test should count resources that have a start-up and minimum run time no longer than what can be started by the real-time market's STUC process. The CAISO proposes that the capacity test consider the start-up time when evaluating an offline bid-in resource by considering both (1) the resource's start-up time, and (2) the hours for which bids for the resource were submitted. A resource would be counted in the upcoming hour's capacity test even if it had a start-up time longer than the real-time pre-dispatch (RTPD) horizon, but only if there was a bid for the resource for the upcoming hour available to the real-time market when it ran at the time calculated as the beginning of the upcoming hour minus the resource's start-up time.

For example, a resource with a four hour start-up time would be counted in the capacity test conducted for hour ending 18 only if bids for the resource were in the market for hour ending 18 when the market was running during hour ending 14 through hour ending 18. This approach ensures capacity that would have been capable of being available for dispatch prior, but for economic decisions made by the EIM, is credited to passing the RSE's capacity test.

The CAISO also proposes that during this period, any offline capacity that participated in the real-time market in RTPD or previously through the STUC horizon that received a binding unit commitment instruction that was subsequently not followed, will not be counted as available capacity towards the test. In addition, capacity that was made available through the STUC horizon, but is on outage during the upcoming hour, or has returned from outage but is unable to ramp to minimum load will also not be counted.

Additionally, it is reasonable to count the capacity of a resource if it is shut down, or receives a state transition down by STUC or RTPD market runs. The CAISO proposes to also count capacity with bids through the hour under evaluation that are available at

³ [CAISO BPM for Market Operations Section 7.7](#)

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the time a resource is decommitted or transitioned into a lower configuration. Under this example, if a resource has a two hour state transition time and is online at hour ending 16, but receives a state-transition instruction that runs through hour ending 18; it would receive credit for the bid in capacity that would have been available but for the market instruction.

Stakeholders contemplated utilizing a shorter availability horizon, between one to two hours, to screen for capacity that should be counted as available in the RSE's capacity test. The CAISO has concerns that limiting available capacity to this truncated horizon has the potential to create competing incentives for EIM participation for resources with a longer startup time. These incentives include the potential for EIM entities to make uneconomic commitment decisions for the purpose of passing the RSE and ensuring future access to EIM transfers, such as:

- base scheduling resources online at minimum load, or
- not following optimal resource de-commitments or
- not following optimal state transitions

An EIM entity should not be dis-incentivized for using a more cost effective resource elsewhere within the EIM footprint; this type of economic displacement is inherent to the commitment and dispatch decisions made under a centrally cleared market and is a primary benefit offered by the EIM. Table 1 offers examples with differing initial conditions and bidding / base scheduling practices that illustrate how the proposal would work. The CAISO assumes that resources with startup times longer than the STUC horizon will be started through the day-ahead processes.

Table 1: Examples of Capacity Test with proposed intertemporal constraints

No.	Resource Capability and Bidding Description	Expected Results
1	Pmax: 400 MW Status at T-270: Online Status at Final RSE: Online Output: 200 MW Startup Time: 180-minutes Availability: Bid continuously starts at 400 MW 270-minutes prior to operating hour	Capacity is credited The resource was online at the time of the final RSE. Therefore, their entire 400 MW will be credited as available capacity. This is because the capacity was made available to the EIM.

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No.	Resource Capability and Bidding Description	Expected Results
2	<p>Pmax: 400 MW Status at T-270: Offline Status at Final RSE: Offline Output: 0MW Startup Time: 180-minutes Availability: Bid continuously starts at 400MW 270-minutes prior to operating hour</p>	<p>Capacity is Credited</p> <p>The resource was made available to the EIM for dispatch within the operating horizon and could have ramped to minimum load. The test, for optimal decisions made by the EIM, did not bring the resources online. Therefore, the EIM entity will be credited for 400 MW in their capacity test</p>
3	<p>Pmax: 400 MW Status at T-270: Online Output: 100 MW Status at Final RSE: Offline Startup Time: 180-minutes Availability: Bid continuously bid from 270-minutes and prior to the operating hour</p>	<p>Capacity is credited</p> <p>While the resource was offline, it was online at the start of the RSE test and made available through the STUC horizon. Therefore, the resources was made available for optimal use the EIM entity and will be credited for 400 MW in their capacity test.</p>
4	<p>Pmax: 400 MW Status at T-270: Online Schedule: 100 MW Status at Final RSE: Offline Startup Time: 180-minutes Availability: Bid from 270-120 minutes prior to the operating hour</p>	<p>Capacity is not credited</p> <p>While the resource was online to start, during STUC it was de-committed either by the EIM or the EIM entity. At the time of its de-commitment, bids were not available through the hour under evaluation. As such, the capacity for this resource is not credited to the EIM entity.</p>

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No.	Resource Capability and Bidding Description	Expected Results
5	Pmax: 400 MW Status at T-270: Offline Schedule" 0 MW Status at Final RSE: Offline Startup Time: 600 Minutes Availability: Bid continuously start at 270 Minutes prior to operating hour	Capacity is not credited Since the resources start time is outside of the real time operating horizon (STUC), the capacity is not credited as available capacity to the EIM BAA.

4.1.2 Flexible Ramping Test Modifications

The flexible ramping test currently measures a balancing authority areas ability to ramp between forecasted demands including uncertainty, for each fifteen minute interval within the hour under evaluation. This measurement is conducted using the real-time pre-dispatch schedule immediately prior to the hour being evaluated as the reference point. To increase the accuracy of this test, the CAISO proposes to calculate the quantity of any power balance constraint relaxation, if needed, that is present in the market solution. This quantity will then be accounted for in the flexible ramping sufficiency test, for both the upward and downward requirements. This adder to account for power balance constraint relaxation will exclude any operator load adjustments inherent to the market schedule. This change will ensure that the market schedule that is used as the reference point in the flexible ramping sufficiency test does not have an artificially biased ramping requirement due to capacity shortfalls preventing market schedules from fully balancing to demand.

4.1.3 Balancing Test Modifications

The RSE balancing test was designed to offer a financial incentive for EIM balancing authority areas to provide base schedules near forecasted demand to ensure equitable and robust participation in the EIM. This test has not been applied to the CAISO balancing authority area, as the CAISO does not actively make available to the market its supply through the base scheduling process. As previously stated by the CAISO and

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supported by comments from the Six Cities,⁴ the intent of the balancing test is to prevent gaming opportunities.

For the CAISO, real-time market imbalance energy is settled relative to day-ahead schedules produced by the CAISO's integrated forward market. Although CAISO day-ahead schedules depend on the schedules and bids submitted by market participants, various mechanisms exist to incent scheduling to the demand forecast in the integrated forward market, i.e. market prices and convergence bids. Although the CAISO balancing authority area's load forecast may change between the day-ahead market and real-time, it would be inequitable to apply the balancing test to the real-time demand forecast as that may be significantly different than the forecast that was used in the day-ahead timeframe. In addition, it would be inconsistent with the objectives of the balancing test because real-time market imbalance energy in the CAISO is settled against integrated forward market schedules, not the real-time demand forecast. Conversely, EIM base schedules are the reference for settling real-time imbalance energy in EIM balancing authority areas outside of the CAISO. These base schedules are submitted in the same timeframe that the demand forecast used by the balancing test is produced, and through their very nature are open to potential over or under scheduling to attempt to exploit systemic differences in congestion.

Therefore, the CAISO believes it is still appropriate to exclude the CAISO balancing authority area from the balancing test. However, the CAISO proposes to exclude any EIM participant not subject to the balancing, and subsequent over and under scheduling test from the potential revenues resulting from failures of the balancing and subsequent over/under scheduling tests as they are not subject to the test that derives these revenues.

4.1.4 Generally applicable modifications

This section of the paper describes changes that can apply to both the capacity, flexible ramp sufficiency, and in some cases balancing test.

4.1.4.1 Demand Response Inclusion within the RSE

Should an EIM balancing authority area operate a demand response program that can reduce load and in turn, free resources to participate in the EIM, the reduction in

⁴ [Comments on issue paper and workshop presentations/discussion – Six Cities](#)

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capacity should be able to be represented for the purpose of participating in the EIM. Currently, only demand response programs in excess of 4% of an EIM entity's load are able to be incorporated into the demand forecast that serves as an input to the RSE.

The CAISO envisions two methods through which demand response can be utilized by an EIM entity:

1. The CAISO will provide an EIM entity the ability to adjust the demand forecast used by the RSE to account for demand response programs that are not currently able to be represented within the CAISO market. These reductions will be reflected in the forecast used to determine the requirements in both the capacity and flexible ramping sufficiency tests. The election to reduce the CAISO generated load forecast will result in the forecast being treated as an EIM entity generated forecast; with automatic application of the over and under scheduling tests. To do this, the load adjustment will also be accounted for in the calculation of the load base schedule that is used to determine imbalance for settlement purposes. The load reduction provided by a demand response program can be performed at the customized load aggregation point level using load distribution factors provided by the EIM entity.
2. An EIM entity can include demand response through registration and bidding as a proxy demand response resource using CAISOs existing proxy demand response model. All requirements for registering demand response as a participating resource will apply to ensure all resource types within the EIM receive equitable treatment.

The CAISO has concerns that there is a potential for fictitious demand adjustments to be made for the purpose of passing the capacity for flexible ramp sufficiency test. The CAISO proposes that each EIM entity who plans to utilize a demand response program sign an attestation that adjustments made to the demand forecast used by the RSE correspond to expected reductions in demand provided by their programs. In addition, the CAISO requests comments from stakeholders on if a more stringent threshold than the existing 5% is appropriate for the under scheduling test and if the 150% of the LMP charge that the existing test proposes⁵ is sufficient to ensure that adjustments to base schedules to represent expected demand response is not misused.

⁵ [CAISO BPM for Energy Imbalance Market - § 11.3.2](#)

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4.1.4.2 Delivery of CAISO Import Schedules

As presented in the workshop, and detailed in comments, stakeholders have concerns that speculative imports into the CAISO are being over-credited as available capacity in the RSE's capacity test. The CAISO agrees that imports on which there is not a reasonable assurance of delivery should not be counted as capacity.

The CAISO proposes that CAISO imports that have not accepted their award and submitted a transmission profile e-Tag equal to their hour ahead scheduling process schedule by the forty minutes prior to the operating hour (T-40) deadline,⁶ should not be counted as available capacity for the purpose of passing the RSE. The CAISO believes import schedules supported by an e-Tag with a valid transmission profile should be counted towards as it is a reasonable representation of intent for an import awardee to deliver on the award; this corresponds to a positive affirmation of intent to deliver. In addition, the CAISO imposes an under/over delivery charge which further incentivizes the delivery of awards. The charges are for undelivered awards with submitted transmission profiles equate to 75% of the higher of the real-time dispatch or fifteen minute market locational marginal price.

The CAISO uses the schedules produced by the RTPD run at 52.5 minutes (RTPD-6) prior to the hour as its input to the final RSE. With the current sequencing of the RSE and RTPD market runs, the automatic reduction of import awards that have not submitted a transmission profile by the T-40 deadline are not incorporated until the RTPD run that initiates following the final RSE that begins 37.5 minutes prior to the operating hour. Accounting for this potentially underlived capacity can be done by reducing the RTPD-6 import awards that are used as an input for the RSE.

The CAISO does not believe that requiring full e-Tag at T-40, prior to the NERC/NAESB T-20 deadline for completing-tags, i.e. completing the energy profile section, is an appropriate pre-condition for participation in the CAISO's real-time market. Requiring full e-Tags prior to this deadline would preclude the CAISO from accessing energy supply that is made available following T-40; such as renewable or slice supply in the pacific northwest whose allocations are determined after this deadline. Figure 1 details the interaction of the RTPD and RSE runs with the T-40 transmission profile deadline.

⁶ [CAISO Tariff § 11.31.1.2](#)

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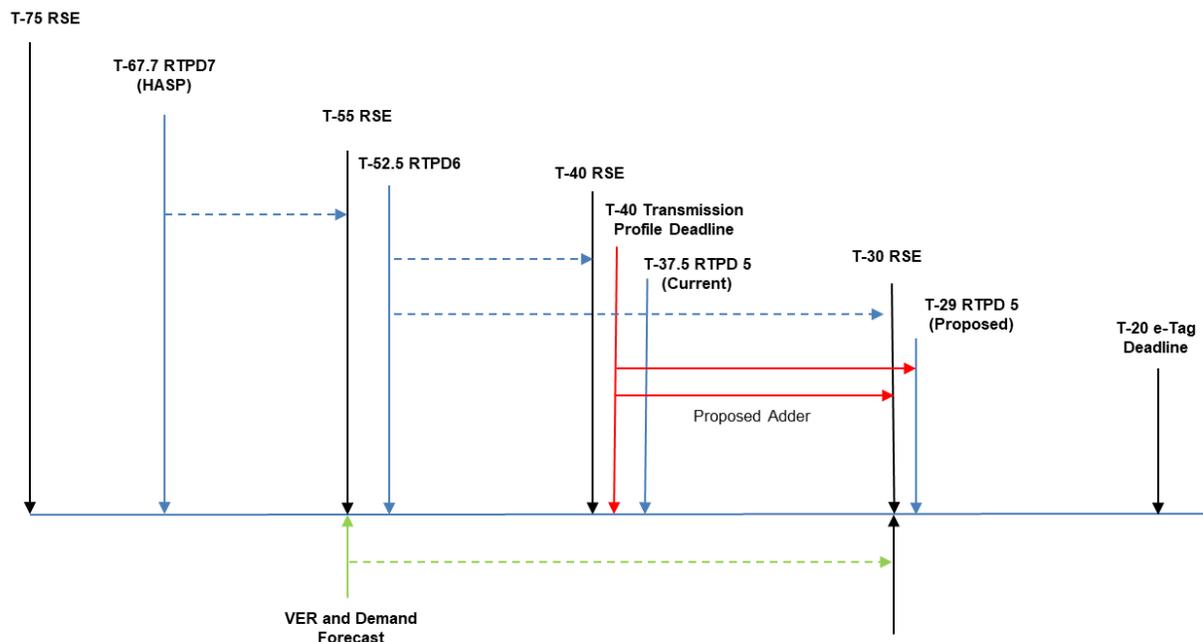


Figure 1: Sequencing of RSE, RTPD and Intertie Deviation Settlement timelines

4.1.4.3 Use of firm load as non-spin and spin

Some stakeholders commented that a balancing authority area should be deemed resource insufficient in the event it is in an energy emergency and has resorted to arming firm load to meet reserve requirements. For example, the CAISO was in such a situation in August 2020. The CAISO believes this is a reasonable point and consequently proposes that the real-time market's dispatch of additional energy transfers into a balancing authority area should be limited when a balancing authority area is under an energy emergency and meeting reserve requirements by arming load.

4.2 Resource Sufficiency Test Transparency

4.2.1 Additional Transparency

Stakeholders in their comments and at the workshop, urged the CAISO to provide additional transparency through regular reporting and data on the performance and accuracy of the RSE as this has been greatly beneficial in understanding the calculation, accuracy, and performance of the RSE. The CAISO agrees this transparency is beneficial in helping balancing authority areas better understand the RSE. However, the CAISO recognizes it serves a dual role, both as the market operator and as a balancing authority area that participates in the EIM, and that

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reporting from an independent third party can be beneficial. Therefore, the CAISO proposes to no longer provide capacity and flexible ramping failure information for all balancing authority areas as part of its regular reporting activities. Instead, this reporting role will be assumed by the CAISO's Department of Market Monitoring (DMM). The CAISO believes the DMM is the appropriate body to assume this reporting role because it regularly inspects the day-ahead and all real-time markets for efficiency and effectiveness. They also identify and report any market design flaws for all markets through their quarterly reports and through special reports and presentations. The CAISO believes this proposal merely clarifies the reporting they will perform for the EIM. The DMM will provide the EIM performance briefings to the EIM Governing Body on a quarterly basis. Conversely, the CAISO proposes to provide all data necessary to the DMM, and once established, the EIM Governing Body Market Expert to assist them in their reporting role.

The CAISO and DMM seek to define with stakeholders, what standard performance reporting metrics will entail. The metrics will be intended to monitor the accuracy and performance of the RSE within the EIM and to the extent possible be automatically generated⁷.

As a starting point, the CAISO proposes the following information to be reported on for each EIM participant:

- Unloaded capacity versus EIM transfers during tight system conditions
- Capacity considered as available in the RSE versus what is available in real-time
- Renewable forecast used in the RSE versus renewable forecast used in real-time pre-dispatch
- Load forecast used in the RSE versus load forecast observed in real-time dispatch

The CAISO and DMM seek stakeholder comments on the proposed standard performance reporting metrics and any additional metrics that should be considered.

At this time, the CAISO does not propose to provide any additional special reporting beyond what has been described above. The CAISO has and will continue to provide overall market performance reports for anomalous events, such as stressed system conditions (e.g. August 2020).

As a result of its DMM reporting proposal, the CAISO will no longer provide its EIM performance briefings in the Market and Performance Planning Forum. Instead, the

⁷ The CAISO proposes to automate the production of these metrics such that manual data extraction is not required.

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CAISO proposes to assume the role of providing EIM data to market participants, the Department of Market Monitoring, Market Surveillance Committee, and once established, the EIM Governing Body Market Expert.

4.2.2 Increasing EIM entities situational awareness regarding test performance

The CAISO agrees that additional data transparency is needed and proposes to provide each balancing authority area's detailed RSE advisory and binding results for their capacity and flexible ramping tests. The CAISO proposes to provide this data through the CAISO Market Results Interface (CMRI). The CAISO believes this additional data will enable EIM balancing authority areas to spot check their own performance of the RSE. This will allow for validation that inputs to the capacity and flexible ramp sufficiency tests are correct, and in turn will ensure that the results of the capacity and flexible ramping sufficiency tests are being accurately calculated and producing results consistent with expected data inputs. The CAISO also believes this additional data will enable participants to more accurately formulate their base schedules into the EIM.

The CAISO will provide the following data inputs for each balancing authority area following the capacity and flexible ramping tests results:

- Trade Date
- Resource's Master File ID
- Mega-watt quantity of capacity available for each hour
- Mega-watt ramping capacity for each hour
- Ramping type
- Test time
- Balancing authority area specific load forecast by hour
- Balancing authority area specific export quantity by hour
- Balancing authority area specific uncertainty requirement by hour
- Balancing authority area specific diversity benefit amount by hour

The CAISO seeks stakeholder comments on the proposed data availability and if any additional data should be considered.

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The CAISO seeks stakeholder comments on this elements of its proposal and requests any further feedback the CAISO should consider for transparency and reporting.

4.2.3 Uncertainty Calculation

Stakeholders raised concerns regarding the calculation of the uncertainty requirements that are used as inputs to the capacity test. These include the uncertainty requirements for variable energy resources, load, and historical net import/export delivery. The CAISO plans to update the uncertainty calculations for variable energy resources and load with the quantile regression methodology approved in the *Flexible Ramping Product Refinements* policy. The quantile regression uncertainty calculation is planned for implementation prior to the implementation of the enhancements in this initiative. Given the timing, the CAISO believes that developing data reporting metrics for the existing histogram calculation for variable energy resources and load is outside of the scope of this initiative. The CAISO does plan to review the impact of the addition of the current uncertainty requirements to the capacity test and discuss these results at an upcoming Market Surveillance Committee meeting.

The historical net import/export deviation calculates, with a 95% confidence interval, a future projection of intertie deviation between T-40 and T-20 using a retroactive review of deviations from the previous 90-days. This ensures that largest 2.5% of deviations are excluded from the calculation. Consequently, it ensures that the largest magnitude of intertie uncertainty relating to a failure to deliver is not added to the capacity requirement. This equates to 54 hours across the last 90 days. Additionally, the EIM Business Practice Manual (BPM) includes a provision to exclude outlier data from this calculation.⁸

The CAISO requests stakeholder comments on the appropriateness of the 2.5% threshold, in light of the ability to exclude outlier data.

5 Proposal Phase 2

This section of the paper discusses the scope of future enhancements to the resource sufficiency evaluation that the CAISO plans to address in a second phase of this initiative. Based on the written comments submitted by stakeholders, as well as

⁸ [CAISO EIM Business Practice Manual § 11.3.2.2](#)

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participation during the June 25th and 28th workshops the CAISO believes that deferring these topics to a second phase of the initiative will allow additional time for policy development, and for that development to be based upon observed performance of a more accurate and transparent resource sufficiency evaluation.

5.1 Resource Sufficiency Evaluation Failure Consequences

Following the discussion during the RSE workshops and written comments submitted to the CAISO, the CAISO does not believe that it is appropriate at this time, to put forward a proposal for revised RSE failure consequences. As expressed by multiple stakeholders, it would be premature to propose financial consequences for RSE failure, in light of the enhancements that are being made within this initiative, as well as the pricing improvements the CAISO made in the *Market Enhancements for Summer 2021* initiative. The addition of financial consequences for a failure of the EIM's RSE represents a fundamental change to the existing voluntary nature of EIM participation. As proposed by the select EIM entities in their comments, this type of change should only be done "with a clear rationale",⁹ which the CAISO believes the completion, implementation and performance review of the effectiveness of the proposed RSE enhancements is necessary to achieve.

In addition, during the workshop, a presentation was made on applying financial consequences to previously cleared EIM transfers following the failure of the RSE. The CAISO has concerns regarding this proposal on the principle that EIM transfers that were voluntarily made while all participants were resource sufficient should be settled at the agreed upon market clearing prices produced by the EIM. Applying a consequence to transfers that are made in part based on a past interval's economic decisions, has the potential to create retroactive penalties for following an optimal dispatch produced by the EIM. The CAISO is concerned that any consequence structured in this way have the potential to curb EIM participation because it would create opaque cost assurance provided by the following optimal dispatch and utilizing the EIM to meet each EIM entities' obligation during that hour.

While the CAISO does not believe it is appropriate to add financial consequences for failure of the RSE at this time, it does propose to add review of RSE failure consequences to the stakeholder catalog as a non-discretionary item. Following the implementation, and review of the enhancements proposed in Section 4 of this paper, the CAISO will develop, with stakeholders, appropriate consequences for failure for the

⁹ [Comments of Select EIM Entities Page - 15](#)

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RSE to the extent that the current consequences are deemed insufficient. The CAISO will add this topic to its Policy Initiatives Catalog as a committed initiative, consequently ensuring the topic is added to the Annual Policy Plan.

5.2 Load Forecast Adjustments

Some stakeholders maintain the RSE should use the load forecast that reflects any operator adjustments to the load forecast used by the real-time market. However, the CAISO does not propose to incorporate operator load forecast adjustments into the RSE. Although data shows that the CAISO operators systematically increase the load forecast used by the real-time market's real-time pre-dispatch process, these adjustments are typically done to account for market issues that are being addressed, or have been addressed, by other market enhancements.

The CAISO believes that a well-designed RSE should test for a balancing authority area's ability to meet their expected demand and ramping requirements, rather than forecasted requirements plus out of market actions that are taken to account for existing market design deficiencies. Instead of including load forecast adjustments as an adder to the demand forecast used by the RSE, the CAISO believes it is appropriate to address systemic load conformance through market design improvements.

The CAISO notes the real-time load adjustments are primarily due to the operators compensating for flexible ramping product schedules that are not deliverable because of transmission constraints. The CAISO system operators systemically adjust the CAISO load forecast to increase imports and commit additional generation to compensate for the portion of flexible ramping product schedules that are not deliverable because of transmission constraints. The nodal procurement of flexible ramping product, planned for implementation in spring 2022, will reduce the need for the systematic operator load forecast adjustments

The CAISO proposes to revisit the need to account for operator load conformance in the RSE during the second phase of this initiative. This will allow the implementation of the flexible ramping product enhancements, which will significantly reduce systemic load forecast adjustments. The recent inclusion of the uncertainty requirement in both the capacity and flexible ramping sufficiency tests also accounts for load forecast error that is addressed by operator load forecast adjustments. During the second phase of this initiative, the CAISO will be able to determine if the remaining load conformance is in excess of the uncertainty requirements which are intended to capture forecast error, and if there is still a need for this to be accounted for in the RSE.

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6 EIM Decisional Classification

This paper proposes to adjust the resource sufficiency tests that will apply to the EIM. Under the currently effective Charter for EIM Governance,¹⁰ the CAISO proposes that the EIM Governing Body would have primary authority with respect to this issue, because the resource sufficiency test would not exist but for the EIM. See Guidance Document §II.A. Previously, in the June 3, 2021 Issue Paper, the ISO had proposed that the EIM Governing Body would have an advisory role with respect to the changes to the resource sufficiency evaluation because those changes will be uniform across the entire market footprint, and were not driven primarily by an issue specific to EIM balancing authority area. Stakeholder comments on the paper, however, pointed out the more relevant rule noted above (the “but for” test from the Guidance Document), and the ISO has adjusted the proposed classification accordingly.

This proposed classification reflects the current state of this initiative and may change as the stakeholder process moves ahead. The CAISO encourages stakeholders to submit comments on the issue. If any stakeholder disagrees with this proposed classification, please include in your written comments a justification of which classification is more appropriate.

Also note that this proposed decisional classification applies to this Phase I of the Resource Sufficiency Enhancements initiative. When Phase II of the initiative begins, a different analysis may apply.

7 Stakeholder Engagement

Table 2 outlines the proposed schedule to complete the policy for the EIM resource efficiency evaluation enhancements:

¹⁰ The Governance Review Committee adopted a proposal that would change the rules about the role of the EIM Governing Body in approving policy initiatives. If the EIM Governing Body and the Board of Governors approve this proposal in their joint session on August 20, 2021, the new rules would govern the presentation of this initiative for decision in December.

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On August 23 the CAISO will hold a stakeholder call to present its straw proposal. On August 27 the CAISO will discuss select elements of the straw proposal with the Market Surveillance Committee. Materials for both of these upcoming presentations will be posted on the initiative webpage at the link provided above.

Table 2

Date	Milestone
June 3, 2021	Issue Paper posted
June 18, 2021	Deadline to submit presentations for June 25 and 28 workshops
June 25 and 28, 2021	Stakeholder workshop to discuss issue paper
July 9, 2021	Comments due – issue paper and workshop discussions
Aug 16, 2021	Straw Proposal posted
Aug 23, 2021	Straw Proposal Stakeholder Call
Sept 8, 2021	Straw Proposal Comments Due
Oct 6, 2021	Draft Final Proposal Posted
Oct 11, 2021	Draft Final Proposal Stakeholder Call
Oct 22, 2021	Draft Final Proposal Comments due
Nov 8, 2021	Final Proposal Posted, Draft BRS, and Draft Tariff Language
Nov 15, 2021	Final Proposal Stakeholder Call
Nov 22 2021	Final Proposal Stakeholder Comments Due
December 6, 2021	EIM GB Meeting
December 15, 2021	BOG Meeting

Appendix

A. Existing Design

The RSE is run at seventy-five (T-75), fifty-five (T-55) and forty (T-40) minutes prior to the upcoming hour. The first two tests (T-75 and T-55), produce advisory results that allow a balancing authority area to update their base schedules so they may pass the final, financially binding test at T-40¹¹. The resource sufficiency evaluation is comprised of four tests: 1) feasibility, 2) balancing, 3) capacity, and 4) flexibility. The capacity and flexibility test are designed to ensure EIM entities are resource sufficient. A failure of either the capacity or flexibility test will result in an EIM balancing authority area's incremental transfers being limited to the transfer amount in the most recently passed interval¹². The balancing test is designed to provide an incentive for EIM entities to submit accurate base schedules, and results in financial charges applied to EIM entities for inaccurate schedules. The RSE applies to the CAISO balancing authority area with some differences in its application and operation because the inputs are from the day-ahead market results and not EIM base schedules. The following section provides a detailed description of the existing resource sufficiency evaluation design.

a. Feasibility Test

The feasibility test is intended to serve as an opportunity for EIM participants, who are not members of the CAISO day ahead market, to minimize re-dispatch and resulting imbalance charges that are necessary to resolve infeasible base schedules. The feasibility test performs a power flow evaluation on an EIM balancing authority area's submitted base schedules at T-75, T-55 and T-40 to determine if base schedules would result in violations of transmission limits. Following the posting of results, the EIM entity has an opportunity to adjust its base schedules to resolve advisory violations. The feasibility test is not explicitly applied to the CAISO balancing authority area, as the CAISO's existing market processes use a security constraint economic dispatch to automatically resolve transmission violations. Consequently, the CAISO does not need to make manual adjustments to market results in order to relieve transmission violations

¹¹ [The CAISO has proposed to change the final test to T-30 in the fall of 2021 approved under ER21-955.](#)

¹² CAISO revised to RSE to limit transfers to the most recently passed interval, rather than hour. This change was stakeholder in 2018 through the [EIM Offer Rules Workshops](#)

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as this is accomplished through the market optimization. The market results from the day-ahead market, hour-ahead scheduling process (HASP) and real time pre-dispatch (RTPD) are used for the CAISO balancing authority area in lieu of base schedules.

b. Balancing Test

The balancing test compares EIM balancing authority area's base schedules from generation and imports to a demand forecast to determine hourly imbalances. This test is not currently applied to the CAISO balancing authority area as the day-ahead market, HASP, and RTPD processes are designed to commit supply equal to forecasted demand. Rather, the purpose of the test is provide a financial incentive for EIM balancing authority areas to provide/update base schedules near forecasted demand.

The EIM provides an opportunity for EIM entities and EIM participating resources within those balancing authority areas to operate more efficiently. However, there is an opportunity for EIM entities to under/over schedule within their submitted base schedules as a means to control energy prices or shift costs. For example, an EIM entity could try to avoid de-committing generation to avoid start-up costs by providing base schedules in excess of their forecasted demand. Overscheduling can also present gaming opportunities via imbalance charges when systemic differences in LMP are present.

For this test, EIM balancing authority areas may choose to use the CAISO's demand forecast or use their own forecasts. If the EIM balancing authority area elects to use the CAISO demand forecast, imbalances within 1% result in the balancing authority area passing the test. If the imbalance is greater than 1%, the balancing authority area fails the test. The EIM balancing authority area is subject to over- or under- scheduling load penalties if their actual load is 5% more or less than its base schedule for an hour. If the EIM balancing authority area chooses to use their own demand forecast for the test, they are always subject to the over-or under-scheduling penalties when load is 5% more or less than their base schedule for an hour.

c. Capacity Test

The capacity test determines whether a balancing authority area is participating in the EIM with sufficient supply to meet its demand forecast. In addition, as a result of the

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recent *Market Enhancements for 2021 Summer Readiness*,¹³ the capacity test will require an additional amount of resource capacity to account for net-load uncertainty.

If a balancing authority area fails the capacity up or down test for any interval in an hour, they automatically fail the respective up or down flexibility test for the corresponding hour's fifteen-minute interval.

The capacity test includes the following inputs:

- CAISO's fifteen-minute market (FMM) demand forecast,
- Imports and exports (Hourly net scheduled interchange schedules, NSI),¹⁴
- Resource bids (internal supply and FMM schedules for upward Ancillary Services),
- Resources' de-rates and re-rates, and
- Historical inertia deviations. This ensures the capacity test better reflects the actual inertia availability by discounting systemically undelivered awards. This requirement provides an incremental adjustment to the capacity requirement.

The CAISO calculates the capacity test by determining if total bid range is greater than the total requirement. If the bid range is greater than the requirement, the balancing authority area passes the test. EIM transfers (imports or exports) and temporal constraints are not included in either of the CAISO or EIM balancing authority area's tests.¹⁵

The capacity test is calculated as follows:

$$G^{max} > LF + NSI$$

Where,

G^{max} Upper capacity limit

¹³ [Market Enhancements For Summer 2021 Readiness initiative:](#)

¹⁴ The CAISO's test, only FMM imports and exports are considered in the calculation.

¹⁵ [Bautista Alderete, Guillermo and Kalaskar, Rahul. Resource Sufficiency Evaluation Bid Range Capacity Test. Mar 2021-](#) PowerPoint Presentation.

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LF Load Forecast

NSI Net Schedule Interchange (Export–Import)

For example, a balancing authority area’s upper capacity limit is 100 MW. The load forecast is 147 MW and the net schedule interchange is –50 MW (import).

$$100 \text{ MW} > 147 \text{ MW} - 50 \text{ MW}$$

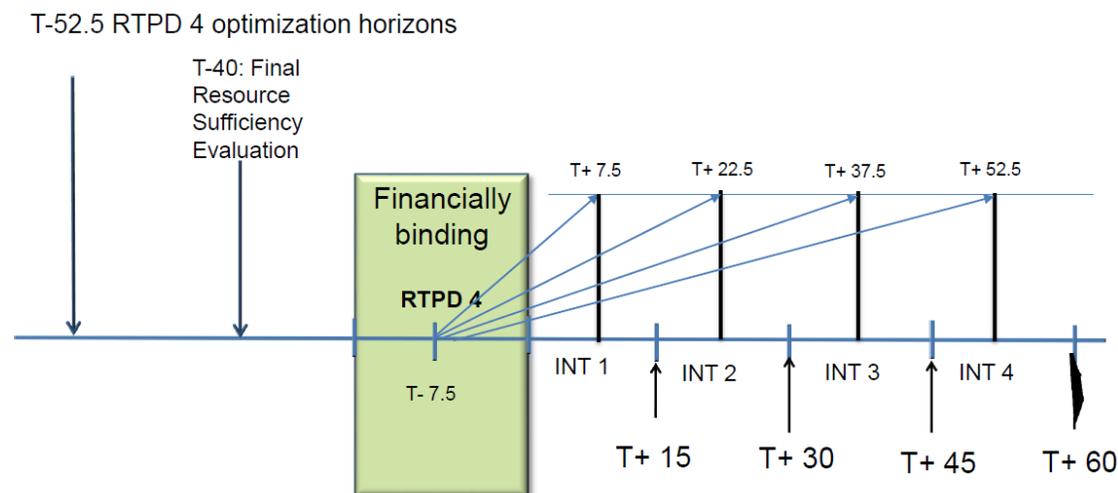
$$100 \text{ MW} > 97 \text{ MW}$$

Total bid range is greater than the total requirement, so the balancing authority area passes the test.

d. Flexible Ramping Sufficiency Test

The flexibility test (flexible ramp sufficiency test) ensures balancing authority areas have sufficient ramping capabilities to meet load forecast change and uncertainty inherent to both load and renewable resource performance. The test assesses that a balancing authority area has upward and downward flexible capacity available to be dispatched in the real-time market. The test evaluates four ramp intervals from the last 15-minute schedule from the proceeding hour to each 15-minute interval of the current hour.

Figure 2 - Temporal Graphic of the Ramping Sufficiency Test



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The flexible ramp test has six inputs: net demand uncertainty, forecasted change in demand, diversity benefit factor, net import capability, net export capability, and flexible ramp credit. The net demand uncertainty is a fixed number for all tests and can increase the requirement. The forecasted change in demand can either increase or decrease the requirement. The diversity benefit, net import capability, net export capability, and flexible ramp credit can reduce the requirement.

The flex ramp up requirement is calculated as follows:

$$F_{RU} = \Delta Demand(T) + MAX [(Flex Up Uncertainty - Net Import Capability), ((Diversity Benefit Factor * Flex Up Uncertainty) - Flex Ramp Up Credit)]$$

Where,

F_{RU} Flexible Ramp Up Requirement

The flex ramp down requirement is calculated as follows:

$$F_{RD} = \Delta Demand(T) + MAX [(Flex Dn Uncertainty - Net Import Capability), ((Diversity Benefit Factor * Flex Dn Uncertainty) - Flex Ramp Dn Credit)]$$

Where,

F_{RD} Flexible Ramp Up Requirement

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B. August 2020 Events

During August 2020, the CAISO balancing authority area experienced a severe heat wave. On August 14 and 15, this heat wave caused the CAISO balancing authority area to enter into energy emergency alert 2 (EEA2) and energy emergency alert 3 (EEA3) conditions.¹⁶ The CAISO was forced to implement rotating electricity outages to preserve supply and demand balance and not propagate their energy shortfall, and its corresponding reliability risks, to neighboring balancing authority areas. During this time, the CAISO passed the RSE's capacity test for all intervals. However, the CAISO failed the flexible ramping sufficiency test for several intervals on August 14-15. During the *Market Enhancements for 2021 Summer Readiness* initiative, stakeholders raised concerns that the CAISO inappropriately passed the capacity test during these intervals. Additionally, during the March 2021 EIM Governing Body meeting, the CAISO Market Surveillance Committee, as well as Bonneville Power Authority (BPA), requested the CAISO provide transparency around how the CAISO passed the RSE test during these conditions.

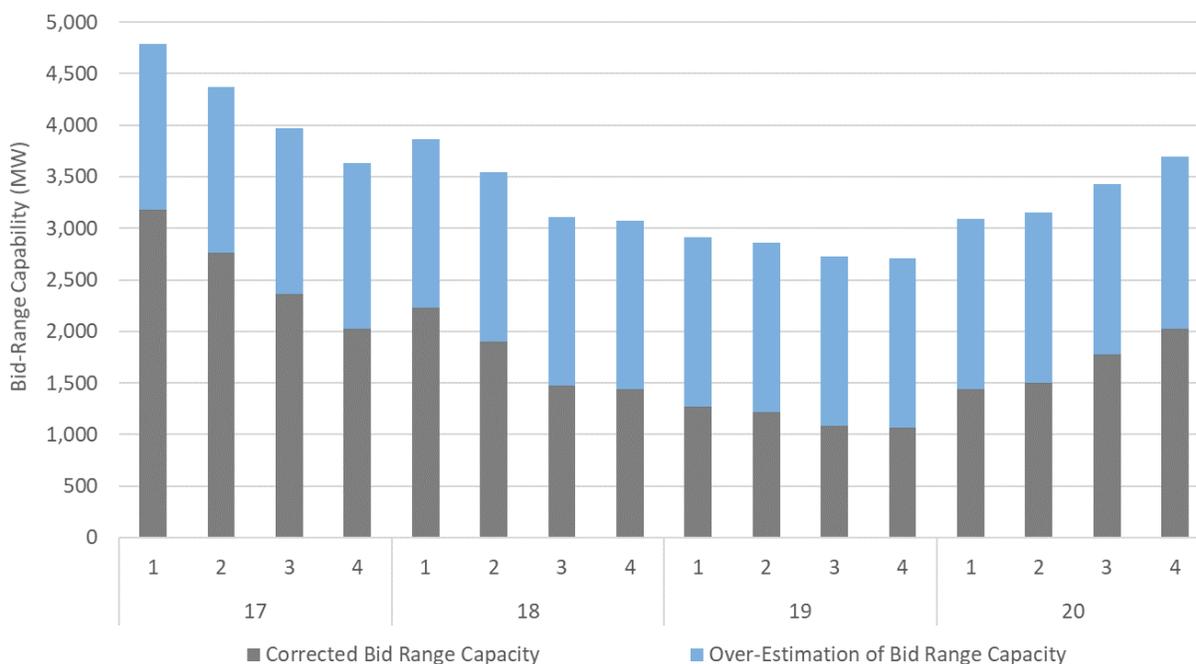
During the CAISO's examination of the August events, it was determined the CAISO passed the test due to software defects, and intertemporal conditions such as startup and ramping constraints. These various factors were not considered in the original test design. The identified software defects related to a double counting of mirror resources and a failure to account for resource derates; these defects were fixed on February 4, 2021. The incorrect application of resource derates resulted in the CAISO inappropriately accounting for approximately 2,000 MW¹⁷ of capacity. **Figure 3** illustrates the difference between overestimated and corrected bid range capacity when derates were correctly applied. This software defect was globally applied to outages submitted by all EIM entity balancing authority areas.

¹⁶ [NERC EOP-011-1 Attachment 1: Energy Emergency Alerts](#)

¹⁷ *Ibid.*

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Figure 3 - August 14, 2021 Overestimation of Bid Range Capacity in the CAISO balancing authority area



The double counting of mirror resources¹⁸ resulted in accounting for fictitious import supply of over 1,000 MW. The remaining over-estimated capacity was the result of a combination of start-up and ramp limited supply, undelivered interchange transactions, and an over-forecasted supply of variable energy resources.

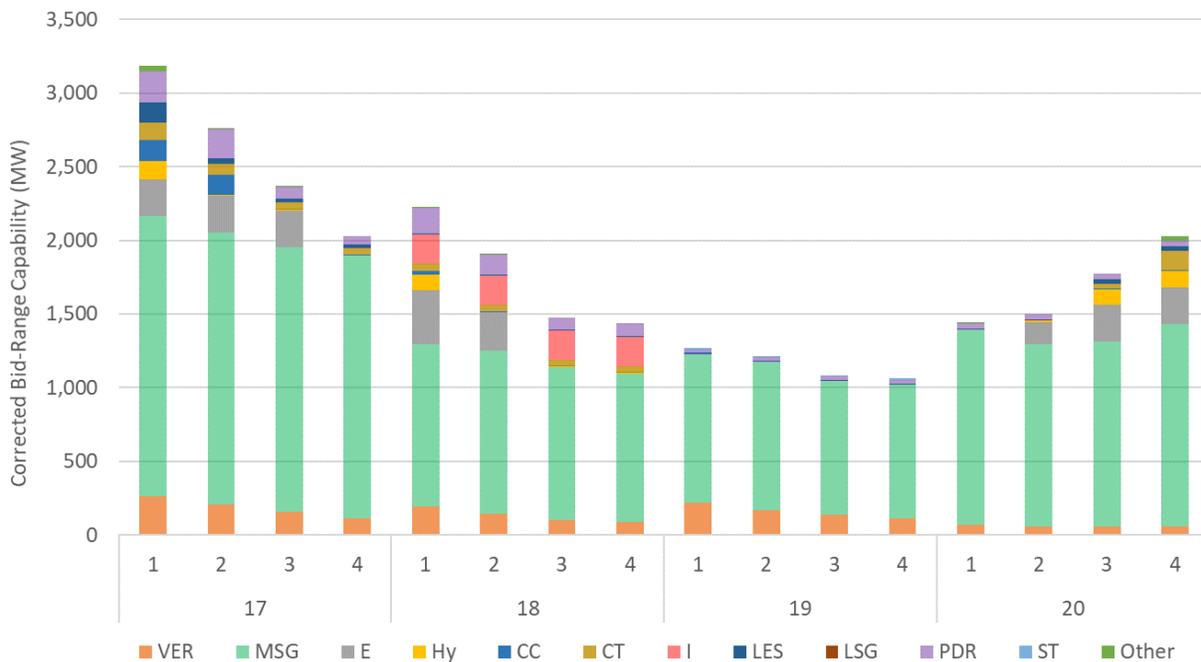
When correcting for these defects this analysis still shows an overestimation of available capacity during these tight supply conditions. As illustrated in **Figure 4**, the majority of the undeliverable capacity was from multi-stage generator resources. Further inspection revealed these multi-stage generator resources were temporally constrained. Variable energy forecasts at T-55 to the operating hour are used in the final evaluation, which also creates the potential for an inaccurate supply picture¹⁹. However, the same variable energy resource forecast is applied to all participating EIM balancing authority areas.

¹⁸Mirror System Resource: A System Resource at a Scheduling Point registered to an EIM Entity for mirroring CAISO intertie schedules at that Scheduling Point, when the associated Energy is generated at, wheeled through, or consumed at the corresponding EIM Entity Balancing Authority Area.

¹⁹The fixing of Variable Energy Forecast prior to the T-55 RSE was an enhancement to the RSE that was implemented on 12/12/2017.

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Figure 4 - August 14, 2020 Overestimation

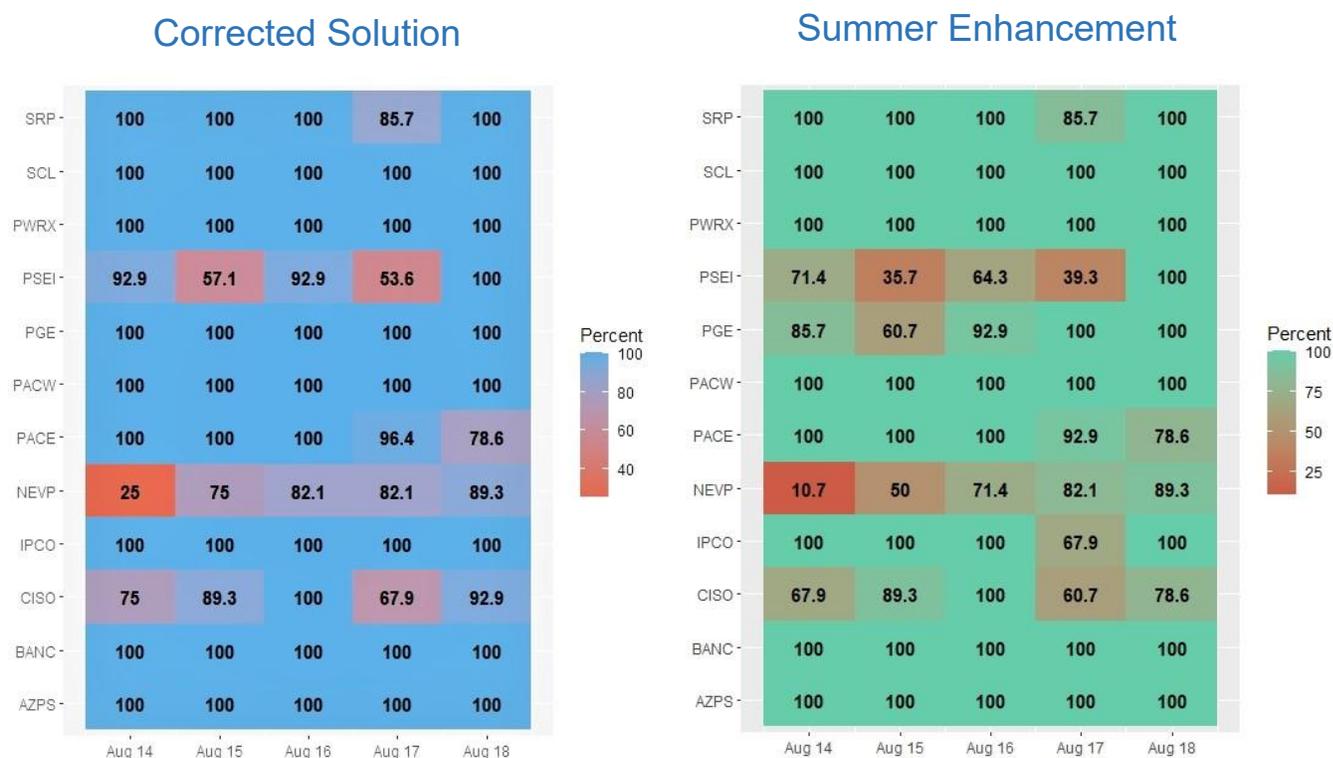


a. Impact of August events on the entire EIM

The events of August 2020 presented challenging operating conditions for many EIM entities. When derates were correctly accounted for, four additional EIM entities would have failed the capacity test during the heat wave. Accounting for the addition of the uncertainty requirement that was approved as part of the *Market Enhancements for Summer 2021*, two additional EIM entities would have experienced capacity test failures during this period. The RSE failures are not unique to any specific region. These results can be seen below in **Figure 5**.

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Figure 5 - August 2020 Heat Wave RSE results



b. DMM’s 2020 analysis on bid range capacity tests

The *Market Enhancements for Summer 2021* initiative’s RSE discussion primarily focused on the CAISO’s capacity and ramp sufficiency test performances. However, the Department of Market Monitoring (DMM)’s report on “Resource sufficiency tests in the energy imbalance market” provided information on the performance of the broader EIM²⁰. Their assessment illustrates that once the CAISO corrected identified software defects, other balancing authority areas also should have failed the bid-range capacity test.

Originally, the overall total of 2020 upward capacity test failures in EIM areas was very low because capacity was overestimating available supply due to the previously reference software defects. DMM’s **Figure 6** illustrates that the number of failures were

²⁰ CAISO Department of Market Monitoring: [Report on Resource Sufficiency Test in the Energy Imbalance Market](#). May 20, 2021.

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low and widespread across all EIM areas, with the most amount of capacity test failures seen in Powerex’s balancing authority area during Q1 and Q2.

Figure 6 - Observed 2020 RSE failures without software defect correction

California ISO	0	0	0	4	6	0	0	0	0	0	0	0
Arizona PS	0	0	4	0	0	1	0	0	0	0	0	9
BANC	0	0	0	0	0	0	1	1	0	2	1	0
Idaho Power	0	0	0	0	0	0	0	0	0	0	0	0
NV Energy	0	0	0	1	1	0	0	0	0	3	6	0
PacifiCorp East	0	0	0	0	0	0	0	0	0	0	4	0
PacifiCorp West	0	3	0	0	0	0	0	0	0	0	4	0
Portland GE	0	0	0	0	0	0	0	0	0	0	0	0
Powerex	12	6	8	6	10	0	0	0	2	2	3	0
Puget Sound En	0	2	0	0	0	0	0	0	0	0	0	0
Salt River Project				7	0	0	0	0	0	3	2	0
Seattle City Light				0	4	0	6	2	0	0	0	0
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	2020											