EIM Resource Efficiency Evaluation Enhancements

Issue Paper

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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 accounting for net load uncertainty in the RSE, to be implemented by summer 2021. This initiative's goal is to continue reviewing potential enhancements that were discussed in the recent initiative, but were determined infeasible to implement by summer 2021, as well as to review any additional potential enhancements.

This paper first provides background information regarding the RSE and then describes a number of potential enhancements. These include:

- Consideration of intertemporal and deliverability constraints in the capacity test
- Modifications to the initial reference point used in the flexible ramping sufficiency test
- Consideration of emergency operator actions within the RSE
- Review of the equitability of the balancing test only being applied to EIM entities
- Consideration of enhanced consequences for failure of either the capacity or ramp sufficiency test

The CAISO is requesting that stakeholders submit proposals on additional RSE modifications that can better ensure that entities participating in the EIM do so in a resource sufficient manner. This request includes design changes to the RSE, potential changes to RSE consequences, as well as any other changes stakeholder believe may be appropriate. The CAISO plans to hold a workshop prior to the publication of a straw proposal for stakeholders to present their design ideas.

2 RSE Background

This section reviews the purpose of the RSE and provides a detailed description of the existing RSE design. In addition, it provides background information on RSE performance for EIM entities in 2020. The 2020 RSE performance information includes detailed analysis on the heat wave events of August 2020.

2.1 Purpose

The purpose of the resource sufficiency evaluation is to ensure each EIM entity is able 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 area. 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. 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 resource sufficiency evaluation does not determine if a balancing authority area is able to meet its individual reliability requirements, rather it is a real-time test that serves are a prerequisite for EIM participation. Ensuring each EIM entity meets their reliability obligations is addressed by individual EIM entities' resource adequacy requirements determined by their regulatory authority, and by NERC reliability standards[1]. The RSE does not necessarily ensure a balancing authority area is resource adequate. Rather, it limits EIM participation in periods in which a balancing authority area fails the evaluation.

In summary, the RSE has been generally accepted as intended to meet the following principles:

- Leaning is participation in the EIM without sufficient capacity and ramping capability to meet expected load
- The resource sufficiency evaluation should 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

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

2.2 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-40[2]. 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 interval[3]. 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 following section provides a detailed description of the existing resource sufficiency evaluation design.

2.2.1 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 and T-55 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 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.

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

[3] 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

2.2.2 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.

2.2.3 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 recent *Market Enhancements for 2021 Summer Readiness,*[4] 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.

[4] *Market Enhancements For Summer 2021 Readiness* initiative:

The capacity test includes the following inputs:

- CAISO's fifteen-minute market (FMM) demand forecast,
- Imports and exports (Hourly net scheduled interchange schedules, NSI),[5]
- Resource bids (internal supply and FMM schedules for upward Ancillary Services),
- Resources' de-rates and re-rates, and
- Historical intertie deviations. This ensures the capacity test better reflects the actual intertie 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.[6]

The capacity test is calculated as follows:

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

Where,

G^{max} Upper capacity limit

LF Load Forecast

NSI Net Schedule (Import-Export)

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 a 50 MW import.

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

[6] Bautista Alderete, Guillermo and Kalaskar, Rahul. *Resource Sufficiency Evaluation Bid Range Capacity Test.* Mar 2021- PowerPoint Presentation.

100 MW > 147 MW – 50 MW

100 MW > 97 MW

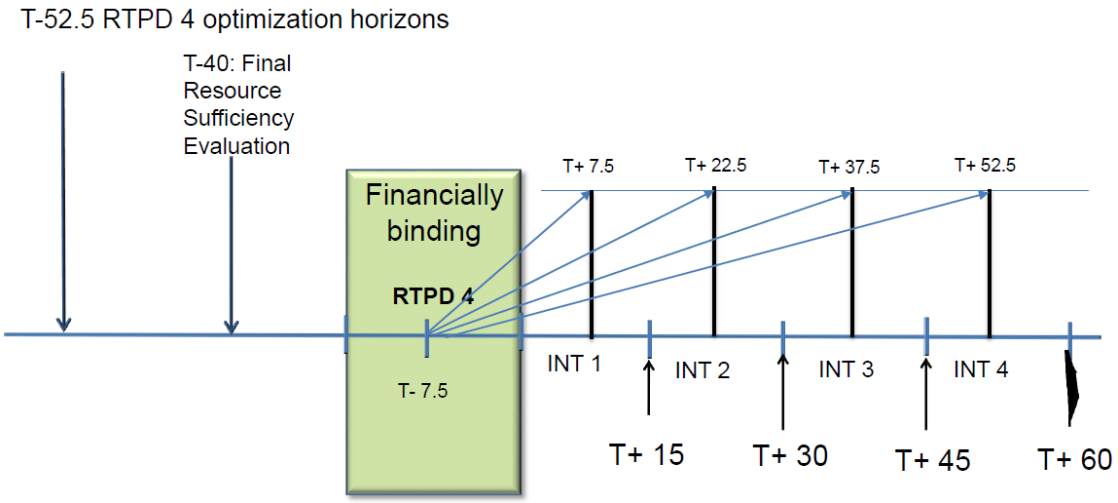
Total bid range is greater than the total requirement, so the balancing authority area passes the test.

2.2.4 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 asses 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 1 - Temporal Graphic of the Ramping Sufficiency Test**Figure 1** illustrates the market intervals that are used for the flex ramp test.

Figure 1 - Temporal Graphic of the Ramping Sufficiency Test



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:

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

Where,

F_{RU} Flexible Ramp Up Requirement

The flex ramp down requirement is calculated as follows:

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

Where,

F_{RD} Flexible Ramp Up Requirement

2.3 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)

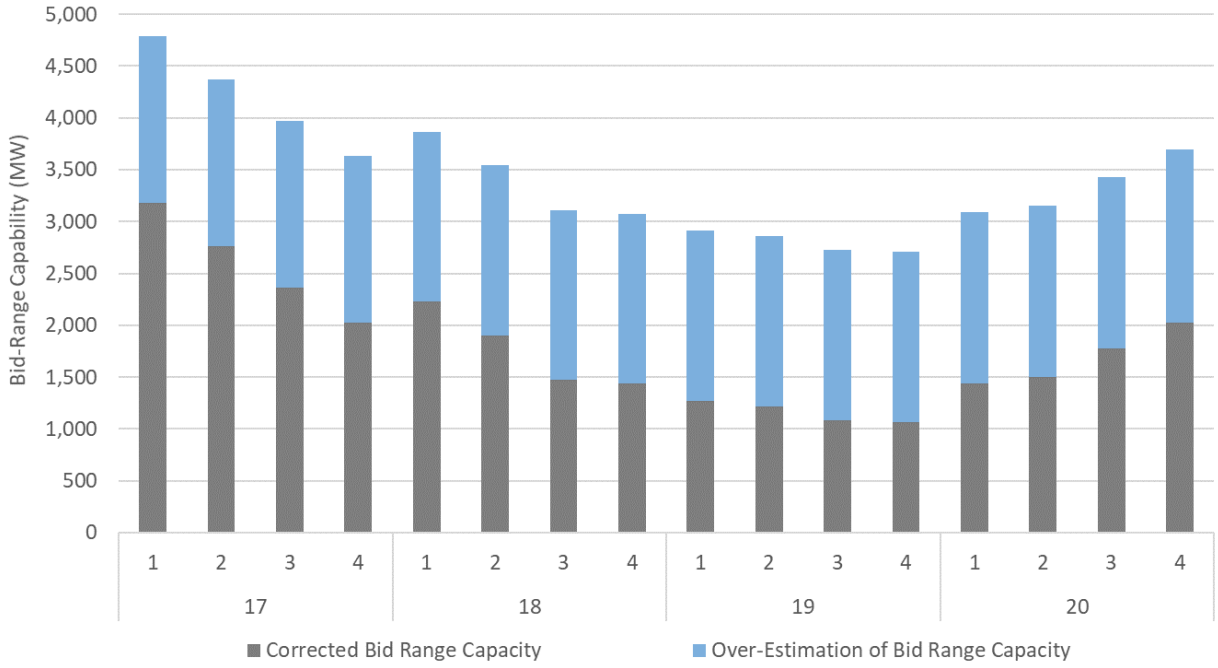
conditions.[7] The CAISO was forced to implement rotating electricity outages to preserve supply and demand balance and not propagate their energy shortfall, and its corresponding reliability risks, to neighboring balancing authority areas. During this time, the CAISO passed the RSE's capacity test for all intervals. However, the CAISO failed the more stringent flexible ramping sufficiency test for a limited number of intervals during the afternoons of August 14-15. During the *Market Enhancements for 2021 Summer Readiness* initiative, stakeholders raised concerns that the CAISO inappropriately passed the test during these intervals. Additionally, during the March 2021 EIM Governing Body meeting, the CAISO Market Surveillance Committee, as well as the 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 MW[8] of capacity. **Figure 2** 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.

[7] NERC EOP-011-1 Attachment 1: Energy Emergency Alerts

[8] *Ibid.*

Figure 2 - August 14, 2021 Overestimation of Bid Range Capacity in the CAISO balancing authority area



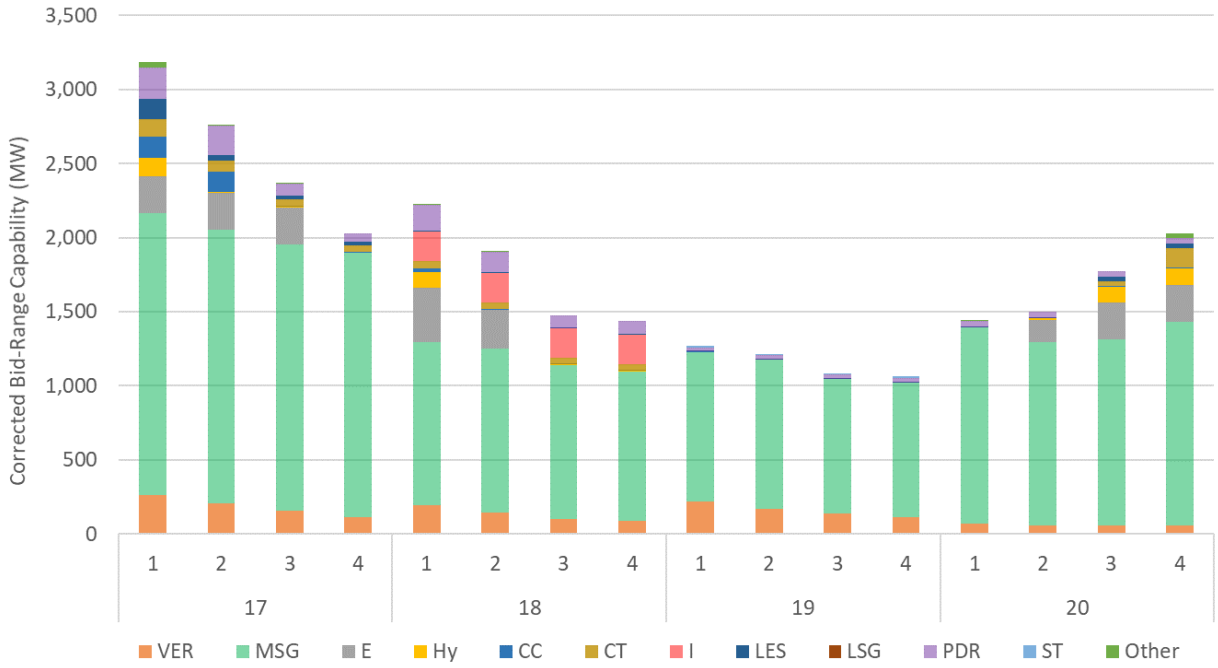
The double counting of mirror resources[9] resulted in accounting for factitious import supply of over 1,000 MW. The remaining over-estimated capacity was the result of a combination of start-up and ramp limited supply, undelivered interchange transactions, and an over-forecasted supply of variable energy resources.

When correcting for these defects this analysis still shows an overestimation of available capacity during these tight supply conditions. As illustrated in **Figure 3**, 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 picture[10]. However, the same variable energy resource forecast is applied to all participating EIM balancing authority areas.

[9]Mirror 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.

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

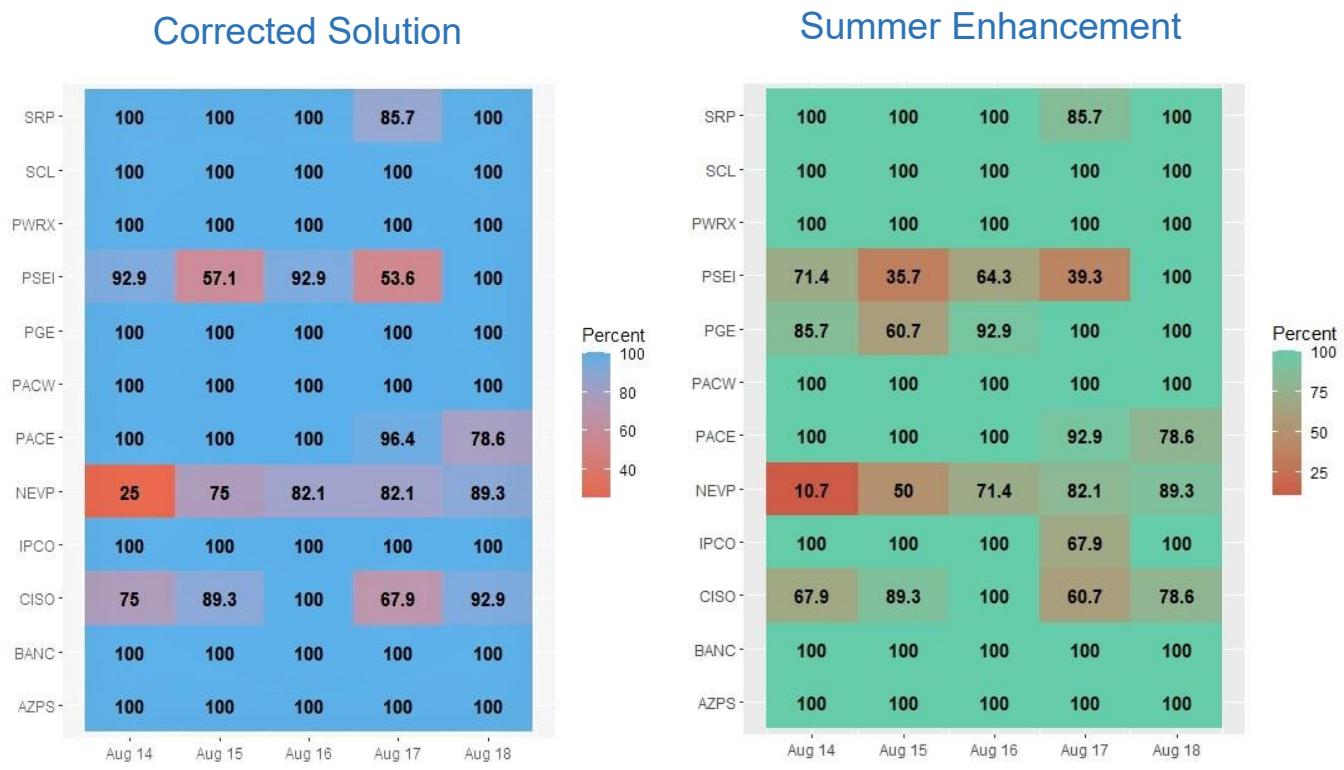
Figure 3 - August 14, 2020 Overestimation



2.3.1 Impact of August events on 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 4**.

Figure 4 - August 2020 Heat Wave RSE results



2.3.2 DMM's 2020 analysis bid range capacity tests

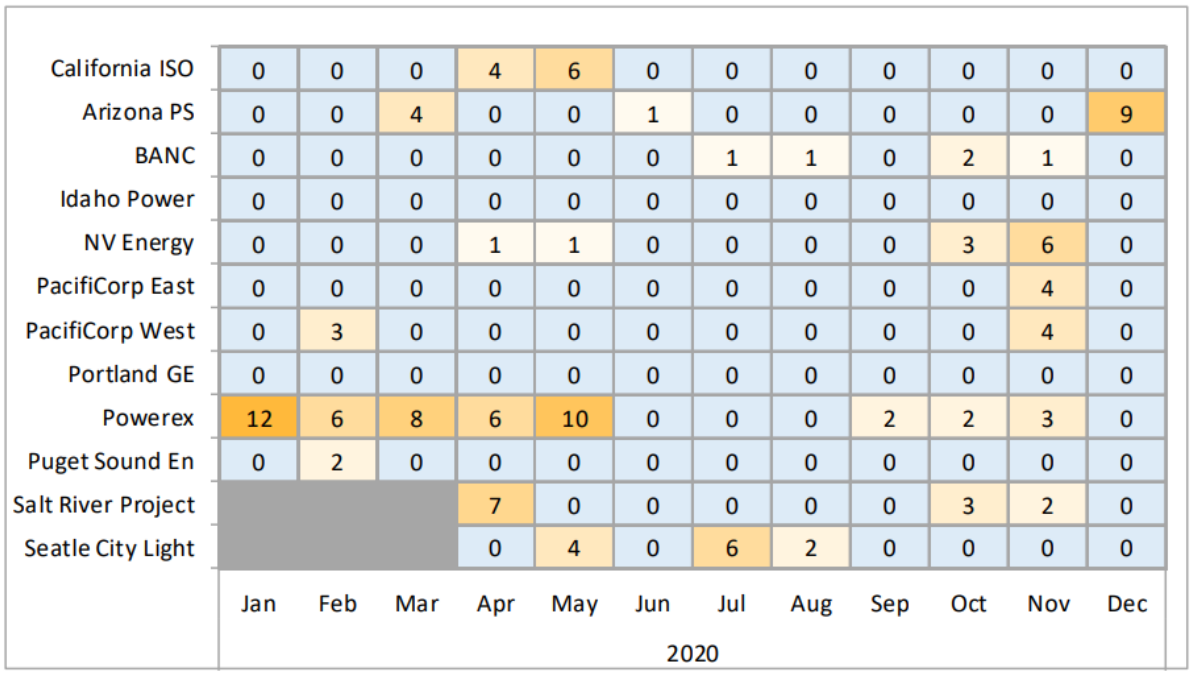
The *Market Enhancements for Summer 2021* initiative's RSE discussion primarily focused on the CAISO's capacity and ramp sufficiency test performances. However, the Department of Market Monitoring (DMM)'s report on "Resource sufficiency tests in the energy imbalance market" provided information on the performance of the broader EIM[11]. 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 5** illustrates that the number of failures were

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

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 5 - Observed 2020 RSE failures without software defect correction



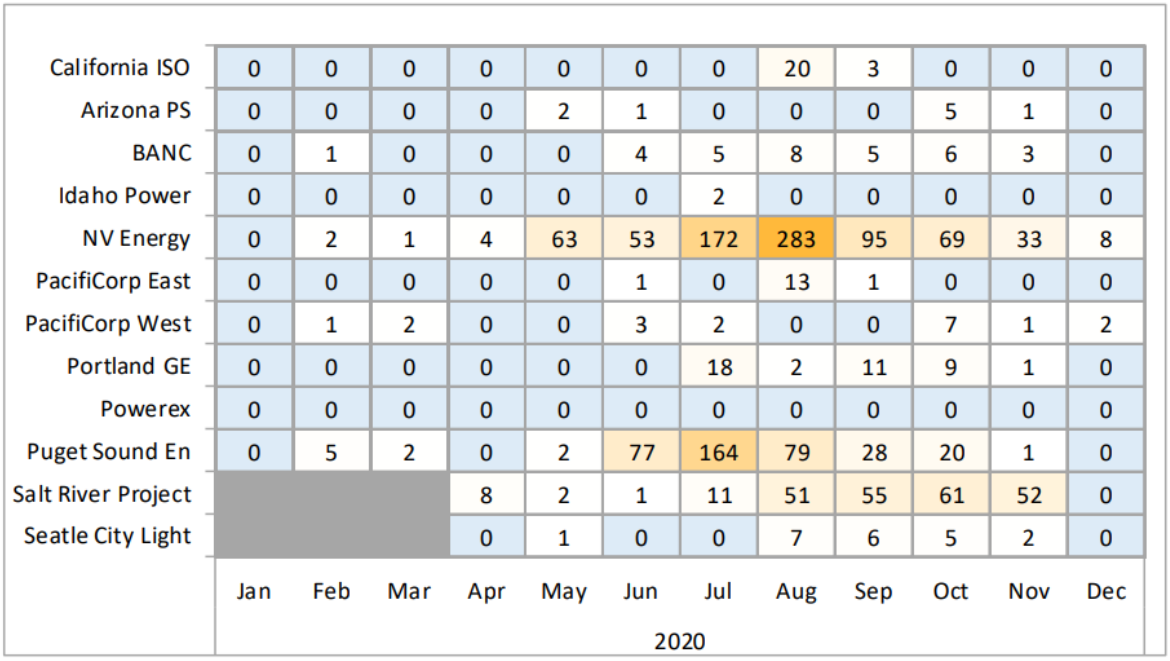
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
California ISO	0	0	0	4	6	0	0	0	0	0	0	0
Arizona PS	0	0	4	0	0	1	0	0	0	0	0	9
BANC	0	0	0	0	0	0	1	1	0	2	1	0
Idaho Power	0	0	0	0	0	0	0	0	0	0	0	0
NV Energy	0	0	0	1	1	0	0	0	0	3	6	0
PacifiCorp East	0	0	0	0	0	0	0	0	0	0	4	0
PacifiCorp West	0	3	0	0	0	0	0	0	0	0	4	0
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
Seatle City Light				0	4	0	6	2	0	0	0	0

2020

Conversely, DMM's

*Figure 6 illustrates the number of additional capacity test failures compared to the original failures, referenced in **Figure 5**, after removing the capacity overestimation. Of note, a significant increase of upward capacity failures in the NV Energy, Puget Sound, and Salt River Project balancing authority areas would have been expected to occur.*

Figure 6 - Observed 2020 RSE failures without overestimated capacity



3 Potential Enhancements to the Resource Sufficiency Evaluation

This section discusses additional scope items the *Resource Sufficiency Evaluation Enhancements* initiative will potentially consider. The CAISO seeks stakeholder input on the appropriateness of these items as well as suggestions for additional scope items.

Potential enhancements include changes to the capacity test, ramp sufficiency test, application of the balancing test as well as enhancements to RSE failure consequences.

3.1 Resource Sufficiency Evaluation Test Design Changes

3.1.1 Balancing Test Modifications

The RSE balancing test was designed to provide 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 selectively make available to the market its supply through the base scheduling process. Rather, the CAISO's day ahead market, HASP, and RTPD, with the exception of import resource adequacy and long start resource supply in the real-time market, utilizes all forward contracted supply bids within its objective function to balance demand and supply, while minimizing cost. This practice is designed to produce balanced schedules that eliminate the gaming opportunities available through the submission of over/under scheduled base schedules. However, during the *Market Enhancements for 2021 Summer Readiness* initiative stakeholders questioned whether the financial penalties associated with this test should be applied to the CAISO from an equitability perspective. The concern that raised is that the CAISO's market process can produce schedules that are not balanced to forecasted demand when the power balance constraint is relaxed due to a lack of supply available to the CAISO.

The CAISO seeks stakeholder comment on if the application of the over/under scheduling test is appropriate for the CAISO, and if any resulting penalties are appropriate in light of the differences between the CAISOs market optimization and the base scheduling process used by other EIM entities.

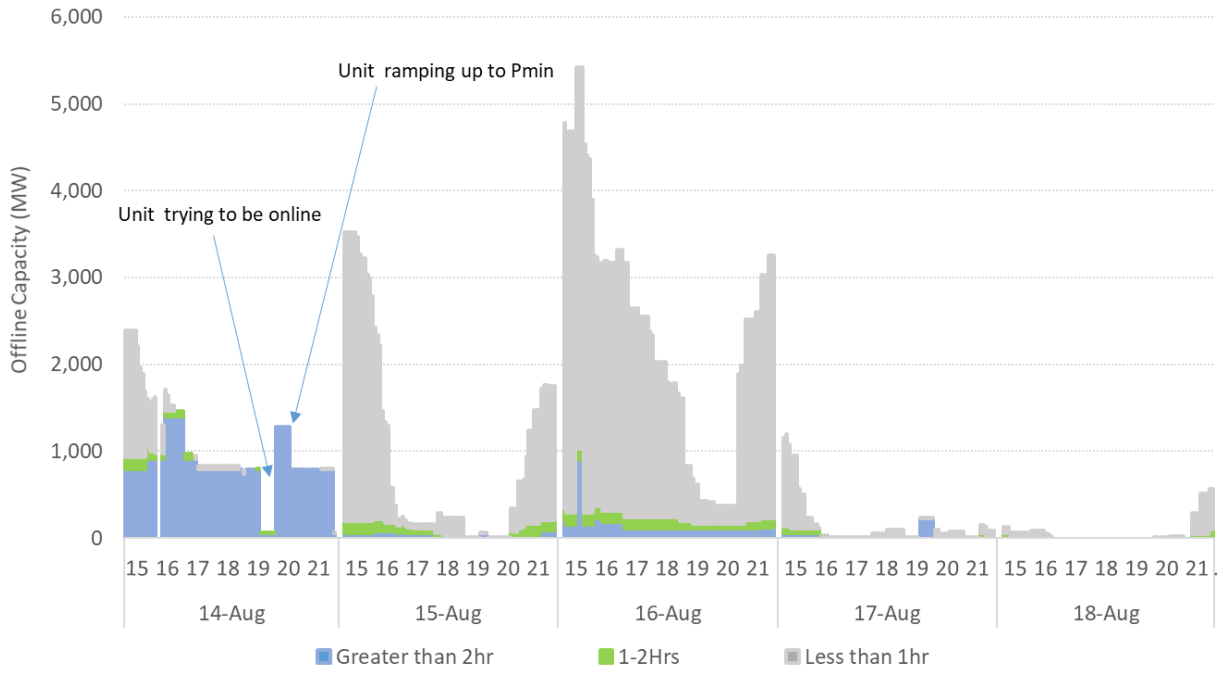
3.1.2 Capacity Test Modifications

3.1.2.1 Consideration of intertemporal constraints

As currently designed, the RSE's capacity test assumes the availability of all bid-in resource capacity within a balancing authority area. Intertemporal constraints, such as a resource's startup, cycling or ramping constraints are not considered. The majority of these constraints are tested in the flexibly ramping test. Not adding intertemporal constraints to the capacity test allows allow for potential inadvertent passing of the

capacity test, as illustrated on August 14, 2021[12]. In their analysis published on May 20, 2021 the CAISO DMM supported the exclusion of capacity that is unavailable because of various operating limitations and independent from any displacement from energy imbalance market transfers[13]. However, additional analysis presented by the CAISO during the May 21, 2021[14] Market Surveillance Committee meeting illustrated that the majority of inaccessible, intertemporal constrained capacity was related to a single long start unit returning from outage. This can be seen in Figure 7, as the capacity with a startup time of greater than two hours was primarily present on August 14th, rather than the remaining days with tight capacity conditions.

Figure 7- Offline Capacity Accounted for in the CAISO RSE Capacity Test



[12] *Ibid.*

[13] *Ibid.*

[14] CAISO Market Surveillance Committee meeting on 5/21/2021 – Resource Sufficiency Evaluation Capacity test performance during the summer heatwave

The CAISO seeks stakeholder comment on whether the capacity test should consider if an EIM entity has sufficient supply to meet their forecast demand and uncertainty, or if that supply needs to be dispatchable within the upcoming hour to meet the forecast demand and uncertainty in that interval.

Should stakeholders believe that the capacity test include inter-temporal constraints to ensure dispatch, how should intertemporal constrains best be applied? To ensure equitable access to EIM transfers, the test may need to consider the reason a resource is not available. A resource being unavailable due to due to economic decisions made by an EIM entity may warrant different consideration then a resource that was de-committed or whose multi-state generator configuration was changed by the EIM optimization. The CAISO seeks stakeholder comment on if a resource's commitment status should be considered as part of the capacity test.

3.1.2.2 Consideration of undeliverable capacity

The capacity test does not consider if available supply schedules and bids are deliverable to meet demand. The feasibility test is a mechanism to alert EIM entities of potential transmission violations. However, the test does not require an entity resolve potential base schedule overloads prior to the EIM. The CAISO seeks stakeholder comment on if capacity that is base scheduled should also be deliverable for the purposes of passing the RSE.

3.1.3 Flexible Ramping Test Modifications

The flexible ramping test currently measures a balancing authority areas ability to ramp between forecasted demand including uncertainty, for each fifteen minute interval with in the operating hour. To accomplish this, the test evaluates if an EIM entity possess sufficient bids to allow it to ramp from a reference point seven and a half minutes prior to the hour (T-7.5) to the midpoint of all fifteen minute intervals in the following hour. The starting point for the CAISO and all EIM entities are the most recent RTPD schedules for the fourth interval of the proceeding hour. This initial reference point is a market solution, which ensures available supply is economically scheduled to meet demand, and where any relaxation of the power balance constraint is done according to preset priorities. Further, this RTPD intervals incorporates load conformance performed by the CAISO or other EIM entities. The flexible sufficiency test is based on forecast demand for the following hour. A flexible ramping test conducted from this operating point does not test for an EIM entities ability to ramp to meet their actual demand. Rather, it just tests the ability to ramp from a market schedule to forecast demand.

The initial reference point may need to be adjusted in order to remove the potential for infeasible operating schedules to be used in the flexible sufficiency test. The infeasibility of the scheduled could be added to the initial reference point. This infeasibility would be defined as the forecasted demand during that interval, minus the supply offered as part of the base schedule or show in a market schedule.

The CAISO seeks stakeholder comment regarding the potential benefits of adding infeasibility to the initial reference point of the flexible ramping test.

3.1.4 Consideration of emergency operator actions

During emergency conditions, operators may take manual actions that can create additional supply, or reduce demand. The CAISO requests stakeholder comment on if these actions, if expected to be taken, should be considered in the RSE.

3.1.4.1 Use of capacity procured as non-spin

A balancing authority area has the ability to utilize load as non-spinning contingency reserves. This measure is used to release capacity previously held as non-spin, as energy during tight system conditions. These actions were taken by CAISO operators during the events of August 2020.[15] This energy, however, is not available to be considered in the resource sufficiency evaluation until after the action is taken and the next hours RSE is conducted. For EIM balancing authority areas, this energy is only shown after the fact, to the extent it is represented in an EIM entities base schedule. For the CAISO, this energy would have to be shown as available in the real time unit commitment process, rather than being dispatched through the real time contingency dispatch (RTCD) process. If similar actions are expected to be taken, and the capacity eventually will be utilized as energy to meet demand during tight system conditions, the CAISO seeks stakeholder comment on if this type of reserved capacity should be allowed to be shown as available bid capacity for the purposes of the RSE.

3.1.4.2 Emergency Demand Response

To the extent that an EIM balancing authority area operates an emergency demand response program, should the reduction in demand be eligible for consideration in the capacity and flexible ramping sufficiency tests within the RSE? If deemed eligible, the

[15] Root Cause Analysis: Mid-August 2020 Extreme Heat Wave

CAISO seeks stakeholder comment on how this emergency capacity reduction is best incorporated into the RSE.

3.2 Resource Sufficiency Evaluation Failure Consequences

During the *Market Enhancements for 2021 Summer Readiness* initiative, multiple stakeholders posited that fixing upward incremental EIM transfers was not a severe enough consequence for a failure of the capacity or flexible ramp sufficiency components of the RSE. These stakeholders asserted that as a result, EIM entities were able to lean on the EIM to cure capacity shortages,[16] as an alternative to sufficient forward procurement. Under this premise, stakeholders proposed additional financial consequences, as well as more punitive limitations to EIM transfers, as possible options to incent more robust forward procurement. The timeline of the *Market Enhancements for 2021 Summer Readiness* initiative did not allow for consideration and policy development of additional consequences for the failure of the RSE. Rather the CAISO committed to examining additional consequences for failure of the RSE in this subsequent initiative.[17]

Should stakeholders support additional consequences, the CAISO proposes that only consequences financial in nature be considered. Operational consequences beyond the current capping of incremental upward EIM transfers has the potential to create additional operational challenges and potential reliability risk, in what may already be stressed operating conditions.

The CAISO also seeks to highlight the concern expressed by the Market Surveillance Committee that the existing histogram approach for calculating uncertainty could lead to incorrect failures of the capacity or flexibility evaluations[18]. This is due to the histogram methodology predicting variable supply availability based upon recently observed data. A high upward uncertainty requirement could be set based on recently overserved resource performance. However, in actuality, the variably that was previously observed leaves the variable energy resources without significant additional downward variability.

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[16] Powerex workshop presentation and WPTF Comments to straw proposal.

[17] This initiative is expected to complete by Q4 2021. Should comments to the issue paper show stakeholder consensus for additional resource sufficiency evaluation consequences the CAISO proposes to bifurcate that topic from this initiative and peruse immediate CAISO board and EIM Governing body approval with the intent of implementing the consequences during Q3 or Q4 of 2021.

[18] MSC Opinion Market Enhancements for 2021 Summer Readiness - Section 3.3

The CAISO seeks stakeholder comments on if creating an additional financial consequence for RSE failure, while the histogram methodology is still used in the determination of uncertainty, is appropriate.

3.2.1 Existing Stakeholder Proposals

During the *Market Enhancements for 2021 Summer Readiness* initiative, stakeholders proposed additional financial consequences for balancing authority areas that fail the RSE.

The following proposals were submitted by stakeholders:

- Apply a sufficiently high parameter price for relaxing the Deficiency Transfer Limit constraint within the market optimization.
- Apply a capacity deficiency charge outside of the market clearing process. This charge would be based on the value of capacity for the entire summer season and the maximum quantity of deficiency experienced by the entity.
- Apply a financial consequence to EIM transfers into a balancing authority area in excess of the diversity benefit for failure of the capacity test. These transfers would be priced near the bid cap to ensure that all supply within an EIM balancing authority area would be utilized prior to the reliance on the EIM for capacity needs.

The CAISO seeks the following input from stakeholders: Is an additional financial consequence for failing either the capacity or flexible ramping sufficiency components appropriate? If so, of these proposals, which proposal would create the appropriate consequence and why? Are there any additional proposals the CAISO should consider? Are there any other policy considerations related to an additional financial consequence that need further consideration and discussion? As part of this initiative, CAISO is requesting stakeholders present their design ideas on how the consequences of the capacity test could be revised.

3.2.2 Application of additional financial consequences

Should stakeholders support perusing additional financial consequences, there are a number of ways that financial consequences can be applied. Stakeholders presented variations of these options during the *Market Enhancements for Summer 2021*

Readiness initiative. More generally, options for additional financial consequences include:

(1) A fixed $/MW hurdle fee – This option would allow the market to optimally clear EIM transfers. It would also ensure revenue from incremental EIM transfers would apply directly to the EIM entities whose excess bid and transfer capacity was supporting those transfers. The size, and potential standardization of a hurdle rate would need further stakeholder discussion and development. Additionally, implementation of the hurdle rate within the market clearing process would add complexity.

(2) A fixed $/MW payment – This option offers a comparatively straightforward implementation because it could apply a fixed payment after-the-fact during the settlement process. The fee would not be included as part of the market clearing process. The allocation of the consequence may more difficult, if the fee is intended to be distributed to balancing authority areas who directly supported the incremental transfers. The sizing of any financial consequence applied under this framework would need additional stakeholder discussion and development.

(3) A fixed capacity payment – Under this design, the EIM entity who fails the RSE would offer a fixed $/MW payment for the right to use capacity in another balancing authority area for a fixed duration of time. The CAISO has a similar internal process for procuring non-forward contracted resource adequacy capacity, called a capacity procurement mechanism (CPM).[19]

Applying this approach, within the construct of EIM, has a number of significant policy questions that would need further stakeholder discussion and development. Such outstanding policy questions include: (1) What would the value of capacity for each balancing authority be based upon? Other existing independent system operators and regional transmission organizations utilize a cost-of-new-entry (CONE) study to provide an upper-price limit within a capacity auction; this essentially serves as the proxy for the cost of constructing a new resource. The CAISO's CPM, which provides a fixed forward payment for the use of capacity not forward contracted through the resource adequacy process, uses a variation of this and is determined by the California Energy Commission. This process values capacity at $6.31/kW-month. Do EIM entity's regulatory bodies produce similar cost-of-new-entry studies that could be used to estimate the cost of avoiding forward procurement? Would the EIM entities accept using CAISO's established fee for the duration of the fixed capacity payment? Or do

[19] Link to Capacity Procurement Mechanism Soft Offer Cap Draft Final Proposal

stakeholders envision needing a similar type of CONE study for the EIM footprint, and as the cost of installing new generation may vary significantly between different regions? Given this, at what granularly would such a study need to be conducted? (2) Would this payment be allocated to all EIM entities supporting the incremental transfer or only a single EIM entity? To the extent that different EIM entities may have different capacity costs, would the deficient entity be able to select a provider? (3) How would whomever receives this revenue transfer, guarantee deliverability of energy into the balancing authority area in shortage to cure the capacity shortfall? What would be the expected duration for this payment to occur? Also, can deliverability be guaranteed over the longer horizon, which a capacity type payment likely contemplates? (4) If not, does a capacity bid-range trading model meet the intended objective of the capacity test? This raises additional questions with how imports and EIM transfers are currently represented in the RSE.

The CAISO seeks comment from stakeholders regarding the three options detailed above, as well as any other options stakeholders believe should be considered. In addition, the CAISO seeks comment on the sizing of a financial consequence, and if stakeholders believe any fee applied would better ensure the objectives of the RSE are being met.

3.2.3 When should consequences should be applied

The RSE is applied during all real-time market intervals. Applying financial consequences to capacity or flexible ramping sufficiency test failures under all conditions has the potential to impose significant financial consequences for inadvertent test failures. As presented in the March 4, 2021 Market Performance and Planning Forum,[20] nearly all EIM entities periodically failed the RSE. These failures largely did not correspond to stressed system conditions. The failures may be more attributable to the mechanics of the test, market software changes by the CAISO, or EIM participation strategies, then a deficiency in forward procurement decisions or an intent to lean on the EIM for incremental energy.

To apply additional financial consequences in a more targeted manner, a metric that is equitable and agreeable to all EIM entities would have to be developed. One such way to do this is through implementing enhanced consequences only during tight system conditions. As the EIM is only a real time market and no regional centralized Day-

[20] Market Performance and Planning Forum. Meeting on March 4, 2021. Slides 45-46

Ahead market currently exists, bilateral day ahead prices may be the best proxy to predict scarce system conditions. Recent CAISO initiatives and the Market Surveillance Committee have highlighted potential concerns regarding using bilateral day ahead prices to inform real time pricing parameters[21]. The CAISO seeks comment on if enhanced consequences should be implemented in a more targeted manner, and if the use of bilateral prices would be an appropriate predictor of scare system conditions. To the extent that stakeholders believes bilateral prices are an appropriate proxy for scare system conditions, the CAISO asks what prices may correlate to these conditions?

3.2.4 Allocation of potential revenue

Any revenue collected in the form of a fee from an EIM entity that fails the RSE will need to be allocated out to other EIM participants. This allocation can be made to either:

(1) all EIM entities who have passed the RSE (hourly or by relevant market interval),

(2) Net negative uninstructed deviation[22], or

(3) EIM entities that supported the incremental transfers out of their balancing authority area to correct a capacity shortfall following a RSE failure through their additional bid capacity and transmission availability used for delivering this energy.

Once revenue is allocated at the EIM entity level, the CAISO proposes that any further allocation occur pursuant to an EIM entities OATT. The CAISO seeks comment on how revenue collected as part of an enhanced RSE failure consequence should be allocated.

3.2.5 Funding potential financial consequence's

Funding of a financial consequence would be the responsibility of the EIM entity who incurred that consequence and would be determined based upon their OATT. The

[21] MSC Meeting on July 30, 2020. Presentation on FERC Order 831 presented by Dr. James Bushnell

[22] The real-time change in Generation or Demand associated with under-scheduled Demand (i.e., Demand that appears unscheduled in Real-Time) and overscheduled Generation (i.e., Generation that is based scheduled or relevant CAISO market run and does not appear in Real-Time), which are netted for each Settlement Interval, apply to a Scheduling Coordinator's entire portfolio, and include Demand, Generation, imports and exports.

CAISO expects this will be a fair and equitable allocation, consistent with each entities procurement policies and procedures.

3.2.5.1 Funding within the CAISO Balancing Authority Area

If an additional financial consequence is appropriate, the financial consequence will be applied to the load serving entities (LSE's) within the CAISO balancing authority area. The CAISO's resource adequacy program preforms the forward procurement of capacity by LSEs in the CAISO's balancing authority area to ensure they are able to meet their demand obligations. In this issue paper, the CAISO highlights two potential options for how the funding of the consequences could be performed:

(1) Assign the financial consequence pro-rata to metered demand within the CAISO

(2) Assign the financial consequence to load serving entities based upon their failure to meet their prescribed capacity procurement targets as specified within the resource adequacy program

(1) Pro-rata allocation to metered demand – Applying charges equally to all load within the CAISO's balancing authority area removes the direct reference to the CAISOs resource adequacy program. Allocating costs pro-rata to demand creates the potential for a forward procurement decision or a failure to replace outaged capacity by one LSE to shift costs to other LSE's within the balancing authority area.

(2) Allocation to load serving entities – This option uses resource adequacy procurement targets as a baseline to assess if each LSE has secured sufficient bid range capacity to ensure the CAISO can fully participate in the EIM. However, by using the resource adequacy program as a baseline, any specific charges relating to capacity insufficiency becomes a defacto additional penalty relating to resource adequacy procurement beyond the currently approved resource adequacy availability incentive mechanism.[23] In addition to this concern, any implementation of a penalty may have to be coordinated with the CAISO's annual resource adequacy procurement process. Aligning financial consequences and the resource adequacy procurement process is likely needed to allow LSEs to hedge against potential RSE failures by procuring additional capacity.

[23] CAISO Tariff For Resource Adequacy replacement requirements

The CAISO seeks comments from stakeholders regarding equitability of funding any potential financial consequences that arise from a failure of the RSE within the CAISO balancing authority area. The CAISO also seeks comments from EIM entities if they envision similar complications on the funding of financial consequences within their balancing authority areas.

3.3 Additional Information of RSE Results

During the *Market Enhancements for 2021 Summer Readiness* initiative, stakeholders raised the concept of a third party organization monitoring RSE performance of balancing authority areas. They suggested the organization could regularly report on the RSE's performance to the EIM Governing Body.

The CAISO seeks stakeholder comment on creating a third party organization to monitor RSE performance, what would be the objective of such reporting, and what actions the EIM Governing Body may take with the information.

Stakeholders have also raised in various venues the request for additional information regarding the results of the RSE. The CAISO asks that stakeholders detail in their comments what additional information, beyond what is currently provided by the CAISO, they believe would be beneficial to have publically posted.

4 EIM Decisional Classification

This issue paper discusses two distinct groups of possible rule changes relating to resource sufficiency. The first would adjust the evaluation tests that will be applied to all balancing authority areas in the EIM, and also calculate a financial penalty to be imposed on a balancing authority that fails the test. The CAISO proposes that the EIM Governing Body would have an advisory role with respect to this issue. The second set of rules concern the allocation among market participants of any penalty that is assessed to the CAISO balancing authority. The CAISO believes that the EIM Governing Body would have no role with respect to this issue.

The rules related to the first issue – resource sufficiency test and for calculating any financial penalty that will be assessed to a balancing authority that fails the test, including the time periods during which these penalties apply – will be uniform across the entire market footprint, including both the CAISO balancing authority area and EIM balancing authority areas. In other words, they will be generally applicable rather than EIM-specific and fall within the primary authority of the EIM Governing Body. Although the CAISO balancing authority area failed the resource sufficiency test at times last

August and September, some EIM balancing authority areas did as well. The primary driver for this proposal is a general desire to dissuade all balancing authority areas from leaning on the others, and to compensate utilities that support the systems that have insufficient resources. The primary driver is to address an issue specific to EIM balancing authority areas. Therefore, this part of the issue paper falls within the advisory authority of the EIM Governing Body.

The second issue concerns how to allocate among market participants any penalties that are assessed against a balancing authority area. These rules are not applicable to the entire real-time market, or conditions of participating in the real-time market and are likely to be determined separately by each EIM balancing authority area. Although allocation of penalties to the CAISO will require a change to the CAISO tariff, this change falls outside the advisory role of the EIM Governing Body, and should go to the CAISO Board only for approval.

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.

5 Stakeholder Engagement

Table *1* outlines the proposed schedule to complete the policy for the EIM resource efficiency evaluation enhancements:

On June 25 and 28, 2021 stakeholders are invited to present their perspectives of the issues described in the paper and potential solutions at a CAISO hosted workshop. If interested, please email the ISO at isostakeholderaffairs@caiso.com no later than June 7, 2021. Interested parties will be asked to submit presentation materials prior to the workshop. The ISO will present the issue paper topics first, followed by presentations from stakeholders. Workshop materials will be posted on the initiative webpage at the link provided above.

Table 1

Date	Milestone

May 28, 2021	Issue Paper posted
June 7, 2021	Deadline to notify ISO to present during June 25 and 28 workshops
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 3, 2021	Straw Proposal posted
Aug 10, 2021	Straw Proposal Stakeholder Call
Aug 27, 2021	Straw Proposal Comments Due
Sept 22, 2021	Draft Final Proposal Posted
Sept 29, 2021	Draft Final Proposal Stakeholder Call
Oct 15, 2021	Draft Final Proposal Comments due
Nov 2, 2021	Final Proposal Posted, Draft BRS, and Draft Tariff Language
Nov 9, 2021	Final Proposal Stakeholder Call
Nov 23, 2021	Final Proposal Stakeholder Comments Due
December 6, 2021	**EIM GB Meeting**
December 15, 2021	**BOG Meeting**

The CAISO will discuss this issue paper with stakeholders during workshops scheduled on June 25 and 28, 2021. Stakeholders should submit comments on the issue paper and workshop discussions/materials through the ISO's commenting tool, using the link on the initiative webpage by close of business on July 9, 2021.