Market Enhancements for Summer 2021 Readiness

Draft Final Proposal

February 18, 2021

Prepared by

James Friedrich
Don Tretheway
Danny Johnson
Perry Servedio
Danielle Tavel
Brittany Dean
Gabe Murtaugh
Brad Cooper

Intentionally left blank

Market Enhancements for Summer 2021 Readiness: Draft Final Proposal

Table of Contents

1. Executive Summary 5
2. Background 8
Root Cause Analysis Summary of Findings 9
3. Changes from Straw Proposal and Stakeholder Comments 10
4. Proposed Market Enhancements 14
Export, Load, and Wheeling Priorities 14
EIM Coordination and Resource Sufficiency Test Review 25
Market Incentives for Imports during Tight System Conditions 29
Real-time Scarcity Price Enhancements 33
Reliability Demand Response Dispatch and Real-time Price Impacts 34
Management of Storage Resources during Tight System Conditions 36
Other Items 39
5. EIM Governing Body Role 41
6. Stakeholder Engagement, Implementation Plan & Next Steps 43
Appendices 44
Implications of Penalty Parameters on Wheels 44
Interaction between EIM Imports and the CAISO Capacity Requirement in the Bid Range Capacity Test 46

1. Executive Summary

This draft final proposal describes the CAISO's proposed market enhancements to prepare for this upcoming summer in light of the performance of the CAISO markets during last summer's heat events. The proposed changes are in response to the findings in the CAISO/CPUC/CEC Root Cause Analysis[1] of last summer's controlled load shedding, the CAISO's own analysis, and stakeholder concerns.

The CAISO's objectives for these enhancements are to:

- Equitably balance the reliability of serving CAISO balancing authority area load with the reliability of exports, while providing open access to the CAISO transmission system.
- Better ensure each balancing authority area participates in the EIM with sufficient resources.
- Provide improved incentives for supply to be available during tight system conditions.

These proposed enhancements are focused on changes that will be feasible for the CAISO and stakeholders to implement by summer 2021.[2] The CAISO plans to address potential longer-term changes in upcoming stakeholder processes.

Despite the fast timeline of this initiative, stakeholders have provided significant timely and relevant input, which has shaped this draft final proposal.

This draft final proposal proposes the following enhancements:

Export, load, and wheeling priorities: In the Root Cause Analysis, the CAISO analyzed and discussed the implications of the scheduling priorities the CAISO market places on serving CAISO balancing area load relative to exports from the CAISO balancing authority area. In this draft final proposal, the CAISO proposes several changes.

The CAISO proposes to modify its market's scheduling priorities to give equal priority to CAISO load, exports supported by non-RA supply contracted to serve load outside the CAISO balancing authority, and wheel through self-schedules across the CAISO balancing authority area. The CAISO also proposes to build upon the business practice manual changes it made on September 5, 2020 to use the CAISO day-ahead market's residual unit commitment process to distinguish high-priority from low-priority exports purchased in the day-ahead market.

[1] California Independent System Operator, California Public Utilities Commission, and California Energy Commission. Final Root Cause Analysis Mid-August 2020 Extreme Heat Wave. January 13, 2021. http://www.caiso.com/Documents/Final-Root-Cause-Analysis-Mid-August-2020-Extreme-Heat-Wave.pdf

[2] The CAISO is currently targeting implementing these market changes on June 1, 2021.

These enhancements will equitably balance the reliability of serving CAISO balancing authority area load with the reliability of exports, while providing open access to the CAISO transmission system.

EIM coordination and resource sufficiency test review: The CAISO proposes enhancements to the resource sufficiency evaluation to reflect each balancing authority area's resources required to meet their net load uncertainty. The CAISO also proposes changes to better reflect each resource's actual available capacity and other changes to more accurately model transfers between balancing authority areas. The EIM's resource sufficiency evaluation is designed to ensure each balancing authority area participating in the EIM provides sufficient resources to reliably serve its load.

These enhancements will better ensure each balancing authority area participates in the EIM with sufficient resources. Although not include in this draft final proposal, the CAISO commits to continue to explore with stakeholders potential changes to the ramifications for failing the resource sufficiency evaluation, such as potential financial consequences, shortly after the completion of this initiative. This may lead to further changes as soon as this summer if feasible and appropriate.

Import market incentives during tight system conditions: The CAISO proposes provisions for bid cost make-whole payments for real-time market hourly block economic imports that provide energy during tight system conditions. These provisions will only be triggered under pre-specified tight supply conditions. This will provide improved incentives for import supply to be available during tight system conditions because the current settlement rules may pay imports less than bid, and this risk can be exacerbated under tight supply conditions.

Real-time scarcity price enhancements: The CAISO proposes an enhancement to improve market pricing when system conditions are very tight and the CAISO is arming load to meet its contingency reserve requirements. This enhancement will price energy at the market's applicable energy bid cap that is from generation the CAISO is releasing from contingency reserves to serve load. The current market rules can decrease market prices when this occurs. This pricing policy appropriately reflects that the CAISO is short supply under these conditions and will provide improved incentives for supply to be available during tight system conditions.

Reliability demand response dispatch and real-time price impacts: The CAISO is proposing enhancements that will improve market pricing when reliability demand response resources are dispatched. Reliability demand response resources are intended to be used immediately prior to or during emergency conditions in the CASIO balancing authority area. The Root Cause Analysis indicated that CAISO system operators manually dispatched these resources outside of the market optimization, which results in suppressed market prices. The proposed

enhancements will result in the ability for the market's real-time pre-dispatch process to dispatch these resources, which will reduce their manual dispatch and allow them to set fifteen-minute market prices.

Management of storage resources during tight system conditions: The CAISO is proposing several enhancements to how its market will dispatch storage resources in phase 1 of its Resource Adequacy Enhancements stakeholder initiative.[3] These enhancements are primarily discussed in that initiative but are also summarized in this draft final proposal as the CAISO proposes to implement enhancements to the CAISO's "minimum state of charge" proposal along with other changes proposed in this draft final proposal prior to this summer. The minimum state of charge requirement ensures that storage resources have enough state of charge on the tightest days to meet day-ahead discharge schedules during peak hours.

The CAISO is proposing significant modifications to the minimum state of charge requirement in the Resource Adequacy Enhancements initiative's final proposal to minimize interfering with storage's real-time market participation.[4] The CAISO is also proposing the minimum state of charge requirement will be a temporary measure, with a two-year sunset period, while the CAISO and its stakeholders develop a market mechanism with proper market incentives to ensure energy availability for the system.

Other items: OASIS report, Interconnection enhancements, RAAIM: The CAISO set aside a topic for miscellaneous items proposed by stakeholders during the scoping phase of this initiative. The CAISO will move forward with two of the three topics considered. First, the CAISO will implement an enhancement to its Open Access Same-time Information System (OASIS) to publish gross import and export schedules by intertie. Second, the CAISO will implement BPM changes to enhance the independent study interconnection process to provide CAISO additional capacity for summer 2021. Finally, the CAISO considered implementing changes to the Resource Adequacy Availability Incentive Mechanism (RAAIM) but decided not to pursue any changes based on implementation complexity and other issues such as implementing changes in the middle of an RA operating year when RA contracting is already complete.

System market power mitigation: In response to stakeholder concerns regarding the numerous changes this summer and concerns that both the CAISO and market participants have limited bandwidth to implement changes for summer 2021 implementation, the CAISO determined that the changes it previously proposed to introduce this summer were of greater priority.

[3] CAISO Resource Adequacy Enhancements stakeholder initiative. https://stakeholdercenter.caiso.com/StakeholderInitiatives/Resource-adequacy-enhancements.
[4] California ISO. Resource Adequacy Enhancements Final Proposal – Phase 1. February 17, 2021 http://www.caiso.com/InitiativeDocuments/ResourceAdequacyEnhancements-Phase1FinalProposal.pdf.

Consequently, it plans to focus on market enhancements that incent supply and ensure the CAISO can operate the grid reliably during constrained conditions. Given that there is no evidence that suppliers exerted system-level market power during the very tight conditions last summer, nor during other parts of the year, the CAISO believes it is more beneficial to devote its and stakeholders' limited resources to focus on the other important changes described in this proposal. Accordingly, the CAISO no longer proposes to proceed with efforts to implement the system market power mitigation measures it developed in 2020 as part of a separate stakeholder process.

The CAISO remains committed to ensuring its markets carefully balance robust pricing signals that appropriately signal scarcity conditions with adequate consumer protection measures against the exercise of market power. As such, it will continue to apply a thoughtful, deliberative, data-driven review of system-level competitive conditions in the CAISO balancing authority area. Although there was an increase in system-level pivotal supplier test failures in Q3 2020 relative to previous years, market prices have remained very competitive, even during the August heat wave.[5] The CAISO will continue to monitor for evidence of suppliers exercising system-level market power and will take measures to address system-level market power if appropriate. The CAISO's current system market power mitigation proposal will be reconsidered and further developed if necessary in conjunction with the comprehensive scarcity pricing initiative later this year.

2. Background

A historic heat wave affected the western United States for several consecutive days in mid-August 2020, causing energy supply shortages that led to two rotating power outages in the CAISO footprint on August 14 and 15. These events were documented in the CAISO/CPUC/CEC Final Root Cause Analysis.[6] The CAISO initiated this expedited initiative in response to these events and is committed to the development of actions to prevent supply gaps in advance of summer 2021.

[5] California ISO Department of Market Monitoring. Report on system and market conditions, issues and performance: August and September 2020. November 24, 2020. http://www.caiso.com/Documents/ReportonMarketConditionsIssuesandPerformanceAugustandSeptember2020-Nov242020.pdf

[6] California Independent System Operator, California Public Utilities Commission, and California Energy Commission. Final Root Cause Analysis Mid-August 2020 Extreme Heat Wave. January 13, 2021. http://www.caiso.com/Documents/Final-Root-Cause-Analysis-Mid-August-2020-Extreme-Heat-Wave.pdf

Where appropriate, the policy changes proposed in this stakeholder initiative aim to be responsive to findings in the Final Root Cause Analysis. The following section summarizes the primary findings of the Final Root Cause Analysis.

Root Cause Analysis Summary of Findings

On January 13, 2021, the CAISO, CPUC, and CEC produced a Final Root Cause Analysis of two rotating outages in the CAISO footprint on August 14 and 15, 2020. The Final Root Cause Analysis finds that the three major causal factors contributing to the August outages were as follows:

1. **The climate change-induced extreme heat wave experienced across the western United States resulted in demand for electricity exceeding existing electricity resource adequacy and planning targets.** The extreme heat wave experienced in August was a 1-in-30 year weather event in California. In addition, since extreme heat wave extended across the western United States, resources in neighboring areas were strained.
2. **In transitioning to a reliable, clean, and affordable resource mix, resource planning targets have not kept pace to ensure sufficient resources that can be relied upon to meet demand in the early evening hours.** This made balancing demand and supply more challenging during the extreme heat wave. The rotating outages both occurred after the period of gross peak demand, during the "net demand peak," which is the peak of demand net of solar and wind generation resources. With today's new resource mix, behind-the-meter and front-of-meter (utility-scale) solar generation declines in the late afternoon at a faster rate than demand decreases. These changes in the resource mix and the timing of the net peak have increased the challenge of maintaining system reliability, and this challenge is amplified during an extreme heat wave.
3. **Some practices in the day-ahead energy market exacerbated the supply challenges under highly stressed conditions.** A subset of energy market practices contributed to the inability to obtain or prioritize energy to serve CAISO load in the day-ahead market that could have otherwise relieved the strained conditions on the CAISO grid on August 14 and 15. The practices that obscured the tight physical supply conditions included under-scheduling of demand in the day-ahead market by load serving entities or their scheduling coordinators and convergence bidding reflecting financial supply positions. In addition, the combination of existing real-time scheduling priorities and a previously implemented market enhancement inadvertently caused the CAISO's markets to fail to account for the obscuring effects of under-scheduling and convergence bidding during August's stressed operating conditions.

3. Changes from Straw Proposal and Stakeholder Comments

The CAISO appreciates the wide array of comments received from a large segment of market participants and stakeholders. It is a testament to the close engagement of the stakeholder community on this initiative, which is vital to its success. The CAISO has carefully considered all stakeholder input in developing this draft final proposal. The CAISO has made every effort to balance the diverse viewpoints of its stakeholders while adhering to principles of sound market design and utility practice. Table 1 summarizes the changes made to this draft final proposal in response to stakeholder feedback.

Table 1: Changes from Straw Proposal and Reasons for Proposed Changes

Topic	Change from Straw Proposal	Reason for Proposed Change
Export, Load, and Wheeling Priorities	PT export scheduling priority set equal to Load.	CPUC, IOUs, and CCAs did not support providing PT exports a higher priority than CAISO load and requested additional validation steps to ensure the supply is available through real-time. Validation of designated supply currently does not consider outages, commitment status, or deliverability. Additional validation rules to confirm the generation is available are highly complex and not implementable by summer 2021.
Export, Load, and Wheeling Priorities	Additional attestation that designated resource is contracted and capable of meeting PT export quantity.	This addresses concerns that the designated resource may not be forward contracted or is a resource type that is unable to meet an hourly block schedule. This attestation will work in concert with the proposal to notify the scheduling coordinator of the resource whenever it is designated to support an export. The CAISO is creating a new flag in its Master File that the resource scheduling coordinator should select if it is unable to attest to the rules, which will prevent the resource by being designated by a scheduling

		coordinator of an export. In addition, the designated resource will need to participate in RUC. The portion of the RUC bid up to the PT export quantity will be at $0.00/MW. The portion of the RUC bid above the PT export priority will be at the RUC bid price. The implementation of the RUC changes may not be implemented on June 1, 2021 in the event additional implementation resources are needed to implement the load, wheel, and PT export scheduling priorities.
Export, Load, and Wheeling Priorities	PT export receives high priority into the real-time market based upon the RUC schedule of the designated resource. PT status can be given to exports that designate a resource with non-RA supply above the resource's RUC award.	Clarifies how scheduling coordinators can firm up their RUC schedules into real-time. Also supports eliminating the current practice of providing all RUC export schedules with higher priority than CAISO load in the real-time market.
Export, Load, and Wheeling Priorities	Wheel through schedules that are price takers receive the same priority as PT exports.	Prior proposal was to set the priority of all wheel through transactions at the LPT export level, which is below load. Some stakeholders expressed concern that this is inconsistent with open access. CAISO evaluated approaches to differentiate wheels between PT and LPT priority if the scheduling coordinator prepaid the wheeling access charge for the month. It was determined that this would not implementable for summer 2021. In addition, the preferred approach to leverage the out-of-balancing authority area load serving entity (OBAALSE) process would only allow monthly participation and import capability that had already been provided to CAISO load serving entities in the annual process.

EIM Coordination and Resource Sufficiency Evaluation Review	Unable to prevent resources that cannot be dispatched within the operating hour to count towards the resource sufficiency evaluation capacity test.	Considered simple rules to exempt resources from the capacity test, but implementation was not straightforward. In addition, DMM noted these simple rules might result in additional failures that are not warranted because unit commitment decisions can be made based upon the economics the EIM.
EIM Coordination and Resource Sufficiency Evaluation Review	Stakeholders supported a longer-term initiative to review changes to resource sufficiency evaluation.	Comprehensive resource sufficiency evaluation discussion on the consequences of failing the tests will be considered in a separate stakeholder process starting in the near future.
Market Incentives for Imports during Tight System Conditions	Provide hourly block imports a make-whole payment versus paying/charging higher of HASP or FMM.	Provides scheduling coordinators with real-time market imports additional protection during hours in which the CAISO anticipates an operating reserve deficiency. Incentivizes import offers because it ensures they will receive at least their bid price. Minimal concern about overlapping import/export bids with the make-whole payment option because real-time exports are less likely during periods when the CAISO anticipates an operating reserve deficiency. Alternative options using HASP pricing involved concerns with complex implementation and concerns with interaction with virtual bids.
Real-time Scarcity Price Enhancements	Do not scale real-time market's penalty prices relative to a $2000/MWh power balance constraint penalty under tight system conditions.	Stakeholders expressed concern with interaction with proposed FERC Order 831 design. The CAISO determined this approach would require extensive effort to work out complex interactions and other summer 2021 proposals are higher priority given RUC will ensure sufficient supply to meet demand. The upcoming scarcity pricing

		initiative will address the issue that this proposal sought to address.
System Market Power Mitigation	The CAISO no longer plans to pursue system-level market power mitigation for summer 2021 to focus on the other important changes described in this draft final proposal. The CAISO's current system market power mitigation proposal will be reconsidered in conjunction with the comprehensive scarcity pricing initiative later this year.	Many stakeholders highlighted that the "scarcity pricing" elements considered in this initiative regarding pricing were not balanced with the system market power mitigation proposal and that CAISO and stakeholders should focus on the other proposals targeted at incentivizing supply during tight conditions. Because of the lack of evidence that suppliers have exerted system-level market power even during the most constrained of conditions, it is unreasonable to continue pursuing implementation of a system market power rule this summer at the expense of risking failing to implement other important measures and causing too many disruptions to the market rules this summer.
Reliability Demand Response Dispatch and Real-time Price Impacts	Propose to expand bid dispatchable option from 5 min to 5, 15 and 60 min.	Stakeholders supported proposed changes. These additional changes provide functionality that already is provided by PDRs.
Reliability Demand Response Dispatch and Real-time Price Impacts	Propose to enable 5 and 15 min discrete RDRRs to set the price in FMM by treating the resource as discrete in the scheduling run but continuous in the pricing run.	Stakeholders supported proposed changes. This additional change further improves the ability for RDRR to set the price.
Management of Storage Resources during Tight System Conditions	No additional storage changes considered in this initiative.	Enhancements to the minimum state of charge constraint proposal in response to stakeholder concerns will be discussed in the Resource Adequacy Enhancements initiative along with other resource adequacy elements that may be implemented for summer 2021.

4. Proposed Market Enhancements

Export, Load, and Wheeling Priorities

Issues

Based on the Root Cause Analysis and related discussions and analysis, the CAISO has determined it is appropriate to modify the relevant priorities the CAISO market places on serving CAISO balancing authority area load relative to exports from and wheeling schedules across the CAISO balancing authority area. Consequently, the CAISO proposes the changes outlined in this section to improve CAISO balancing authority area reliability, while maintaining open access to its transmission system. The CAISO recognizes it is part of a broader electric system and market in the west and believes it is appropriate to provide comparable "firmness" of exports other balancing authority areas provide.

The CAISO seeks to address the following issues related to load, export, and wheeling scheduling priorities in its day-ahead and real-time markets:

- **Build upon CAISO business practice manual changes made on September 5, 2020 to increase the use of the residual unit commitment process to distinguish high-priority exports from low-priority exports**. Following the August heat events, the CAISO changed its scheduling and tagging processes because they were not appropriately accounting for the CAISO load forecast relative to integrated forward market schedules, particularly the amount of virtual supply scheduled in the integrated forward market. This caused the scheduling and tagging processes to erroneously determine the system could physically support more exports than it actually could.

  On September 5, 2020, the CAISO changed two rules in the CAISO business practice manual to resolve this issue. First, the CAISO clarified the RUC process will use schedules from the scheduling run instead of schedules from the pricing run. The CAISO determined it is more effective to use the RUC's scheduling run to ensure export curtailments are reflected correctly. Second, the CAISO clarified it will use RUC schedules for exports, instead of integrated forward market schedules, to determine the day-ahead export amounts that can be tagged, and if not re-bid in, inserted as self-schedules into the real-time market. That is, the RUC schedule would determine the quantity market participants should tag when the export e-Tag is submitted in the day-ahead timeframe. This initiative builds upon these changes to ensure export schedules are physically feasible to ensure more reliable market outcomes.

- **Modify the scheduling priority of exports not supported by contracted non-RA supply relative to CAISO load**. The CAISO Department of Market Monitoring's report on the August heat events[7] showed significant quantities of self-scheduled exports were not supported by contracted-for, non-RA supply. This increased the overall demand that had to be met in the real-time market because exports not supported by physical supply were passed from the RUC commitment process into the real-time market, and they were not subsequently curtailed in real-time hours when CAISO load was curtailed. The changes proposed in this initiative ensure the market will appropriately curtail lower priority exports so CAISO load is served rather than exporting energy from resource adequacy capacity during tight system conditions. The proposed changes still ensure exports from resources contracted to serve load outside of the CAISO balancing authority area receive the same priority as the CAISO's own load. This is to ensure the CAISO market's priorities for supporting exports is consistent with the practices of other balancing authority areas in the west.
- **Modify the scheduling priority of wheel through self-schedules across the CAISO balancing authority area so that they have equal priority with high-priority exports.** Today, self-scheduled wheels effectively have higher scheduling priority than exports backed by non-RA supply because the market treats wheeling schedules as linked import and export self-schedules. If there is congestion at the intertie scheduling point or internal congestion, the market sees the cost to curtail the wheel includes both the penalty price of the export and the penalty price of the import. This differs from the practice of curtailing an export for which the market only sees the export curtailment cost. The CAISO proposes to address this by modifying the scheduling priority of the import leg of wheeling schedules from that of a self-schedule to that of a $0/MWh priced economic import bid. This will equate the cost to curtail a wheel through to that of curtailing exports supported by non-RA supply. Although CAISO load and high-priority exports will have the same penalty price, if there are self-scheduled imports, CAISO load will be met over a wheel through schedule being accepted because of the added cost to the objective function of relaxing the import self-schedule at its penalty price.

Export and Load Priority Workshop January 12, 2021

The CAISO recognizes its market functions in the context of the broader western interconnection and seeks to provide assurance it will deliver exports comparable to what other

[7] California ISO Department of Market Monitoring. Report on system and market conditions, issues and performance: August and September 2020, p.2. November 24, 2020. http://www.caiso.com/Documents/ReportonMarketConditionsIssuesandPerformanceAugustandSeptember2020-Nov242020.pdf

balancing authority areas in the west provide. To better understand other balancing authority areas' practices, the CAISO conducted a stakeholder workshop on January 12, 2021 to discuss its market's priorities for serving load relative to export schedules and to discuss other balancing authority areas' practices. Idaho Power Company shared its practices as a representation of the general practices across the western interconnection.[8] However, the CAISO also understands that these practices are not necessarily documented in other balancing authority areas' Open Access Transmission Tariffs. Based on the Idaho Power Company presentation and accompanying discussion, the CAISO understands that other balancing authority areas decide whether to honor export schedules relative to serving their own load depending on whether the situation involves transmission limitations or an energy shortage.

If transmission is constrained, the CAISO understands other balancing authority areas will curtail schedules in reservation priority order, including transmission schedules supporting exports from the balancing authority area, to resolve the transmission constraint. These curtailments occur in NERC transmission reservation priority order, under the balancing authority area's Open Access Transmission Tariff. Deliveries on non-firm transmission service are curtailed before deliveries on firm transmission service, which are curtailed last. Accordingly, export transmission schedules are subject to potential curtailment depending upon the transmission service priority utilized for the export schedule.

If an energy shortage occurs and the load serving function of the balancing authority area has entered into a firm power contract (where delivery can contractually be interrupted for reliability reasons) from its own resources, it will not interrupt that firm power delivery. For example, it was noted a balancing authority area's load serving function would generally seek not to interrupt power deliveries because interrupting the export could adversely affect the receiving balancing authority area and potentially cause cascading outages across other balancing authority areas, particularly if the energy shortage affects the larger western footprint.[9]

Similarly, the CAISO understands balancing authority areas generally will not interrupt exports from third-party, non-affiliated generators that are not committed to serve the balancing authority area's own load during an energy shortage because the balancing authority area does not have rights to that generator's capacity. One exception is that if, in real time, the third-party generator supporting an export is not generating (e.g., due to forced outage) or is under-generating compared to its transmission exporting schedule, the balancing authority area may

[8] Idaho Power Company. Export and Load Schedules presentation at the CAISO workshop. January 12, 2021. http://www.caiso.com/InitiativeDocuments/IdahoPowerPresentation-MarketEnhancements-Summer2021Readiness-Jan122021Workshop.pdf

[9] Additionally, a supplier's reputation may be damaged if it interrupts firm power export contracts because out-of-BAA parties may not be willing to contract in the future if the supplier does not honor the export.

curtail the schedules to a level commensurate with generator production to avoid exacerbating the energy shortage and associated imbalance.

Current CAISO Market Scheduling Priorities for Exports, Load, and Wheels

Scheduling coordinators may self-schedule load, exports, and/or wheels in the CAISO markets. The CAISO only has one category of transmission not associated with existing rights – new firm use.[10] The CAISO does not require transmission reservations to manage the priority of schedules to address system constraints. The CAISO manages schedules on its grid through the day-ahead and real-time markets and applies scheduling priorities defined in its tariff to conduct curtailments of self-schedules (i.e., price taker bids) in its markets. The CAISO markets honor these self-schedules if there is sufficient generation and transmission capacity to support them. If there is insufficient supply or binding transmission constraints, the CAISO markets will curtail self-schedules to clear the market. The market software determines the priority order in which the various types of self-schedules are curtailed using market parameters known as "penalty prices".[11] These penalty prices are set to specific values to (1) determine the conditions under which a constraint may be relaxed or a self-schedule may be curtailed and (2) establish the market prices when these events happen.

In the day-ahead market, self-schedule curtailments can also occur in the residual unit commitment (RUC) process after the day-ahead integrated forward market is run. The RUC process ensures there is sufficient physical supply to meet the CAISO forecast of CAISO demand. Under normal circumstances, the RUC process commits additional capacity to ensure there are sufficient resources available to serve load in real time. When there is insufficient capacity, the RUC process either curtails integrated forward market export schedules or, at the extreme, does not schedule sufficient supply to meet the CAISO balancing authority area's load forecast. The RUC process determines what portion of the day-ahead schedules are physically feasible based on power balance and intertie constraints.

In the day-ahead market, the scheduling priority of exports relative to load depends on whether the exporting scheduling coordinator designates a resource with non-RA capacity as supporting the export. If a scheduling coordinator identifies an export self-schedule as supported by non-RA capacity, that export receives equal scheduling priority as CAISO self-scheduled load in IFM and the CAISO load forecast in RUC. These exports are referred to as "Price Taker (PT)" exports. Any export self-schedules that do not identify non-RA capacity supporting the export will still be price takers, but they will have lower scheduling priority than CAISO self-scheduled load and demand forecast. These exports are referred to as "Lower Price Taker (LPT)" exports. That

[10] CAISO tariff section 23.

[11] Although self-schedules with the same scheduling priority may be designated the same penalty prices, they may or may not be curtailed equally due to congestion, loss factors, etc.

means if there is insufficient supply or binding transmission constraints, these LPT exports will only clear if there is sufficient supply to first serve self-scheduled CAISO load or demand forecast and PT exports. This ensures CAISO resource adequacy capacity cannot be used to support exports when it is needed to serve CAISO load. Finally, if there is sufficient supply to clear all self-scheduled day-ahead export and load self-schedules, economic load and export bids will be considered.

The CAISO uses a validation process to ensure a resource supporting a PT export is eligible to be designated. When a scheduling coordinator submits a PT export, it provides the self-schedule MW amount and identifies a supporting resource. The CAISO validates that the designated resource has sufficient non-RA supply participating in the market to support the export by comparing the resource's upper economic limit (i.e., the highest operating level in the resource's energy bid) to the resource's designated resource adequacy capacity. Any MW quantity exceeding the designated resource's available non-RA capacity will be given LPT priority. This validation only occurs in the day-ahead market; the CAISO does not re-verify the non-RA capacity in the real-time market if it is scheduled in RUC because all RUC exports receive the same real-time priority.[12] In addition, the validation process does not consider outages, commitment status, or deliverability of the designated resource.

Currently, if export and load self-schedules and economic bids are cleared in the integrated forward market and deemed physically feasible in the RUC process, they receive the highest level of priority (including over CAISO real-time load) when self-scheduled in the real-time market.[13] The market respects that high priority level in real time regardless of what priority the export was considered (i.e., PT, LPT, economic) in the day-ahead market. Effectively, this means the CAISO's market parameters currently prioritize the delivery of exports deemed physically feasible from the day-ahead market even if in that interval CAISO determines it must shed load in the CAISO balancing authority area because system conditions have changed.

Scheduling coordinators can submit incremental self-scheduled exports in the real-time market that are in addition to any day-ahead schedule. If these real-time self-scheduled exports designate a supporting non-RA resource, they receive equal priority as CAISO load in real-time and a higher priority than any new LPT exports submitted in real time (but lower priority than

[12] The CAISO does verify incremental PT exports submitted in the real-time market are supported by non-RA capacity above the designated resource's RUC schedule.

[13] During the August heat wave, any export cleared in the integrated forward market received higher scheduling priority than CAISO load in the real-time market. The CAISO implemented an emergency BPM change on September 5, 2020 that modified its process to give this high scheduling priority only to day-ahead exports determined to be physically feasible in the RUC process. This means that exports scheduled in the integrated forward market but curtailed in the RUC process will have a lower scheduling priority than CAISO load in the real-time market.

feasible day-ahead exports). Consistent with day-ahead market priorities, new LPT export schedules in the real-time market have higher priority than any economic export bids.

In addition to self-scheduling load and exports, scheduling coordinators can also self-schedule wheeling transactions through the CAISO system. Wheel through self-schedules consist of both an import self-schedule and an export self-schedule and can be specified between any two scheduling points in the CAISO system. A constraint in the market exists to ensure wheel through transactions are kept balanced (i.e., the import quantity equals the export quantity). This constraint respects the penalty factors associated with curtailment of both the import self-schedule and the export self-schedule. These penalty factors are additive. Combined, they give self-scheduled wheel throughs a higher scheduling priority in the market than both PT exports and load.[14] Scheduling coordinators can also submit wheel throughs using economic bids, with both the import and export legs providing economic bids. If there is sufficient supply to support all self-schedules, wheels and exports with economic bids compete for the remaining transmission capacity.

Figure 1 summarizes the day-ahead and real-time market scheduling priorities, listed in order of highest priority to lowest priority.

[14] In the event, imports are self-scheduled and create congestion at the intertie scheduling point, the penalty price to relax a self-scheduled import is additive to the load scheduling priority in IFM and the load forecasted priority in RUC.

Figure 1: Current Market Scheduling Priorities

Proposals and Rationale

Proposed Scheduling Priorities for Exports and Load

The CAISO proposes the following scheduling priorities for export and load schedules:

- **PT exports will continue to have equal priority to CAISO load in all markets.** The same policy exists today but this is a change from the straw proposal that proposed PT exports have higher priority than load in all markets. Several stakeholders opposed providing PT exports higher priority. Stakeholders also requested additional validation steps to ensure non-RA resources have available energy to support the transaction. Validation of designated supply currently does not consider outages, commitment status, or deliverability. Implementing the necessary validation rules to confirm the generation is available and generating is complex, and the CAISO is unable to implement by summer 2021. However, the CAISO is further defining what providing "non-RA supply" in subsequent sections.
- **PT exports must re-declare a supporting resource in its real-time market bid to maintain its PT status.** Today, there is no requirement a scheduling coordinator re-declare a supporting resource in the real-time market because all exports that have received a RUC schedule automatically have a higher scheduling priority than load in real-time. Having the scheduling coordinator re-declare a supporting resource ensures

the market can verify that in real time there is sufficient non-RA generation bid into the market to support the high-priority export. If a supporting resource is not designated in the real-time market bid, the export will be assigned lower real-time market priority than PT exports but higher priority than new LPT exports submitted in the real-time market to encourage forward contracting and scheduling of exports.

- **LPT and economic exports in the day-ahead market will have a lower priority than CAISO load.** This change is foundational to ensure lower priority exports (i.e., exports not backed by non-RA supply) will be appropriately curtailed by the market to minimize the export of RA capacity dedicated to CAISO load during tight system conditions. Unlike the current practice where all exports that receive a RUC schedule automatically have a higher scheduling priority than load in real-time, LPT and economic exports must secure capacity from a non-RA resource in order to receive high priority in the real-time market. This is appropriate because the CAISO cannot determine when clearing the day-ahead market if the export is supported by RA or non-RA supply. Unlike other balancing authority areas in the west, the CAISO determines schedules through a market optimization and therefore cannot determine if available system capacity is not needed to serve CAISO load when clearing an export bid. The CAISO can provide similar treatment to exports supported by non-RA supply as other balancing authority areas in the west by providing equivalent scheduling priority to CAISO load. This respects that non-RA capacity is contracted with a load serving entity outside of the CAISO balancing authority area, similar to the treatment RA resources from specified resources in the source balancing authority area are provided to CAISO RA imports.
- **LPT exports and economic exports that are deemed feasible in RUC and are self-scheduled into the real-time market will receive higher priority than new LPT exports and economic exports bidding in the real-time market.** The market will honor any export deemed feasible in RUC to the extent possible over new exports submitted in the real-time market to encourage forward scheduling of exports. That means if there are supply insufficiencies, incremental exports submitted in the real-time market will be curtailed before exports backed by a day-ahead RUC schedule.
- **The CAISO will notify the scheduling coordinator of the designated resource when its resource supports a PT export, and will add a tariff rule stating that by allowing the resource to be designated, the scheduling coordinator of the resource attests the generation has been forward contracted with an external load serving entity.** This allows the CAISO to ensure designated resources are under contract to serve load in another balancing authority area. Capacity under contract to CAISO load serving entities cannot support a high priority export. This proposed tariff rule seeks to address the concern of resources designating capacity above their net qualifying capacity (NQC) to support an export. Variable energy resources and other use-limited resource types may

have upper economic limits that differ greatly from their NQC capacity shown for resource adequacy purposes. For example, a 100 MW solar resource may have only 20 MW of NQC shown on a resource adequacy supply plan even though a load serving entity has procured the entire resource. Such a resource could potentially submit bids up to 100 MW depending on its forecasted energy. Designating capacity above a resource's NQC to support an export is unfair because (1) although the additional MW of capacity cannot be shown on a resource adequacy plan, a CAISO load-serving entity may have contracted for the entire resource, (2) resource performance both above and below NQC are used to determine the NQC of the resource for RA purposes, and (3) the resource owner could double sell its capacity if its designated capacity to support an export overlaps with its RA must-offer obligations under the CAISO tariff. The CAISO will rely on the aforementioned tariff rule because developing a process whereby the CAISO would validate actual contractual arrangements between exporters and internal resource owners would be too complex. The CAISO is creating a new Master File flag that the resource scheduling coordinator should select if it is unable to attest to the rules above, which will prevent the resource by being designated by a scheduling coordinator of an export.

- **The CAISO will add a tariff rule stating that by allowing the resource to be designated, the scheduling coordinator of the resource attests that the resource is capable at the time of bid submission of supporting an hourly block schedule in the relevant operating hour equal to the PT export quantity.** Certain resource types may be unable to sustain their fixed MW quantity over the entire course of a block hourly schedule. Self-schedule bids can only clear the day-ahead market and real-time market as a block hourly schedule. Such export schedules should not have a high priority as they could cause the CAISO to support the export from other supply to the detriment of other demand because the designated resource is unable to sustain an hourly block schedule.
- **Scheduling coordinators of energy only resources will be excluded from being designated to support a PT export**. These resources have not completed a deliverability assessment in the generator interconnection process and thus cannot ensure deliverability. Because such resources cannot sustain an hourly block schedule if there is local congestion, the resource should not be designated to support a high priority export.
- **PT exports must designate a resource internal to the CAISO.** Exporters cannot designate an import to support a PT export. These transactions can bid properly as a self-schedule wheel through.
- **Designated resources must participate in RUC up to the export self-scheduled quantity.** If a supporting resource does not receive an IFM schedule equal to or greater than the corresponding PT export, the supporting resource must submit a RUC

availability bid up to the export self-scheduled quantity. If virtual supply or bid-in load clears below the CAISO forecast, additional physical resources will be committed in RUC. If a scheduling coordinator of the designated supporting resource submits a RUC bid quantity and price in excess of the PT export quantity, the portion up to the PT export quantity will be set to $0.00/MWh. The portion above the PT export quantity will be set to the submitted RUC availability bid price.

This rule ensures that resources supporting a PT export and resource adequacy resources supporting CAISO load are considered equally when evaluating the resources needed to meet overall demand (the CAISO load forecast and PT exports). Otherwise, designated resources could bid high to avoid being committed to serve their share of demand. It would also not be equitable to allocate RUC costs to CAISO load serving entities driven by non-zero RUC bids submitted for a resource designated to support an export. The implementation of the RUC changes may not be implemented on June 1, 2021 in the event additional implementation resources are needed to implement the load, wheel, and PT export scheduling priorities.

- **If the supporting resource for a PT export does not receive a RUC schedule, the scheduling coordinator must rebid the resource in the real-time market for the export to maintain PT priority.** This ensures the real-time market has sufficient bids to support the export if system conditions change between day-ahead and real-time. Without a RUC schedule, a designated resource would otherwise have no obligation to offer in the real-time market. If the export does not rebid in real-time with a designated resource, the export's real-time scheduling priority will be equivalent to a day-ahead LPT export or economically bid export (i.e., lower priority than CAISO load but higher priority than new LPT exports) up to its RUC award.
- **If a designated resource receives a RUC schedule, real-time bids for the designated resource will be generated even if the scheduling coordinator does not re-bid the export.** This rule currently applies to any resource receiving a RUC schedule because all resources with a RUC award have a real-time must-offer obligation.
- **PT status in real-time can be provided through two means:** (1) the lower of the designated resource's RUC schedule or day-ahead export RUC schedule because the CAISO automatically generates bids for RUC awards and (2) a designated resource bid into the real-time market with available non-RA capacity above the resource's RUC schedule. The same scheduling priority in real-time applies in both situations. Table 2 provides numerical examples to help explain these points. Export A is a 100MW export self-schedule with Generator A as a designated supporting resource. Generator A bids 80MW in the day-ahead market. It receives an 80MW schedule in IFM but is curtailed to 60MW in RUC. That means Export A can only receive 60MW of day-ahead PT priority

and the remaining 40MW is day-ahead LPT priority. However, in the real-time market, Generator A provides 120MW of bids and Export A increases their bid quantity to 140MW. If a designated resource bids into the real-time market above its RUC schedule, that quantity can be used to support a PT export. The remaining 20MW of Export A's bid that is not supported by Generator A has scheduling priority of a new LPT bid submitted in the real-time market (i.e., lower scheduling priority than load and day-ahead exports). The remaining examples follow a similar logic.

Table 2: Export Priority Examples

Resource	DAM Bid	Supporting Resource	DAM Priority	IFM Schedule	RUC Schedule	RTM Bid	Supporting Resource	RTM Priority
Export A	100	Generator A	80 DAPT 20 DALPT	100	100	140	Generator A	60 DAPT 60 RTPT 20 RTLPT
Generator A	80			80	60	120		
Export B	100	Generator B	80 DAPT 20 DALPT	100	100	140	Generator B	60 DAPT 10 RTPT 30 DALPT 40 RTLPT
Generator B	80			40	60	70		
Export C	100	Generator C	80 DAPT 20 DALPT	100	100	140	Generator C	60 DAPT 60 RTPT 20 RTLPT
Generator C	80			0	60	120		

Note: The scheduling priorities are DAPT = RTPT = Load/Demand > DALPT > RTLPT

Proposed Scheduling Priorities for Wheels

The CAISO proposes the following scheduling priorities for wheels:

- **Self-scheduled wheel throughs will have scheduling priority equal to PT exports.** Currently, self-scheduled wheel throughs have higher priority than PT exports. The CAISO proposes to give them the same priority. The CAISO will implement this policy replacing the self-scheduled import leg of the wheel bid to a $0 import bid and setting the self-scheduled export leg of the wheel bid at PT priority. Similar to exports, any self-scheduled wheel through will have higher priority than new self-scheduled wheel throughs bid into the real-time market to encourage forward contracting and scheduling of wheels. Additional detail on the implications of this proposal on wheels can be found in the Appendix.

Figure 2 summarizes the proposed scheduling priorities, listed from highest to lowest, beginning summer 2021.

Figure 2: Proposed Market Scheduling Priorities

- **Day-Ahead Market**
  1. PT Export, Load & SS Wheel
  2. LPT Export
  3. Economic Export & Economic Wheel
- **Real-Time Market**
  1. PT Export, Load & SS Wheel
  2. RUC Export w/o Gen
  3. LPT Export
  4. Economic Export & Economic Wheel

EIM Coordination and Resource Sufficiency Test Review

Issues

The Western Energy Imbalance Market (EIM) has provisions for a resource sufficiency evaluation to ensure each balancing authority area participating in the EIM provides sufficient resources to reliably serve its load to prevent inappropriate "leaning" on the capacity procured by other balancing authority areas. The market freezes transfers at their previous level in the event a balancing authority area fails the resource sufficiency evaluation.

One component of this evaluation is the bid range capacity test. This test is applied to all EIM balancing authority areas at T-75, T-55 and T-40 to the hour, and is used to validate that a balancing authority area possesses sufficient capacity to meet its load and export obligations. As currently implemented, a failure of the bid range capacity or the flexible ramping capacity components of the resource sufficiency evaluation will result in an EIM balancing authority area's EIM transfer limit being fixed at the results of the most recently passed interval.

The Final Root Cause Analysis stated that the CAISO balancing authority area only failed the more restrictive flexible ramping sufficiency portion of the resource sufficiency evaluation for less than two hours on each August 14 and 15. The CAISO balancing authority area did not fail the resource sufficiency evaluation's bid range capacity test. During this period, the CAISO experienced multiple hours of energy emergency, including two separate firm load-shedding events. The ability for a balancing authority area to pass the bid range capacity test during

these emergency conditions indicate there may be shortcomings in either the design or implementation of the test.

During its review of the August 2020 events, the CAISO identified two defects relating to the implementation of the bid range capacity test. The first defect related to resource rerates and derates not being reflected in the capacity available for the test. The second defect related to inadvertent double counting of "mirror resources," which the CAISO market uses to model transfers between balancing authority areas. The events of September 6 between the Arizona Public Service and the CAISO balancing authority areas highlighted additional areas of potential improved coordination between EIM balancing authority areas.

The August 2020 events also pointed to the potential need to revise the consequences for failing the resource sufficiency evaluation. Some stakeholders contend it is inequitable to allow transfers without additional consequences when a balancing authority area fails the resource sufficiency evaluation, particularly when the balancing authority area is unable to meet its own load.

A theme in the comments provided by stakeholders is that additional enhancements to the resource sufficiency evaluation are needed to ensure it accurately captures whether a balancing authority area in the EIM is providing sufficient resources to serve its load without leaning. A wide range of stakeholders support the CAISO facilitating further discussions to ensure the resource sufficiency evaluation meets this objective. Although, additional enhancements are not feasible to implement in the short time available to develop and implement enhancements prior to summer 2021, the CAISO plans to explore additional enhancements in a separate stakeholder process starting in the near future.

Multiple stakeholders contend that the current penalty of freezing incremental transfers is not sufficient to prevent balancing authority areas participating in the EIM from leaning. Stakeholders highlighted in their comments that systemic leaning may be the result of forward capacity procurement decisions for a balancing authority area, with the failure of the resource sufficiency evaluation being a symptom of these decisions. They maintain that it is imperative for the CAISO to continue to work with stakeholders to develop further measures to increase disincentives against leaning and promote more equitable market participation. Some have suggested that a significant financial penalty should be assessed when transfers occur into a balancing authority area during periods when it is short on resources and fails the resource sufficiency evaluation.

Although the CAISO does not believe it is feasible to develop a penalty proposal on the implementation timeline of this initiative, the CAISO plans to continue stakeholder discussions regarding design of a financial penalty or similar recourse for failing the resource sufficiency

evaluation in a separate stakeholder process starting soon. This recourse could be in the form of a capacity payment outside of the market from a balancing authority area that fails the resource sufficiency evaluation to the balancing authority area or areas that are the source of the transfers. The CAISO would seek to implement any proposed changes resulting from these discussions later in summer 2021 if feasible and appropriate.

Additional detail on how the bid range capacity test is applied to the CAISO balancing authority area can be found in the Appendix.

Proposal

The CAISO proposes to enhance the resource sufficiency evaluation by making the following changes to its bid range capacity test that will:

- Account for resource derates and rerates.
- Ensure imports represented through mirror resources are not double counted.
- Include load uncertainty within each balancing authority area's bid range capacity requirement.

Accounting for resource's derates will better reflect expected capacity the CAISO balancing authority area has available. Not double counting mirror system resources will ensure that the import capacity available to the CAISO balancing authority area in the resource sufficiency evaluation is accurate. Corrections of these identified software defects will ensure the resource sufficiency evaluation is applied consistent with the CAISO tariff.

Net load uncertainty is currently part of the CAISO market's calculation of the quantity of flexible ramping product to procure. Uncertainty is defined as each balancing authority area's calculated flexible ramping requirement minus the diversity benefit created by EIM participation. The quantity of flexible ramping product to procure for load uncertainty is determined using a histogram based on historic data that measures the error in the net load forecast during each 15-minute interval in the upcoming hour. With the implementation of the flexible ramping product refinements,[15] the uncertainty calculation is being updated to be estimated by a quantile regression that considers expected forecast of loads and variable energy resources.

The inclusion of uncertainty within the bid range capacity test is reasonable to prevent a balancing authority area inadvertently leaning on the EIM to address its uncertainty. The uncertainty requirement will be added to the existing bid range capacity test requirements. The CAISO recognizes that its inclusion raises the requirements for a balancing authority area to

[15] CAISO Flexible Ramping Product Enhancements stakeholder initiative. https://stakeholdercenter.caiso.com/StakeholderInitiatives/Flexible-ramping-product-refinements

pass the test. Nonetheless, this change is appropriate given that each balancing authority is ultimately responsible for meeting its load, including the uncertainty in its net load. The inclusion of the uncertainty requirement within the bid range capacity test does not remove the economic decision to procure uncertainty on a demand curve. An EIM entity accessing EIM supply without procuring their uncertainty requirement effectively leans on the EIM to the extent that the EIM has lower priced supply then the procurement targets specified in the demand curve. Including uncertainty in the capacity test eliminates this opportunity for leaning.

As part of this initiative's straw proposal, the CAISO proposed the principle of not including any capacity in the bid range capacity test that would not be operationally available within the time horizon of the test. While on its surface this principle appears straightforward, its application is significantly nuanced. Appropriately applying this principle would have to address cold and warm startup times for offline resources, cycling resources whose start-up and minimum run times exceed the current CAISO real-time market optimization horizon, as well as offline resources that have received an advisory startup instruction. Further consideration would have to be given to resources whose offline status or existing multi-state generator configuration was based on an economic decision previously made by the EIM optimization. Given these complexities, the CAISO does not believe this principle is implementable by the summer of 2021, but plans to further discuss this principle in a future initiative.

In addition to the changes identified above, the CAISO is also proposing the following changes to improve EIM entity coordination, based on lessons learned from the events of last summer:

- Retain the last solved advisory real-time dispatch (RTD) results as a basis to set transfers should an EIM entity run out of advisory RTD intervals while in contingency operation.
- Update mirror system resources to have auto-mirroring enabled for transactions between the CAISO and the other EIM balancing authority areas.[16]
- Revise the penalty price parameters associated with the adjustment of EIM energy transfers submitted as base schedules (i.e., "Base ETSRs" and intertie schedules).

While in contingency operations, the net transfers into the contingency balancing authority area will no longer be optimized by the real-time market. RTD will continue to optimize only the internal participating resources of the EIM balancing authority area. The net EIM transfers into the balancing authority area are instead set during each RTD run, to the results of the advisory RTD solution prior to the balancing authority area entering into contingency

[16] The EIM auto-match functionality automatically matches an EIM entity's intertie schedule change outside the market clearing of the real-time market because of changes to interchange e-tags at designated EIM interties or scheduling points with matching changes to an associated EIM non-participating resource EIM base schedule.

operations. Should the contingency operation extend beyond the advisory horizon of the last pre-contingency RTD run, the net EIM transfers will default to 0 MW. This can result in large area control error (ACE) deviations, which can in turn lead to potential reliability risk to the balancing authority area.

The auto-mirror feature facilitates the mirroring of intertie schedules with the CAISO balancing authority area at CAISO intertie scheduling points from system resources in an EIM balancing authority area. Enabling the auto-mirroring functionality is appropriate as it removes manual action undertaken by the EIM entity to update their system resources to reflect intertie awards at CAISO scheduling points. This requirement will apply to cleared interchange transactions between the CAISO and the EIM entity scheduling coordinator.

During the events of September 6, the CAISO experienced high levels of north-to-south congestion that resulted in unintended interactions between the real-time market's power balance constraint slack variable, loss penalty factors, and constraint shift factors. A condition arose where a mirror resource's locational marginal price exceeded the export protection penalty price. As a result, a mirror resource with Arizona Public Service was cut to 0 MW as part of the optimal solution. Effectively, an adjustment to an intertie schedule was determined to be the optimal solution prior to the relaxation of a congestion-based constraint modeled within the CAISO balancing authority area. To prevent this from occurring again, the CAISO is proposing to review and make changes to ensure penalty prices are set to appropriate values relative to each other such that base transfer schedules (base ETSRs) and EIM interchange schedules are not subject to economic adjustment due to congestion within another balancing authority area.

Market Incentives for Imports during Tight System Conditions

Issues

The CAISO's current import settlement rules may at times create disincentives for suppliers to offer hourly block economic import supply to the CAISO real-time market. The CAISO's real-time market clears hourly block economic import bids based on prices from the hour-ahead scheduling process (HASP). However, the CAISO settles these offers at fifteen-minute market (FMM) prices. Because the CAISO market does not provide any sort of make-whole payment to hourly block economic imports, suppliers can be at risk of being paid less than their bid price.

This may be a marginal disincentive for suppliers to offer imports to the real-time market. The risk of being paid less than bid price can be especially acute during stressed system conditions. This is a concern because the Final Root Cause Analysis pointed out during the summer events the CAISO balancing authority area needed energy in excess of its resource adequacy capacity. During tight system conditions, CAISO system operators take out-of-market measures to ensure

reliability. These measures include upward adjustments to the load forecast in HASP and making out-of-market import purchases. These measures tend to suppress FMM prices relative to HASP prices.

For example, on August 16, the CAISO made out-of-market purchases of imported energy and encouraged additional import bids. The HASP price for hour ending 19 used to clear hourly block import bids at the NOB intertie was $262. However, the FMM prices used to settle the imports averaged -$149. The negative FMM prices resulted from the out-of-market purchases creating congestion in the FMM, which was not reflected in HASP. Consequently, suppliers were actually charged to deliver needed imports.

In the DMM's Q3 2020 Report on Market Issues and Performance, they analyzed the compensation of hourly block economic imports after the August 2020 events. Their analysis calculated hourly block economic imports' revenues compensation at FMM prices compared to their compensation at HASP prices. They found that although on net, of the hours analyzed, FMM revenues exceeded potential revenues at HASP prices, even though HASP prices were higher than FMM prices in some hours during this period. Therefore, they suggested a bid cost recovery or pay-as-bid option could be warranted during high demand hours.[17]

Proposal

The CAISO believes that under normal operating conditions it continues to be appropriate to clear hourly block imports and exports in the HASP and settle them at FMM prices without provisions for a make-whole payment to bid price.[18] However, as outlined above, during very tight system conditions, the benefits of provisions for an import bid make-whole payment likely exceed the drawbacks. Consequently, the CAISO proposes provisions for bid cost make-whole payments for real-time market hourly block economic imports during tight system conditions.

The CAISO proposes that the imports eligible for a bid make-whole payment include:

- Real-time market import amounts that are incremental to any import amount scheduled in the day-ahead market.
- Real-time market import amounts that are the result of an export scheduled in the day-ahead market and reduced by the real-time market.

Under this proposal, the CAISO will calculate an hourly make-whole payment as the positive difference between a scheduling coordinator's bid price and the hourly average FMM locational

[17] The Department of Market Monitor Q3 2020 Report on Market Issues and Performance, Special Issues, page 114. http://www.caiso.com/Documents/2020ThirdQuarterReportonMarketIssuesandPerformance-Feb4-2021.pdf

[18] The CAISO's Order 764 stakeholder process discusses further the reasons the market currently does not pay or guarantee the HASP price. http://www.caiso.com/Documents/Nov26_2013_TariffAmendment-Real-TimeMarketDesignEnhancementsRelated-Order764_ER14-480.pdf

marginal price for each of the applicable hours in which the CAISO identifies tight system conditions will exist.

The CAISO proposes to define tight system conditions as hours for which:

- The CAISO issues an alert notice by 3p.m. the day before an operating day that states the CAISO anticipates an operating reserve deficiency for specified hours, or
- The CAISO issues a warning notice or emergency notice during an operating day that states the CAISO anticipates or is experiencing an operating reserve deficiency during specified hours.[19]

For example, on August 13, 2020 there was an alert notice issued for hours 1700-2100 on August 14, 2020. In the real-time on August 14, 2020, the CAISO issued a warning notice for hours 1200-2359, as well as Stage 2 and Stage 3 emergencies for hours 1520-2100 and 1836-2038 respectively.[20] The CAISO's proposal to apply the make-whole payment settlement rule to hourly block economic imports would have applied to hours 1200-2359 on August 14, 2020.

Imports that are not delivered and are subject to charges under the intertie deviation settlement rules will not be eligible for a make-whole payment. Additionally, imports that have their settlement prices adjusted under the HASP reversal rule for not submitting an e-tag will not be eligible for a make-whole payment.[21]

The examples below illustrate the CAISO's proposed approach for providing bid cost make-whole payments for real-time market hourly block economic imports during tight system conditions.

Example A:

Assume tight system conditions based on the criteria described and assume the following:

- A supplier submits an import bid priced at $100/MWh for 0-50 MW, and $150/MWh for 50-100 MW.
- HASP prices on the applicable intertie are greater than the import bid price and HASP schedules a 100 MW import based on the import bid.

[19] More information on the definition of the alert, warning, and emergency operational notifications can be found at http://www.caiso.com/Documents/SystemAlertsWarningsandEmergenciesFactSheet.pdf

[20] More information on the alerts, warnings, and emergencies issued for 2020 can be found at http://www.caiso.com/Documents/AWE-Grid-History-Report-1998-Present.pdf#search=stage%201

[21] The following CAISO Tariff sections outline the intertie deviation settlement and HASP reversal rules: 11.31 - Under/Over Delivery Charge for Deviations from Intertie Awards and 11.32 - Measures to Address Intertie Scheduling Practices.

- FMM prices decrease relative to HASP prices and average $90/MWh for the four FMM intervals in the hour.
- The CAISO market would calculate the make-whole payment as:
    - 50 MW * ($100-$90/ MWh) + 50 MW * ($150-$90/MWh) = $3,500, which equates to $35/MWh

Example B:

Assume tight system conditions have been identified based on the criteria and assume the following:

- A supplier with 100 MW export scheduled in the day-ahead market rebids the export in the real-time market at $100/MWh.
- HASP prices on the applicable intertie are greater than the export bid price and HASP reduces the export schedule to 0 MW, making it effectively a 100 MW real-time market import.
- FMM prices decrease to an average of $90/MWh for the four FMM intervals in the hour.
- The CAISO market would calculate the make-whole payment as:
    - 100 MW * ($100-$90/MWh) = $1,000, which equates to $10/MWh.

In the past, there has been concern about make-whole payments because of the potential for overlapping import and export bids from the same scheduling coordinator with an accompanying make-whole payment for the import. The concern is that the settlement of an overlapping import and export could net to zero yet the scheduling coordinator receives an accompanying make-whole payment for the import while delivering zero net incremental energy to the CAISO.

However, the CAISO believes the risk of this scenario occurring is minimal because of the limited periods of time that the make-whole provisions will apply. In addition, export bids are unlikely to clear in the real-time market during tight system conditions. Real-time market economic export bids have a lower priority than CAISO load and it is unlikely they will clear when CAISO issues notices signaling the need for more supply. Additionally, the CAISO plans to monitor bidding activity associated with the periods in which the make-whole payment rule is in effect. The CAISO proposes that it have the authority to suspend the make-whole payment provisions if there are adverse market outcomes resulting from the rule.

The CAISO proposes to allocate uplift costs from the make-whole payments to CAISO measured demand and any EIM energy transfers out of the CAISO balancing authority areas. Based on the ratio of measured demand (metered demand and exports) to net EIM transfers out of the CAISO, the CAISO expects to allocate the overwhelming majority of the costs of the make-whole

payments to CAISO metered demand and exports. The CAISO will allocate the remainder of the make-whole payment costs to EIM entities that have net EIM transfers into their balancing authority area during each five-minute real-time dispatch interval.

This cost allocation methodology is similar to how the CAISO allocates the costs for real-time market bid cost recovery uplift payments to CAISO measured demand and between the CAISO and other EIM balancing authority areas. This methodology is consistent with cost causation principles because a balancing authority area's transfer out quantities compared to its demand reflect the portion of make-whole payment costs incurred in its balancing authority area to support energy transfers to another balancing authority area.

In response to the CAISO's straw proposal for this initiative, a number of stakeholders suggested various import settlement methodologies that were based on HASP prices. The CAISO determined that any option using HASP prices is infeasible to implement by summer 2021, as it would require extensive system and process changes. The CAISO plans to explore further pricing enhancements in the scarcity pricing initiative planned for later this year. Potential options could include settlement at HASP prices during system emergencies or development of an hour-ahead market run.

Real-time Scarcity Price Enhancements

Issue

Current practices may lower energy prices during tight supply conditions

When the CAISO meets its real-time demand requirement with generation it had originally reserved to meet its contingency reserve requirements, the market may produce lower energy prices at a time when it should be signaling very tight supply conditions with high prices.

When the CAISO is in an energy emergency (EEA3), it is allowed to use generators providing contingency reserves to serve demand and meet its contingency reserve requirement by arming load. "Arming load" is a process where CAISO system operators inform load-serving entities to make all preparations necessary to be able to drop load in a controlled manner if a generation contingency were to occur. The load-serving entities inform the CAISO system operators of how much load they are able to arm and works with the CAISO system operators to determine an appropriate quantity. CAISO system operators then use the market software to release the contingency reserves for use as energy.

After the CAISO system operators perform these actions, the market software uses the underlying resource energy bids to clear demand. This additional supply at bid cost may decrease prices during a time when real-time prices should increase to reflect the very tight supply conditions.

Proposal

When arming load to meet contingency reserve requirements, the CAISO proposes to release both contingent and non-contingent operating reserves at the bid cap price rather than at bid cost. This will set prices at the offer cap when there is insufficient generation supply to meet both energy and contingency reserve requirements. This pricing policy should attract more supply to the market and this pricing outcome will appropriately signal the tight supply condition.

The CAISO will price the released reserves at the bid-cap price that is applicable at that time. For instance, during the bid-cap pricing now applicable, the released reserves will have a $1,000/MWh bid. Once CAISO's proposed policies from its FERC Order 831 – Import Bidding and Market Parameters initiative[22] are effective, the released reserves will have an energy bid price of $2,000/MWh when (1) there is a submitted and cost-verified energy bid from a resource-specific resource greater than $1,000/MWh or (2) a CAISO-calculated "maximum import bid price," used to screen the costs of imports, is greater than $1,000/MWh.

The CAISO no longer proposes to scale real-time penalty prices to $2,000/MWh during tight supply conditions. In the previous draft of this proposal, the CAISO proposed to scale real-time penalty prices relative to a $2,000/MWh power balance constraint penalty price when the day-ahead market cleared above $800/MWh or operators issue alerts or warnings. This policy would have complex market interactions that the CAISO should take more time to consider.

Reliability Demand Response Dispatch and Real-time Price Impacts

Issues

Reliability Demand Response Resources (RDRRs) are intended to be used immediately prior to or during emergency conditions, at the discretion of CAISO system operators.[23] The CAISO system operators have the ability either to enable RDRR for optimal dispatch within the market, or to manually dispatch RDRR. As currently implemented, RDRR resources are either unable to or inefficient in setting market prices. When manually dispatched, RDRRs do not set the marginal energy price. When manually dispatched out of merit, its reduction in load can suppress prices, which in turn may result in fewer economic imports clearing into the CAISO. RDRRs are currently only dispatched in RTD, whose advisory horizon extends approximately 65 minutes. RDRRs are allowed a maximum of a 40-minute startup time and a maximum of a 1-

[22] CAISO FERC Order 831 – Import Bidding and Market Parameters stakeholder initiative. https://stakeholdercenter.caiso.com/StakeholderInitiatives/FERC-Order-831-Import-bidding-and-market-parameters

[23] California Public Utilities Commission. Decision 10-06-034. June 24, 2010. https://docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/119815.htm

hour minimum run time. When only considered in RTD, the startup and minimum run time often extends beyond the optimization horizon, leading to the potential for inefficient market dispatch.

As identified in the Final Root Cause Analysis, RDRRs were manually dispatched by CAISO system operators on August 14 and 15. The reason RDRRs are dispatched manually rather than through the market is driven by to two separate issues with how reliability demand response is implemented.

RDRRs are modeled and dispatched as a generating resource within the CAISO's market. However, their production is reflected as less load. To ensure the impact of RDRRs are preserved, its dispatch operating target (DOT) needs to count as an addition to the load forecast used by the real-time market. If it is not accounted for, then the market optimization will see less load, and respond by clearing less imports or reducing output of physical resources on the system. Accounting for RDRR production in the real-time market load forecast is currently a manual process performed by CAISO system operators. As currently implemented, the CAISO has hundreds of individual resources associated to RDRR programs. Allowing the market to optimally dispatch RDRRs would result in system operators having to coordinate the load forecast adjustments based on the dispatch of hundreds of resources during a system emergency. RDRR resources are often manually dispatched due to the difficulty associated with this task.

RDRRs typically have a maximum run time of four hours, with some allowing multiple starts within a day for a total daily run time of five hours. Given their limited use, CAISO system operators prefer to ensure that RDRRs are dispatched at a time when their four-hour maximum run time and subsequent return to normal load levels does not inadvertently add load during system conditions that are similar to or worse than when they were originally dispatched. For example, RDRRs dispatched optimally by the market at 3PM could return to normal load levels at 7PM near the net load peak. For this reason, CAISO system operators tightly control through manual dispatch when these resources are utilized during an emergency event.

Proposal and Rationale

The CAISO is proposing to dispatch RDRRs in real-time pre dispatch (RTPD) so they can be optimally dispatched within a longer horizon. Ensuring that the optimization horizon at a minimum captures the RDRR startup and maximum minimum run times will increase the efficiency of the market dispatch.

The CAISO is also proposing to allow RDRRs to register as 5-, 15-, or 60-minute dispatchable to better reflect their resource's parameters. For resources registered as 15-minute dispatchable, the CAISO is proposing they be allowed to set the marginal energy price in the fifteen-minute

market whether they are registered as continuous or discrete. Resources registered as 5-minute dispatchable will be able to set the marginal energy price in RTD. This change is accomplished by reflecting discrete resources as discrete in the scheduling run, but treating them as continuous in the pricing run. RDRRs registered as 60-minute dispatch that clear in HASP will receive a fifteen-minute market schedule and will settle at the corresponding locational marginal price during each fifteen-minute market interval. This is consistent with how all hourly block energy resources are currently treated within the CAISO markets. These changes will allow the price signals created by the market to better reflect the operational value of RDRRs. Allowing the market to optimally dispatch RDRRs when prices indicate that they are needed will remove the price suppression effect created by their out-of-merit manual dispatch, which in turn will allow more economic imports to clear. Furthermore, allowing the market to dispatch RDRRs when the expected price in HASP or the price in the FMM exceeds 95% of the soft bid cap will ensure conventional resources and proxy demand response (PDR) resources are utilized prior to this emergency product when it is economic to do so.

The CAISO is also proposing to update its systems to account for RDRRs within its load forecast, removing the need for manual load forecast adjustments by CAISO system operators. This will be accomplished by adding the dispatched RDRR quantity to the load forecast for future intervals for the duration of time RDRRs are dispatched.

Management of Storage Resources during Tight System Conditions

The CAISO anticipates that about 1,800 MW of storage will be available for dispatch on its system by summer 2021. This is a significant increase from the current 550 MW of storage available for dispatch and the roughly 200 MW of storage available during summer 2020. Nearly all of this new capacity is a result of an authorization of 3,300 MW new resource adequacy capacity by the California Public Utilities Commission (CPUC). The CPUC authorized this procurement over a three-year period with new capacity coming online beginning in 2021. Nearly all of the 3,300 MW of new procurement is 4-hour duration lithium-ion batteries and many of these storage devices will be located at new or existing solar facilities. Integrating these new resources will require updates to existing tools and development of new tools to ensure that the CAISO is able to effectively dispatch, optimize, and manage these resources.

Storage resources are fundamentally different from traditional gas resources in that they are unable to generate energy but instead store energy and move it from one time of the day to another. This works well in the CAISO system where energy tends to be abundant during the middle part of the day when solar is available but stretched thin during evening peak periods when renewables contribute very little and load is high. In previous stakeholder initiatives, the CAISO developed a model for storage resources that allows tracking of state of charge and positive (discharge) and negative (charge) dispatch instructions. In the fourth energy storage

and distributed energy resource (ESDER 4) initiative, the CAISO developed policy to apply market power mitigation to storage resources and allowed scheduling coordinators to submit target end-of-hour state of charge thresholds for inclusion in the real-time market. The CAISO has scheduled development for these changes for the fall 2021 software release.[24]

The CAISO is not proposing any new policy related to storage resources in this initiative. Instead, this initiative serves as a place to broadcast a complete picture of ongoing work to prepare the system for the new storage resources expected this summer. These changes include introduction of the minimum state of charge (MSOC) requirement, updates to the requirements for resources shown for regulation up and regulation down, and new tools for CAISO system operators to help manage storage resources. These changes are discussed in detail in the subsections below.

Minimum State of Charge

The CAISO proposes the minimum state of charge requirement as a component of the Resource Adequacy Enhancements (RAE) initiative.[25] This policy includes provisions to ensure that in the real-time market, storage resources are charged to a level that will ensure enough ability to deliver day-ahead discharge awards. This is critical for the CAISO because there is otherwise no mechanism to ensure that this energy is available in the real-time market and the energy may be critical to meeting peak net load periods.

The storage community expressed concern about the minimum state of charge requirement, and asked that the CAISO impose the requirement in a way to minimally impact the number of hours that the requirement would bind, and thus have a smaller impact on the ability for storage resources to participate in the real-time market. They also requested that the constraint be imposed on a limited number of days, again to reduce the overall impact that the requirement might have on a storage resource's ability to participate in the real-time market. Finally, the storage community requested that the CAISO develop a compensation mechanism for storage resources that are charged and held at a specific state of charge in the real-time market.

The CAISO is only proposing the minimum state of charge as a stopgap tool for storage management for critical periods this summer and next summer, and is only requesting approval to use this tool for two years. Second, the CAISO agrees that this tool only be imposed on the most critical days, and that this would only be triggered on days when the residual unit

[24] CAISO Energy Storage and Distributed Energy Resources Phase 4 stakeholder initiative. https://stakeholdercenter.caiso.com/StakeholderInitiatives/Energy-storage-and-distributed-energy-resources.
[25] CAISO Resource Adequacy Enhancements stakeholder initiative. https://stakeholdercenter.caiso.com/StakeholderInitiatives/Resource-adequacy-enhancements.

commitment process results in an insufficiency during a specific hour. This occurred on 23 days in 2020 (a very hot year), but only once in 2019 and once in 2018. The CAISO cannot offer any additional market compensation to storage resources that may be subject to the minimum state of charge requirement. Generally, rules for compensation can be very complicated and there is insufficient time to evaluate such rules through a stakeholder process. However, the CAISO contends that only resource adequacy storage resources would be subject to the minimum charge requirement. The resource adequacy program is a voluntary program and storage resources may elect not to show capacity through this program. If a resource owner elects not to show a storage resource as resource adequacy capacity, then the CAISO will not impose this requirement on the resource.

The CAISO maintains that a long-term solution to ensure state of charge from the storage fleet in the real-time market is necessary. The CAISO also agrees that resources providing these products to the CAISO are valuable and should receive compensation. The CAISO is committed to beginning a new stakeholder initiative, shortly after the conclusion of the summer 2021 readiness initiative, to address this concern. The CAISO will work to implement a solution from this new initiative upon sunset of the minimum state of charge requirement.

Changes to Regulation Requirements

The CAISO tariff requires that all resources awarded regulation are able to respond quickly and accurately to automatic generator control (AGC) signals from the CAISO and respond to signals consistently for the period corresponding to the award.[26] This implies that storage resources providing regulation must have sufficient energy (i.e., state of charge) to respond to automatic generator control signals, including periods when a storage resource receives regulation up or regulation down awards.

The CAISO is planning to enforce a requirement that storage resources hold enough state of charge so that they will be able to respond to regulation signals at the awarded level for 30 minutes in the real-time market. This implies that if a storage resource receives a 10 MW award for regulation up, they will have at least 5 MWh of state of charge. Similarly, if the storage resource receives a 10 MW award for regulation down, they will be required to hold no more state of charge than 5 MWh below their maximum state of charge.[27] The CAISO will complete these changes through the typical proposed revision requires (PRR) process, which includes input from the stakeholder community. The CAISO plans to open a proposed revision request to capture these changes shortly but has not begun this process yet.

[26] CAISO Tariff section 8.4.1.1 specifies requirements for regulation services.
[27] Actual state of charge values could be somewhat higher, considering a round trip efficiency less than 1.0.

Enhancements to Operator Tools

It is critical that operations has visibility into the state of the storage fleet and has the ability to dispatch the storage fleet to specific levels if needed. There are still relatively few storage resources on the grid, and the CAISO will continue improving and evolving the suite of tools available to system operators for managing these resources as more becomes available and the system operators gain experience with operating and dispatching storage as a significant part of the fleet.

Prior to summer 2021, the CAISO will develop a new screen for the operations team so that they can visualize a system summary of the storage fleet including details for each online storage resource including: current state of charge, site telemetry values, and maximum/minimum operating limits for these resources. Additionally, this screen will show capacity and state of charge aggregated for the storage fleet at the transmission level.

Today, CAISO system operators have no way to send a storage resource an exceptional dispatch instruction to hold or attain a specific state of charge. System operators must monitor storage resources in real time and may run the risk of issuing traditional exceptional dispatches, to provide a specific MW value to the grid, that are infeasible due to actual states of charge for a storage resource. The CAISO will develop an internal tool that will accept a specific threshold or target state of charge for storage resources from system operators and move those resources to a specific state of charge value. System operators will have the ability to specify hours in which these specific limits are issued to storage resources. This tool will help CAISO system operators manage storage resources in the real-time market.

Other Items

New OASIS Report

In response to a stakeholder request, the CAISO will implement an enhancement to its Open Access Same-time Information System (OASIS) to calculate and publish gross import and export schedules by intertie for the CAISO balancing authority area. This OASIS enhancement will report the import and export schedule breakdown by intertie and by direction for the day-ahead and real-time markets. This will allow market participants to view and download this information in the same manner as the current OASIS report on EIM transfers by intertie.

Independent Study Interconnection Enhancements

Issue

The CAISO has three interconnection request processes for transmission-connected resources: the annual cluster study process, the fast track process, and the independent study process. The independent study process is designed for interconnection customers that need to come

online more quickly than the cluster study process, but for resources larger than the 5 MW limit imposed by the fast track process. Currently, the CAISO is aware of two issues that may mitigate independent study interconnection customers' ability to create capacity that load-serving entities can procure this summer. First, the CAISO's behind-the-meter expansion process caps expansions to the lesser of 125 percent of the existing capacity or 100 MW. Second, the independent study process was designed to prevent "queue-jumping" for deliverability,[28] and as such, requires independent study interconnection customers to participate as "energy only" until they can participate in the next cluster deliverability assessment. As such, even if deliverability is available and unused, the CAISO cannot allocate it to independent study interconnection customers on a temporary basis.

Proposal

First, the CAISO proposes to remove the cap on behind-the-meter expansions. The vast majority of expansions today are battery additions on variable energy resources, which are less likely to present the issues the cap was designed for. Removing the cap will allow variable energy resources to hold excess energy when demand is low and then discharge that energy during the system peak.

Second, the CAISO proposes to empower itself to award available interim deliverability on a temporary basis. This will allow load-serving entities to shore up portfolios in tight summer months and it will maximize use of available deliverability capacity. Independent study interconnection customers could avail themselves of the deliverability until the interconnection customer the delivery network upgrades were constructed for comes online, or until the independent study interconnection customer can participate in the next deliverability assessment, receive its own permanent allocation, and has its delivery network upgrades constructed. This will ensure independent study interconnection customers can use available deliverability if they come online quickly while preventing queue jumping for deliverability.

Changes to Resource Adequacy Availability Incentive Mechanism (RAAIM)

The Resource Adequacy Availability Incentive mechanism (RAAIM) defines a standard for evaluating the performance of resource adequacy resources and creates performance incentives and non-availability charges for resource adequacy resources. Based on stakeholder feedback, the CAISO considered several RAAIM changes to be implemented this summer. These potential changes included:

- Changing the availability assessment hours to include weekends and holidays
- Increasing the RAAIM penalty

[28] Deliverability means the ability to delivery energy to load during peak conditions. Deliverability generally is a fundamental requirement to provide resource adequacy capacity.

- Eliminating certain RAAIM exemptions (e.g., for resources < 1 MW)

However, the CAISO has decided not to pursue RAAIM changes this summer for three reasons. First, RAAIM was not identified as a contributing factor to the August outages in the Final Root Cause Analysis. Second, the proposed changes involved significant implementation complexity that the CAISO felt could be better prioritized on other issues. Finally, some stakeholders commented they opposed the proposed changes because RA contracting is already complete and the changes would be implemented in the middle of an RA operating year.

5. EIM Governing Body Role

This initiative proposes to change CAISO market rules in order to incent supply during shortages and otherwise support the reliability of the transmission system during summer 2021, while ensuring equitable market outcomes. Each of the five elements[29] of this initiative is severable for decisional purposes, meaning that if Management does not receive approval to file that element, they would nevertheless plan to file the remaining elements assuming they are approved. Staff believes the role of the EIM Governing Body in the approval of these individual elements of the initiative should be as explained below.

By way of background, the Charter for EIM Governance provides that the "EIM Governing Body will have advisory authority over any other rules that govern participation in the ISO's entire real-time market, including rules that specifically govern the real-time market or rules that generally apply to any participation in ISO markets." A proposed change to the rules of the real-time market, or rules that apply to participation in the market generally, falls within the primary authority of the EIM Governing Body if at least one of two conditions is satisfied: either the proposed new rule is EIM-specific in the sense that it applies uniquely or differently in the balancing authority areas of EIM Entities, as opposed to a generally applicable rule or, when a proposed market rules are generally applicable, if "an issue that is specific to the EIM balancing authority areas is the primary driver for the proposed change."

Staff applies these rules to the individual elements of this initiative as follows:

1) ***Export, Load, and Wheeling Priorities*** would modify the tariff rules about the relative priority in the real-time market between CAISO balancing authority area load, wheel through self-schedules, and exports that are backed by non-RA resources under contract to serve load outside the CAISO balancing authority area.

[29] Note that "Management of Storage Resources during Tight System Conditions" and "Other Items" are not included because they do not include a policy/tariff change in this initiative.

Proposed classification: This element would fall within the Governing Body's advisory role because it would change generally applicable rules of the real-time market, and because the primary driver for this change is not an issue specific to EIM balancing authority areas. The proposed rules will affect participation in EIM by changing the rules governing use of CAISO transmission.

2) ***EIM Coordination and EIM Resource Sufficiency Test Review*** would modify the tariff rules governing the EIM resource sufficiency evaluation to better account for resource availability, uncertainty about load, and related technical changes to ensure the resource sufficiency evaluation functions appropriately.

   Proposed classification: This element falls within the primary authority of the Governing Body because some of the proposed new resource sufficiency rules are EIM-specific.

3) ***Market Incentives for Imports during Tight System Conditions*** would change tariff rules regarding the settlement of imports into the CAISO balancing authority area.

   Proposed classification: Because this would not change rules that apply to the entire real-time market, rules that impose conditions on participation in any market timeframe, or rules that apply to EIM balancing authority areas specifically or uniquely, this element falls outside the Governing Body's advisory role. This element does not affect participation in EIM.

4) ***Real-Time Scarcity Pricing Enhancements*** would change tariff rules about pricing when the CAISO balancing authority area meets its real-time demand requirement with supply that it had initially designated to meet contingency reserve requirements. The operating reserves would be released at the bid cap rather than at bid cost.

   Proposed classification: This element would fall within the Governing Body's advisory role because it would change generally applicable rules of the real-time market, and because the primary driver for this change is not an issue specific to EIM balancing authority areas.

5) ***Reliability Demand Response Dispatch and Real-Time Price Impacts*** would change tariff rules about the dispatch of resources designated as reliability demand response so that these resources are included in real-time pre-dispatch, which will account for their startup and minimum run times.

   Proposed classification: Because this would not change rules that apply to the entire real-time market, rules that impose conditions on participation in any market timeframe, or rules that apply to EIM balancing authority areas specifically or uniquely,

this element falls outside the Governing Body's advisory role. It affects only California emergency demand response programs as they relate to resource adequacy for California and how these resources are dispatched.

These proposed classifications reflect the current state of this initiative, which may change. The CAISO encourages stakeholder comments, particularly if there is disagreement with a proposed classification. Please include in your written comments a justification for the alternative classification that would be more appropriate.

6. Stakeholder Engagement, Implementation Plan & Next Steps

The schedule for stakeholder engagement is provided below. The CAISO targets the March 10, 2021 EIM Governing Body and March 24-25, 2021 CAISO Board of Governors meeting.

Table 3: Stakeholder engagement and implementation development plan

Date	Milestone
Summary Draft Final Proposal	
Draft Final Proposal Posted	February 18, 2021
Stakeholder Meeting	February 22, 2021
Comments Due	February 26, 2021
Post Draft Tariff Language	February 18, 2021
Post Business Requirement Specifications (BRS)	Week of Feb 22, 2021
Stakeholder Meeting – tariff and BRS	February 26, 2021
Comments Due - tariff and BRS	March 3, 2021
EIM Governing Body Meeting	March 10, 2021
CAISO Board of Governors Meeting	March 24-25, 2021
Implementation	June 1, 2021

Stakeholders are encouraged to participate in the public conference calls to review the draft final proposal, draft tariff language, and business requirements specifications. The draft final proposal will be discussed on February 22, 2021. The draft tariff language and business requirement specifications will be discussed on February 26, 2021. Please submit written comments by dates shown in table above using the comments templates linked on the initiative webpage.[30]

[30] CAISO Market Enhancement for Summer 2021 Readiness stakeholder initiative. https://stakeholdercenter.caiso.com/StakeholderInitiatives/Market-enhancements-for-summer-2021-readiness

Appendices

Implications of Penalty Parameters on Wheels

Existing Transmission Contracts (ETCs) and Transmission Ownership Rights (TORs) have the highest scheduling priority in the scheduling runs, even above CAISO load. In determining the Maximum Import Capability (MIC) allocation, this import capability is reserved for ETC/TOR use and is not allocated to CAISO load-serving entities to be used for RA imports. In the Congestion Revenue Right (CRR) allocation, ETC/TOR import capability is not included in the transmission limits used in the simultaneous feasibility test. Since the CAISO considers ETCs/TORs in both the MIC process and CRR process, they have the highest scheduling priority, which will not change for summer 2021.

For summer 2021, the CAISO is addressing wheels that could crowd out RA imports because the wheels were not considered in either the MIC allocation or the CRR process. The CAISO is unable to implement changes for summer 2021 that would allocate import capability to these wheels. The proposal gives the same scheduling priority to the wheel export leg as PT exports. This is accomplished by setting the import leg to $0 MWh and not as a self-schedule. A market constraint ensures the import and export leg are equal. The cost in the objective function will only be the export leg penalty price.

The following sections discuss the penalty prices for the scheduling run in the integrated forward market, residual unit commitment process, and the hour ahead scheduling process. These are simplified examples showing just the implication from the penalty prices alone by assuming no impact of losses or other congestion.[31]

Integrated Forward Market

The penalty price for self-scheduled load, PT exports, and the export leg of a self-scheduled wheel is $1450.

The penalty price for self-scheduled imports is -$400.

- If an import self-schedules and is needed to meet self-scheduled load, the cost of not meeting load is $1850. The cost of not meeting the wheel is $1450. The import will clear IFM and the wheel will not.

[31] The examples are based on the current set of penalty parameters pegged to a bid cap of $1000. The CAISO will still aim to preserve the proposed priorities when penalty prices will later be pegged to a bid cap of $2000 under the FERC Order 831 paradigm.

- If an import submits a bid below $0/MWh (for example -$5) and it is needed to meet self-scheduled load, the cost of not meeting load is $1455. The cost of not meeting the wheel is $1450. The import will clear IFM and the wheel will not.
- If an import submits a bid above $0/MWh (for example $10) and it is needed to meet self-scheduled load, the cost of not meeting load is $1440. The cost of not meeting the wheel is $1450. The wheel will clear IFM and the import will not.

Residual Unit Commitment

Note that RUC clears based upon RUC availability bids, which have an offer cap of $250 for non-RA resources. Resource adequacy resources and designated supporting resources for PT exports effectively bid $0/MWh for RUC availability covering the RA obligation or the PT export quantity. The CAISO proposes to modify the penalty prices for the CAISO load forecast to more closely model how penalty prices are applied in the hour ahead scheduling process for wheels.

The penalty price for the CAISO load forecast, PT exports, and the export leg of a self-scheduled wheel is $1600.

The penalty price for self-scheduled imports in IFM is -$650.

The penalty price for economically bid imports in IFM is the minimum (energy bid price -$250, or $0).

- If an IFM-cleared non-RA import that self-scheduled in IFM is needed to meet the CAISO load forecast, the cost of not meeting load is $2250. The cost of not meeting the wheel is $1600. The import will clear RUC and the wheel will not.
- If an IFM-cleared non-RA import that had an economic bid in IFM (for example $100) is needed to meet the CAISO load forecast, the cost of not meeting load is $1750. The cost of not meeting the wheel is $1600. The import will clear RUC and the wheel will not.
- If an IFM-cleared non-RA import that had an economic bid in IFM (for example $500) is needed to meet the CAISO load forecast, the cost of not meeting load is $1600. The cost of not meeting the wheel is $1600. The import or the wheel will clear RUC.
- If an RA import that did not clear IFM is needed to meet the CAISO load forecast, the cost of not meeting load is $1600. The cost of not meeting the wheel is $1600. The import or the wheel will clear RUC.

Hour Ahead Scheduling Process

Since wheels are hourly block schedules, HASP determines the real-time schedules.

The penalty price for new LPT exports is currently $1150.

The penalty price for new PT exports is currently $1450.

The penalty price for RUC exports is currently $1800. This will be changed to $1450 to be equal to load and real-time PT exports.

The penalty price for the power balance constraint above 300MW of regulation is $1450.

The penalty price for the power balance constraint between 0MW and 300MW of regulation is $1100.

The penalty price for a RUC self-schedule import is -$750.

The penalty price for a real-time self-schedule import is -$400.

- If a RUC import self-schedule is needed to meet the CAISO load forecast, the cost of not meeting load is $2200. The cost of the wheel is $1450. Load will be served before any RUC or RT wheel.
- If a real-time import self-schedule is needed to meet the CAISO load forecast, the cost of not meeting load is $1850. The cost of the wheel is $1450. Load will be served before any RUC or RT wheel.
- If a real-time import that economically bids less than $0/MWh (such as -$10) is needed to meet the CAISO load forecast, the cost of not meeting load is $1460. The cost of the wheel is $1450. Load will be served before any RUC or RT wheel.
- If a real-time import that economically bids greater than $0/MWh (such as $20) is needed to meet the CAISO load forecast, the cost of not meeting load is $1430. The cost of the wheel is $1450. The RUC or RT wheel will be served before CAISO load.

The CAISO does not expect non-RA imports to be bidding less than their cost, which is definitely higher than $0. This provides the CAISO access to RA imports, which can bid less than $0. However, it does not grant CAISO load priority if the import is non-RA because it bids greater than $0, so the self-schedule wheel would clear first.

Interaction between EIM Imports and the CAISO Capacity Requirement in the Bid Range Capacity Test

How EIM Transfers Impact Internal Resources

- When advisory EIM transfers into the CAISO balancing authority area (BAA) displace an internal resource, the CAISO's upward capacity requirement is increased. The CAISO's available bid range also increases because those same resources are still available.
- When advisory EIM transfers out of the CAISO BAA increases an internal resource's schedule, the CAISO's upward capacity requirement is decreased. Consequently, the

CAISO's available bid range also decreases because those same resources are not available to meet CAISO load.

How EIM Transfers Impact Imports/Exports

- When advisory EIM transfers into the CAISO BAA reduces an hourly block import that cleared RUC, the CAISO's requirement increases by the displaced hourly block import. However, the CAISO is unable to count the cleared hourly block schedule toward the requirement. Consequently, no additional capacity is freed up to meet the requirement.
- When advisory EIM transfers into the CAISO BAA are not economic, HASP may clear more hourly block imports above RUC schedules to serve CAISO. This will decrease the CAISO capacity requirement and preserve internal CAISO generation capacity to pass the requirement.
- When advisory EIM transfers into the CAISO BAA allow an hourly block export out of the CAISO, the CAISO's capacity requirement is increased. However, there is not additional internal generation available to meet the capacity requirement.
- When advisory EIM transfers into the CAISO BAA allow for an advisory EIM transfers out of the CAISO BAA, the CAISO's capacity requirement is unchanged.
- When advisory EIM transfers out of the CAISO BAA are not economic, the CAISO will support exports, only to the extent possible by their internal resources. This increases the CAISO's capacity requirement.
- When advisory EIM transfers out of the CAISO BAA increase an hourly block import that cleared RUC, the CAISO's capacity requirement is unchanged.
- When advisory EIM transfers out of the CAISO BAA decrease an hourly block export that cleared RUC, the CAISO's capacity requirement is reduced. The CAISO available bid range also increases because existing resources remain available.