FERC Order No. 831 – Import Bidding and Market Parameters

Revised Draft Final Proposal

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1 Executive Summary

This initiative explores modifications related to the CAISO's compliance filing with Federal Energy Regulatory Commission (FERC) Order No. 831. In its compliance filing, the CAISO revised its tariff to raise the energy bid cap from $1,000/MWh to $2,000/MWh. It also revised its tariff to require suppliers within the CAISO balancing authority area that submit energy bids above $1,000/MWh to base bids on verifiable actual or expected costs.[1] This initiative addresses modifications to two topics related to the changes the CAISO proposed to comply with Order No. 831:[2]

- The "penalty prices" at which the CAISO markets will relax market constraints under the increased energy bid cap in order to comply with FERC Order No. 831. The CAISO market uses these penalty prices or market constraint relaxation price parameters, to relax constraints in the market and set prices if needed to reach a solution. This includes the power balance constraint that requires supply to equal demand, which sets the system marginal energy cost under such conditions.

- A price-screening methodology for import bids greater than $1,000/MWh.

FERC Order No. 831 requires RTOs/ISOs to verify costs underlying cost-based bids above $1,000/MWh before a bid is used in the market. The order additionally provides for after-the-fact make-whole payments to the extent an RTO/ISO cannot verify a resource's costs before the market runs. The order did not require verification of import or virtual bids above $1,000/MWh. However, the Commission indicated that it would consider proposals by RTOs/ISOs to verify or otherwise review the costs of imports or exports and/or develop additional mitigation provisions for import and export transactions above $1,000/MWh.[3]

Similarly, Order No. 831 did not specify how the RTO/ISO should set its market constraint relaxation prices (also referred to as penalty prices) to be consistent with the increased bid cap. However, it stated an RTO/ISO may file, pursuant to section 205 of the Federal Power Act, to propose modifications to shortage prices or other market elements that require revision in light of the offer cap.[4] The CAISO intends to present its proposal to FERC in a separate filing, under section 205 of the Federal Power Act, consistent with FERC's direction.

[1] FERC Order No. 831 available at https://www.ferc.gov/whats-new/comm-meet/2016/111716/E-2.pdf.
[2] Note that this document addresses these topics in different order than the revised straw proposal.
[3] FERC Order No. 831 at p. 197 available at https://www.ferc.gov/whats-new/comm-meet/2016/111716/E-2.pdf.
[4] FERC Order No. 831 at p. 213 available at https://www.ferc.gov/whats-new/comm-meet/2016/111716/E-2.pdf.

In the CAISO's proposed tariff changes to comply with FERC Order No. 831[5], it did not propose to cost-verify non-resource specific import bids and proposed to allow suppliers to submit such import bids up to $2,000/MWh.[6] The CAISO also proposed to set the market constraint relaxation penalty prices relative to the new $2,000/MWh bid cap in all market intervals. Subsequently, the CAISO initiated this policy initiative to explore alternative approaches to these topics. In January 2020, the CAISO notified FERC that it would extend implementation of its compliance with Order No. 831 to fall 2021 to allow more time for policy development and implementation resulting from this policy initiative.

The CAISO proposes to set the power balance penalty price used by the market to $2,000/MWh, and scale related price parameters accordingly, only for those intervals in which verified energy costs are greater than $1,000/MWh. Specifically, it will use these higher priced parameters only 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. Resource-specific resources include CAISO generating units, EIM participating resources, and resource-specific import bids.[7]

When the market uses the penalty prices scaled to a $2,000/MWh power balance penalty price and must relax the power balance constraint, the CAISO proposes to set energy prices based on the amount of the shortfall in supply to meet demand. If the system wide shortfall is no more than 150 MW, then the market will set energy prices based on the price of the highest-priced cleared economic bid. Otherwise, the market will set prices based on the $2,000/MWh power balance penalty price. This design reflects that small supply shortfalls do not represent actual shortages.

The CAISO determined 150 MW to be an appropriate threshold based on the CAISO operator's good utility practices of managing the real-time balancing of the CAISO area, which strikes a balance between strictly matching supply to demand and regulation deployment. Under these practices the CAISO generally considers imbalances of up to 150 MW as within a permissible band that can be handled with the continuous updates of dispatch operating targets.[8]

The CAISO proposes each EIM balancing authority area would propose a permissible band calculated by their documented operational practices based on similar criteria

[5] Submitted in September 2019.
[6] As part of the CAISO compliance to Order No. 831, the CAISO has already proposed to verify import bids from resource specific system resources' costs similarly to the cost-verification for internal resources' energy bids. See CAISO Order No. 831 Compliance Filing, transmittal letter at pp. 10-11.
[7] A resource-specific system resource is the term used in the CAISO tariff, is a resource with specific generation design characteristics registered in Master File and modeled as either as a generating unit or a system resource. A list of import tariff definitions can be found here: http://www.caiso.com/InitiativeDocuments/ImportTariffMatrix-Feb042020.xlsx
[8] Appendix A discusses the calibrations necessary for all penalty prices or ancillary services scarcity prices that are tied to the maximum energy bid price as described in the tariff and BPMs. The CAISO proposes to scale ancillary services scarcity prices relative to $2,000/MWh when there are bids greater than $1,000/MWh. This is the same approach for when bids are below $1,000/MWh.

used by the CAISO. These documented operational practices would need to be based on good utility practice and not based on economic or market considerations.

Regarding the second topic this policy initiative addresses, this revised draft final proposal presents a methodology to price screen non-resource specific import bids greater than $1,000/MWh. This methodology differs from what the CAISO has recently filed with FERC for cost-verifying energy bids for resource-specific resources.[9] Rather than verifying actual or expected operating costs, as the CAISO will do for resource-specific resources, the CAISO proposes to calculate a "maximum import bid price" that it will use to screen non-resource specific import bids. The CAISO will calculate this maximum import bid price based on published bilateral energy price indices. Under this approach, the CAISO market will only accept import bids priced higher than $1,000/MWh in periods when the CAISO-calculated maximum import bid price is also greater than $1,000/MWh.

The import bid price screening will apply differently to non-resource specific import bids providing resource adequacy capacity than it will to those not providing resource adequacy capacity. The CAISO market will reduce resource adequacy non-resource specific import bids priced higher than $1,000/MWh to the greater of the CAISO-calculated maximum import bid price or $1,000/MWh.

The CAISO market will not reduce the price of non-resource adequacy non-resource specific import bids higher than $1,000/MWh. However, the CAISO will only accept these bids when the maximum import bid price is greater than $1,000/MWh or there is a cost-verified resource-specific bid greater than $1,000/MWh. When either of these conditions exist, the market will accept non-resource adequacy non-resource specific import bids up to $2,000/MWh.

Similarly, the CAISO market will only accept virtual bids greater than $1,000/MWh in the event the maximum import bid price is greater than $1,000/MWh or there is a cost-verified resource-specific bid greater than $1,000/MWh. This rule is necessary because as a result of the penalty pricing proposal, the CAISO market cannot accept import bids or virtual bids greater than $1,000/MWh. This is because the market's power balance penalty price will only be set at $2,000/MWh when the CAISO-calculated maximum import bid price is greater than $1,000/MWh. The market will not clear bids greater than $1,000/MWh when the power balance penalty price is set at $1,000/MWh.

[9] The cost-verification approach for resource-specific resources was developed in the *Commitment Cost and Default Energy Bid Enhancements* policy initiative and was recently submitted to the FERC in Docket ER20-2360, available at http://www.caiso.com/Documents/Jul9-2020-TariffAmendment-CommitmentCostsandDefaultEnergyBidEnhancementsCCDEBE-ER20-2360.pdf.

2 Background

In 2016, the Federal Energy Regulatory Commission (FERC) issued FERC Order No. 831 that required Independent System Operators and Regional Transmission Organizations (ISOs/RTOs) to revise their tariffs to raise the energy bid cap from $1,000/MWh to $2,000/MWh, and generally required suppliers that submit bids above $1,000/MWh to base those bids on verifiable costs. The rule changes in Order No. 831 created a structure where internal supply offers above $1,000/MWh are effectively automatically mitigated to an amount equal to a supplier's expected or actual costs.

Order No. 831 required that ISOs verify the costs underlying these cost-based offers above $1,000/MWh before an offer could be used to calculate energy prices. If an ISO could not verify the costs underlying the offer before the market clearing process begins then that offer may not be used to calculate energy prices. However, the supplier may be eligible for an after-the-fact make-whole payment if the resource is dispatched and the resource's costs can be verified after-the-fact. Suppliers will also be eligible for make-whole payments if the ISO dispatches a resource and its verified cost-based incremental energy bid exceeds $2,000/MWh. The order did not require verification of import or virtual bids above $1,000/MWh. However, the Commission indicated that it would consider proposals by RTOs/ISOs to verify or otherwise review the costs of imports or exports and/or develop additional mitigation provisions for import and export transactions above $1,000/MWh.[10]

Similarly, Order No. 831 did not specify how the RTO/ISO should set its penalty prices but indicated an RTO/ISO may file, pursuant to section 205 of the Federal Power Act, to propose modifications to shortage prices or other market elements that require revision in light of the offer cap.[11]

The CAISO submitted its proposed tariff changes to comply with FERC Order No. 831 in September 2019 and proposed that they go into effect in fall 2020. In its proposed tariff changes,[12] the CAISO did not submit a separate filing requesting authority to cost-verify or price screen import bids above $1,000/MWh. However, the CAISO decided to further address this topic in this initiative because of the CAISO balancing authority area's increasing dependence on imports.

In addition, a number of stakeholders objected to continuing to set the power balance penalty price at the hard energy bid cap, which under Order No. 831 increases from $1,000/MWh to $2,000/MWh. This would result in market prices being set to

[10] FERC Order No. 831 at p. 197 available at https://www.ferc.gov/whats-new/comm-meet/2016/111716/E-2.pdf.
[11] FERC Order No. 831 at p. 213 available at https://www.ferc.gov/whats-new/comm-meet/2016/111716/E-2.pdf.
[12] Developed in the CAISO's Commitment Cost and Default Energy Bid Enhancements (CCDEBE) stakeholder initiative available at http://www.caiso.com/StakeholderProcesses/Commitment-costs-and-default-energy-bid-enhancements.

$2,000/MWh if the market has to relax the power balance constraint. Consequently, this initiative also addresses this topic.

In January 2020, the CAISO notified FERC that it would likely extend implementation of its Order No. 831 compliance requirements to fall 2021 to allow more time for policy development and implementation resulting from this policy initiative.[13]

3 Stakeholder Comments and Changes from the Draft Final Proposal

The CAISO appreciates the written stakeholder comments received in response to this initiative's draft final proposal and the subsequent stakeholder call. The following summarizes these comments and the changes resulting from them.

Power Balance Constraint Relaxation Pricing Comments and Changes

In the draft final proposal, the CAISO proposed that the market would set energy prices based on the price of the highest-priced cleared economic bid when the market must relax the power balance constraint and there are energy costs greater than $1,000/MWh. In this event, the market uses constraint penalty prices scaled to a $2,000/MWh power balance penalty price and would otherwise set prices based on the $2,000/MWh power balance penalty price.

Stakeholders generally supported the CAISO's proposal to scale penalty prices to the $2,000/MWh power balance penalty price only during market intervals when verified energy costs are greater than $1,000/MWh. However, some stakeholders opposed the CAISO's proposal to use the highest-priced cleared economic bid to set energy prices when the penalty prices are scaled to a $2,000/MWh power balance penalty price. Some of these stakeholders also pointed out that there could be an unintended consequence of this approach, such as the highest-priced cleared economic bid could be less than $1,000/MWh when the market must relax the power balance constraint, even when penalty prices are scaled to a $2,000/MWh power balance penalty price. This could undermine the CAISO's existing shortage pricing mechanism in which prices would increase to the energy bid cap if there is not enough supply to meet demand.

EIM entities are supportive of the CAISO's proposal; however, they maintain that they are not obligated to make all of their supply available to the CAISO market. Therefore, if the market has to relax the power balance constraint for a balancing authority area in the EIM, this may not indicate true shortage conditions and setting prices based on the $2,000/MWh power balance penalty price would be inappropriate. The CAISO notes that this situation is somewhat similar in the CAISO balancing authority area. Relaxing

[13] *See* CAISO Motion for Leave to Answer and Supplemental Answer of the California Independent System Operator Corporation to Comments and Limited Protest, FERC Docket No. ER19-2757, at page 3-5 (January 31, 2020) (available at: http://www.caiso.com/Documents/Jan31-2020-SuppAnswer-to-Comments-Order831Compliance-ER19-2757.pdf)

the power balance constraint does not necessarily indicate shortage of supply. It may simply indicate the market did not start up the right resources before a given interval. However, the CAISO does agree that small supply and demand imbalances likely do not indicate conditions in which operators do not need to take action. Therefore, the CAISO agrees that it is inappropriate to set energy prices based on a $2,000/MWh power balance penalty price for small infeasibilities in which operators would not otherwise take action.

Market Surveillance Committee (MSC) members expressed the opinion that using the highest-priced cleared economic bid to set energy prices may not send an appropriate shortage price signal to the market. Under the current market design, when the market has to relax the power balance constraint, it sets prices at $1,000/MWh, which can be greater than the last economic bid. The MSC members advocated that shortage price signals are necessary to provide incentives for flexible resources and will help ensure that imports are delivered.

Further, the MSC noted that using the highest-priced cleared economic bid to set energy prices in the pricing run could still result in prices near $2,000/MWh because there could be non-RA import bids and virtual bids. They pointed out that one of these bids will likely clear when the market relaxes the power balance constraint and would set the energy price at or near $2,000/MWh.

A stakeholder recommend that the CAISO apply an adder above the highest-priced cleared economic bid when the $2,000/MWh power balance penalty price is in effect. They advocated that this adder would provide an effective shortage signal without resulting in massive windfalls. However, adding a premium on to the price of the highest-priced cleared economic bid would create an incentive for generators behind constraints to over-generate because prices generators receive would be inconsistent with their dispatch instructions.

Based on consideration of all of these comments, in this revised draft final proposal the CAISO proposes to maintain the proposal to only scale the market constraint penalty prices relative to a $2,000/MWh power balance penalty price during intervals when verified energy costs are greater than $1,000/MWh. When penalty prices are scaled to a $2,000/MWh power balance penalty price and there is a power balance constraint infeasibility, the CAISO proposes to set energy prices in the pricing run based on the amount of shortfall in supply to meet demand. Additionally, the CAISO recognizes it is unreasonable to set the penalty prices to $2,000/MWh when there are small infeasibilities. For example, the CAISO balancing authority area operators do not take action for intermittent supply and demand differences up to 150 MW because they do not result in operational concerns.

Consequently, the CAISO has modified its approach to relax the power balance constraint before pricing the power balance penalty price at $2,000/MWh. If the system

wide shortfall is no more than 150 MW, then the market will set energy prices based on the price of the highest-priced cleared economic bid. Otherwise, the market will set prices based on the $2,000/MWh power balance penalty price.

The CAISO proposes each EIM balancing authority area would propose a permissible band calculated by their documented operational practices based on similar criteria used by the CAISO. These documented operational practices would need to be based on good utility practice and not based on economic or market considerations.

This updated proposal fixes the unintended consequence of setting the energy price in the pricing run at a value less than the current $1,000/MWh power balance penalty price when market constraint penalty prices are scaled to $2,000/MWh.

Finally, multiple stakeholders recommend the CAISO focus its efforts on accurately reflecting scarcity pricing conditions in the market. They suggest the CAISO prioritize a separate scarcity pricing stakeholder effort to adopt scarcity pricing market design mechanisms.

The CAISO acknowledges the concerns stakeholders have regarding scarcity pricing, and is addressing these as part of the Flexible Ramping Product (FRP) Refinements initiative and in Bundle 3 of the Extended Day-Ahead Market (EDAM) initiative.[14] Within the FRP refinements initiative, the CAISO is proposing to make the flexible ramping product nodal-based, which will increase the utilization and deployment of this product. This will ensure the power balance constraint is not triggered prior to the flexible ramping product constraints being fully relaxed, because it will ensure the resources awarded flexible ramping product are accessible. When the flexible ramping product requirements are relaxed, the demand curve price gradually increases the energy price above the marginal energy offer. As the requirement relaxation increases, the energy price increases to higher levels prior to relaxing the power balance constraint. The power balance penalty price is only triggered after the full flexible ramping product requirement cannot be met.

In Bundle 3 of the EDAM initiative, which is scheduled to begin in Q2 2021, the CAISO will explore enhancing its market's scarcity pricing provisions. The scope of these enhancements will be defined at the onset of this initiative.

Import Bid Cost Verification Requirements Comments and Changes

In this initiative's draft final proposal, the CAISO proposed to price-screen all import bids greater than $1,000/MWh using a CAISO-calculated "maximum import bid price" based on published electrical price indices. The CAISO proposed to not attempt to verify the

[14] Information on the CAISO's Flexible Ramping Product Refinements initiative is available at: http://www.caiso.com/StakeholderProcesses/Flexible-ramping-product-refinements.
Information on the CAISO's Extended Day-Ahead Market initiative is available at: http://www.caiso.com/StakeholderProcesses/Extended-day-ahead-market

actual costs behind an import. The draft final proposal also proposed to apply the maximum import bid price to non-resource specific import bids and reduce any offer greater than the maximum import bid price or $1,000/MWh. Finally, the draft final proposal proposed to not provide after-the fact cost recovery for import bids that were reduced.

Stakeholders continue to support the CAISO's intent to screen import bid prices greater than $1,000/MWh. However, stakeholders differed on the type of imports that should be subject to price screening. Some stakeholders maintain all import resources, regardless of resource adequacy status should be screened using the maximum import bid price. They stated limiting the bid price of only resource adequacy imports could discourage procuring resource adequacy capacity from import supply. On the other side, some stakeholders continue to maintain that "voluntary" non-resource adequacy import supply should not be subject to price screening. They stated it is not practical to develop a methodology that would accurately determine imports' actual costs. This is because the CAISO market does not link import bids to specific generators for which the CAISO would have information to estimate costs. In addition, the costs include opportunity costs that can be very subjective.

A number of stakeholders stated that reducing submitted import bid prices would entail too much risk that a bid could be reduced to below actual costs. They maintained that there would have to be provisions for after-the-fact cost recovery make whole payments if this option were to be adopted. They maintained that not providing for make whole payments would discourage non-resource adequacy imports from being offered to the CAISO market. However, stakeholders did not propose a viable methodology in their comments that the CAISO could use to determine import's costs.

The CAISO continues to maintain determining the costs of imports and providing make-whole payments after-the-fact to be unpractical.

The CAISO agrees with stakeholders that provisions to reduce non-resource adequacy import bids to a maximum import bid price could discourage these imports from bidding into the CAISO market. However, because the CAISO depends on resource adequacy imports to meet its load, it is appropriate to have the same safeguards that are in place for internal resource adequacy resources to protect against unjustified prices greater than $1,000/MWh. Non-resource adequacy imports do not have the same requirement to offer to the market that resource adequacy imports do. Because of this, importers may not offer to the CAISO market if they were faced with the risk of having their bid reduced below actual costs with no provisions for after-the-market cost recovery.

Consequently, in this revised draft final proposal, the CAISO continues to propose to only reduce resource adequacy import bids greater than $1,000/MWh to the CAISO-calculated maximum import bid price. The CAISO also proposes to not provide for after-the-fact cost recovery for import bids. This proposal will not have the effect of

reducing the quantity of import supply because resource adequacy resources are required to offer these imports to the CAISO market.

Although this proposal allows non-resource adequacy import bids to set prices, there are two factors to mitigate the risk that they will inflate CAISO market prices. First, by design the market should be able to use only resource adequacy resources to meet CAISO balancing authority area demand. Second, the CAISO will only accept non-resource adequacy bids when the maximum import bid price is greater than $1,000/MWh or there is a cost-verified resource-specific bid greater than $1,000/MWh. When either of these conditions exist, the market will accept non-resource adequacy non-resource specific import bids up to $2,000/MWh.

Stakeholders also suggested modifications to the proposed maximum import bid price calculation that the CAISO adopted in this revised draft final proposal. Rather than calculating two separate maximum import bid prices for the north and south interties, the CAISO now proposes to calculate a single maximum import bid price. Stakeholders also suggested the CAISO modify their proposal to use the day-ahead SMEC from a more recent day than a historical SMEC. Section 4.2.2 reflects these changes.

4 Proposal

This section describes the CAISO's proposal for setting market prices when the market must relax the power balance constraint, as well as associated rules for setting market constraint relaxation price parameters, in the context of the $2,000/MWh hard energy bid cap. It also describes the CAISO's proposal for price screening import bids priced greater than $1,000/MWh.

The CAISO proposes to set the power balance penalty price used by the market to $2,000/MWh, and scale related price parameters accordingly, only during periods when energy costs are greater than $1,000/MWh.

When the market uses the penalty prices scaled to a $2,000/MWh power balance penalty price and must relax the power balance constraint, the CAISO proposes to set energy prices based on the amount of the shortfall in supply to meet demand. The CAISO determined 150 MW to be an appropriate threshold based on the CAISO operator's good utility practices of managing the real-time balancing of the CAISO area, which strikes a balance between strictly matching supply to demand and regulation deployment. Under these practices the CAISO generally considers imbalances of up to 150 MW as within a permissible band that can be handled with the continuous updates of dispatch operating targets.

The CAISO proposes each EIM balancing authority area would propose a permissible band calculated by their documented operational practices based on similar criteria

used by the CAISO. These documented operational practices would need to be based on good utility practice and not based on economic or market considerations.

The CAISO proposes to price screen import bids greater than $1,000/MWh to determine the bids used by the CAISO market. The CAISO proposes to calculate a "maximum import bid price" that it will use to screen import bids, calculated based on published bilateral energy price indices and natural gas prices.

The CAISO market will only accept import bids priced greater than $1,000/MWh in periods in which the CAISO-calculated maximum import bid price or a cost-verified energy bid for a resource-specific resource is also greater than $1,000/MWh. In this event, the market will reduce resource adequacy import bids above $1,000/MWh to the CAISO-calculated maximum import bid price. In this event, the market will accept non-resource adequacy import bids and virtual bids up to $2,000/MWh.[15]

4.1 Power Balance Constraint Relaxation Pricing and Constraint Penalty Prices

The CAISO tariff specifies the relevant scheduling and pricing parameters that apply when the CAISO market must relax a constraint to reach a feasible solution.[16]

The power balance constraint ensures that the sum of generation and imports equals the sum of demand, including exports and transmission losses.[17] The shadow price of the power balance constraint establishes the system marginal energy cost, which the market uses to determine locational marginal prices. Today, this constraint is set to the maximum energy bid price (the "hard" bid cap) of $1,000/MWh. This allows for bids to clear up to the hard bid cap.

The tariff also specifies the scheduling and pricing parameters for relaxing transmission constraints,[18] the pricing parameters when there is insufficient supply to meet demand (power balance constraint),[19] ancillary services scarcity pricing,[20] and for protecting existing contracts and transmission ownership rights.[21] These parameters, included in Appendix A, are established based on the existing $1,000/MWh maximum bid price market participants can submit to the CAISO markets. The Market Operations business

[15] Likewise, the CAISO will only accept physical demand and export bids above $1,000/MWh when one of these conditions is met.
[16] *See* Section 27.4.3 of the CAISO tariff available at http://www.caiso.com/Documents/Section27-CAISOMarkets-Processes-asof-Aug12-2019.pdf.
[17] See Appendix C Part B of the CASIO tariff available at http://www.caiso.com/Documents/AppendixC-LocationalMarginalPrice-asof-Aug1-2019.pdf#search=power%20balance%20constraint.
[18] *See* Sections 27.4.3.1 and 27.4.3.2 of the CAISO tariff available at http://www.caiso.com/Documents/Section27-CAISOMarkets-Processes-asof-Aug12-2019.pdf.
[19] *See* Sections 27.4.3.3 and 27.4.3.4 of the CAISO tariff available at http://www.caiso.com/Documents/Section27-CAISOMarkets-Processes-asof-Aug12-2019.pdf.
[20] *See* Section 27.1.2 and its subsections of the CAISO tariff available at http://www.caiso.com/Documents/Section27_CAISOMarkets_Processes_Jan28-2020.pdf.
[21] *See* Section 27.4.3.5 of the CAISO tariff available at http://www.caiso.com/Documents/Section27-CAISOMarkets-Processes-asof-Aug12-2019.pdf.

practice manual (BPM) documents the full set of scheduling and pricing parameters used in the various markets that are calibrated based on the values set in the CAISO tariff.[22]

The additional pricing parameters outlined in the BPM and included in Appendix A, are associated with constraints in the optimization and govern the conditions under which constraints may be relaxed and the setting of market prices when any constraints are relaxed. Importantly, the magnitude of the penalty price values in the tables for each market reflect the hierarchical priority order in which the associated constraint may be relaxed in that market by the market software[23].

The power balance constraint needs to be at least as high as the highest submitted energy bid price. Otherwise, the optimization will relax the constraint rather than clear bids priced above its value.

The CAISO market utilizes both a scheduling and pricing run to produce awards (dispatches) and prices. In the scheduling run, the market optimizes all submitted bids and clears awards based on the most effective economic solution. In the event a solution cannot be achieved, the market will adjust non-priced parameters (*i.e.*, uneconomic adjustments) or relax constraints to attain a solution. The awards and resulting prices of this solution are passed to the pricing run. The pricing run information of the potential uneconomic adjustments and/or constraint relaxation is retained because after solving the scheduling run, the amounts of the adjustments and relaxations are known. These instances are modeled in the pricing run with slack variables with a small range beyond the solution of the scheduling run in order to have room in the optimization of the pricing run to find a solution and produce binding prices. In the event uneconomic adjustments are made or constraints are relaxed, the relevant penalty prices are applied.

The CAISO proposes that the power balance penalty price remain at $1,000/MWh under routine conditions and all other market constraint penalty prices will remain scaled to $1,000/MWh. The CAISO proposes to set the power balance penalty price to $2,000/MWh, and scale the rest of the market constraint penalty prices relative to $2,000/MWh, only under specific conditions. Consequently, this assumes that under normal market conditions the shortage price signal sent by the power balance constraint relaxation price should be based on the $1,000/MWh soft energy bid cap.

[22] Additional information is available in the Business Practice Manual for Market Operations available at https://bpmcm.caiso.com/BPM%20Document%20Library/Market%20Operations/BPM_for_Market%20Operations_V63_redline.pdf

[23] Additional information is available in the Business Practice Manual for Market Operations available at https://bpmcm.caiso.com/BPM%20Document%20Library/Market%20Operations/BPM_for_Market%20Operations_V63_redline.pdf

Specifically, under this proposal, the CAISO market would utilize two sets of pricing parameters[24]:

1. Pricing parameters will be scaled to a $1,000/MWh power balance penalty price when both of the following conditions exist in any interval of the market horizon:
    i. Resource-specific resources[25] have not submitted a cost-verified energy bid greater than $1,000/MWh.
    ii. The CAISO-calculated maximum allowable import bid price is not greater than $1,000/MWh.
2. Pricing parameters for the power balance constraint will be scaled to $2,000/MWh when either of the following conditions exist in any interval of the market horizon:
    i. Resource-specific resources have submitted a cost-verified energy bid greater than $1,000/MWh.
    ii. The CAISO-calculated maximum allowable import bid price is greater than $1,000/MWh.

Further, the CAISO proposes that if the conditions are satisfied to set the pricing parameter for the power balance constraint to $2,000/MWh and the market must relax the power balance constraint, the market would set energy prices in the pricing run based on the amount of infeasibility from the scheduling run up to the $2,000/MWh hard energy bid cap. The amount of infeasibility in the scheduling run will be compared to a small threshold value. The CAISO determined 150 MW to be an appropriate threshold value based on the CAISO operator's good utility practices of managing the real-time balancing of the CAISO area, which strikes a balance between strictly matching supply to demand and regulation deployment. Under these practices, the CAISO generally considers imbalances of up to 150 MW as within a permissible band that can be handled with the continuous updates of dispatch operating targets.

If the amount of infeasibility determined in the scheduling run is greater than 150 MW, the energy prices in the pricing run will be based on the $2,000/MWh power balance penalty price. Otherwise, if the amount of infeasibility is less than or equal to 150 MW, the energy prices in the pricing run will be based on the highest-priced cleared economic bid, unless that bid is priced less than $1,000/MWh. In that case, energy prices in the pricing run will be based on $1,000/MWh, i.e. the power balance penalty price the market would use if costs are below $1,000/MWh.

[24] The two sets of market constraint pricing parameters are outlined in Appendix A.
[25] See Footnote **Error! Bookmark not defined.**.

The CAISO proposes each EIM balancing authority area would propose a permissible band calculated by their documented operational practices based on similar criteria used by the CAISO. These documented operational practices would need to be based on good utility practice and not based on economic or market considerations.

The CAISO's intent is to avoid setting energy prices based on the $2,000/MWh power balance penalty price when there are small infeasibilities that do not necessarily represent significant shortage conditions. By ensuring that energy prices must be at least $1,000/MWh when the market relaxes the power balance constraint, the approach avoids the potential for setting the energy price in the pricing run below $1,000/MWh when the market must relax the power balance constraint and when penalty prices are scaled to the $2,000/MWh power balance penalty price.

Figure 1: CAISO permissible band versus observed MW infeasibilities (July 2018-June 2020)

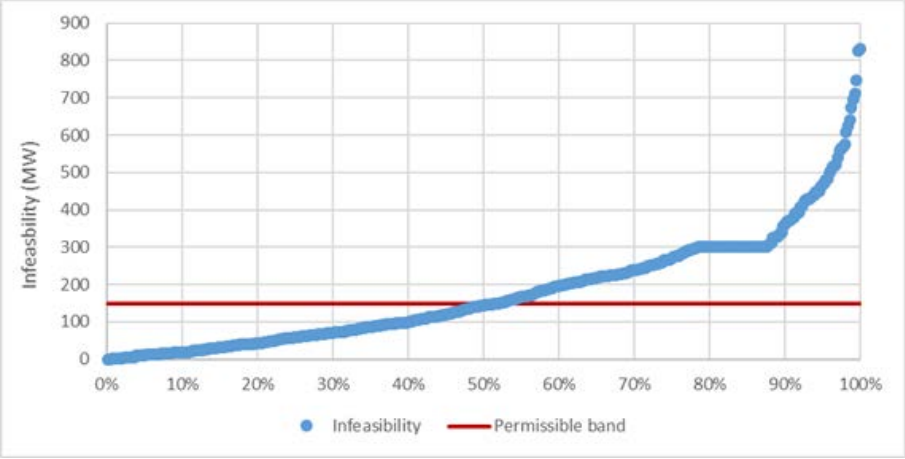


Figure 1 depicts the CAISO's permissible band of 150 MW versus the observed CAISO infeasibilities; i.e. power balance constraint relaxation. The horizontal access shows the percentage of all infeasibilities that are below the corresponding infeasibility amounts on the vertical axis. Approximately 50-55% of all infeasibilities are below the 150 MW permissible band.

The CAISO real-time market includes individual power balance constraints for each EIM balancing authority area and an overall power balance constraint for the market. The overall power balance constraint for the market applies to the CAISO balancing authority area as well. The CAISO will set all of these power balance constraints at $2,000/MWh, and scale the other market constraints accordingly, when the conditions are met to set the power balance penalty price to $2,000/MWh.

Additionally, it is important to note that if the conditions are met to set the power balance penalty price to $2,000/MWh (*i.e.*, there is a cost-verified energy bid from a resource-

specific resource greater than $1,000/MWh or the CAISO-calculated maximum import bid price is greater than $1,000/MWh) for any hour in the day-ahead market, the $2,000/MWh power balance penalty price will be used for all hours of the day. In the real-time market, if the power balance penalty price is set to $2,000/MWh in a given trading hour, the real-time market will use the $2,000/MWh power balance penalty price for all intervals of overlapping real-time market horizons. If the conditions to set the power balance penalty price to $2,000/MWh in all intervals of a real-time market horizon are not met, a $1,000/MWh power balance penalty price will be used in all intervals of that real-time market horizon. This is irrespective of the fact that a $2,000/MWh power balance penalty price may have been used for one or more of these intervals in a previous real-time market run. This approach is necessary so the market functions consistently across all intervals in its horizon.

The examples below illustrate the CAISO's overall proposed approach for establishing penalty prices and setting prices when the market relaxes the power balance constraint.

Example A:

The following example illustrates how penalty prices will remain set to the $1,000/MWh power balance penalty price when the highest-priced submitted bid from a resource-specific resource and the CAISO-calculated maximum allowable import bid price are both less than or equal to $1,000/MWh.

Assume the following market inputs in the real-time market:

- Highest-priced bid from a resource-specific resource = $900/MWh
- CAISO-calculated maximum allowable import bid price = $200/MWh
- System wide permissible band = 150 MW @ $1,000/MWh

Given the conditions listed above, in the scheduling and pricing runs, the power balance penalty price would be set to $1,000/MWh to determine the dispatch and prices.

Assume the market must relax the power balance constraint. Energy prices would be set based on the $1,000/MWh power balance penalty price.

Example B:

The following example illustrates how penalty prices will be set to the $2,000/MWh power balance penalty price when the highest-priced submitted bid from a resource-specific resource is greater than $1,000/MWh. This example also outlines how energy prices are determined in the pricing run based on the amount of infeasibility.

Assume the following market inputs in the real-time market:

- Highest-priced bid from a resource-specific resource = $1,200/MWh
- CAISO-calculated maximum allowable import bid price = $700/MWh
- System wide permissible band = 150 MW @ $1,000/MWh

In the scheduling and pricing runs, the power balance penalty price would be set to $2,000/MWh to determine the dispatch because there is a submitted and cost-verified energy bid from a resource-specific resource greater than $1,000/MWh.

Assume the market must relax the power balance constraint and the highest-priced cleared economic bid is $1,200/MWh. Energy prices in the pricing run would be set based on the following:

- If the scheduling run infeasibility ≤ 150 MW, energy prices in the pricing run will be based on the $1,200/MWh highest-priced cleared economic bid.
- If the scheduling run infeasibility > 150 MW, energy prices in the pricing run will be based on the $2,000/MWh power balance penalty price.

Example C:

The following example illustrates how penalty prices will be set to the $2,000/MWh power balance penalty price when the CAISO-calculated maximum allowable import bid price is greater than $1,000/MWh. This example also outlines how energy prices are determined in the pricing run based on the amount of infeasibility when there is no resource-specific bid greater than $1,000/MWh.

Assume the following market inputs in the real-time market:

- Highest-priced bid from a resource-specific resource = $900/MWh
- CAISO-calculated maximum allowable import bid price = $1,100/MWh
- System wide permissible band = 150 MW @ $1,000/MWh

In the scheduling and pricing runs, the power balance penalty price would be set to $2,000/MWh to determine the dispatch because the CAISO-calculated maximum allowable import bid price is $1,100/MWh, which is greater than $1,000/MWh.

Assume the market must relax the power balance constraint and the highest-priced submitted bid from a resource-specific resource is $900/MWh. Energy prices in the pricing run would be set based on the following:

- If the scheduling run infeasibility ≤ 150 MW, energy prices in the pricing run will be based on the $1,000/MWh because there is no resource-specific bid greater than $1,000/MWh.

- If the scheduling run infeasibility > 150 MW, energy prices in the pricing run will be based on the $2,000/MWh power balance penalty price.

Example D:

The following example illustrates how penalty prices will be set to the $2,000/MWh power balance penalty price when the CAISO-calculated maximum allowable import bid price is greater than $1,000/MWh. This example also outlines how a submitted resource-adequacy import bid will be reduced to the CAISO-calculated maximum allowable import bid price. Further, this example highlights how energy prices are determined in the pricing run based on the amount of infeasibility.

Assume the following market inputs in the real-time market:

- Highest-priced bid from a resource-specific resource = $900/MWh

- Highest-priced resource adequacy import bid = $1,200/MWh

- CAISO-calculated maximum allowable import bid price = $1,100/MWh

- System wide permissible band = 150 MW @ $1,000/MWh

In the scheduling and pricing runs, the power balance penalty price would be set to $2,000/MWh to determine the dispatch because the CAISO-calculated maximum allowable import bid price is $1,100/MWh, which is greater than $1,000/MWh. The market reduces the submitted $1,200/MWh resource adequacy import bid to the $1,100/MWh maximum allowable import bid price.

Assume the market must relax the power balance constraint and the highest-priced cleared economic bid is the $1,100/MWh import bid. Energy prices in the pricing run would be set based on the following:

- If the scheduling run infeasibility ≤ 150 MW, energy prices in the pricing run will be based on the $1,100/MWh highest-priced cleared economic bid.

- If the scheduling run infeasibility > 150 MW, energy prices in the pricing run will be based on the $2,000/MWh power balance penalty price.

Example E:

The following example illustrates how penalty prices will be set to the $2,000/MWh power balance penalty price when the highest-priced submitted bid from a resource-specific resource is greater than $1,000/MWh. This example also outlines how energy prices are determined in the pricing run based on the amount of infeasibility for an EIM balancing authority area when it is import constrained and the market must relax the power balance constraint for that specific EIM balancing authority area.

Assume the following market inputs in the real-time market:

- Highest-priced bid from a resource-specific resource within an EIM balancing authority area = $1,200/MWh
    - This EIM balancing authority area is import constrained.
- CAISO-calculated maximum allowable import bid price = $900/MWh
- EIM balancing authority area's permissible band = 100 MW @ $1,000/MWh
- EIM balancing authority area's available balancing capacity supply = 20 MW @ $100/MWh

Given the conditions listed above, in the scheduling and pricing runs, the power balance penalty price would be set to $2,000/MWh to determine the dispatch because there is a submitted and cost-verified energy bid from a resource-specific resource greater than $1,000/MWh. This applies to all individual balancing authority area power balance constraints in the EIM area and the market power balance constraint for the EIM area as a whole.

Assume the market must relax the power balance constraint in the import constraint EIM balancing authority area. The highest-priced cleared economic bid within the balancing authority is the $1,200/MWh bid. Energy prices in the pricing run would be set based on the following:

- If the scheduling run infeasibility ≤ 120 MW, energy prices in the pricing run will be based on the $1,200/MWh highest-priced cleared economic bid.

- If the scheduling run infeasibility > 120 MW, energy prices in the pricing run will be based on the $2,000/MWh power balance penalty price.

The scheduling run infeasibility is compared to the sum of the EIM balancing authority area's permissible band amount and their available balancing capacity supply amount.

Since the market outside of this import constrained EIM balancing authority area can reach a feasible solution, the overall system's power balance constraint does not need to be relaxed in this example, and prices outside the constrained balancing authority area are produced using its normal process.

The "available balancing capacity" feature currently implemented in the EIM allows the market to recognize additional resources outside the market EIM participants use to meet their balancing authority responsibilities.[26] It includes bids for these resources in the market's bid stack, when the market must relax the power balance constraint for an EIM balancing authority area. This allows the marginal economic bid to set the energy price within the balancing authority area and not the power balance penalty price.

In the event the market would otherwise relax the power balance constraint for a balancing authority area in the EIM other than the CAISO, the available balancing capacity feature uses the capacity from the out-of-market available balancing capacity at penalty prices from $1,050/MWh to $1,200/MWh. This ensures that all available bids submitted up to the bid cap of $1,000/MWh are scheduled prior to releasing available balancing capacity into the bid stack. The pricing run then produces prices incorporating bids from the available balancing capacity resources.

Under the approach described in this revised draft final proposal, the available balancing capacity will be released between $2,100/MWh and $2,400/MWh in the scheduling run when the $2,000/MWh set of pricing parameters is used in the market. This will ensure the priority level of available balancing capacity is maintained in the bid stack in the scheduling run.

4.2 Screening import and virtual bids greater than $1,000/MWh

This section describes the CAISO's proposal to price-screen import bids greater than $1,000/MWh.

The CAISO proposes that its market will only accept import bids priced higher than $1,000/MWh in periods in which a CAISO-calculated "maximum import bid" price is also greater than $1,000/MWh or when the CAISO has cost-verified a resource-specific

[26] Additional information on the available balancing capacity feature is available in the Energy Imbalance Market Transition period Draft Final Proposal http://www.caiso.com/Documents/DraftFinalProposal_EIMTransitionPeriod.pdf.

resource bid greater than $1,000/MWh. Similarly, the CAISO market will only accept virtual bids greater than $1,000/MWh under these conditions.

This import bid price screening will apply differently to imports providing resource adequacy capacity than it will to imports not providing resource adequacy capacity. The CAISO market will reduce resource adequacy import bids priced higher than $1,000/MWh and higher than the CAISO-calculated maximum import bid price to the CAISO-calculated maximum import price. When it does this, it will not reduce a bid to a price below $1,000.

The CAISO market will not reduce the price of non-resource adequacy import bids higher than $1,000/MWh. However, the CAISO will only accept these bids when the maximum import bid price is greater than $1,000/MWh or there is a cost-verified resource-specific bid greater than $1,000/MWh. When either of these conditions exist, the market will accept non-resource adequacy import bids up to $2,000/MWh.

Because the CAISO also proposes to calibrate its penalty prices based on the availability of a cost-verified bid and the price of the maximum import bid price, the CAISO market can only accept import bids or virtual bids greater than $1,000/MWh when the market's power balance penalty price is set at $2,000/MWh. Under the approach presented in this revised draft final proposal, this is only when the CAISO-calculated maximum import bid price is greater than $1,000/MWh or when the CAISO has cost-verified a resource-specific resource bid greater than $1,000/MWh. The market will not clear bids greater than $1,000/MWh when the power balance penalty price is set at $1,000/MWh, *i.e.*, when it has not cost-verified a supply bid greater than $1,000/MWh.

The import bid price screening approach differs somewhat from the CAISO's approach for cost-verifying energy bids for resource-specific resources.[27] For bids for resource-specific resources (internal or external) greater than $1,000/MWh, the CAISO will verify each resource's actual or expected costs by on the supplier's contemporaneously available information. In contrast, the CAISO-calculated maximum import bid price represents prevailing energy prices based on published bilateral energy prices indices. It is not representative of the source of a particular import's actual operating costs, although it may represent opportunity costs. The CAISO will not require suppliers to submit import bids based on actual or expected costs.

[27] These include supply resources within the CAISO balancing authority area and resources outside the CAISO modeled as resource-specific system resources. The cost-verification approach for resource-specific resources was developed in the *Commitment Cost and Default Energy Bid Enhancements* policy initiative and was recently submitted to the FERC in Docket ER20-2360, available at http://www.caiso.com/Documents/Jul9-2020-TariffAmendment-CommitmentCostsandDefaultEnergyBidEnhancementsCCDEBE-ER20-2360.pdf.

4.2.1 Application to Resource Adequacy Imports

As described above, the CAISO proposes to reduce the price of only resource adequacy import bids greater than $1,000/MWh to the CAISO-calculated maximum import bid price, or $1,000/MWh, whichever is higher. It also proposes to not provide for after-the-fact cost recovery for import bids for which it reduced the price.

As described in Section 3, the CAISO agrees with stakeholders that provisions to reduce non resource adequacy import bids to a maximum import bid price without cost recovery would discourage imports from bidding into the CAISO market. Suppliers would likely be reluctant to offer imports to the CAISO market if they would be at risk of having their bid reduced to a CAISO calculated price without provisions for an after-the-fact make whole payment if they could demonstrate that their bid represented actual costs. However, the CAISO does not believe there is a practical methodology for it to objectively determine import costs, which would be needed to provide importers with a make-whole after the fact payment.

However, reducing resource adequacy imports to the maximum import bid price will not reduce import supply. Resource adequacy resources are required to submit bids under the must-offer requirements as they apply to imports to the CAISO market. Although this may impose a small risk that a resource adequacy import bid may be reduced to a price below a supplier's cost, suppliers could presumably factor this risk into their bilateral resource adequacy contracting price.

This proposed approach will allow non-resource adequacy import bids (and virtual bids) in the market above the CAISO-calculated maximum import bid price and up to $2,000/MWh during certain periods. However, two factors will mitigate the risk that this will result in excessive market prices. First, the market will not allow any energy bids greater than $1,000/MWh unless the CAISO-calculated maximum import bid price or a cost-verified resource-specific bid is greater than $1,000/MWh. Second, the market should be able to meet CAISO balancing authority area demand using only bids from resource adequacy resources. All resource adequacy bids are subject to either cost-verification rules or the maximum import bid price. This means bids priced higher than the highest-priced bid for a resource adequacy resource are unlikely to clear the market and set CAISO market prices.[28] The day-ahead market has the additional protection that energy supply clears against economic demand bids. Thus, demand can protect itself against unreasonably high prices through specifying a maximum price at which it wants to schedule demand.

As discussed above, the CAISO's approach for price-screening import bids differs based on whether the import bid is from a resource adequacy resource. In the *System*

[28] The CAISO's market clears supply bids in price merit order.

Market Power Mitigation initiative the CAISO proposes to treat both resource adequacy and non-resource adequacy imports the same - all import bids would not be subject to system-level market power mitigation. The respective approach the CAISO has proposed in the two initiatives is different because the two initiatives have different objectives.

The objective of CAISO's FERC Order No. 831 policy initiative is to ensure all supply needed to meet the ISO's load responsibility (resource adequacy resources) that provide bids priced above $1,000/MWh represent verified costs. As discussed in FERC's Order No. 831, market power concerns are heightened when a resource's energy bid is greater than $1,000/MWh. Although the Commission did not require verification of import bids as it did for bids internal resource bids greater than $1,000/MWh, it recognized similar concerns could exist and each ISO/RTO could request measures necessary to address such issues.

In the CAISO's case, the CAISO has determined that its reliance on import energy makes it appropriate to also verify import bids represent actual costs. In contrast to mitigation the CAISO performs for local market power mitigation for all bids, including those below $1,000/MWh, Order No. 831 recognizes that bids above $1,000/MWh must be cost verified irrespective of whether the ISO/RTO has evaluated whether or not there exists the ability to exercise market power. In the case of bids above $1,000/MWh, there is a presumption that such bids exceed what would typically be actual costs and therefore there is a need to validate those bids. In particular, the CAISO relies on resource adequacy requirements to ensure there is enough capacity to serve its load. Therefore, it relies on the resource adequacy import bids differently than it does non-resource adequacy.

That said, as discussed above, the CAISO is proposing that it would not also not allow an import bid above $1,000/MWh from a non-resource adequacy import if it has not found the maximum import price exceeds $1,000/MWh or it cost verified a resource-specific system resource above $1,000/MWh.

In contrast, in the system market power initiative, the CAISO is proposing rules to test whether there is a need to mitigate energy bids because of the potential that suppliers, through concentration of supply, may be able to exercise market power at the balancing authority area level. Based on its approach for testing whether there exists such circumstances, the CAISO has determined that import bids, whether resource adequacy or not, would not be subject to mitigation because imports are most likely not pivotal supply. Therefore, there would be no basis for mitigating import resources, similar to the CAISO's proposal to not mitigate internal resources that are not pivotal.

4.2.2 Maximum Import Bid Price Calculation

As described above, the CAISO-calculated maximum import bid price would be used to screen import and virtual supply bids and is intended to represent prevailing energy prices. The CAISO proposes to calculate the maximum import bid price based on an energy price component that uses the maximum of two published bilateral electrical prices, Mid-C or Palo Verde.

The CAISO will calculate separate maximum import bid prices for the day-ahead and real-time markets.

Both the bilateral electric hub prices are published as multi-hour block rather than hourly prices. The energy price component methodology will convert these multi-hour block prices into hourly prices to reflect that hourly prices change throughout the day. This reflects that CAISO prices vary by hour. The calculation will convert daily multi-hour block electrical prices from the published electric price indices into hourly prices by multiplying them by the ratio of each hour's day-ahead SMEC to the average day-ahead SMEC of a previous day. A previous day's day-ahead SMEC is calculated separately for on and off-peak hours. The resulting price will be multiplied by 110 percent.

The CAISO would perform this calculation each day and use the resulting maximum import bid prices in the respective CAISO markets.

The CAISO proposes to calculate this maximum import bid price for each hour as follows:

$$\textbf{Maximum import bid price} = \textbf{Energy Price} \times 1.1$$

The maximum import bid price approximates the prevailing bilateral price of electricity as an hourly price. As described further below, the energy price component uses the maximum of two published bilateral electrical index prices from Mid-Columbia or Palo Verde.

Both of these prices are daily prices rather than hourly prices. The energy price component converts these daily prices into hourly prices.

The 110 percent multiplier is to account for differences in prices between published price indices and individual transactions. The published electrical price indices are based on the weighted average price of all electric transactions. Therefore, a supplier's opportunity costs for individual sales outside of the CAISO may be higher than the corresponding published electrical indices.

The following subsections describe the components of the maximum import bid price calculation.

Energy Price Component

As described above, the energy price component of the proposed maximum import bid price equation estimates the current prevailing hourly bilateral electricity price. It does this by converting daily published electric hub index prices into hourly prices.

The calculation must convert daily prices into hourly prices because electrical indices are daily multi-hour block prices, while CAISO prices are hourly prices in the day-ahead market. The electrical price indices are published as separate peak and off-peak hour prices for each day. The peak price represents the price for a 16-hour block of energy. Whereas, the CAISO market clears and sets prices hourly in the day-ahead market and clears and sets prices every 15-minutes in the real-time market.

The energy price component of the proposed maximum import bid price equation calculates an hourly energy price based on the daily electric hub index price. This hourly energy price will be adjusted based on CAISO day-ahead hourly SMEC. The energy price will increase the hourly maximum import bid price relative to the daily hub price in which the day-ahead (DA) SMEC is typically greater over the day. The maximum import bid price will decrease the price in hours that the day-ahead SMEC is typically less over the day. The calculation would multiply the energy price component by the ratio of each hour's day-ahead SMEC to the average day-ahead SMEC of a previous day. A previous day's day-ahead SMEC is calculated separately for on and off-peak hours.

The energy price component of the maximum import bid price equation will be calculated hourly as follows:

Energy Price =

Electric Hub Price x Hourly Shaping Factor

Where, Hourly Shaping Factor is:

[1+ (CAISO Hourly DA SMEC – CAISO Average DA SMEC of on/off peak hrs) / (CAISO Average DA SMEC of on/off peak hrs)]

Electric Hub Price

The CAISO proposes to use the highest price for each on/off peak prices from either the Mid-Columbia or Palo Verde electric price hub indices. The CAISO proposes to use Mid-Columbia and Palo Verde because they are representative electrical prices for the bilateral market outside of the CAISO balancing authority area.

The CAISO previously proposed to calculate separate electric hub prices for both the north and south intertie regions. However, based on stakeholder suggestions, the CAISO proposes to simplify this calculation and calculate only a single price for the

entire CAISO balancing authority area. Stakeholders also pointed having two import bid calculations would create implementation challenges for virtual bids.

The electric hub price used in the maximum import bid calculation for the day-ahead market and real-time market differs. Price differences in both markets are due to bid submission deadlines and when bilateral electric hub prices are published.

The following example illustrates how the day-ahead market is currently using a day old electric price.

Example F:

> Assume today is Wednesday, July 22, 2020.
>
> The prior evening, July 21, the Intercontinental Exchange (ICE) published electric prices for trade-date July 22 at around 8 pm. At 9 pm on July 21, the CAISO uses the published electric price for trade-date July 22 to calculate real-time prices beginning with hour-ending 1.
>
> On July 22, the CAISO is preparing to run the day-ahead market for July 23. However, the only published electric price information available at that time is for trade-date July 22, published the prior evening on July 21. Therefore, the CAISO is using a "day-old" electric price in the day-ahead market.

The CAISO understands using a day-old electric price in the day-ahead market is problematic. Consequently, the CAISO proposes to update day-ahead electric prices similar to its natural gas price procedure for the day-head market. The following example illustrates the CAISO's proposal:

Example G:

> Assume today is Wednesday, July 22, 2020. Electric bilateral trading is occurring for trade-date July 23.
>
> At 8:30 am on July 22, the CAISO proposes to review trading on ICE for next-day electric prices applicable for trade-date July 23. This is considered a "snap shot" of prices for July 23 until the market closes and a final price is reported by the ICE around 8 PM later that evening. The CAISO would use this "snap shot" price in the day-ahead market that runs at 10 am on July 22 for trade-date July 23.
>
> Meanwhile, the same July 23 product described above continues to trade during the remainder of July 22. The final electric price for trade-date July 23 is published around 8 pm on July 22 by ICE. This price is then used in the CAISO real-time market beginning with July 23 hour-ending 1.

The CAISO's proposal allows for a more up-to-date electric price to be used in the day-ahead market. However, for the real-time market, the CAISO doesn't have any up-to-date information to also update electric prices because there is no real-time electric bilateral index. Consequently, if system market conditions change overnight, market conditions would not be reflected in the published electric price used for the real-time market.

Hourly Shaping Factor

The CAISO proposes to use a previous day's day-ahead SMEC in each hour to shape bilateral multi-hour block electric hub prices. Using a previous day's day-ahead SMEC in the shaping factor is appropriate because it is a more direct indicator of expected hourly price variation than historical SMEC.

The CAISO proposes to shape the price in each hour based on the ratio of the day-ahead system marginal energy cost to the average system marginal energy cost of a previous day. It would do this using the day-ahead SMEC from a previous day. A previous day's day-ahead SMEC is calculated separately for on and off-peak hours.

For example, if the CAISO is calculating an energy price on a weekday (e.g. Wednesday), the CAISO would use the day-ahead SMEC from a previous weekday (e.g. Tuesday). For weekends (e.g. Saturday or Sunday), the CAISO proposes to use the day-ahead SMEC from the corresponding day-ahead SMEC of a previous weekend. For holidays, the CAISO proposes to use the day-ahead SMEC from the most recent off peak day.

The CAISO proposes to use a previous day's day-ahead SMEC in the proposed shaping factor because a previous day has a smaller average margin of error than compared to the previous proposal of using the day-ahead SMEC from the same month from the previous year. Under this approach, the CAISO will not publish its calculated ratios in advance.

For example, on July 21 at 10 AM, the CAISO is calculating the day-ahead market hourly shaping factors for trade-date July 22. The CAISO must use the day-ahead SMEC calculated on July 21 for July 22 because the day-ahead market results for July 22 haven't occurred yet. **Example H** below demonstrates how the day-ahead market would use the day-ahead SMEC of July 21 in the day-ahead hourly shaping calculation for trade-date July 22, Hour-Ending 10:

Example H:

Hourly Shaping Factor =

$$1 + \left[\frac{(DA\ SMEC\ of\ July\ 21, 2020\ HR\ 10) - (Avg\ DA\ SMEC\ of\ ON\ peak\ hrs\ of\ July\ 21{,}2020)}{Avg\ DA\ SMEC\ of\ ON\ peak\ hrs\ of\ July\ 21, 2020}\right]$$

For the real-time market, the CAISO will calculate the hourly shaping factor for trade-date July 22 using the day-ahead SMEC for trade-date July 22. The CAISO is able to use the day-ahead SMEC of trade-date July 22 because the day-ahead market results for trade-date July 22 were published at 1 pm on July 21. The CAISO calculates real-time prices for trade-date July 22 at 9 pm on July 21. **Example H** below demonstrates how the day-ahead SMEC of July 22, 2021 is used in the real-time market hourly shaping calculation of trade-date July 22, Hour-Ending 10:

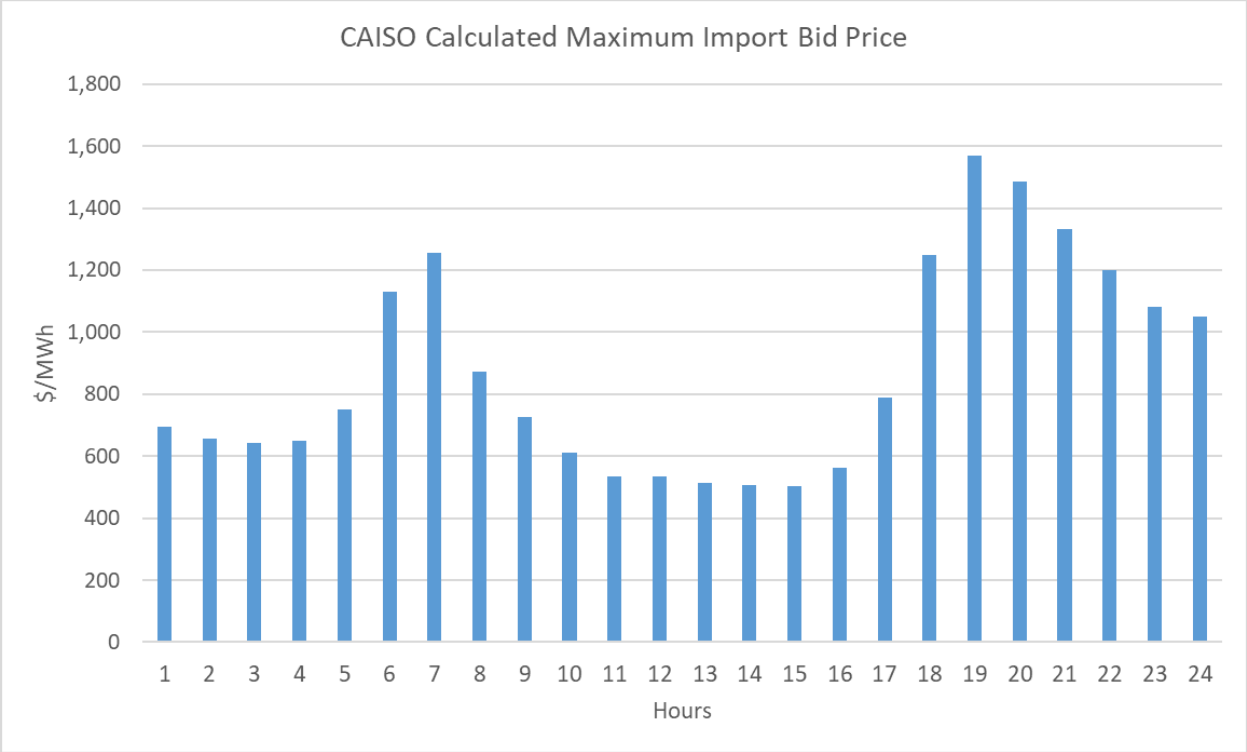
Example I:

Hourly Shaping Factor =

$$1 + \left[\frac{(DA\ SMEC\ of\ July\ 22, 2020\ HR\ 10) - (Avg\ DA\ SMEC\ of\ ON\ peak\ hrs\ of\ July\ 22, 2020)}{Avg\ DA\ SMEC\ of\ ON\ peak\ hrs\ of\ July\ 22, 2020}\right.$$

Example J illustrates how bilateral prices are adjusted by the hourly shaping factor.

Example J:



Example J depicts the proposed calculated energy price for the abnormally high priced bilateral prices that occurred in March 2019. The Mid-Columbia on/off-peak prices were used in this calculation because they were greater than the bilateral trading hub prices

at Palo Verde. The Mid-Columbia on-peak price was $891/MWh and off-peak price was $832/MWh. These prices are used in the corresponding hours. For example, on-peak pricing will be used in hours ending 0700-2200. The CAISO will shape the Mid-Columbia prices by the SMEC in that hour relative to the same hour of a previous day's SMEC. For example, the maximum import bid price in Hour Ending 4 is $651/MWh. While in Hour Ending 20, the maximum import bid price is $1,484/MWh.

5 Energy Imbalance Market Governing Body Advisory Role

As described above this initiative considers two topics:

1. Methodology to establish market constraint relaxation penalty prices under a $2,000/MWh hard energy bid cap.
2. Price screening methodology for import bids greater than $1,000/MWh.

These two topics would be severable for decisional purposes, because even if potential changes to address one of the topics was not approved, the CAISO would nevertheless file amendments to implement potential changes to address the other topic. The CAISO believes the EIM Governing Body should have an advisory role in the approval of the proposed changes.

The rules that govern decisional classification were amended in 2019 when the Board adopted changes to the Charter for EIM Governance and the Guidance Document. An initiative proposing to change rules of the real-time market now falls within the primary authority of the EIM Governing Body either if 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 for proposed market rules that are generally applicable, if “an issue that is specific to the EIM balancing authority areas is the primary driver for the proposed change.”

The initiative does not satisfy the first test, because the market rules proposed to address the two topics described above would not be EIM-specific. The screening of import bids would be specific to the CAISO balancing authority area. The market constraint relaxation penalty prices and proposed price mechanism when the power balance constraint must be relaxed is applicable to the entire CAISO market footprint, including othering balancing authority areas participating in the EIM. Moreover, primary driver for addressing these topics is not specific to the EIM balancing authority areas. The effects of any change to the market constraint penalty prices would be similar in the CAISO balancing authority area and EIM balancing authority areas. Accordingly, this initiative would fall entirely within the advisory role of the EIM Governing Body.

In comments on earlier papers, a group of EIM Entities objected to this proposed classification. Their objection was focused exclusively on the classification of the item involving penalty prices when a power balance constraint is relaxed, as opposed to the method for screening import bids. To gain a better understanding of their concerns, CAISO staff discussed the objections with representatives of some of the EIM Entities. These representatives agreed that the proposed market rule regarding penalty prices is generally applicable to the entire market, as opposed to EIM-specific. Their concern about the proposed classification involves the second test described above – whether

"an issue that is specific to the EIM balancing authority areas is the primary driver for the proposed change." They emphasized the fact that it was the EIM Entities who filed the primary protest of the ISO's initial compliance filing at FERC, which would have resulted in penalty prices at the cap. Without this protest, they maintain, the CAISO would not have asked FERC for time to pursue this initiative.

CAISO appreciates the role that the EIM Entities' played in pushing for a harder look at penalty prices through the protest they filed at FERC. Management continues to believe, however, that the penalty price item is properly classified as advisory, because the test is not which entity or set of entities complained. A generally applicable market rule, such as the proposed rule about penalty prices, falls within the primary authority of the Governing Body only if "an issue that is specific to the EIM balancing authorities" was the primary driver of the proposed change. Here, the issue is the level of penalty prices when a market constraint is relaxed, an issue that is not "specific to" EIM balancing authority areas. This is an issue for the entire market footprint; it is not specific to one or more EIM balancing authority areas to the exclusion of the CAISO balancing authority area. Accordingly, the primary driver test is not met, even if it is the EIM balancing authority areas that may arguably care more about the issue, or cared more at an early critical point. (Moreover, a rule that the determining factor is who protested first or loudest could create undesirable incentives.) In sum, the CAISIO believes the initiative is properly classified.

With that said, stakeholders are encouraged to submit a response to the EIM classification of this initiative as described above in their written comments, particularly if they have concerns or questions.

6 Stakeholder engagement

The schedule for stakeholder engagement is provided below. The CAISO will present its proposal to the Energy Imbalance Market Governing Body at their September 16, 2020 meeting and to the Board of Governors' at their September 30 – October 01, 2020 meeting.

Date	Event
7/22/2020	Publish revised draft final proposal
7/29/2020	Stakeholder conference call on revised draft final proposal
8/12/2020	Stakeholder comments due
July- Aug 2020	Development of draft Business Requirement Specifications and Tariff language
Sept 16, 2020	Energy Imbalance Market Governing Body meeting
Sept 30 – Oct 01, 2020	Board of Governors meeting
Fall 2021	Expected implementation, concurrent with FERC 831 compliance implementation

Stakeholders should attend the stakeholder conference call on July 29, 2020 and provide written comments by August 12, 2020.

7 Appendix A - Market constraint relaxation penalty parameters values

This section provides the specific value settings for the set of CAISO market parameters that are used for adjusting non-priced quantities in the market optimizations.

The parameter values are all of market parameters that are based on the hard energy bid cap specific in the CAISO tariff and in the Business Practice Manual (BPM) for Market Operations. This section includes two tables based on market process: the Integrated Forward Market (IFM) and the Real Time Market (RTM).

The magnitude of the penalty factor values in the following tables for each market reflect the hierarchical priority order in which the associated constraint may be relaxed in that market by the market software. These tables are organized by penalty price, scheduling run value, and pricing run value. Based on the proposal described in Section 4.1, there are two columns dedicated to each scheduling run and pricing run values depending on if the pricing parameters are scaled to a $1,000/MWh or $2,000/MWh power balance penalty price . Since the price floor of -$150/MWh is not being adjusted, all existing negative pricing parameter values will remain the same as today even when the power balance penalty price is set to $2,000/MWh.

All of the following paramter values will be specified in the BPM for Market Operations[29] and the CAISO Tariff Sections 27 and 30.[30]

[29]These parameter values will be specified in Section 6.6.5 of the Business Practice Manual for Market Operations available at https://bpmcm.caiso.com/Pages/BPMDetails.aspx?BPM=Market Operations

[30] *See* Sections 27 and 30 of the CAISO tariff available at http://www.caiso.com/Documents/Section27-CAISOMarkets-Processes-asof-Aug12-2019.pdf and at http://www.caiso.com/Documents/Section30-Bid-Self-ScheduleSubmission-CAISOMarkets-asof-Nov13-2019.pdf respectively.

Integrated Forward Market (IFM) Parameter Values

Described in BPM for Market Operations or Tariff Section	Penalty Price Description	Scheduling Run Value [31] when submitted and cost-verified bids are below $1,000/MWh and CAISO-calculated maximum import bid price is not greater than $1,000/MWh ($/MWh)	Pricing Run Value when submitted and cost-verified bids are below $1,000/MWh and CAISO-calculated maximum import bid price is not greater than $1,000/MWh ($/MWh)	Scheduling Run Value when submitted and cost-verified bids are greater than $1,000/MWh or the CAISO-calculated maximum import bid price is greater than $1,000/MWh ($/MWh)	Pricing Run Value when submitted and cost-verified bids are greater than $1,000/MWh or the CAISO-calculated maximum import bid price is greater than $1,000/MWh ($/MWh)	Comment
BPM for Market Operations Section 6.6.5	Power balance constraint *(Market energy balance)*	6,500	1,000	13,000	2,000	Market energy balance is the requirement that total supply equal the sum of total demand plus losses for the entire system. In the IFM energy balance reflects the clearing of bid-in supply and demand; in the MPM component of the DAM it reflects the scheduling of bid-in supply against the ISO demand forecast.
BPM for Market Operations Section 6.6.5 and Tariff Section 27.4.3.1	Transmission constraints: Intertie scheduling	5,000	1,000	10,000	2,000	Intertie scheduling constraints limit the total amount of energy and ancillary service capacity that can be scheduled at each scheduling point.
BPM for Market Operations Section 6.6.5	Legacy Reliability Must-Run (LRMR) pre-	-6000	-150	-6,000	-150	The ISO considers transmission constraints

[31] Penalty values in the scheduling run are negatively valued for supply reduction and positively valued for demand reduction.

Described in BPM for Market Operations or Tariff Section	Penalty Price Description	Scheduling Run Value [31] when submitted and cost-verified bids are below $1,000/MWh and CAISO-calculated maximum import bid price is not greater than $1,000/MWh ($/MWh)	Pricing Run Value when submitted and cost-verified bids are below $1,000/MWh and CAISO-calculated maximum import bid price is not greater than $1,000/MWh ($/MWh)	Scheduling Run Value when submitted and cost-verified bids are greater than $1,000/MWh or the CAISO-calculated maximum import bid price is greater than $1,000/MWh ($/MWh)	Pricing Run Value when submitted and cost-verified bids are greater than $1,000/MWh or the CAISO-calculated maximum import bid price is greater than $1,000/MWh ($/MWh)	Comment
	dispatch curtailment (supply)					when determining LRMR scheduling requirements. After the ISO has determined the LRMR scheduling requirements, the market optimization ensures that the designated capacity is scheduled in the market.
BPM for Market Operations Section 6.6.5	Pseudo-tie layoff energy	-4,000	-150	-4,000	-150	Pseudo-tie layoff energy is scheduled under contractual arrangements with the balancing authority in whose area a pseudo-tie generator is located.
BPM for Market Operations Section 6.6.5 and Tariff Section 27.4.3.1	Transmission constraints: branch, corridor, nomogram (base case and contingency analysis)	5,000	1,000	10,000	2,000	In the scheduling run, the market optimization enforces transmission constraints up to a point where the cost of enforcement (the “shadow price” of the constraint) reaches the parameter value, at which

Described in BPM for Market Operations or Tariff Section	Penalty Price Description	Scheduling Run Value [31] when submitted and cost-verified bids are below $1,000/MWh and CAISO-calculated maximum import bid price is not greater than $1,000/MWh ($/MWh)	Pricing Run Value when submitted and cost-verified bids are below $1,000/MWh and CAISO-calculated maximum import bid price is not greater than $1,000/MWh ($/MWh)	Scheduling Run Value when submitted and cost-verified bids are greater than $1,000/MWh or the CAISO-calculated maximum import bid price is greater than $1,000/MWh ($/MWh)	Pricing Run Value when submitted and cost-verified bids are greater than $1,000/MWh or the CAISO-calculated maximum import bid price is greater than $1,000/MWh ($/MWh)	Comment
						point the constraint is relaxed.
BPM for Market Operations Section 6.6.5	Transmission Ownership Right (TOR) self schedule	5,900, -5,900	1,000, -150	11,800, -5,900	2,000,-150	A TOR Self-Schedule will be honored in the market scheduling in preference to enforcing transmission constraints.
BPM for Market Operations Section 6.6.5	Existing Transmission Contract (ETC) self schedule	5,100 to 5,900, -5,100 to -5,900	1,000, -150	10,200 to 11,800, -5,100 to -5,900	2,000,-150	An ETC Self-Schedule will be honored in the market scheduling in preference to enforcing transmission constraints. The typical value is set at $5,500/MWh, but different values from $5,100/MWh to $5,900/MWh are possible if the instructions to the ISO establish differential priorities among ETC rights. For some ETC rights the ISO may use values below the stated scheduling run range if that is required for consistency with the

Described in BPM for Market Operations or Tariff Section	Penalty Price Description	Scheduling Run Value [31] when submitted and cost-verified bids are below $1,000/MWh and CAISO-calculated maximum import bid price is not greater than $1,000/MWh ($/MWh)	Pricing Run Value when submitted and cost-verified bids are below $1,000/MWh and CAISO-calculated maximum import bid price is not greater than $1,000/MWh ($/MWh)	Scheduling Run Value when submitted and cost-verified bids are greater than $1,000/MWh or the CAISO-calculated maximum import bid price is greater than $1,000/MWh ($/MWh)	Pricing Run Value when submitted and cost-verified bids are greater than $1,000/MWh or the CAISO-calculated maximum import bid price is greater than $1,000/MWh ($/MWh)	Comment
						instructions provided to the ISO by the PTO.
BPM for Market Operations Section 6.6.5	Converted Right (CVR) self schedule	5,500, -5,500	1,000, -150	11,000, -5,500	2,000, -150	A CVR Self-Schedule is assigned the same priority as the typical value for ETC Self-Schedules.
BPM for Market Operations Section 6.6.5	Ancillary Service Region Regulation-up and Regulation-down Minimum Requirements	2,500	250	5,000	500	In the event of bid insufficiency, AS minimum requirements will be met in preference to serving generic Self-Scheduled demand, but not at the cost of overloading transmission into AS regions.
BPM for Market Operations Section 6.6.5	Ancillary Service Region Spin Minimum Requirements	2,250	250	4,500	500	Spinning reserve minimum requirement is enforced with priority lower than regulation up minimum requirement in scheduling run.
BPM for Market Operations Section 6.6.5	Ancillary Service Region Non-Spin Minimum Requirements	2,000	250	4,000	500	Non-spin reserve minimum requirement is enforced with priority lower than spin minimum requirement in scheduling run.

Described in BPM for Market Operations or Tariff Section	Penalty Price Description	Scheduling Run Value [31] when submitted and cost-verified bids are below $1,000/MWh and CAISO-calculated maximum import bid price is not greater than $1,000/MWh ($/MWh)	Pricing Run Value when submitted and cost-verified bids are below $1,000/MWh and CAISO-calculated maximum import bid price is not greater than $1,000/MWh ($/MWh)	Scheduling Run Value when submitted and cost-verified bids are greater than $1,000/MWh or the CAISO-calculated maximum import bid price is greater than $1,000/MWh ($/MWh)	Pricing Run Value when submitted and cost-verified bids are greater than $1,000/MWh or the CAISO-calculated maximum import bid price is greater than $1,000/MWh ($/MWh)	Comment
BPM for Market Operations Section 6.6.5	Ancillary Service Region Maximum Limit on Upward Services	1,500	250	3,000	500	In the event of multiple AS regional requirements having bid insufficiency, it is undesirable to have multiple constraints produce AS prices equaling multiples of the AS bid cap. An alternative way to enforce sub-regional AS requirements is to enforce a maximum AS requirement on other AS regions, thereby reducing the AS prices in the other regions without causing excessive AS prices in the sub-region with bid insufficiency.
BPM for Market Operations Section 6.6.5	Self-scheduled CAISO demand and self-scheduled exports using identified non-RA supply resource	1,800	1,000	3,600	2,000	Pursuant to section 31.4, the uneconomic bid price for self-scheduled demand in the scheduling run exceeds the uneconomic bid price for self-scheduled supply and self-scheduled

Described in BPM for Market Operations or Tariff Section	Penalty Price Description	Scheduling Run Value [31] when submitted and cost-verified bids are below $1,000/MWh and CAISO-calculated maximum import bid price is not greater than $1,000/MWh ($/MWh)	Pricing Run Value when submitted and cost-verified bids are below $1,000/MWh and CAISO-calculated maximum import bid price is not greater than $1,000/MWh ($/MWh)	Scheduling Run Value when submitted and cost-verified bids are greater than $1,000/MWh or the CAISO-calculated maximum import bid price is greater than $1,000/MWh ($/MWh)	Pricing Run Value when submitted and cost-verified bids are greater than $1,000/MWh or the CAISO-calculated maximum import bid price is greater than $1,000/MWh ($/MWh)	Comment
						exports not using identified non-RA supply resources.
BPM for Market Operations Section 6.6.5	Self-scheduled exports not using identified non-RA supply resource	1,150	1,000	2,300	2,000	The scheduling parameter for self-scheduled exports not using identified non-RA capacity is set below the parameter for generic self-schedules for demand.
BPM for Market Operations Section 6.6.5	Regulatory Must-Run and Must Take supply curtailment	-1,350	-150	-1,350	-150	Regulatory must-run and must-take supply receive priority over generic self-schedules for supply resources.
BPM for Market Operations Section 6.6.5	Price-taker supply bids	-400	-150	-400	-150	Generic self-schedules for supply receive higher priority than Economic Bids at the bid floor.
BPM for Market Operations Section 6.6.5	Conditionally qualified Regulation Up or Down self-provision	-405	NA	-405	NA	Conversion of AS self-schedules to Energy pursuant to section 31.3.1.3 received higher priority to maintaining the availability of regulation, over spinning and

Described in BPM for Market Operations or Tariff Section	Penalty Price Description	Scheduling Run Value [31] when submitted and cost-verified bids are below $1,000/MWh and CAISO-calculated maximum import bid price is not greater than $1,000/MWh ($/MWh)	Pricing Run Value when submitted and cost-verified bids are below $1,000/MWh and CAISO-calculated maximum import bid price is not greater than $1,000/MWh ($/MWh)	Scheduling Run Value when submitted and cost-verified bids are greater than $1,000/MWh or the CAISO-calculated maximum import bid price is greater than $1,000/MWh ($/MWh)	Pricing Run Value when submitted and cost-verified bids are greater than $1,000/MWh or the CAISO-calculated maximum import bid price is greater than $1,000/MWh ($/MWh)	Comment
						non-spinning reserve.
BPM for Market Operations Section 6.6.5	Conditionally qualified Spin self-provision	-400	NA	-400	NA	Conversion of AS self-schedules to Energy pursuant to section 31.3.1.3 receives higher priority to maintaining the availability of spinning reserve, over non-spinning reserve.
BPM for Market Operations Section 6.6.5	Conditionally qualified Non-Spin self-provision	-395	NA	-395	NA	This penalty price for conversion of self-provided non-spinning reserves balances the maintenance of AS self-schedules with ensuring that the conversion to energy occurs before transmission constraints are relaxed.
BPM for Market Operations Section 6.6.5	Conditionally unqualified Reg Up or Down self-provision	-195	NA	-195	NA	In instances where AS self-provision is not qualified pursuant to the MRTU tariff, the capacity can still be considered as an AS bid, along with regular AS

Described in BPM for Market Operations or Tariff Section	Penalty Price Description	Scheduling Run Value [31] when submitted and cost-verified bids are below $1,000/MWh and CAISO-calculated maximum import bid price is not greater than $1,000/MWh ($/MWh)	Pricing Run Value when submitted and cost-verified bids are below $1,000/MWh and CAISO-calculated maximum import bid price is not greater than $1,000/MWh ($/MWh)	Scheduling Run Value when submitted and cost-verified bids are greater than $1,000/MWh or the CAISO-calculated maximum import bid price is greater than $1,000/MWh ($/MWh)	Pricing Run Value when submitted and cost-verified bids are greater than $1,000/MWh or the CAISO-calculated maximum import bid price is greater than $1,000/MWh ($/MWh)	Comment
						bids. The price used for considering unqualified AS self-provision is lower than the AS bid cap, to allow it to be considered as an Economic Bid.
BPM for Market Operations Section 6.6.5	Conditionally unqualified Spin self-provision	-170	NA	-170	NA	Same as above.
BPM for Market Operations Section 6.6.5	Conditionally unqualified Non-Spin self-provision	-155	NA	-155	NA	Same as above.
Tariff Section 27.1.2.3.1	Regulation Down Pricing – Insufficient Supply	Price set as percentage of $1,000/MWh, depending on the amount the CAISO market is short of supply needed to meet the Regulation Down requirement.	Price set as percentage of $1,000/MWh, depending on the amount the CAISO market is short of supply needed to meet the Regulation Down requirement.	Price set as percentage of $2,000/MWh, depending on the amount the CAISO market is short of supply needed to meet the Regulation Down requirement.	Price set as percentage of $2,000/MWh, depending on the amount the CAISO market is short of supply needed to meet the Regulation Down requirement.	N/A
Tariff Section 27.1.2.3.2	Non-Spinning Reserve Pricing – Insufficient Supply	Price set as percentage of $1,000/MWh, depending on the amount the CAISO market is short of supply needed to meet the Non-Spinning Reserve requirement.	Price set as percentage of $1,000/MWh, depending on the amount the CAISO market is short of supply needed to meet the Non-Spinning Reserve requirement.	Price set as percentage of $2,000/MWh, depending on the amount the CAISO market is short of supply needed to meet the Non-Spinning Reserve requirement.	Price set as percentage of $2,000/MWh, depending on the amount the CAISO market is short of supply needed to meet the Non-Spinning Reserve requirement.	N/A
Tariff Section 27.1.2.3.3	Spinning Reserve Pricing –	Price set as 10% of $1,000/MWh.	Price set as 10% of $1,000/MWh.	Price set as 10% of $2,000/MWh.	Price set as 10% of $2,000/MWh.	N/A

Described in BPM for Market Operations or Tariff Section	Penalty Price Description	Scheduling Run Value [31] when submitted and cost-verified bids are below $1,000/MWh and CAISO-calculated maximum import bid price is not greater than $1,000/MWh ($/MWh)	Pricing Run Value when submitted and cost-verified bids are below $1,000/MWh and CAISO-calculated maximum import bid price is not greater than $1,000/MWh ($/MWh)	Scheduling Run Value when submitted and cost-verified bids are greater than $1,000/MWh or the CAISO-calculated maximum import bid price is greater than $1,000/MWh ($/MWh)	Pricing Run Value when submitted and cost-verified bids are greater than $1,000/MWh or the CAISO-calculated maximum import bid price is greater than $1,000/MWh ($/MWh)	Comment
	Insufficient Supply					
Tariff Section 27.1.2.3.4	Regulation Up Pricing – Insufficient Supply	Price set as 20% of $1,000/MWh.	Price set as 20% of $1,000/MWh.	Price set as 20% of $2,000/MWh.	Price set as 20% of $2,000/MWh.	N/A
Tariff Section 27.4.3.3	Insufficient Supply to Meet Self-Schedule Demand in IFM	NA	1000	NA	2000	Pricing run parameter set at hard energy bid cap.
Tariff Section 27.4.3.5	Protection of TOR, ETC and Converted Rights Self-Schedules in the IFM	To be calculated according detail in comment.	To be calculated according detail in comment.	To be calculated according detail in comment.	To be calculated according detail in comment.	Penalty prices must be set higher than values specified in section 27.4.3.1.

Real Time Market Parameters

Described in BPM for Market Operations or Tariff Section	Penalty Price Description	Scheduling Run Value [32] when submitted and cost-verified bids are below $1,000/MWh and CAISO-calculated maximum import bid price is not greater than $1,000/MWh ($/MWh)	Pricing Run Value when submitted and cost-verified bids are below $1,000/MWh and CAISO-calculated maximum import bid price is not greater than $1,000/MWh ($/MWh)	Scheduling Run Value when submitted and cost-verified bids are greater than $1,000/MWh or the CAISO-calculated maximum import bid price is greater than $1,000/MWh ($/MWh)	Pricing Run Value when submitted and cost-verified bids are greater than $1,000/MWh or the CAISO-calculated maximum import bid price is greater than $1,000/MWh ($/MWh)	Comment
BPM for Market Operations Section 6.6.5	Energy balance/Load curtailment and Self-Scheduled exports utilizing	1,450	1,000	2,900	2,000	Scheduling run penalty price is set high to achieve high priority in serving

[32] Penalty values in the scheduling run are negatively valued for supply reduction and positively valued for demand reduction.

Described in BPM for Market Operations or Tariff Section	Penalty Price Description	Scheduling Run Value [32] when submitted and cost-verified bids are below $1,000/MWh and CAISO-calculated maximum import bid price is not greater than $1,000/MWh ($/MWh)	Pricing Run Value when submitted and cost-verified bids are below $1,000/MWh and CAISO-calculated maximum import bid price is not greater than $1,000/MWh ($/MWh)	Scheduling Run Value when submitted and cost-verified bids are greater than $1,000/MWh or the CAISO-calculated maximum import bid price is greater than $1,000/MWh ($/MWh)	Pricing Run Value when submitted and cost-verified bids are greater than $1,000/MWh or the CAISO-calculated maximum import bid price is greater than $1,000/MWh ($/MWh)	Comment
	non-RA capacity					forecast load and exports that utilize non-RA capacity. Energy bid cap as pricing run parameter reflects energy supply shortage.
BPM for Market Operations Section 6.6.5 and Tariff Section 27.4.3.1	Transmission constraints: Intertie scheduling	1,500	1,000	3,000	2,000	The highest among all constraints in scheduling run, penalty price reflects its priority over load serving. Energy bid cap as pricing run parameter reflects energy supply shortage.
BPM for Market Operations Section 6.6.5	Legacy Reliability Must-Run (LRMR) pre-dispatch curtailment (supply), and Exceptional Dispatch Supply	-6,000	-150	-6,000	-150	LRMR scheduling requirement is protected with higher priority over enforcement of internal transmission constraint in scheduling run. Energy bid floor is used as the pricing run parameter for any type of energy self-schedule.
BPM for Market Operations Section 6.6.5	Pseudo-tie layoff energy	-1,500	-150	-1,500	-150	Energy bid floor is used as the pricing run parameter for

Described in BPM for Market Operations or Tariff Section	Penalty Price Description	Scheduling Run Value [32] when submitted and cost-verified bids are below $1,000/MWh and CAISO-calculated maximum import bid price is not greater than $1,000/MWh ($/MWh)	Pricing Run Value when submitted and cost-verified bids are below $1,000/MWh and CAISO-calculated maximum import bid price is not greater than $1,000/MWh ($/MWh)	Scheduling Run Value when submitted and cost-verified bids are greater than $1,000/MWh or the CAISO-calculated maximum import bid price is greater than $1,000/MWh ($/MWh)	Pricing Run Value when submitted and cost-verified bids are greater than $1,000/MWh or the CAISO-calculated maximum import bid price is greater than $1,000/MWh ($/MWh)	Comment
						any type of energy self-schedule.
BPM for Market Operations Section 6.6.5 and Tariff Section 27.4.3.1	Transmission constraints: branch, corridor, nomogram (base case and contingency analysis)	1,500	1,000	3,000	2,000	Scheduling run penalty price will enforce internal transmission constraints up to a re-dispatch cost of $ of congestion relief in $1,500/MWh or $3,000/MWh. Energy bid cap as pricing run parameter consistent with the value for energy balance relaxation under a global energy supply shortage.
BPM for Market Operations Section 6.6.5	Real Time TOR Supply Self Schedule	-5,900	-150	-5,900	-150	In RTM, TOR self-schedule scheduling run penalty price is much higher in magnitude than generic self-schedule but lower than transmission constraint. Energy bid floor is used as the pricing run parameter as any type of energy self-schedule.

Described in BPM for Market Operations or Tariff Section	Penalty Price Description	Scheduling Run Value [32] when submitted and cost-verified bids are below $1,000/MWh and CAISO-calculated maximum import bid price is not greater than $1,000/MWh ($/MWh)	Pricing Run Value when submitted and cost-verified bids are below $1,000/MWh and CAISO-calculated maximum import bid price is not greater than $1,000/MWh ($/MWh)	Scheduling Run Value when submitted and cost-verified bids are greater than $1,000/MWh or the CAISO-calculated maximum import bid price is greater than $1,000/MWh ($/MWh)	Pricing Run Value when submitted and cost-verified bids are greater than $1,000/MWh or the CAISO-calculated maximum import bid price is greater than $1,000/MWh ($/MWh)	Comment
BPM for Market Operations Section 6.6.5	Real Time ETC Supply Self Schedule	-5,100 to -5,900	-150	-5,100 to -5,900	-150	In RTM the range of penalty prices for different ETCs supply self-schedules are much higher in magnitude than generic supply self-schedules but lower than TOR. Energy bid floor is the pricing parameter for all energy supply self-schedules.
BPM for Market Operations Section 6.6.5	Ancillary Service Region Reg-Up and Reg-Down Minimum Requirements	1,450	250	2,900	500	Scheduling run penalty price is below the one for transmission constraint. Pricing run parameter is set to the AS market bid cap to reflect AS supply shortage.
BPM for Market Operations Section 6.6.5	Ancillary Service Region Spin Minimum Requirements	1,400	250	2,800	500	Scheduling run penalty price is lower than the one for regulation-up minimum requirement. Pricing run parameter is set to the AS market bid cap to reflect AS supply shortage.

Described in BPM for Market Operations or Tariff Section	Penalty Price Description	Scheduling Run Value [32] when submitted and cost-verified bids are below $1,000/MWh and CAISO-calculated maximum import bid price is not greater than $1,000/MWh ($/MWh)	Pricing Run Value when submitted and cost-verified bids are below $1,000/MWh and CAISO-calculated maximum import bid price is not greater than $1,000/MWh ($/MWh)	Scheduling Run Value when submitted and cost-verified bids are greater than $1,000/MWh or the CAISO-calculated maximum import bid price is greater than $1,000/MWh ($/MWh)	Pricing Run Value when submitted and cost-verified bids are greater than $1,000/MWh or the CAISO-calculated maximum import bid price is greater than $1,000/MWh ($/MWh)	Comment
BPM for Market Operations Section 6.6.5	Ancillary Service Region Non-Spin Minimum Requirements	1,350	250	2,700	500	Scheduling run penalty price is lower than the one for spin minimum requirement. Pricing parameter is set to the AS market bid cap to reflect AS supply shortage.
BPM for Market Operations Section 6.6.5	Ancillary Service Region Maximum Limit on Upward Services	1,200	250	2,400	500	Scheduling run penalty price is lower than those for minimum requirements to avoid otherwise system-wide shortage by allowing sub-regional relaxation of the maximum requirement. AS market bid cap as pricing run to reflect the otherwise system-wide shortage.
BPM for Market Operations Section 6.6.5	Self-scheduled exports not using identified non-RA supply resource	1,150	1,000	2,300	2,000	Scheduling run penalty price reflects relatively low priority in protection as compared to other demand categories. Energy bid cap as pricing run parameter to reflect energy

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						supply shortage.
BPM for Market Operations Section 6.6.5	Final IFM Supply Schedule	-750	-150	-750	-150	Scheduling run penalty price is much higher in magnitude than supply generic self-schedule but lower than ETCs. Energy bid floor is the pricing parameter for all energy supply self-schedules.
BPM for Market Operations Section 6.6.5	Regulatory Must-Run and Must Take supply curtailment	-1,400	-150	-1,400	-150	Scheduling run penalty price reflects the higher priority of regulatory must-run and must-take supply received over generic self-schedules for supply resources. Energy bid floor is the pricing parameter for all energy supply self-schedules.
BPM for Market Operations Section 6.6.5	Price-taker supply bids	-400	-150	-400	-150	Energy bid floor is the pricing parameter for all energy supply self-schedules.
BPM for Market Operations Section 6.6.5	Qualified Load Following self-provision Up or Down	-8,500	0	-8,500	0	Scheduling run penalty price reflects the highest priority among all categories of

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						AS self-provision. AS bid floor is used as the pricing parameter for any type of AS self-provision.
BPM for Market Operations Section 6.6.5	Day ahead conditionally qualified Reg Up or Down Award	-7,750	0	-7,750	0	Scheduling run penalty price is higher than the penalty price for energy balance constraint to reflect higher in priority over energy. AS bid floor is pricing parameter for any type of AS self-provision.
BPM for Market Operations Section 6.6.5	Day ahead conditionally qualified Spin Award	-7,700	0	-7,700	0	Scheduling run penalty price is lower than the one for Reg-up. AS bid floor is pricing parameter for any type of AS self-provision.
BPM for Market Operations Section 6.6.5	Day ahead conditionally qualified Non-spin Award	-7,650	0	-7,650	0	Scheduling run penalty price is lower than the one for Spin. AS bid floor is pricing parameter for any type of AS self-provision.
BPM for Market Operations Section 6.6.5	Conditionally qualified Reg Up or Down Real Time self-provision (RTUC only)	-405	0	-405	0	Scheduling run penalty price allows the conversion of AS self-schedules to energy to

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						prevent LMP of local area from rising so high as to trigger transmission constraint relaxation. AS bid floor is pricing parameter for any type of AS self-provision.
BPM for Market Operations Section 6.6.5	Conditionally qualified Real Time Spin self-provision (RTUC only)	-400	0	-400	0	Scheduling run penalty price is below the one for regulating-up. AS bid floor is pricing parameter for any type of AS self-provision.
BPM for Market Operations Section 6.6.5	Conditionally qualified Real Time Non-Spin self-provision (RTUC only)	-395	0	-395	0	Scheduling run penalty price is below the one for spin. AS bid floor is pricing parameter for any type of AS self-provision.
BPM for Market Operations Section 6.6.5	Conditionally unqualified Reg Up or Down Real Time self-provision (RTUC only)	-195	0	-195	0	In scheduling run, AS self-provision not qualified in pre-processing can still be considered as an AS bid with higher priority in the energy/AS co-optimization along with regular AS bids. AS bid floor is pricing parameter for

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						any type of AS self-provision.
BPM for Market Operations Section 6.6.5	Conditionally unqualified Spin Real Time self-provision (RTUC only)	-170	0	-170	0	Same as above.
BPM for Market Operations Section 6.6.5	Conditionally unqualified Non-Spin Real Time self-provision (RTUC only)	-155	0	-155	0	Same as above.
BPM for Market Operations Section 6.6.5	System power balance constraint	1,100, -155	1,000, -155	2,200, -155	2,000, -155	To reflect the role regulation plays in balancing the system for undersupply conditions when economic bids are exhausted, the ISO allows the system power balance constraint to relax by as much as the seasonal regulation requirement. For over-supply conditions, when economic bids are exhausted, the ISO allows the system power balance constraint to relax to about 10% of the seasonal regulation requirement.

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						The prices are selected to allow for coordinated dispatch of bids that may exist at or near the bid cap, or at or near the bid floor.
BPM for Market Operations Section 6.6.5	Power Balance constraint for individual. EIM areas	1,100, -750	1,000, -150	2,200, -750	2,000, -150	Subject to the FERC order granting waiver of tariff sections 27.4.3.2.and 27.4.3.4, and consistent with Section 10.1.6 of the BPM for Energy Imbalance Market, which implement the price discovery mechanism overriding the pricing parameters and yielding the last economic signal under constraint relaxation. The scheduling run parameter is set to -750 for the individual EIM areas to coordinate the relaxation of the EIM power balance constraint during over-generation

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						conditions relative to congestion on non-EIM constraints.
BPM for Market Operations Section 6.6.5	EIM Upward Available Balancing Capacity Range	1,200 through 1,050	Bid in Prices Range for EIM Participating resource and DEB for EIM Non-Participating	2,400 through 2,100	Bid in Prices Range for EIM Participating resource and DEB for EIM Non-Participating	The Penalty Price Range used for the Available Capacity Range prices to maintain the economic merit order reflected in the energy bid prices of the allocated energy bid portions
BPM for Market Operations Section 6.6.5	EIM Downward Available Balancing Capacity	-250 through -350	Bid in Prices Range for EIM Participating resource and DEB for EIM Non-Participating	-250 through -350	Bid in Prices Range for EIM Participating resource and DEB for EIM Non-Participating	The Penalty Price Range used for the Available Capacity Range prices to maintain the economic merit order reflected in the energy bid prices of the allocated energy bid portions
BPM for Market Operations Section 6.6.5	EIM Transfer Constraint	1,500	1,000	3,000	2,000	Penalty price and pricing parameter consistent with the transmission constraint;
BPM for Market Operations Section 6.6.5	EIM Entitlement Rate of Change Constraint (RTD Only)	1,500	0	3,000	0	Penalty price aligned with EIM transfer constraint is currently applicable to

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						RTD 5 minute rate of change.
BPM for Market Operations Section 6.6.5	Administrative Flexible Ramp Down Price Floor	-152	-152	-152	-152	Downward Demand Curve Price Cap
BPM for Market Operations Section 6.6.5	Administrative Flexible Ramp Up Price Ceiling	247	247	494	494	Upward Demand Curve Price Cap
Tariff Section 27.1.2.3.1	Regulation Down Pricing – Insufficient Supply	Price set as percentage of $1,000/MWh, depending on the amount the CAISO market is short of supply needed to meet the Regulation Down requirement.	Price set as percentage of $1,000/MWh, depending on the amount the CAISO market is short of supply needed to meet the Regulation Down requirement.	Price set as percentage of $2,000/MWh, depending on the amount the CAISO market is short of supply needed to meet the Regulation Down requirement.	Price set as percentage of $2,000/MWh, depending on the amount the CAISO market is short of supply needed to meet the Regulation Down requirement.	N/A
Tariff Section 27.1.2.3.2	Non-Spinning Reserve Pricing – Insufficient Supply	Price set as percentage of $1,000/MWh, depending on the amount the CAISO market is short of supply needed to meet the Non-Spinning Reserve requirement.	Price set as percentage of $1,000/MWh, depending on the amount the CAISO market is short of supply needed to meet the Non-Spinning Reserve requirement.	Price set as percentage of $2,000/MWh, depending on the amount the CAISO market is short of supply needed to meet the Non-Spinning Reserve requirement.	Price set as percentage of $2,000/MWh, depending on the amount the CAISO market is short of supply needed to meet the Non-Spinning Reserve requirement.	N/A
Tariff Section 27.1.2.3.3	Spinning Reserve Pricing – Insufficient Supply	Price set as 10% of $1,000/MWh.	Price set as 10% of $1,000/MWh.	Price set as 10% of $2,000/MWh.	Price set as 10% of $2,000/MWh.	N/A
Tariff Section 27.1.2.3.4	Regulation Up Pricing – Insufficient Supply	Price set as 20% of $1,000/MWh.	Price set as 20% of $1,000/MWh.	Price set as 20% of $2,000/MWh.	Price set as 20% of $2,000/MWh.	N/A
Tariff Section 27.4.3.4	Insufficient Supply to Meet CAISO	1,000	1,000	2,000	2,000	Pricing run parameter set

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	Forecast of CAISO Demand in the RTM					at hard energy bid cap.
Tariff Section 30.6.2.1.2.1	Marginal Real-Time Dispatch Option	To be calculated according detail in comment.	To be calculated according detail in comment.	To be calculated according detail in comment.	To be calculated according detail in comment.	Penalty prices set as a percentage of the hard energy bid set forth in Section 39.6.1.1.
Tariff Section 30.6.2.1.2.2	Discrete Real-Time Dispatch Option	To be calculated according detail in comment.	To be calculated according detail in comment.	To be calculated according detail in comment.	To be calculated according detail in comment.	Penalty prices set as a percentage of the hard energy bid set forth in Section 39.6.1.1.