



California ISO

Local Market Power Mitigation Enhancements

Issue Paper/Straw Proposal

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Table of Contents

1	Introduction	3
2	EIM Decisional Classification	4
3	Stakeholder Comments	5
	3.1 Proposed Market Power Mitigation Framework Enhancements.....	6
	3.2 Alternate Hydro Default Energy Bid Option.....	7
4	Principles	8
5	Proposal	9
	5.1 Mitigation Framework Enhancements	9
	5.1.1 Prevention of Flow Reversal.....	9
	5.1.2 Prevention of Economic Displacement between Mitigated Balancing Authority Areas	14
	5.2 EIM Use-Limited Default Energy Bid.....	23
	5.3 Reference Level Adjustments	29
	5.3.1 Gas Resources	30
	5.3.2 EIM Use-Limited Resources	31
	5.4 Gas Prices Indices	32
6	Stakeholder Engagement	32
	6.1 Stakeholder Comments.....	33
	Appendix A	34
	6.2 Commitment Cost and Default Energy Bids Enhancements – Before Market Reference Level Adjustment Requests	34
	6.3 California ISO's Local Market Power Mitigation Design	36
	6.3.1 Day-Ahead Market.....	38
	6.3.2 Real-Time Market	39

1 Introduction

The CAISO's local market power mitigation rules include measures to mitigate a supplier's energy bid in cases when local market power exists. EIM participants have identified cases when mitigation results in the market dispatching their use-limited resources at prices below their marginal costs and often in quantities greater than needed to resolve market power. In addition, market participants, including those with resources in the CAISO balancing authority area, have raised concerns related to recent real-time gas price volatility.

This paper presents the CAISO's straw proposal for several enhancements to address these concerns. Some of these enhancements are specific to resources in the EIM in balancing authority areas outside of the CAISO, while others also relate to resources in the CAISO balancing authority area. These include refinements to the reference level adjustment process recently developed as part of the *Commitment Cost and Default Energy Bid Enhancements* (CCDEBE) initiative.¹ The CAISO proposes the following enhancements:

- **Real-time market power mitigation process mechanics:** Market participants have expressed concerns about two situations that can arise because of the market power mitigation process in the CAISO's real time-market: (1) "flow reversal," and (2) "economic displacement."²

Flow reversal occurs in cases when an EIM balancing authority area or group of balancing authority areas are import-constrained in the real-time market's market power mitigation run, triggering mitigation, which then makes the balancing authority area or areas then become exporters at the mitigated bid price. This situation is mitigating resources' bids in quantities greater than needed to resolve market power because the exported power does not involve market power. The CAISO proposes to address this issue by modifying the calculation of the competitive locational marginal price (LMP) used in the market power mitigation process. This modification will prevent flow reversal from occurring and will also improve the market power mitigation process for resources in the CAISO balancing authority area.

Economic displacement is a similar situation to flow reversal that occurs when a group of balancing authority areas are import-constrained in the real-time market's market power mitigation run. Economic displacement can occur when the real-time market increases transfers from one balancing authority area to another, relative to its market power mitigation run, since they become more

¹ <http://www.caiso.com/informed/Pages/StakeholderProcesses/CommitmentCosts/DefaultEnergyBidEnhancements.aspx>.

² These situations are not applicable to resources within the CAISO balancing authority area because mitigation for a congested EIM transfer constraint is only triggered when there is congestion between an EIM balancing authority area or group of balancing authority areas and the CAISO balancing authority area.

economic when a resource's bids are mitigated. Although market power mitigation should protect against market power within the combined balancing authority area "bubble," it does not seem appropriate to dispatch greater quantities at the mitigated price than was originally scheduled in the market power mitigation run. The CAISO proposes to address this issue by limiting transfers between EIM balancing authority areas to the amount scheduled in the market power mitigation run, thus preventing economic displacement.

- **Default energy bid for EIM use-limited resources:** EIM participants have stated that the CAISO's existing methodologies for calculating default energy bids do not always accurately reflect actual costs for use-limited resources in the EIM outside of the CAISO balancing authority area. Although the mitigation process enhancements described above address the situations in which the market dispatches resources in quantities greater than that needed to resolve market power, the market will still need to mitigate EIM resources' bids to their default energy bid to resolve market power. To address stakeholder concerns related to EIM use-limited resources' default energy bids, the CAISO proposes an additional default energy bid option for EIM use-limited resources.
- **Reference level adjustment process:** The CAISO proposes changes to the reference level adjustment process used for default energy bids and commitment costs. These changes include provisions to request a change to the day-ahead energy price used as an input to the EIM use-limited resource default energy bid as well as provisions to update the gas price information used for gas-fired resource default energy bids in the real-time market.
- **Gas price indices:** The CAISO proposes consolidating the published gas-price indices the market uses to calculate gas-fired resources' reference levels.

2 EIM Decisional Classification

This initiative will consist of components that are within the EIM Governing Body's primary approval authority and components that are within their advisory role to the CAISO Board of Governors.

As described above, this initiative explores four types of enhancements related to the CAISO's existing bid mitigation processes. As currently planned, two of the proposed changes fall within the EIM Governing Body's advisory role. The other two fall within its primary approval authority. These two groups of changes are severable for decision purposes. Accordingly, the CAISO plans to present them separately to the EIM Governing Body, one for advisory input and the remainder for approval.

First, the proposal would modify the calculation of the competitive locational marginal price and used in market power mitigation. This change affects rules that apply

uniformly in both the CAISO and EIM balancing authority areas. Consequently, this component falls within the EIM Governing Board's advisory to the Board.

Second, the proposal would freeze transfer quantities between groupings of EIM balancing authority areas subject to mitigation to the quantities scheduled in the market power mitigation run. This enhancement would apply exclusively to EIM balancing authority areas and therefore falls within the EIM Governing Body's primary authority.

Third, the proposal would create a new default energy bid designed to approximate the opportunity costs for EIM use-limited resources along with a reference level adjustment process that is specific to this default energy bid. These enhancements would apply exclusively to resources in EIM balancing authority areas and therefore fall within the EIM Governing Body's primary authority.

Fourth, the initiative includes enhancements to the reference level adjustment process used by the real-time market for gas-fired resources and changes to the gas price index used to calculate reference levels in both the day-ahead and real-time markets. These changes would apply uniformly in both the CAISO and EIM balancing authority areas. Consequently, these components fall within the EIM Governing Board's advisory to the Board.

This initiative is not classified as hybrid for approval purposes because each proposal is severable for decisional purposes. As the topics are currently proposed, the CAISO would present the first and fourth topics to the EIM Governing Body for advice, and the second and third topics for approval. Assuming the second and third topics are approved by the EIM Governing Body, the topics would then be placed on the Board of Governors consent agenda at their next meeting. In addition, the CAISO would seek the Board of Governor's approval from for the remaining topics.

Stakeholders are encouraged to submit responses to the proposed EIM classification of this initiative in their written comments following the stakeholder conference call—particularly if there are any questions or concerns.

3 Stakeholder Comments

Stakeholders submitted initial comments following the EIM Offer Rules working group meeting that included discussing market power mitigation in the EIM on April 30, 2018, with a second working group meeting held on July 19, 2018. Nearly all stakeholder comments supported the establishment of a separate initiative to address the CAISO's current approach to local market power mitigation, which is largely viewed as exposing entities—particularly EIM entities—to bid mitigation below their actual marginal costs. Additional comments submitted for the July workshop and are summarized below.

3.1 Proposed Market Power Mitigation Framework Enhancements

The existing local market power mitigation framework is designed to promote competitive conditions for EIM entities. Powerex has identified instances when an energy-limited resource submits an offer that is mitigated, even in cases when the bid reflects the seller's estimated marginal costs. Powerex and other supporting stakeholders encourage the CAISO explore design enhancements to address this market power mitigation framework in order to more appropriately mitigate energy bids in the EIM.

Release of Energy after Mitigation

Powerex, Bonneville Power Authority (Bonneville), and Public Generating Pool (PGP) support a local market power mitigation design enhancements that would allow a resource to forego an uneconomic dispatch when mitigation is applied. Instead, the resource would be released to sell to other balancing authority areas. This approach would eliminate the potential to exercise local market power through the submission of excessively high offer prices, but prevent dispatching the resource to serve other's load at prices below the seller's offer prices.

Excessive Mitigation

The most adverse direct consequence—as identified by Powerex and supported by several other stakeholders—is the replacement of a resource's offer price, with a price that is below the entity's identified marginal costs. Stakeholders highlighted additional adverse impacts that involve mitigation of a resource with a corresponding dispatch of a resource beyond the total energy that the EIM participant sought to make available over a given period. Consequently, the entity may be inhibited from operating the resource economically to meet retail load during the peak periods. Stakeholders contend this inefficient depletion of an energy-limited resource through the application of the default energy bid might also increase inefficient production from other energy-limited resources in the EIM. Ultimately, stakeholders claim that there is a loss of market efficiency during these instances because finite energy from these flexible resources will be unavailable to the market during subsequent higher-priced hours, when this additional supply would have been more valuable.

Conduct and Impact Test

The New York Independent System Operator (NYISO) and Mid-Continent System Operator (MISO) in the Eastern Interconnection address market power mitigation through the application of conduct and impact tests. Powerex and Public Generating Pool (PGP) support this approach in the EIM, arguing that its application will more accurately identify and mitigate attempts to exercise market power. PGP and Powerex argue that the conduct test would apply only in cases when a seller's offer prices are at an "upper threshold," with levels significantly above an established reference price or default energy bid for an applicable resource. Bonneville—though not expressing direct

support—found particular interest in the conduct and impact test concepts and the distinction between the presence of market power and the exercise of market power.

Flow Reversal

“Flow reversal” occurs when an EIM balancing authority area is import-constrained, triggering mitigation to prices that result in subsequent dispatch of resources to serve another balancing authority area’s load. Entities including Powerex and Seattle City Light share concerns related to these instances when areas outside of CAISO’s footprint can become constrained due to economic offers to purchase energy, effectively reducing output in order to conserve internal resources. When the EIM entity seeks to purchase energy in the EIM and reduce output, it incurs a cost, and does not profit from higher EIM prices. These flow reversals are problematic, as EIM entities are uneconomically being forced to sell.

Several entities recommend further analyzing flow reversal occurrences to better understand how this issue impacts or may impact other EIM entities. Powerex further proposes blocking exports during intervals that the applicable entity’s purchases are mitigated to sales.

3.2 Alternate Hydro Default Energy Bid Option

Powerex, Bonneville Power Authority (Bonneville), Chelan Public Utility District (Chelan PUD), and several other supporting entities support enhancements to the existing application of the default energy bid framework, which they maintain is inadequate in capturing the opportunity costs of hydro and potentially other energy-limited resources. The additional default energy bid option proposed by Powerex would either be \$25/MWh, or a reference price plus a margin equal to the lesser of \$100 or 300% of an established reference price. The reference price would be based on an index price at a liquid and competitive trading point within the region of the supplier (for Powerex, for example, this would be the Intercontinental Exchange (ICE) Day-Ahead On-Peak Mid-C Price Index).

Southern California Edison (SCE) support a formulaic approach to calculate default energy bids for energy-limited resources that reflect the lowest point of the most valuable duration on the resource’s price curve. SCE has further expressed concern that any proposed formulation (potentially based on a regional index, plus a percentage adder) would result in a different default energy bid for resources with different energy limitations. Similarly, Chelan PUD supports the development of a default energy bid construct based on historical pricing data to approximate values of short- and long-term energy constraints, with a timeframe and location appropriate to each resource.

Idaho Power Company (IPC) argues that the CAISO should offer greater flexibility in accepting negotiated default energy bids, recognizing each entity’s expertise in calculating their resource’s opportunity costs. IPC further suggests that an initiative that

introduces a new default energy bid should be accompanied by further enhancements to the CAISO's mitigation framework to reduce cases of over-mitigation.

Six Cities questions whether an additional default energy bid approach is necessary, particularly given the available option for entities to negotiate default energy bids. Further, Six Cities supports a uniform application of market rules to internal and external resources to avoid concerns about potential discrimination or market distortion. Similarly, Bonneville and Puget Sound Energy (PSE) both argue that the development of any new default energy bid option should consistently apply to all energy-limited resources. Portland General Electric (PGE) further supports an initiative that will balance consistent requirements and outcomes. Specifically, the initiative should not distort the day-to-day functioning of the CAISO's market or result in price-formation fundamentals that disproportionately benefit one type of market participant, or class of participating resources.

Finally, Western Power Trading Forum (WPTF) seeks clarification on whether an additional default energy bid would be available for all resource types, or restricted to EIM hydro or energy-limited resources. WPTF cautions that any default energy bid option designed to reflect opportunity costs should not qualify for the opportunity cost adder, as developed under Commitment Cost Enhancements Phase 3 (CCE3) due to energy limitations.

4 Principles

The CAISO believes the following market design principles are appropriate when considering design enhancements to the market power mitigation process, default energy bids, and the reference level adjustment process:

- Supply should not be forced to sell power below its bid price if it cannot exert market power. Supply bids should be mitigated to marginal costs to the extent supply has market power.
- EIM is a voluntary market and each balancing authority area should have sufficient supply to meet its own load and reliability responsibilities. In cases of mitigation involving EIM transfers to another balancing authority area, supply should not be forced to sell energy at a mitigated price beyond what is needed to resolve market power. The use of mitigated bids should not result in additional economic displacement of other supply.
- The competitive locational marginal in each interval should accurately reflect market conditions in each interval.
- The marginal costs used to calculate default energy bids for use-limited resources should include opportunity costs for future market sales. These

calculated default energy bids should have access to similar reference level adjustment process that is available to thermal resources.

- Gas prices used to calculate reference levels should account for real-time gas prices volatility so that the CAISO efficiently dispatches supply, resulting in accurate market prices that minimize the need for after-the-fact cost recovery.

5 Proposal

In this section, the CAISO proposes changes to its local market power mitigation process, default energy bid option for EIM use-limited resources, enhancements to its reference level adjustment process, and a change to the gas price index used in the market.

5.1 Mitigation Framework Enhancements

The CAISO proposes modify limited parts of the market power mitigation process to address stakeholders concerns associated with inappropriately mitigating energy bids in the EIM. One of these changes will also be applicable to resources within the CAISO balancing authority area. These changes will reduce instances when a resource is at the default energy bid to serve load in another balancing area beyond what is required to protect against market power.

5.1.1 Prevention of Flow Reversal

The situation referred to as “flow reversal,” identified in the offer rule workshop, occurs in cases when an EIM balancing authority area or group of balancing authority areas are import-constrained in the real-time market’s market power mitigation run, triggering mitigation, which then makes the balancing authority area or areas then become exporters at the mitigated bid price. This situation is mitigating resources’ bids in quantities greater than needed to resolve market power because the exported power does not involve market power.

The CAISO believes this situation can be addressed by changes to way the market uses the “competitive locational marginal price” in its market power mitigation run. The market power mitigation process mitigates resources to the greater of their default energy bid or the competitive locational marginal price.³

The competitive locational marginal price is intended to place a floor on a mitigated offer prices at a level that would have prevailed if a non-competitive constraint did not bind. Flow reversal is caused when an EIM balancing authority area is import-constrained, which triggers mitigation. After offers are replaced with mitigated bids, the imports received from other balancing authority areas in the EIM are no longer economic. In

³ The market calculates the competitive locational marginal price based on the price at a location deemed competitive within the CAISO balancing authority area.

extreme cases, the EIM balancing authority area that is mitigated may end up exporting to the other EIM balancing authority areas because of the low mitigated price.

The CAISO proposes adjusting the competitive local marginal price for each market run, even if it increases relative to a subsequent run in the hour to address flow reversal. This will prevent flow reversal. The current rules do not allow for the competitive locational marginal price to increase if a resource has been mitigated in a previous market run, the competitive locational marginal price can only decrease. If a resource is mitigated in a prior fifteen-minute market run, the resource will be mitigated for the remainder of the hour in both fifteen-minute market and real time dispatch using the competitive locational marginal price from the first interval. If a resource is mitigated in a prior real time dispatch run, the resource will be mitigated for the remainder of the 15-minute interval using the competitive locational marginal price from the first interval.

This change will also benefit internal CAISO resources by using a more appropriate competitive locational marginal price in each market interval.

The CAISO proposes to eliminate the balance of the hour mitigation rules in fifteen-minute market. Currently, the CAISO only performs the dynamic competitive path assessment for the binding interval and uses this calculation for the advisory intervals. The CAISO proposes to perform the dynamic competitive path assessment for each 15-minute interval including the advisory intervals. This will allow the competitive locational marginal price to be recalculated for each binding fifteen-minute market interval.

In the 5-minute real-time dispatch, the CAISO proposes to continue to use the first advisory interval to perform the dynamic competitive path assessment for the next market run. The CAISO proposes to eliminate two current rules which do not allow for market power mitigation to be considered for each market run individually:

1. Eliminate the rule that if a resource is mitigated in the fifteen-minute market that it is automatically mitigated in real time dispatch.
2. Eliminate the rule that if mitigated in the first or second 5-minute interval that the remaining 5-minute interval(s) in the given 15-minute market interval is mitigated.

Competitive Locational Marginal Price Adder

As discussed at the August 3, 2018 Market Surveillance Committee⁴ meeting, even if the competitive locational marginal price is calculated for each market run, there can be changes in the dispatch order that may result in changes in import quantities in constrained areas. To address this concern the CAISO is proposing to add a small

⁴ The presentation is available at http://www.aiso.com/Documents/Presentation-EIMMarketPowerMitigationDiscussion-FTI-Consulting-Aug7_2018.pdf

parameter so that the mitigated bid is slightly higher than the competitive locational marginal price outside the import-constraint area.

The following mitigated bid calculation will be applied to resources assuming the market bid is higher than the default energy bid:

$$\text{Mitigated bid} = \text{MAX} (\text{Default Energy Bid}, \text{Competitive Locational Marginal Price} + \$0.xx \text{ parameter})$$

The parameter added to the competitive locational marginal price is nominal, used to establish price separation between competitive and non-competitive areas. This price separation will further prevent flow reversal from occurring in cases when a resource is mitigated to the competitive locational marginal price.

The examples below illustrate implementation results of incorporating this rule into the mitigation framework.

The following assumptions apply for all examples:

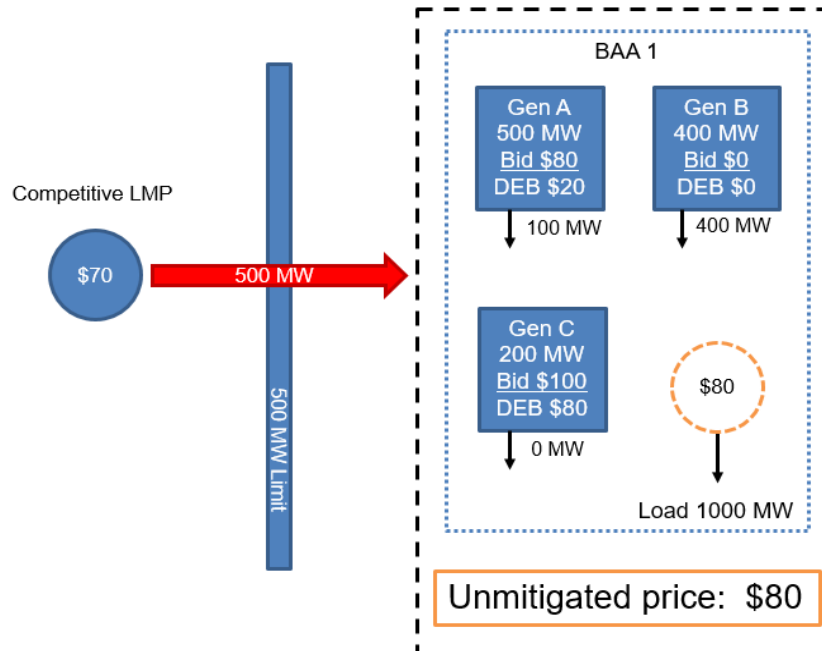
- During the market power mitigation run, only resource-submitted bids are used to generate an unmitigated price for each balancing authority area.
- Due to a constraint into, or out of a given balancing authority area, the dynamic competitive path assessment has determined the balancing authority area to be non-competitive; therefore, the balancing authority area is subject to mitigation.
- During the subsequent market power mitigation run, the higher of default energy bids submitted for each resource in the balancing authority area, or the competitive locational marginal price (plus a nominal adder) will establish the mitigated price for each balancing authority area. For simplicity, a \$1 adder will be used as the added parameter.

Example A:

This example demonstrates a case of a single balancing authority area that is import-constrained with a competitive locational marginal price plus the proposed nominal adder (\$1) that is greater than the default energy bids.

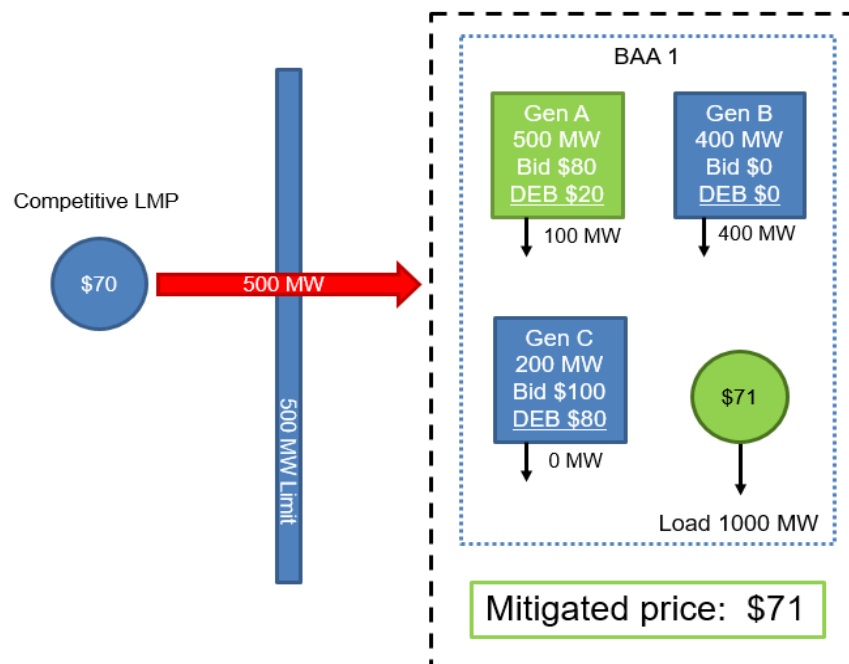
1. Market Power Mitigation Run:

- Imports into balancing authority area 1 are limited to the binding constraint of 500 MW.
- By comparing the only submitted bid prices to the competitive locational marginal price, the unmitigated price for balancing authority area 1, set by Generator A, is \$80.



2. Market Run:

- By comparing only the competitive locational marginal price + \$1 to the default energy bid in the market run, the mitigated price for balancing authority area 1 is \$71.
 - The competitive locational marginal price + \$1 is greater than Generator A's \$20 default energy bid.



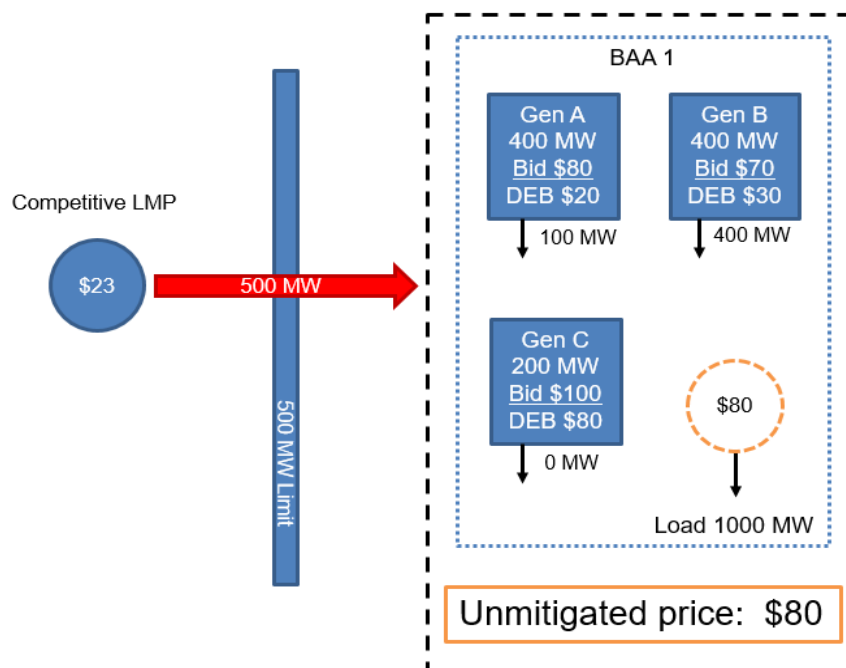
As a result of using an accurate competitive locational marginal price and adding a small parameter, the 500 MW import is not reduced. If for example, under existing rules, the prior competitive locational marginal price was \$15, Generator A would be mitigated to its default energy bid of \$20. The resource would be dispatched to its full output reducing the import below the transfer limit because Generator A is seen as more economic than resources outside the constrained area.

Example B:

This example demonstrates a case of a single balancing authority area that is import-constrained with a competitive locational marginal price plus a nominal adder (\$1) that is less than the default energy bids.

1. Market Power Mitigation Run:

- Imports into balancing authority area 1 are binding.
- By comparing the only submitted bid prices to the competitive locational marginal price, the unmitigated price for balancing authority area 1, set by Generator A, is \$80.

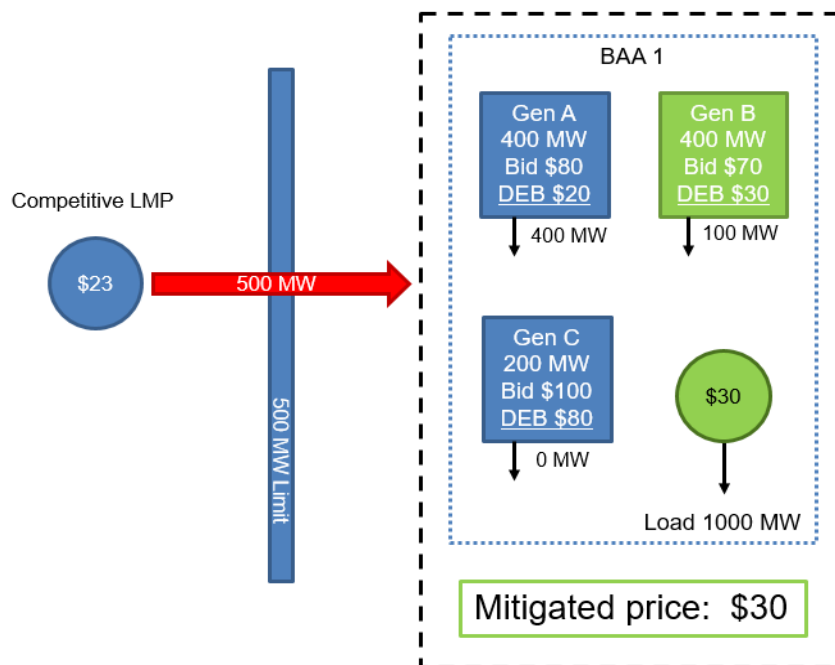


2. Market Run:

- A change in dispatch occurs for Generator A and Generator B after the market power mitigation run, because only the competitive locational marginal price + \$1 and the default energy bids are considered in this market run.
 - Generator B has a higher default energy bid than Generator A, thus it is dispatched down to 100 MW in the market run, where as in the market

power mitigation run it was dispatched to its full capacity of 400 MW because it was more economic to dispatch than Generator A when only considering the submitted bid values.

- The mitigated price for balancing authority area 1 is \$30 in this example because the \$30 default energy bid for Generator B is higher than \$24 (the competitive locational marginal price + \$1).



Under this example, there is no reduction in the import because the marginal resource using mitigated bids costs more than the competitive locational marginal price. The use of mitigated bids does result in a change in the dispatch within the balancing authority area, but the impact is isolated to balancing authority area 1. To the extent an EIM entity is concerned that Generator A being dispatched at 400 MW conflicts with its planned use of the resource, the EIM entity could manually dispatch Generator A to 100 MW and Generator B to 400 MW. This would not affect the market price within the balancing authority area.

5.1.2 Prevention of Economic Displacement between Mitigated Balancing Authority Areas

As shown above, the changes to the competitive locational marginal price will address flow reversal when a single balancing authority area is import-constrained. However, additional rules are needed to address instances where a group of EIM entities become import-constrained. As observed in previous examples, mitigation can result in a different dispatch within the constrained regions when mitigated bids are used. However, given the voluntary nature of the EIM, allowing economic displacement of

resources between EIM entities when using mitigated bids should be addressed. Economic displacement consists of replacing energy from one resource with energy from another beyond what is necessary to resolve market power in meeting imbalance needs because a resource is dispatched higher as a result of mitigation. It does not appear to be appropriate to mitigate bids for this additional energy as the EIM is voluntary and the additional quantity of energy for which bids would be mitigated or the transfer capacity to deliver it did not have to be offered.

The second proposed rule would limit changes in exports or imports from one EIM balancing authority area to another EIM balancing authority area in the constrained region., as presented in examples C, D, E, and F. The rule will prevent exports from increasing, or imports from decreasing in a manner that would result in one balancing authority area serving additional load in another balancing authority area because its resources have lower-priced mitigated bids.

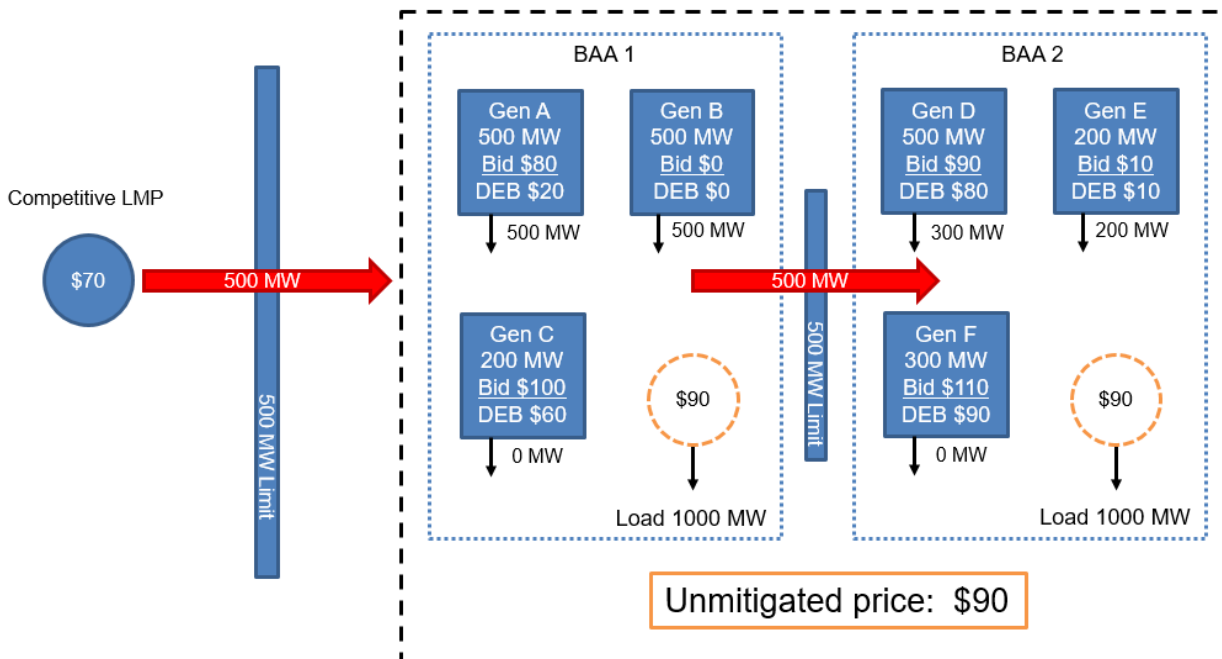
Economic displacement and the CAISO's proposed changes are illustrated by the following examples.

Example C

This example demonstrates a case of a region in which two balancing authority areas are import-constrained with a competitive locational marginal price plus a nominal adder (\$1) that is greater than the default energy bid in balancing authority area 1 and less than the default energy bid in balancing authority area 2.

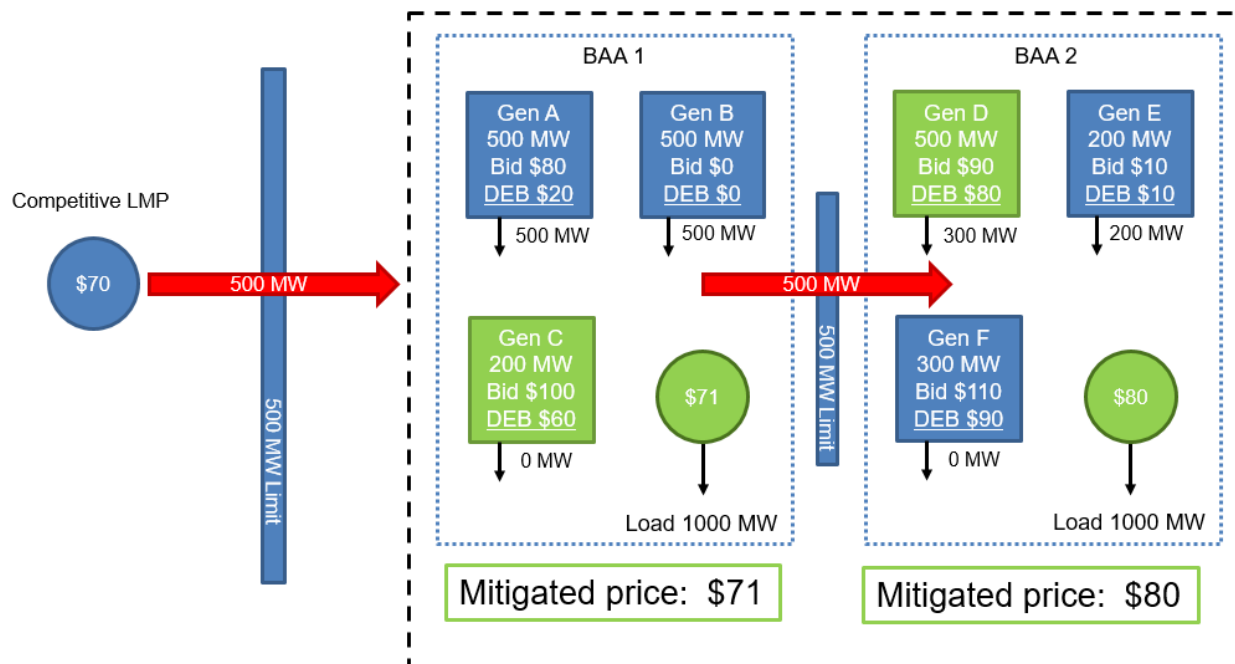
1. Market Power Mitigation Run:

- Imports into the region of balancing authority area 1 and balancing authority area 2 are binding.
- There is a binding constraint importing from balancing authority area 1 to balancing authority area 2.
- The unmitigated price for balancing authority area 1 and balancing authority area 2, set by Generator D, is \$90.



2. Market Run:

- The mitigated price for balancing authority area 1 is \$71 in this example because the competitive location marginal price + \$1 is higher than the \$60 default energy bid for Generator C.
 - Generator C is the marginal resource in balancing authority area 1 because the constraint between balancing authority area 1 to balancing authority area 2 is binding at 500 MW.
- The mitigated price for balancing authority area 2 is \$80 in this example because the \$80 default energy bid for Generator D is higher than \$71 (competitive locational marginal price + \$1).
- Exports from balancing authority area 1 to balancing authority area 2 are binding with a 500 MW transfer limit, creating price separation and two different mitigated prices.



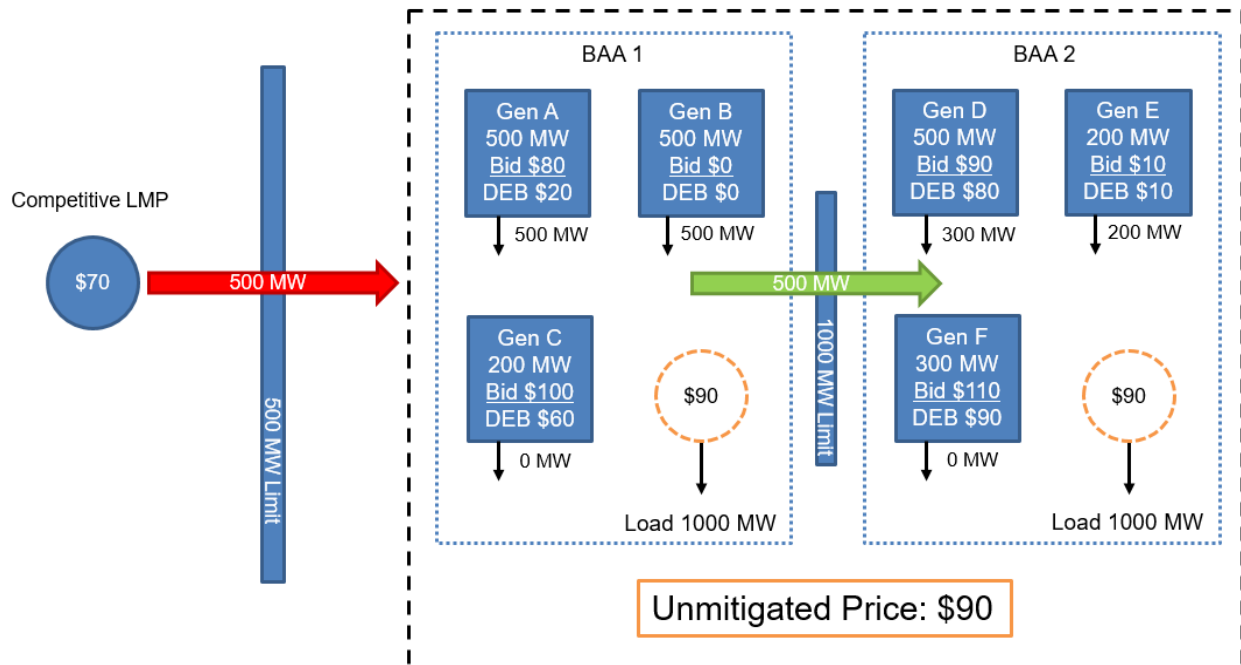
This example shows that if the transfer capability between balancing authority area 1 and balancing authority area 2 is binding, then additional transfers are not affected by mitigated bids. The re-dispatch of resources is isolated within each balancing authority area.

Example D

This example demonstrates a case of a region in which two balancing authority areas are import-constrained with a competitive locational marginal price plus a nominal adder (\$1) that is greater than the default energy bid in balancing authority area 1 and less than the default energy bid in balancing authority area 2. Additionally, this example introduces the proposed rule to freeze the export schedule in the market power mitigation run from balancing authority area 1 to balancing authority area 2.

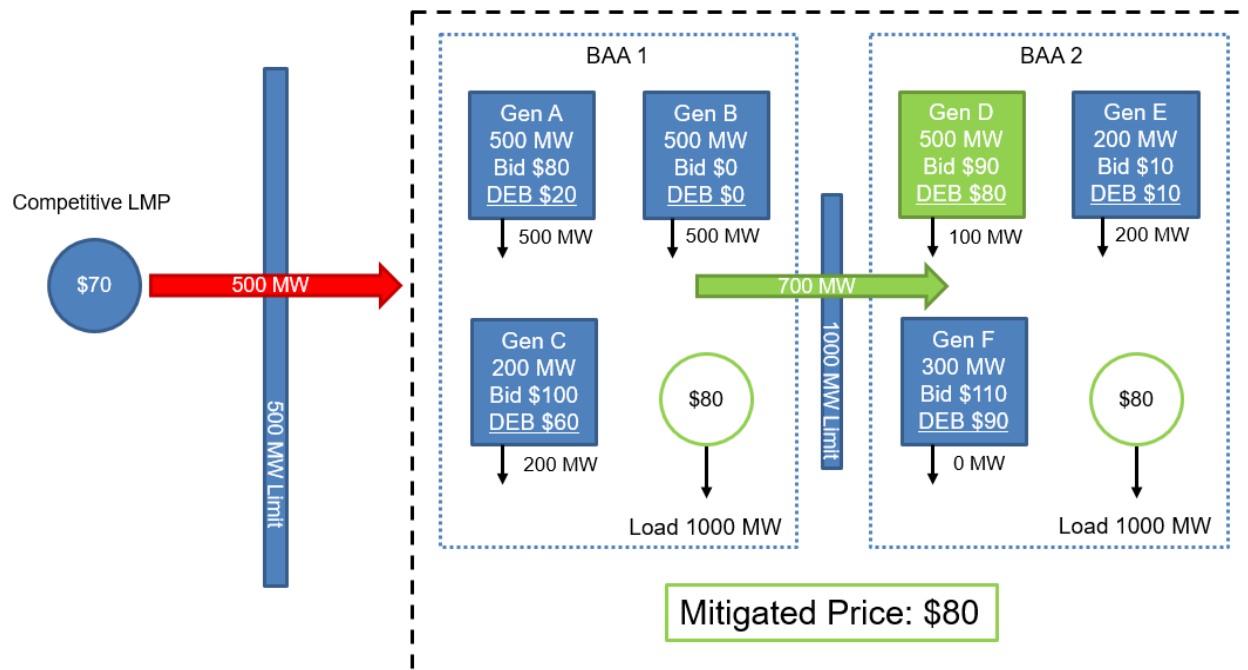
1. Market Power Mitigation Run:

- Imports into the region of balancing authority area 1 and balancing authority area 2 are binding.
- There is a constraint importing from balancing authority area 1 to balancing authority area 2 that is not binding.
- The unmitigated price for balancing authority area 1 and balancing authority area 2, set by Generator D, is \$90.



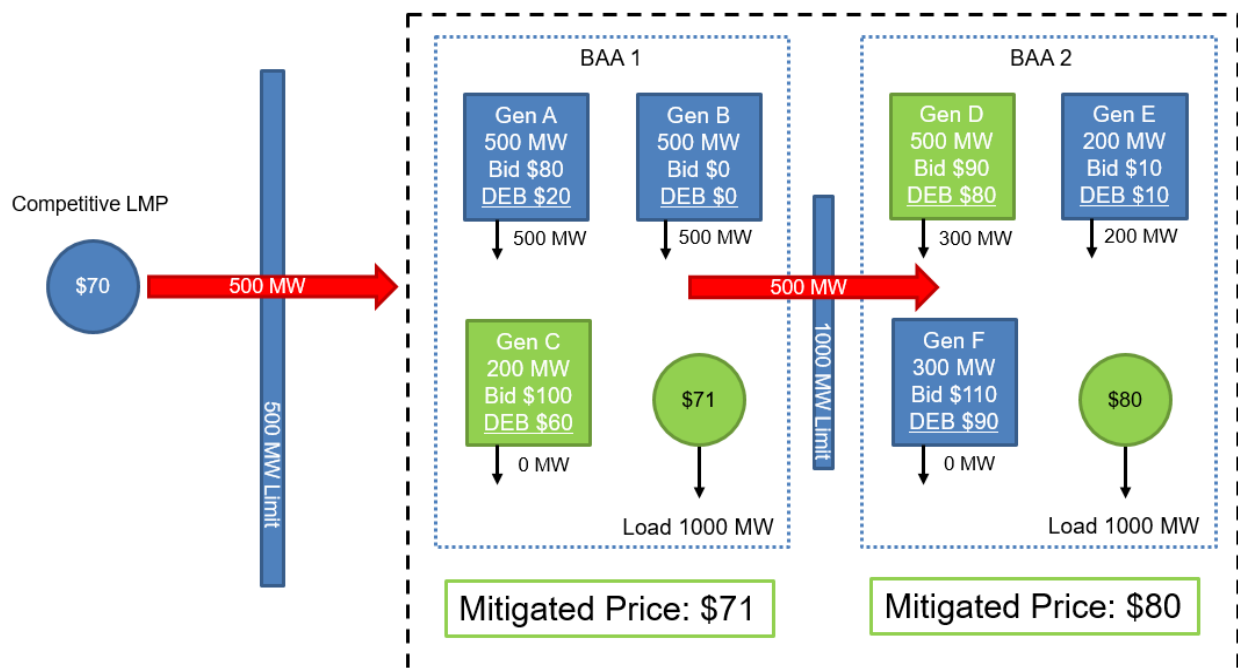
2. Market Run:

- A change in dispatch occurs for Generator C and Generator D after the market power mitigation run, because only the competitive locational marginal price + \$1 and the default energy bids are considered in the market run.
 - Generator D has a higher default energy bid than Generator C, thus it is only dispatched 100 MW in the market run, whereas in the market power mitigation run it was dispatched to 300 MW because it was more economic to dispatch more of Generator D when only considering the submitted bid values than dispatching Generator C.
- The mitigated price for balancing authority area 1 and balancing authority area 2 is \$80 in this example because the \$80 default energy bid for Generator D is greater than \$71 (competitive location marginal price + \$1)
- With the change in dispatch in the market run, balancing authority area 1 shifts from exporting only 500 MW to balancing authority area 2 to exporting 700 MW to balancing authority area 2.
 - This shift is problematic, as mitigated prices would result in resources within balancing authority area 1 economically displacing resources in balancing authority area 2 to serve load in balancing authority area 2.



3. Market Run with Proposed Rule:

- By introducing the proposed rule that sets the balancing authority area's net scheduled interchange at the market power mitigation schedule for the market run will prevent incremental exports and thereby maintain the voluntary nature for one balancing authority area serving another balancing authority area's load.
- Applying this rule to this example freezes the exports from balancing authority area 1 to balancing authority area 2 at 500 MW (market power mitigation schedule).
- With this constraint introduced and by only considering the competitive locational marginal price + \$1 and the default energy bids in this market run, the mitigated prices for the balancing authority areas in this region differ.
 - The mitigated price for balancing authority area 1 would be \$71, since the competitive locational marginal price + \$1 is greater than the \$60 default energy bid for Generator C.
 - The mitigated price for balancing authority area 2 remains at \$80, since the \$80 default energy bid for Generator D is greater than \$71 (competitive locational marginal price + \$1).



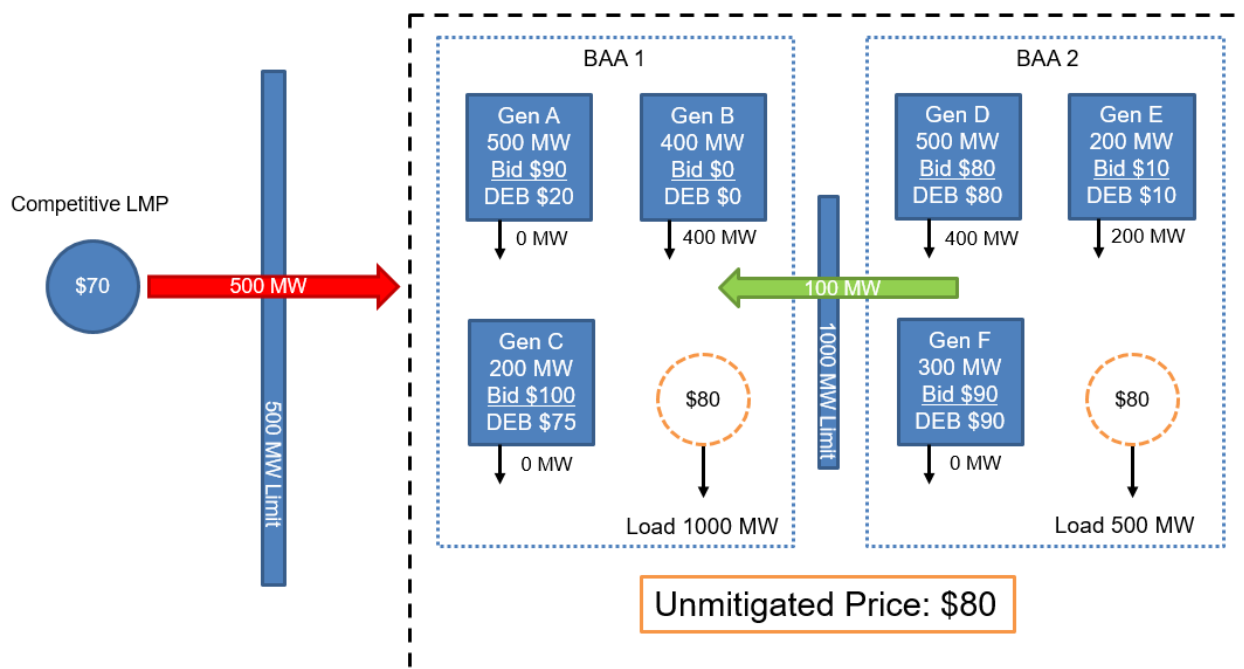
The result of this example with the proposed rule is the same result as Example C. EIM entities must make sufficient transmission available to capture the diversity benefit used for passing the resource sufficiency test. If 500 MW of transfer capability between balancing authority area 1 and balancing authority area 2 is needed for balancing authority area 1 to pass the downward flexible ramping test, Balancing authority area 1 benefits from the EIM transfer to balancing authority area 2 even though the balancing authority area 1 price is set by the competitive locational marginal price. However, if additional exports occurred this would result in additional economic displacement as a result of mitigation.

Example E

This example constrained with a competitive locational marginal price plus the a nominal adder (\$1) that is greater than the default energy bid in balancing authority area 1 and less than the default energy bid in balancing authority area 2. Additionally, this example introduces the proposed rule to freeze the export schedule in the market power mitigation run from balancing authority area 2 to balancing authority area 1.

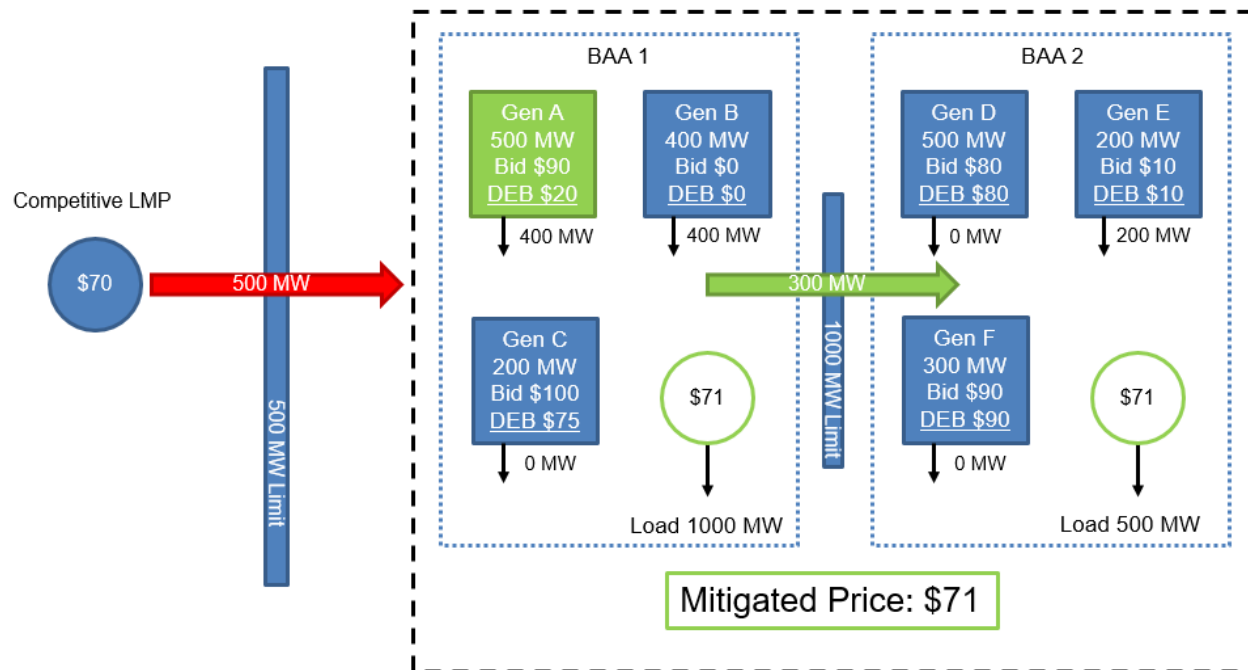
1. Market Power Mitigation Run:

- Imports into the region of balancing authority area 1 and balancing authority area 2 are binding.
- There is a constraint importing from balancing authority area 2 to balancing authority area 1 that is not binding.
- The unmitigated price for balancing authority area 1 and balancing authority area 2, set by Generator D, is \$80.



2. Market Run:

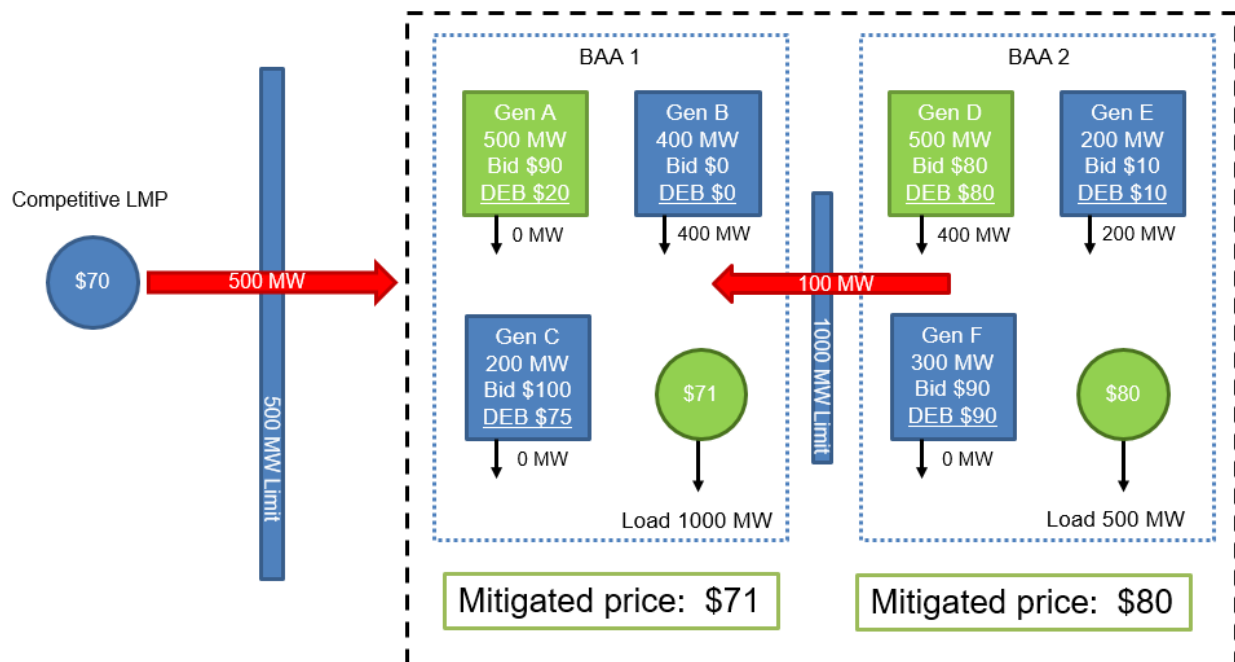
- A change in dispatch occurs for Generator A and Generator D after the market power mitigation run, because only the competitive locational marginal price + \$1 and the default energy bids are considered in this market run.
 - Generator D has a higher default energy bid than Generator A, thus it is not dispatched in the market run, whereas in the market power mitigation run it was dispatched to 400 MW because it was more economic to dispatch than Generator A when only considering the submitted bid values.
- The mitigated price for balancing authority area 1 and balancing authority area 2 is \$71 in this example because the competitive location marginal price + \$1 is higher than the \$20 default energy bid for Generator A.
- With the change in dispatch in the market run, balancing authority area 1 shifts from importing 100 MW from balancing authority area 2 to exporting 300 MW to balancing authority area 2.
 - This shift is problematic, as mitigated prices would result in resources within balancing authority area 1 economically displacing resources in balancing authority area 2 to serve load in balancing authority area 2 because mitigated bid were used.



As this example shows, since the transfer limit between balancing authority area 1 and balancing authority area 2 is not binding, the re-dispatch caused by using mitigated bids is not isolated to a given balancing authority area. This results in balancing authority area 1 having to sell at mitigate prices beyond the transfer that is economic based upon submitted bids.

3. Market Run with Proposed Rule:

- By introducing the proposed rule that sets the balancing authority area's net scheduled interchange at the market power mitigation schedule for the market run will prevent flow reversal and thereby maintain the voluntary nature for one balancing authority area serving another balancing authority area's load.
- Applying this rule to this example limits exports from balancing authority area 1 to balancing authority area 2 to 0 MW and limits exports from balancing authority area 2 to balancing authority area 1 to 100 MW (market power mitigation schedule).
- With this constraint introduced and by considering the competitive locational marginal price + \$1 and the default energy bids in this market run, the mitigated prices for the balancing authority areas in this region differ.
 - The mitigated price for balancing authority area 1 would remain at \$71, since the competitive locational marginal price + \$1 is greater than the \$20 default energy bid for Generator A.
 - The mitigated price for balancing authority area 2 is \$80, since the \$80 default energy bid for Generator D is greater than the competitive locational marginal price + \$1.



5.2 EIM Use-Limited Default Energy Bid

As described in Section 3 Stakeholder Comments, many stakeholders advocate for the need for an alternate default energy bid for EIM resources, in addition to enhancements to the mitigation framework. They maintain a new default energy bid option is needed because the current framework does not adequately capture opportunity costs of hydro and other energy-limited resources. Stakeholders further argue that a new default energy bid should not be based on a formula that assumes precise inputs. They maintain a precise formulaic approach to determine sales opportunities outside the EIM and transient short-term limitations makes calculating opportunity costs very subjective and are best calculated by market participants.

The mitigation framework enhancements proposal described above addresses most of the mitigation issues raised by stakeholders. The narrow issue remains regarding default energy bids when a resource is mitigated to resolve market power. The accuracy of the default energy bid is important when a resource's bids are mitigated to default energy bids when market power is detected. This can cause a resource with limited availability to run when it would have been more optimal to run at a later day/time.

To address this default energy bid issue, the CAISO proposes to offer all use-limited resources in the EIM an alternate default energy bid option called the EIM use-limited default energy bid.⁵ This default energy bid calculation methodology will be available as

⁵ A resource may apply for use-limited status by submitting an application to the ISO via the process outlined in Section 2.1 of the Commitment Cost Enhancements Phase 3 guidebook located here: <http://www.caiso.com/Documents/UseLimitedResourceGuideBook-CommitmentCostEnhancementsPhase3.pdf>.

an option in addition to the current cost based, locational marginal price and negotiated default energy bid options.

The current cost based default energy bids may currently also include opportunity cost adders, which consider the limited availability of fuel for a resource over a specified time horizon, and determine appropriate cost adders to be applied to start-up and minimum load reference levels, and well as default energy bids.⁶ These adders increase default energy bids so that use-limited resource bidding at these prices are optimally dispatched – when prices are sufficiently high – over that time horizon. Although these opportunity cost adders can account for intertemporal energy sales at a unit's specific location, they may not capture the potential opportunity for EIM participants to make intertemporal energy sales outside of the EIM at bilateral trading hubs. In this case, they are not settled at the locational marginal prices the CAISO uses to calculate its current opportunity cost adders.

The CAISO proposes that the EIM use-limited default energy bid be comprised of day-ahead and month-ahead futures prices at a bilateral trading hub. This method is used to potentially represent the opportunity cost of generating today based on the opportunity to sell energy during the higher priced periods in the future. For example, for a hydro resource that has the ability to store water for three months because of flow and pondage limitations, the CAISO assumes that the resource would be able to sell energy immediately in the market, or save that energy for future months. This results in an opportunity cost of generating energy today, at the highest price that energy could be sold for in the future. This mechanism uses future energy trading hubs as a proxy for the potential value of future sales.

As mentioned above, the EIM use-limited default energy bid will be available for only use-limited resources within the EIM markets. When this default energy bid option is selected, the CAISO will determine which trading hub index will be appropriate for use based on the location of the resource.⁷ When this option is selected for a specific resource, the default energy bid will be calculated using the following equation:

$$\text{MAX} (DA \text{ Peak Index}, MA \text{ Index}_{+1}, MA \text{ Index}_{+2}, \dots, MA \text{ Index}_{+N}) \times 1.10$$

⁶ The CAISO is anticipating that resources selecting the EIM use-limited default energy bid option would not be eligible for opportunity cost adders.

⁷ The EIM use-limited default energy bid option may be selected in ISO Masterfile, similar to the cost, LMP, or negotiated default energy bid options.

Where,

- *DA Peak Index* – Day-ahead (DA) peak price at a specific trading hub
- *MA Index_{+M}* – Month-ahead (MA) price at a trading hub for the successive month *m* after the current month⁸
- *N* – The number of months of storage capability that the use-limited resource has available⁹

As indicated in the formula above, any resource selecting the EIM use-limited default energy bid option will be required to submit an available amount of time that use-limited fuel can be stored, in months, to the CAISO. This value will determine the number of months of futures data that will be considered in the maximization component of the default energy bid calculation.

The CAISO performed an analysis from October 2016 through September 2017 to determine what default energy bids would have been based on historic bilateral prices at Mid-Columbia. Then, the CAISO compared these calculated values to actual locational area price energy market prices for north of path 15 (NP-15) and EIM prices for the PacifiCorp West (PACW) balancing authority area. Based on the assumption that resources were bidding in at the calculated default energy bids, CAISO assumed that the resources would have been dispatched during those intervals when locational marginal prices were higher than default energy bids, and would have received market revenues during those intervals.¹⁰ Further, the CAISO compared these results to publically available FERC electric quarterly report (EQR) data showing individual transactions for energy trades completed by British Columbia Hydro during the same period, similar to data included in requests and feedback provided to the CAISO advocating for a new default energy bid option. Results of this analysis are shown below.

⁸ Day-ahead peak and month-ahead indices may include: Mid-Columbia, California-Oregon Border, North of Path 15, South of Path 15, and Palo-Verde.

⁹ For the purposes of this formula, any storage capability value in master file above 12 will be rounded to 12, and any value at or below 1 will be rounded to 1. Any resource without a storage capability value submitted in master file will have a default energy bid calculated, as if they have one month of storage available. The formula for this default energy bid in this scenario would be: $\text{MAX}(\text{DA MIDC PEAK}, \text{MA MIDC}_{+1}) * 1.1$.

¹⁰ The implicit assumption was made that hydro resources bidding in this manner would not impact observed market prices.

Figure 1: Average monthly dispatched (NP-15) prices compared to EQR transactions

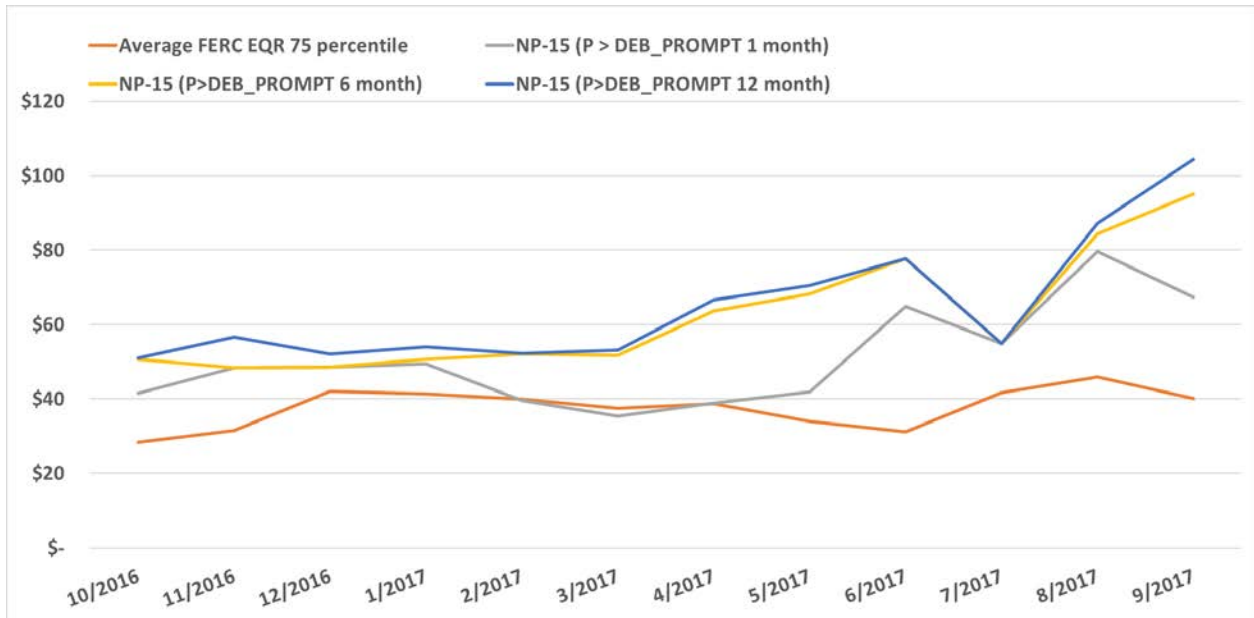


Figure 2: Average monthly dispatched (PACW) prices compared to EQR transactions

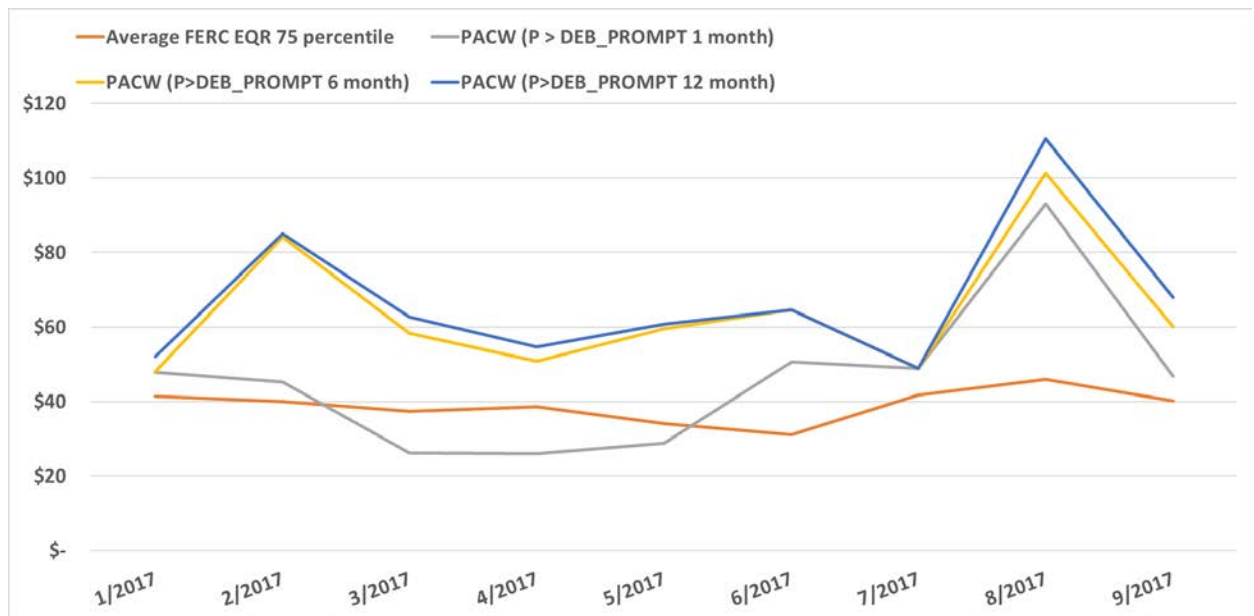


Figure 3: Percentage of intervals dispatched at NP-15 prices

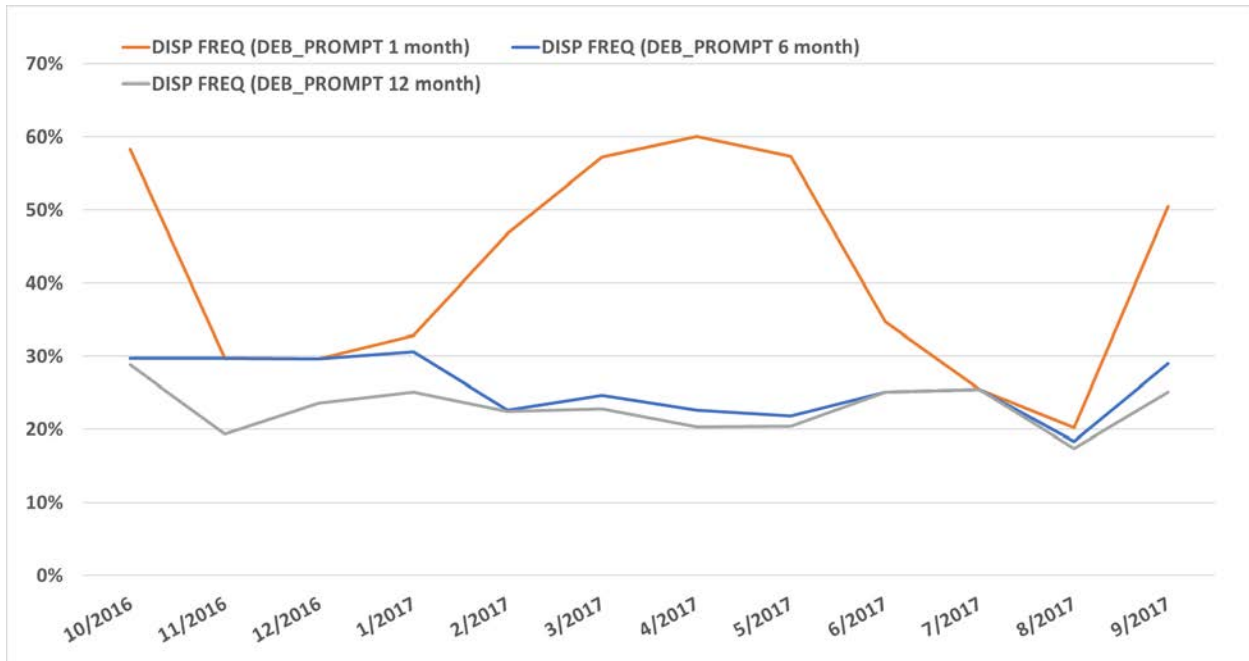
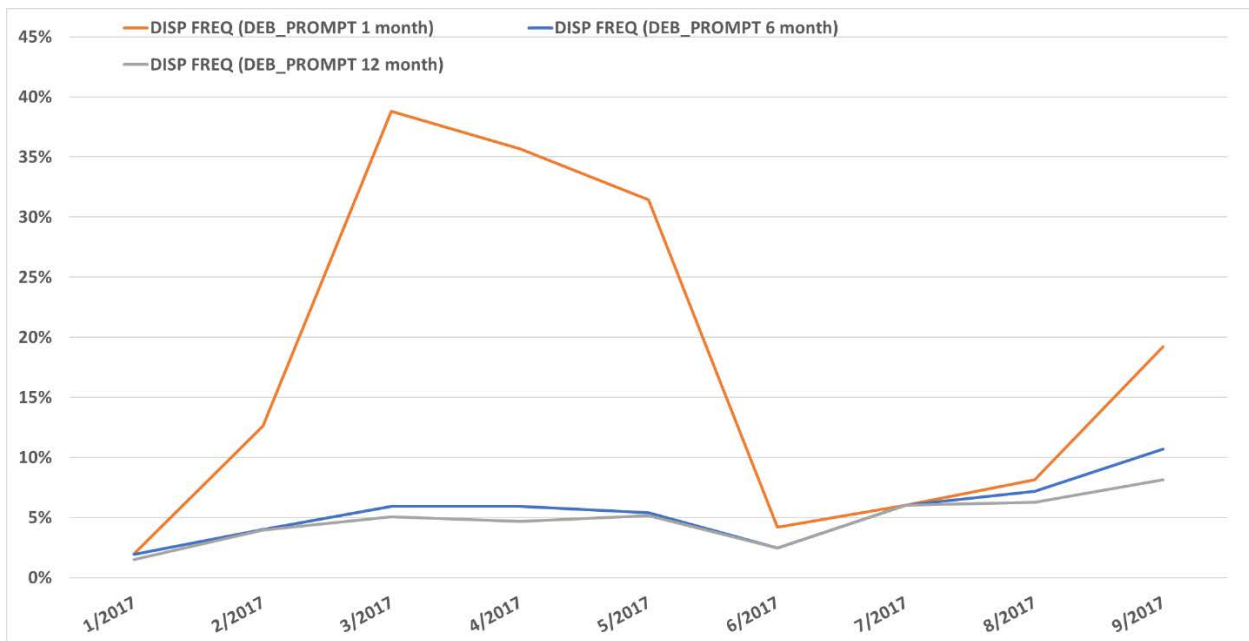


Figure 4: Percentage of intervals dispatched at PACW prices



Based on the analysis above, the CAISO concludes the following:

- A resource bidding in at the proposed EIM use-limited default energy bid using peak Mid-Columbia prices with multiple months of storage, would receive higher average prices than the 75th percentile of FERC electric quarterly report prices.
- Resources with 12 months of storage almost always have a significantly greater default energy bid than resources with only one month of storage.
- Resources bidding in at the default energy bid with 1 month of storage would be more frequently dispatched than those with 12 months of storage. For example, in March 2017 resources with one month of storage were only dispatched 57% of intervals, while resources with 12 months of storage were dispatched 23% of intervals, when exposed to NP-15 prices. Similarly, for March 2017, resources with one month of storage were only dispatched 39% of intervals, while resources with 12 months of storage were dispatched 5% of intervals when exposed to PacifiCorp West prices.

Additionally, the CAISO completed a counterfactual example for a resource using the EIM use-limited default energy bid with peak Mid-Columbia prices and 12 months of available storage, bidding into a market exposed to NP-15 prices at default energy bids. This exercise was used to arrive at a percentage of intervals that the resource would run, matching the data shown in Figure 4, then comparing those intervals to the optimal set (highest priced) of intervals that the resource would choose if they operated the same frequency of intervals during a specific month. This analysis shows that a resource using the EIM use-limited default energy bid during the majority of months analyzed would result in the resource operating optimally during almost all hours.

Table 1 - Counterfactual example comparing default energy bids to optimal conditions

Date	Frequency Dispatched (12 month storage @ Mid-C)	Optimal Price to Operate	Optimal Dispatch Pct
Oct-16	29%	\$ 36.80	98%
Nov-16	19%	\$ 35.91	95%
Dec-16	24%	\$ 40.83	82%
Jan-17	25%	\$ 39.85	89%
Feb-17	22%	\$ 36.59	98%
Mar-17	23%	\$ 35.06	99%
Apr-17	20%	\$ 37.02	99%
May-17	20%	\$ 37.21	99%
Jun-17	25%	\$ 34.63	98%
Jul-17	25%	\$ 38.89	86%
Aug-17	17%	\$ 45.49	58%
Sep-17	25%	\$ 42.81	73%

5.3 Reference Level Adjustments

The CAISO’s recent *Commitment Costs and Default Energy Bid Enhancements (CCDEBE)* policy initiative established a reference level adjustment process in which suppliers will be able to request a before-the-market adjustment to a resource’s reference level for start-up cost, minimum load cost, or default energy bids.¹¹ This process was established in recognition that the CAISO’s reference levels based on published price information may always be accurate.

In order for a supplier to request an adjustment to its reference level, the supplier’s actual costs must actually be more than the CAISO’s calculated reference level. Suppliers must retain sufficient justification supporting the need for a reference level adjustment request.¹²

The CAISO has not yet filed the tariff changes resulting from the CCDEBE initiative with FERC. It plans to do so in 2019 so it can implement them in Fall 2019. Based on recent gas market events, this section describes a proposed modification to the reference level adjustment process for gas resources.

This section also describes a new proposed process to provide for reference level adjustments for resources using the EIM use-limited default energy bid option described above. This process would allow EIM participants to request adjustments to a default

¹¹ California ISO will not support adjustment requests to the transition component. Instead, a supplier should submit the request to adjust the start-up costs of the multi-stage generators configurations. The verified amounts will be used in the estimated proxy cost option for transition costs

¹² For conditions that would warrant a supplier’s cost expectations to differ from their administratively calculated cost estimates, see : Second Revised Draft Final Proposal Commitment Cost and Default Energy Bid Enhancements, 36

energy bid in the event bilateral electricity prices increase relative to the day-ahead trading hub index used in the default-energy bid formula.

5.3.1 Gas Resources

The CAISO proposes to amend the reference level adjustment process for gas resources developed in CCDEBE to better account for gas price volatility. After recent large differences in the price for same-day gas purchases relative to the gas price index the CAISO uses for the real-time market, the CAISO now proposes to provide for manual review of market participant requests to adjust reference levels used for the CAISO's real-time market.

Currently, the real-time market uses the day-ahead gas price index published the day before the real-time market. The current CCDEBE policy allows for reference level adjustments up to a "reasonable threshold" based on gas price increases of 125% relative to the index for Monday and other days without a published index and 110% for all other days. The policy provides for the CAISO to automatically approve or reject these requests based on this criteria.

However, based on recent volatility of same-day gas prices relative to the day-ahead index (e.g. prices for July 23, 2018), the CAISO now believes the added implementation complexity of a manual approval process for reference level adjustment requests for the real-time market is justified. The CAISO now proposes to manually review these requests and may approve adjustments for individual resources or adjust its automated screening criteria for all resources in a gas region, as appropriate.

Under this proposed modification, the supplier may request a manual consultation if a supplier requests a reference level adjustment that exceeds the automated reasonableness threshold. The CAISO would then review the supplier's requested adjustment amount and cost documentation submitted by the supplier, and also review related information such as same-day gas trading information occurring on the Intercontinental Exchange (ICE) trading platform or other suppliers' requests. The CAISO would approve the reference level adjustment if the requested amount appears to reflect current costs.

If it appears these costs are likely applicable to other resources in a gas region, the CAISO will adjust the resource's reasonableness threshold for other resources in the same gas region. This reasonableness threshold establishes an amount the CAISO will automatically verify a resource's reference level adjustment. This would be the case if the CAISO were to receive numerous adjustment level requests from several resources from the same region and/or the adjustment request is consistent with same-day trading information the CAISO observes on ICE.

Gas Suppliers requesting a manual consultation for a real-time market reference level adjustment will be required to provide documentation supporting the amount of their

reference level adjustment. Bidding up to a supplier's reasonableness threshold is not a safe harbor and reference level adjustment requests must be based on actual costs.

Consistent with the previously developed policy, if a supplier's requested reference level adjustment request is unable to be verified before market, the supplier's standard reference level will be used in the market. Any unverified amount requested above the supplier's standard reference level will be eligible for after-market review and potential uplift payment(s).

CAISO retains the right to verify suppliers followed the guidelines for submitting reference level adjustment requests, and to potentially perform an audit on frequently submitted and automatically-approved adjustments.

5.3.2 EIM Use-Limited Resources

The CAISO also proposes an additional reference level adjust for resources using the EIM use-limited resource default energy bid. Even with the alternate default energy bid, the day-ahead energy price index used in the equation to reflect short-term limitations may not reflect actual real-time electricity trading prices. Therefore, EIM resources using this option may also need to adjust their default energy bid to reflect their short-term limitation costs expectations not captured by CAISO's administratively calculated costs.

The CAISO proposes to allow EIM use-limited resources that have selected the alternate hydro default energy bid option to request a reference level adjustment (i.e. default energy bid adjustment) based on real-time electricity prices. This would adjust the day-ahead energy component of the alternate default energy bid equation shown below.

The alternate default energy bid equation is calculated as follows:

$$\text{MAX} (\text{DA PEAK INDEX}, \text{MA INDEX}, \text{MA INDEX}_{+2}, \dots, \text{MA INDEX}_{+N}) \times 1.10$$

To be eligible for such a reference level adjustment, a supplier with a resource using the EIM use limited resource default energy bid must be able to demonstrate real-time energy prices at which they can sell the energy from the resource are greater than day-ahead index prices used in their default energy bid equation. This is the component of the equation shown in red above.

The CAISO would automatically approve requests up to a reasonableness threshold but the supplier would have to retain supporting documentation. This is different than a default energy bid with a scalar greater than the 110% the CAISO proposes for the EIM use-limited default energy bid. The level used for the reasonableness threshold can be greater than the default energy bid scalar of 110% because a default energy bid is a safe harbor for which a supplier can bid up irrespective of whether actual costs are that

high. Conversely, suppliers would only be able to request reference level adjustments up to the reasonableness threshold based on costs they can document.

Suppliers must retain documentation supporting reference level adjustment requests are based on differences from day-ahead and real-time electricity trading prices. This would be information such as real-time ICE trading information or bilateral offers to buy electricity.

The CAISO will use an automatic screen comparing a requested amount against a reasonableness threshold that reflects typical variations in real-time electricity prices versus the day-ahead index. The CAISO would develop what the threshold would be appropriate based on analysis examining the historical variation of index prices and hourly bilateral prices

If a supplier's requested reference level adjustment request is unable to be verified before the close of the market, the supplier's standard reference level will be used in the market. Any unverified adjustment amount above the supplier's reference level will be eligible for after-market review and potential uplift payment(s).

5.4 Gas Prices Indices

The CAISO proposes to remove references to Intercontinental Exchange (ICE) in the CAISO tariff regarding gas price indices because Intercontinental Exchange index is no longer available. S&P Global Platts, another gas index, now contains information about Intercontinental Exchange trades through their daily and monthly North America natural gas indices. The CAISO will continue to reference S&P Global Platts as a source of gas indices that now contains information about ICE trades.

The CAISO also proposes to modify the requirement for the CAISO to use a minimum of two gas indices to determine the blended gas price use in the CAISO markets. The CAISO is proposing to allow the gas price index to be determined with as few as one index available from the various index providers. The publications the CAISO uses today include the following: Natural Gas Intelligence, SNL Energy/BTU's Daily Gas Wire, and Platt's Gas Daily.

The CAISO does not propose to modify the current practice of updating every weekday morning the gas price index for day-ahead market calculations using the information available from ICE trades.

6 Stakeholder Engagement

Table 2 outlines the proposed schedule to complete policy for the EIM Identified Market Power Mitigation Enhancements.

Management may seek approval of the mitigation framework enhancements items at an earlier EIM Governing and CAISO Board of Governors meeting. If so, remaining policy

items would be presented to the EIM Governing Body and CAISO Board of Governors during their March 2019 meetings.

Table 2

Date	Milestone
September 13, 2018	Issue Paper/Straw Proposal Posted
September 19, 2018	Stakeholder Call
October 3, 2018	Stakeholder Written Comments Due
October 10, 2018	Stakeholder Working Group Meeting
October 31, 2018	Revised Straw Proposal Posted
November 8, 2018	Stakeholder Call
November 29, 2018	Stakeholder Written Comments Due
December 21, 2018	Draft Final Proposal Posted
January 3, 2019	Stakeholder Call
January 10, 2019	Stakeholder Written Comments Due
March 12, 2019	EIM Governing Body Meeting
March 28, 2019	Board of Governors Meeting

6.1 Stakeholder Comments

The CAISO will discuss this issue/straw proposal with stakeholders during a teleconference on September 19, 2018. Stakeholders should submit their written comments to initiativecomments@caiso.com by close of business on October 3, 2018.

Appendix A

Background

The purpose of this section is to provide context needed to understand the CAISO's issue/straw proposal presented in Section 6, Proposals. The CAISO will present this context by discussing the following:

- *Commitment Cost and Default Energy Bids Enhancements*– Before Market Reference Level Adjustment Requests
- California ISO's Local Market Power Mitigation Design
- Stakeholder Comments following the *EIM Offer Rules* stakeholder workshops¹³

6.2 Commitment Cost and Default Energy Bids Enhancements – Before Market Reference Level Adjustment Requests

The CAISO recently completed a policy initiative titled, *Commitment Costs and Default Energy Bid Enhancements*, which evaluated the CAISO's market rules relating to supplier's bidding flexibility. The CAISO plans to file the tariff revisions needed to implement the changes resulting from this initiative in 2019 prior to implementing them in Fall 2019.

Through the *Commitment Costs and Default Energy Bid Enhancements* initiative, the CAISO determined the existing reference level (i.e. default energy bids and commitment cost caps) design did not always accurately reflect suppliers' costs. To address stakeholder's concerns, the initiative developed provisions for suppliers to have the ability to request adjustments to reference levels used by the market. These reference level adjustments may be used to adjust a resource's startup cost, minimum load cost, or energy cost (default energy bid). Suppliers can only request an adjustment when conditions arise that drive the supplier's actual cost away from the CAISO's administratively calculated cost estimates. The supplier must be able to provide documentation supporting justification of their new cost using actual and current information.¹⁴ Suppliers are prohibited from utilizing reference level adjustments for strategically placing bids to inflate market revenues or create uplift.

¹³ For details regarding the *EIM Offer Rules* stakeholder workshop, see:

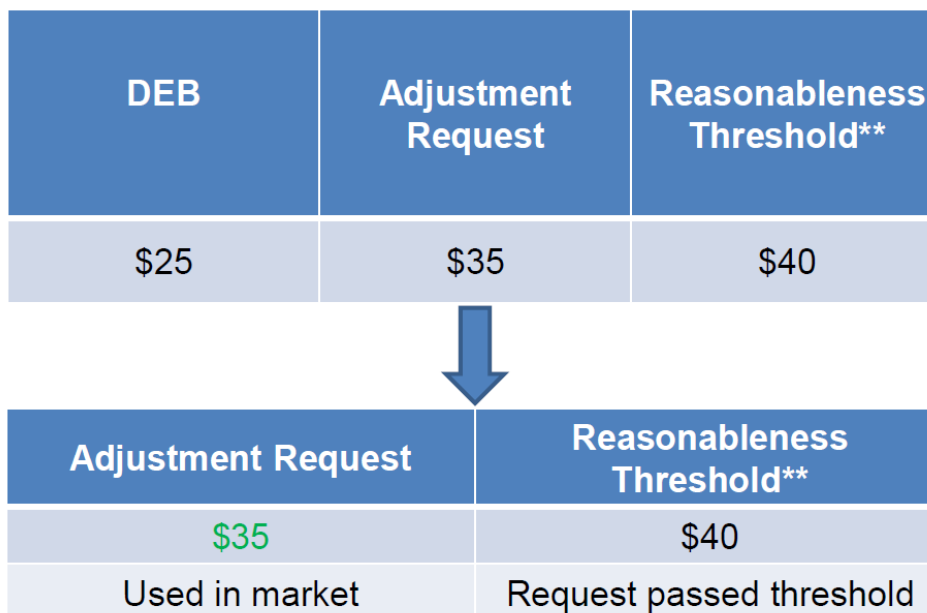
<http://www.aiso.com/informed/Pages/MeetingsEvents/MiscellaneousStakeholderMeetings/Default.aspx>

¹⁴ Suppliers will not be required to submit this documentation to the CAISO for every adjustment request; however, it must be available upon request.

After a supplier submits a reference level adjustment request, the CAISO will verify the requested amount before a market run.¹⁵ To verify an adjustment request, the CAISO will use an automatic screen comparing the requested amount against a “reasonableness threshold”. This reasonableness threshold establishes an amount the CAISO will automatically verify for a resource’s reference level adjustment. The reasonableness threshold is different based on if a resource is gas-fired or non-gas-fired. For gas resources, the reasonableness threshold includes a gas price volatility scalar of either 125% or 110%.¹⁶ For non-gas resources, the reasonableness threshold is 110%.¹⁷

Assume a supplier would like to request an adjustment to their default energy bid. Their default energy bid is \$25 and they believe their costs are now \$35. The supplier would submit the adjustment request; the CAISO would then verify the request through the automatic screen using the reasonableness threshold. The reasonableness threshold for this resource is \$40. The supplier’s adjustment amount of \$35 would pass the reasonableness threshold and the \$35 would be used in the market.

**** Value unknown to SC**



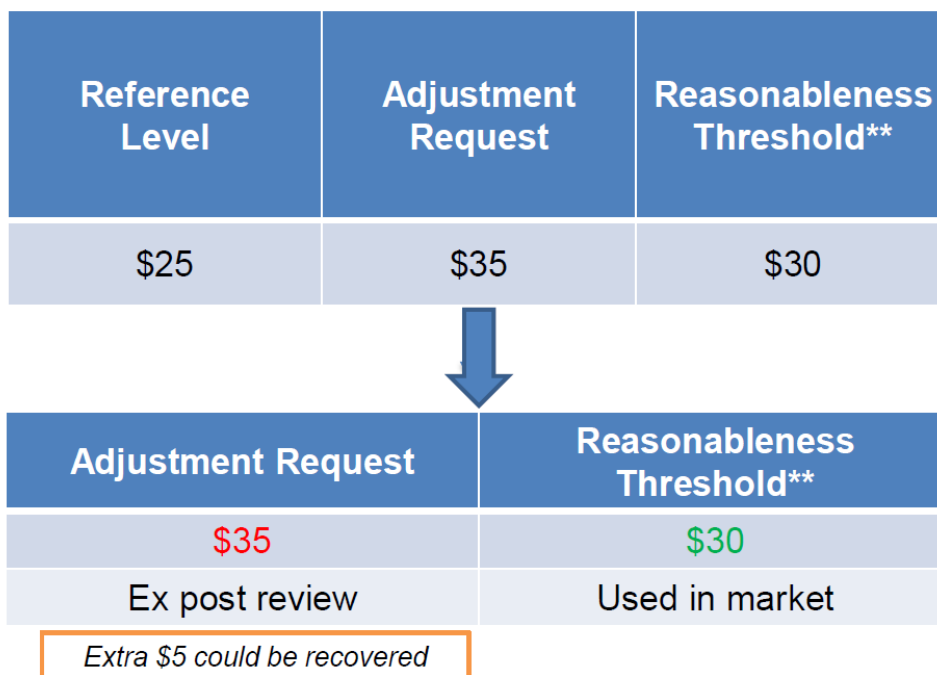
¹⁵ If the CAISO is unable to verify an adjustment before the market run, the CAISO will determine whether costs were actual costs incurred above the adjusted reference level through the after-market verification process.

¹⁶ The volatility scalars will vary depending on the day. For Monday and days without a published index when the market would fall back on the prior day’s published index (e.g. weekdays after holidays), the volatility scalar will be 125%. For all other days the volatility scalar will be 110%.

¹⁷ The scaled fuel equivalent costs are calculated by applying a volatility scalar to Master File registered fuel equivalent cost values.

Assume the same supplier would like would like to request an adjustment to their default energy bid. Their default energy bid is \$25 and they believe their costs are now \$35. The supplier would submit an adjustment request; the CAISO would then verify the request through the automatic screen using the reasonableness threshold. The reasonableness threshold for this resource is \$30. The supplier's adjustment amount of \$35 would fail the reasonableness threshold. The CAISO would limit their adjustment to the reasonableness threshold amount of \$30. The remaining \$5 would be eligible for after the market review (ex-post) and could be potentially be recovered through the bid cost recovery process.

**** Value unknown to SC**



The CAISO provided after the market review and after-the-fact cost recovery mechanism for any reference level adjustment that was limited because a supplier's adjustment request exceeded the reasonableness threshold. However, a supplier's cost recovery is limited to actually incurred costs that exceed either: a cap or mitigated price level.¹⁸

6.3 California ISO's Local Market Power Mitigation Design

Each organized electric market has a methodology used to detect market power and trigger bid mitigation when it is detected. This section will describe the CAISO's current market power mitigation methodology and bid mitigation.

¹⁸ May not include any adders above cost such as a risk related adder or unrecovered costs through market revenues.

The CAISO evaluates market power through a market structure assessing two quantitative measures for energy.¹⁹ The CAISO's market power mitigation test is most commonly referred as a three pivotal supplier test.²⁰ To assess transmission competitiveness, the CAISO must first determine if there is sufficient supply to meet demand. Competitiveness is assessed through the dynamic competitive path assessment which includes the three pivotal supply test²¹

The three pivotal supplier test evaluates a local area in the market at a given constraint and determines if the constraint is competitive or uncompetitive. The three largest suppliers are removed and the local area is re-assessed to determine if there is sufficient supply to meet demand in the area. If there is enough supply to meet demand without the three largest suppliers in the area, the supplier is not pivotal and the constraint is competitive. If there is not enough supply to meet demand without the three largest suppliers, the suppliers are pivotal and the constraint is uncompetitive. Suppliers in an uncompetitive constraint may exercise market power and are subject to mitigation procedures.²² For example, assume there are seven different suppliers in a locally constrained area with load of 500 MW. The three largest suppliers in the area have a total supply of 650 MW. The test would determine if the remaining suppliers have enough supply to meet the load of 500 MW. If the remaining four suppliers did not have enough supply to meet load, the constraint would be deemed uncompetitive. After the pivotal supplier test is complete, the residual supply index determines the ratio of supply from non-pivotal suppliers to demand. If the residual supply index is less than 1.0, then an uncompetitive level of supply is available.²³

After the dynamic competitive path assessment is completed, the CAISO then determines what portion of the marginal congestion component of a resource's node is from the uncompetitive transmission constraints, known as the locational marginal price decomposition method. A positive non-competitive congestion component indicates the potential of local market power. The non-competitive congestion component of each locational marginal price is calculated as the sum over all non-competitive constraints of the product of the constraint shadow price and the shift factor of the resource to the constraint. Every resource with a locational marginal price non-competitive congestion component greater than zero is subject to mitigation.

¹⁹ Pending FERC approval of tariff changes resulting from the *Commitment Cost and Default Energy Bid Enhancements (CCDEBE)* initiative, the CAISO will also evaluate commitment cost market power.

²⁰ Structure refers to the ownership of available supply (or capacity) in a market.

²¹ Determines if there is sufficient residual supply of counterflow to meet the demand for counterflow on a given constraint.

²² Exercising market power may include a supplier inflating their energy prices, commitment costs, or withholding capacity.

²³ Demand Response Resources, Participating Load, and Non-Generator Resources are considered in the market power mitigation process, but are not subject to mitigation.

Bids for these resources are mitigated down to the higher of the resource's default energy bid, or the "competitive locational marginal price" at the resource's location.²⁴ The locational marginal price is equal to System Marginal Energy Cost (SMEC) + Competitive Congestion Component + Non-Competitive Congestion Component + LOSSES. The competitive locational marginal price is equal to SMEC + Competitive Congestion Components + LOSSES.

A resource's energy cost reference level (i.e. default energy bid) for gas or non-gas suppliers is calculated using one of the following three options:

1. Variable Cost Option (CAISO Tariff Section 39.7.1)
2. Negotiated Rate Option (CAISO Tariff Section 39.7.1.3)
3. Locational Marginal Price Option (CAISO Tariff Section 39.7.1.2)
4. *Variable Cost Option plus Bid Adder* (CAISO Tariff Section 39.7.1.4 for frequently mitigated units)²⁵

A supplier for each resource ranks the variable cost, negotiated, or locational marginal price options as their preferred method order for calculating their default energy offer. If a supplier does not provide a ranking preference, the above order applies as the ranking default.²⁶

The negotiated option requires the supplier to provide cost information to establish an approved rate formulation. Suppliers who elect to have their rate negotiated, first submit a proposed default energy bid (i.e. energy reference level) along with supporting documentation. If denied, the CAISO and the supplier will enter into negotiations for sixty days. During this period, if the supplier and the CAISO agree to a rate, it will generally become effective within eleven business days.²⁷ The negotiated default energy offer will remain in effect until it is modified by FERC; modified by mutual agreement between the CAISO and supplier; or the negotiated rate expires, is terminated, or is modified in accordance with any FERC order.²⁸ The CAISO files these values in a confidential report with FERC each month.

6.3.1 Day-Ahead Market

The day-ahead market power mitigation process occurs prior to the integrated forward market and consists of single market run in which all modeled transmission constraints

²⁴ The LMP established in the LMPM run minus the non-competitive congestion component thereof (competitive LMP = $LMP_i - LMP_i^{NC}$).

²⁵ Only applies to a "Frequently Mitigated Unit that is eligible for a Bid Adder may select a fourth Default Energy Bid option, which is equal to the Variable Cost Option plus the Bid Adder as described in Section 39.7.

²⁶ California ISO Business Practice Manual, Market Operations, Section 6.5.4 Default Energy Bids

²⁷ California ISO Tariff Section 39.7.1.3.1 Submission Process:

http://www.aiso.com/Documents/Section39_MarketPowerMitigationProcedures_asof_May2_2017.pdf

²⁸ *Id.*

are enforced. The purpose of the day-ahead market power mitigation process is to determine which supply offers need to be mitigated before the integrated forward market runs.

6.3.2 Real-Time Market

The CAISO's real-time conducts a market power mitigation process in the Real-Time Unit Commitment (RTUC) run and in the five-minute real-time dispatch run (RTD).²⁹

6.3.2.1 Hour-Ahead Scheduling Process

The hour-ahead scheduling mitigation process uses results from real-time unit commitment run (RTUC). The hour-ahead scheduling process uses a single mitigated supply offer for the entire trading hour is calculated using the minimum supply offer price of the four mitigated bid curves from the fifteen-minute levels at each supply offer.³⁰ The purpose of the hour-ahead scheduling process is to estimate the fifteen-minute market results for scheduling hourly import supply offers.

6.3.2.2 Fifteen-Minute Market

The fifteen-minute market mitigation process uses results from real-time unit commitment run (RTUC). For the fifteen-minute market, mitigation begins with a resource's unmitigated supply offer for the first fifteen-minute interval of a trading hour.³¹ After the mitigation runs, the market receives mitigation results for each fifteen-minute interval of a trading hour (*i.e.*, four fifteen-minute intervals in an hour is equal to four separate mitigated supply offers for the hour).

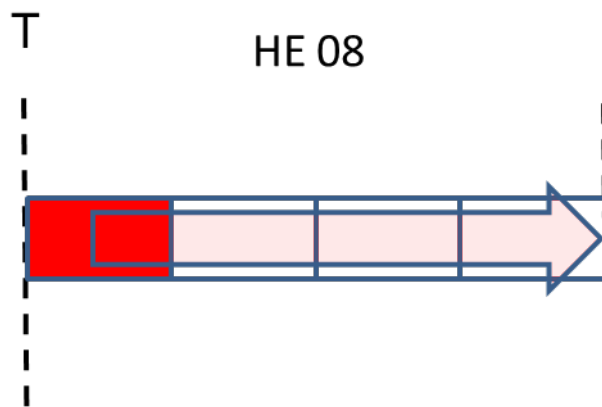
If mitigation occurs to a supply offer in the first fifteen-minute, the remaining intervals within the trading hour are mitigated using the mitigated supply offer from the first interval as illustrated below in **Example 1**.

Example 1: Market power is determined for a resource in the first fifteen-minute interval of the fifteen-market indicated in red.

²⁹ Pending FERC approval of *Commitment Cost and Default Energy Bid Enhancements*, market power mitigation will occur in Short-Term Unit Commitment run (STUC).

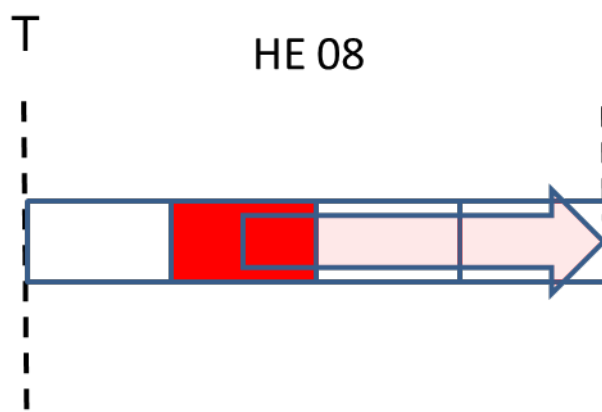
³⁰ California ISO Business Practice Manual, Real-Time Market, Section 34.1.5.3 Hour-Ahead Scheduling Process MPM.

³¹ There are four (4) fifteen-minute intervals in an hour.



If market power is not detected in the first interval of the fifteen-minute market, but is detected for the second interval, a resource’s supply offer will be mitigated for the second interval and all remaining intervals of the trade hour. The same logic would apply if market power was not detected for the first or second interval of the fifteen-market, but was detected for the third interval. Example 2 illustrates this logic below.

Example 2: Market power is determined for a resource in the second fifteen-minute interval of the fifteen-market indicated in red.



6.3.2.3 Five-Minute Market

The five-minute market, also known as real-time dispatch, receives mitigation results from the corresponding fifteen-minute interval. The five-minute market will mitigate further using the results from the previous run where the current binding interval was the first advisory interval. Then, the market will determine if the next five-minute interval has market power and if the supply offer should be mitigated. If market power is detected in a five-minute market, the corresponding fifteen-minute interval will be mitigated.