



California ISO

System Market Power Mitigation

Revised Draft Final Proposal

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1 Executive summary

This revised draft final proposal describes the CAISO's proposed approach for system-level market power mitigation in the real-time market that would be applied to energy offers for resources within the CAISO balancing authority area.

The CAISO has proposed in this initiative that it will implement system-level market power mitigation only in the real-time market as an initial implementation so that it could be in-place by summer 2021. The *extended day-ahead market enhancements* initiative will consider a system-level market power mitigation process for the day-ahead market.

The CAISO proposes an automated system-level market power mitigation process that evaluates the results of the real-time market's hour-ahead scheduling process for when certain price screens indicate that the CAISO should be reasonably concerned about market outcomes. It will test for the potential for market power based on a residual supply index calculation using three pivotal suppliers (pivotal supplier test). It will consider offers for resources within the CAISO balancing authority area and import offers as potentially pivotal supply in this test. It will only mitigate offers for resources located within the CAISO balancing authority area because the intent of the test is to address system-level market power in the CAISO balancing authority area. It will use a calculated competitive locational marginal price (LMP) to ensure that the mitigation process does not mitigate offers for resources within the CAISO balancing authority area beyond the amount needed to address market power.

The CAISO will only apply the system-level market power mitigation process when it is reasonably concerned about market outcomes. The CAISO is taking a cautious design approach because broadly applying system-level market power mitigation when there is not actually the potential for market power could discourage supply and demand participation in the market or lead to market prices that do not support suppliers' real operating costs. It could also discourage demand from engaging in long-term contracting, which is a fundamentally essential protection against market power. The CAISO believes it should only intervene in the market in such a broad way when it is reasonably concerned about market outcomes.

To limit the CAISO's intervention to periods when it is reasonably concerned about market outcomes, the market systems will only apply the system-level market power mitigation process under the following conditions. First, the CAISO proposes that the mitigation process should only be applied during a market horizon that will properly account for the competitive pressure hourly-block imports place on internal supply. This is necessary because the CAISO actively participates in the west-wide market for hourly-block import energy. Second, the CAISO proposes to only apply the mitigation process when it is reasonably concerned that its balancing authority area is in a constrained region of the western interconnection. This is necessary because suppliers in constrained regions may exercise market power. Finally, the CAISO proposes to apply the mitigation process only when market prices rise high enough to indicate that suppliers could be exercising market power.

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When the conditions described above occur, the CAISO proposes to use a pivotal supplier test to determine if the system is potentially uncompetitive. The pivotal supplier test used for system-level market power mitigation will reduce each supplier's potentially pivotal supply by the supplier's load-serving obligations because suppliers do not have an incentive to raise offer prices from resources used to serve their own demand.

The CAISO's intent in developing this proposal is to address system-level market power within the CAISO balancing authority area. For this reason, if the pivotal supplier test fails, indicating the potential for system-level market power, the CAISO proposes to only mitigate offers from pivotal supplier resources located within the CAISO balancing authority area. Offers will be reduced to the greater of the resource default energy bid or a calculated competitive LMP.

The CAISO proposes that the system-level market power mitigation process will calculate a system-level specific competitive LMP to use as part of system-level mitigation. The CAISO proposes to calculate the system-level competitive LMP to be a value that will ensure that resources are not dispatched up at mitigated bid prices to export energy to balancing authority areas outside the constrained region. This is consistent with the principle incorporated into the existing local market power mitigation and balancing authority area mitigation in the energy imbalance market (EIM) designs that ensures that the mitigation process does not mitigate resource offers in potentially uncompetitive areas beyond the amount needed to address market power in the potentially uncompetitive area. The proposed competitive LMP calculations for system-level market power mitigation ensures market power mitigation does not over-mitigate supply offers by setting a mitigated price floor that accounts for potential exports at intertie locations and EIM transfers to other balancing authority areas. The market power mitigation pass of the real-time market will therefore only affect price and dispatch within the constrained region that was found to be potentially uncompetitive.

2 Stakeholder comments and changes to this proposal

In the previous draft final proposal, the CAISO proposed that the system-level market power mitigation process test for market power in the real-time market's hour-ahead scheduling process with a residual supply index calculation using three pivotal suppliers. The CAISO proposed criteria for triggering the pivotal supplier test that included only triggering the test when (1) the CAISO balancing authority area is in the highest priced region in the EIM, (2) CAISO energy prices are at least \$100/MWh, (3) CAISO energy prices are greater than published bilateral electrical price indices, and (4) CAISO energy prices are at least as high as the CAISO's proxy cost calculation of a hypothetical gas peaker. The CAISO maintained that this would result in triggering system-level mitigation only when the CAISO balancing authority area did not have access to additional competitively priced energy from both the Western Energy Imbalance Market and the broader western interconnection's bi-lateral market.

The CAISO made the following modifications to its proposal:

1. The market systems will only trigger the system market power mitigation process when the following two conditions occur: (1) the CAISO balancing authority area marginal energy cost is greater than internal CAISO and external proxy peaker prices and (2) the CAISO balancing authority area marginal energy cost is the highest balancing authority area marginal energy cost in the EIM and the CAISO is in an import transfer constrained region of the EIM. When comparing the CAISO balancing authority area marginal energy cost to other balancing authority area marginal energy costs in the EIM, the market systems will not consider other balancing authority areas with higher marginal energy costs if they have failed their upward Flex Ramp Sufficiency Test.
2. The pivotal supplier test will consider economic import offers as potentially pivotal supply.
3. The competitive LMP will be calculated to be the greater of the highest import offer cleared on a constrained CAISO intertie and the next highest balancing authority area marginal energy cost in the EIM.

In previous proposals, the CAISO considered whether it should perform a system-level three-pivotal supplier test in the fifteen-minute and five-minute markets in addition to performing it in the hour-ahead scheduling process. The CAISO continues to propose to perform the test in the hour-ahead scheduling process despite examples cited by some stakeholders in which suppliers may exercise market power by ignoring dispatch instructions and under-generating, *physically* withholding supply. The CAISO's market's automated market power mitigation processes that mitigate offers are designed to prevent suppliers from successfully *economically* withholding supply by inflating offer prices. Other applicable rules address physical withholding.

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The CAISO believes its proposal to evaluate competitiveness in the hour-ahead scheduling process appropriately addresses potential system-wide market power. The CAISO market power mitigation processes are structured to address economic withholding. Supply offers are due before the operating hour and suppliers cannot change those offers between the hour-ahead scheduling process and the fifteen-minute and five-minute markets. In the hour-ahead scheduling process, the CAISO evaluates all supply offers against competitive hourly-block import supply. If a supplier within the CAISO attempts to economically withhold supply, the CAISO would clear lower cost hourly-block imports instead, leaving the internal CAISO supplier without energy schedules and unlikely to receive energy schedules in the fifteen-minute and five-minute markets. The CAISO continues to propose to only perform the pivotal supplier test in the hour-ahead scheduling process because this process properly accounts for the competitive pressure that hourly block import supply places on internal suppliers.

Several stakeholders opposed the use of bi-lateral electrical trading hub prices in both the test trigger and the competitive locational marginal price calculation. First, they reason that using bi-lateral trading hub prices may improperly assume that the trading hub is in a competitive region. Second, they observe that the bi-lateral trading hub prices can be illiquid during intervals with tightened supply conditions. Third, they explain that using the bi-lateral trading hub prices would effectively circumvent the system market power mitigation in the real-time market because those trading hub clearing prices incorporate an expectation of the CAISO's day-ahead market prices which will not be subject to system-level market power mitigation. Stakeholders recommended that the CAISO should instead consider using a proxy peaker price based on internal CAISO gas hub prices.

As described in **Section 7.2**, the CAISO acknowledges there may be issues with using the bi-lateral trading hub prices in the pivotal supplier test trigger and has updated its proposal to instead be based on when CAISO prices are greater than both internal CAISO and external hypothetical proxy peaker costs plus an adder. The size of the adder will account for commitment, GHG, and variable operations and maintenance costs that are not currently included as part of the CAISO's proxy peaker cost calculation. The CAISO proposes to use the external proxy peaker prices to indicate when there may be limitations on CAISO's access to west-wide energy that are beyond CAISO's boundary. The CAISO proposes to use the internal CAISO proxy peaker prices to indicate that suppliers may be able to exercise market power by elevating prices above this reasonable estimate of marginal energy costs. As described in **Section 7.5**, the CAISO also acknowledges that there may be issues with using the bi-lateral trading hub prices in the real-time competitive LMP calculation and has updated its proposal to be based on import offer prices and EIM balancing authority area marginal energy costs.

Some stakeholders believe the CAISO should extend its pivotal supplier test to test EIM participating generators controlled by suppliers that also control resources in the CAISO balancing authority area. The CAISO's intent in developing this proposal has been to address system-level market power within the CAISO balancing authority area. Broader

system-level market power mitigation efforts would require far more extensive system changes to account for changing groupings of EIM balancing authority areas. Additionally, such changes would have to be considered relative to the voluntary nature of EIM participation outside the CAISO balancing authority area.

Some stakeholders suggest that the CAISO should pursue a conduct and impact test rather than a three-pivotal supplier test. They argue system-level market power mitigation should only be triggered when there is a clear impact to market prices and market participants have exceeded pre-defined bidding thresholds. The CAISO continues to propose in this revised draft final proposal to structure the system-level market power mitigation process similar to its existing market power mitigation processes using a pivotal supplier test, rather than applying a different style test at a system-level than at a local level. The CAISO has extensive experience designing and implementing market power mitigation processes that use the pivotal supplier test, and such tests remain a just and reasonable way to identify and mitigate potential market power. The implementation timeline for this initiative does not afford the CAISO enough time to fully evaluate, design, and implement a full conduct-and-impact style market power test. Nonetheless, through the stakeholder process, the CAISO has discovered that various impact-style price screens can add value to its system-level test, and it has proposed to use those screens, as described in **Section 7.2**.

Stakeholders requested additional information on the frequency that the proposed system-level market power test would be triggered and the frequency with which it would result in mitigation. The CAISO will provide an estimate the frequency in which the pivotal supplier test would have been triggered prior to seeking approval for tariff changes from the CAISO Board of Governors. However, it has determined that an estimate of how often the proposal would have resulted in mitigation is not feasible prior to developing the full software capabilities. Because the CAISO anticipates that the test will be triggered in many less intervals than previous proposals, it believes an estimate of how often the test would actually result in mitigation would not reveal much additional insight.

Finally, multiple stakeholders recommend the CAISO focus its efforts on accurately reflecting scarcity pricing in the market in tandem with addressing system market power. They suggest, at a minimum, the CAISO prioritize a separate scarcity pricing stakeholder effort to adopt scarcity pricing market design mechanisms. This initiative is narrowly focused on designing and implementing a market power mitigation process to identify and mitigate system-level market power in CAISO balancing authority area prior to Summer 2021. However, the CAISO acknowledges the concerns stakeholders have regarding scarcity pricing, and has begun to address them as part of the Flexible Ramping Product (FRP) Refinements. Those changes will place an increasing premium on energy prices as energy becomes scarce and the market forgoes procuring flexible capacity. In addition, the market conditions during the August heat waves demonstrate the need to comprehensively consider the role of scarcity pricing in the CAISO markets and to consider further CAISO market changes. Consequently, the CAISO plans to complete a separate scarcity pricing market design initiative in 2021.

3 Issue

The CAISO's current approach to measures to address system-level market power in the CAISO balancing authority area is based on past assumptions that the CAISO market is competitive at the balancing authority area (*i.e.*, "system") level. Because of this, the only mitigation for system-level market power in the CAISO balancing authority area are its energy bid caps. The CAISO market does not dynamically test for or otherwise mitigate for system-level market power in the CAISO balancing authority area. Also because of this assumption, the market power processes used for both the CAISO balancing authority area as well as the other balancing authority areas in the EIM use a "competitive LMP" calculated based on the prices within the CAISO balancing authority area.

In recent analyses, the CAISO and the Department of Market Monitoring found that conditions in the CAISO balancing authority area were potentially uncompetitive during certain times, and the Department of Market Monitoring believes that these conditions have been worsening over the past three years. The CAISO found that there were 201 hours (just over 2 percent of the hours) in 2018 in which its supply mix was potentially uncompetitive.¹ The Department of Market Monitoring completed a similar analysis, finding the supply mix was potentially uncompetitive in 272 hours in 2018.² This metric prepared by the Department of Market Monitoring shows that competitive conditions have worsened over the past three years, with only a recent uptick in competitiveness in 2019.³

Both the CAISO's and the Department of Market Monitoring's metrics are broad structural indicators that do not directly measure if suppliers actually possess substantial system-level market power in the CAISO's energy markets. In its recent opinion on system market power, the Market Surveillance Committee noted from their review of these analyses that pivotal supplier tests indicate that there might have been some limited potential for market power at the system level. However, according to analyses of prices and costs that have been carried out to date, this market power has not been exploited very frequently or aggressively.⁴

Nonetheless, the CAISO is concerned that market conditions in the coming years may change in ways that will exacerbate the potential for system-level market power. Changes and trends that may increase the potential for system-level market power in the coming years include:

¹ "Analysis of Structural System-Level Competitiveness in the CAISO Balancing Authority Area, Revised Version," September 3, 2019, <http://www.caiso.com/Documents/RevisedWhitePaper-SystemMarketPowerAnalysis.pdf>

² The Department of Market Monitoring summarized its findings in a June 7, 2019 presentation to the Market Surveillance Committee. http://www.caiso.com/Documents/Presentation-AnalysisOfSystemLevelMarketPowerDMM-June7_2019.pdf

³ See Department of Market Monitoring, "2019 Third Quarter Report on Market Issues and Performance," Section 3.5.2, published on December 5, 2019.

⁴ Market Surveillance Committee, "Opinion on System Market Power Mitigation," Section II, November 5, 2019. http://www.caiso.com/Documents/MS-C-DraftOpiniononSystemMarketPowerMitigation-Nov5_2019.pdf

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- Retirement and mothballing of gas capacity in the CAISO balancing authority area.
- Fewer energy tolling contracts between gas units within the CAISO and load serving entities without an incentive to exercise market power.
- Tightening west-wide supply conditions.

In this initiative, the CAISO intends to design a system-level market power mitigation process that aligns with its principles discussed in **Section 4**. Following these principles, the CAISO can develop a market power mitigation process that will capture instances where suppliers may exercise material market power at a system-level regardless of if the conditions above materialize.

4 Principles

Effective market power mitigation should result in energy prices that approximate the prices that would occur in a competitive market (*i.e.*, prices should reflect the marginal cost of the highest cost unit dispatched). Any approach should consider whether suppliers have the opportunity to exercise market power (*i.e.*, when conditions are uncompetitive) because mitigation during actual competitive conditions may discourage supply and demand participation in the market. For example, suppliers may seek competitive sales elsewhere in the western interconnection rather than risk under-compensation through the CAISO's market. As for the demand side, potential mitigation of suppliers during actual competitive conditions may discourage demand from participating in the market and engaging in forward contracting.

The CAISO continues to believe that system market power is best addressed through long-term contracting, which includes the long-term procurement framework and resource adequacy requirements developed by the CPUC and other local regulatory authorities. These are an essential component of the protections against market power in the overall market design.⁵ The CAISO's "damage control" bid caps also continue to be a component of the CAISO's system market power mitigation and take into consideration the overall competitiveness of energy markets.⁶ FERC agreed the CAISO's overall market design was just and reasonable and noted that "if the CAISO believes the mitigation package along with strong market behavior rules and the must-offer obligation for resource adequacy generation is insufficient to prevent the exercise of market power, the CAISO can immediately request a change of one or more of the market power mitigation measures."⁷

Consequently, in this initiative the CAISO has proposed to use the following principles to address system market power:

- Energy prices should reflect the marginal cost of the highest cost resource used to meet demand. Energy prices should be competitive across the region when energy transactions are not limited by transmission capability.
- A supplier should not be forced to sell power below its offer price if it cannot exert market power. Supply offers should be mitigated to marginal costs to the extent supply has market power.

⁵ MRT Transmittal Letter, FERC Docket No. ER06-615, at p. 40, <http://www.aiso.com/Documents/MRTUTransmittalLetter.pdf> (February 9, 2006).

⁶ Although the FERC increased the "damage control" caps in Order No. 831, the increase is subject to cost verified incremental bids for internal resources, which provides a reasonable measure for ensuring system prices do not exceed the marginal cost of the highest cost unit dispatched. These protections are not present with regards to the CAISO market at the interties, where participants will be able to submit economic bids that exceed \$1000/MWh up to \$2000/MWh without cost verification. Therefore, the CAISO is considering cost verification procedures for intertie bids in a separate initiative.

⁷ MRTU September 21, 2006 Order, Docket ER06-615, at P 1020 (116 FERC ¶ 61,274) (available at: http://www.aiso.com/Documents/September21_2006FERCOrderAcceptingCaliforniaISOCComplianceFilinginDocketNo_ER02-1656-024_Amendment44-MRTU_.pdf)

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- The mitigation design should not deter robust market participation and long-term forward contracting. The design should maintain strong incentives for suppliers and consumers to economically participate in the CAISO's market and to enter into long-term forward energy contracts.
- Mitigation should be effective at mitigating the exercise of market power. A supplier should not be able to easily circumvent the effects of the mitigation.

5 Scope

The CAISO plans to implement system-level market power mitigation in two phases. The CAISO plans to implement a first phase expeditiously so system-level market power mitigation measures are in place by summer 2021. A second phase will allow time to address more complex and/or contentious policy issues and more extensive system development.

The CAISO outlines below the scope of the phase 1 implementation. The approach for each scope item is based on the principles described in **Section 4**.

5.1 Implement in real-time market

The phase 1 scope addresses system-level mitigation in the real-time market. There are structural limitations that make the real-time market particularly susceptible to suppliers potentially exercising market power and, as such, any design the CAISO would pursue would at a minimum apply to its real-time market. The CAISO also believes there are many different requirements to consider regarding implementing system-level market power in the day-ahead market that may take longer to resolve than the phase 1 policy development timeline.

The Market Surveillance Committee highlighted some concerns that may arise if the CAISO were to only apply system-level market power mitigation to the real-time market. The CAISO believes that real-time market power mitigation will add a significant level of protection against the exercise of market power in the day-ahead market until it can develop day-ahead market system-level market power mitigation in phase 2 of this initiative.

5.2 Pivotal supplier test trigger

The phase 1 scope includes determining the circumstances in which the market power mitigation process will consider the CAISO balancing authority area to be import constrained or whether import constraints must be binding to apply mitigation. Within the phase 1 scope, the CAISO has also considered the view of some stakeholders that the CAISO balancing authority area does not need to be import constrained to apply system-level market power mitigation.

5.3 Pivotal supplier test application

The phase 1 scope considers the appropriate quantities of supply included in calculating the residual supply index used for system-level market power mitigation measures. In general, supply offers have certain limitations (such as whether import offers are limited by intertie transmission constraints) that must be considered in mitigation design. The phase 1 scope also includes considering whether a supplier's load serving obligations should be subtracted from its supply quantity in calculating its supply quantity used in the residual supply index calculation. This may be appropriate to more accurately

identify suppliers that have an incentive to economically withhold supply from the market.

5.4 Energy offer mitigation

The phase 1 scope also includes considering whether system-level market power mitigation applies to energy offers for resources within the CAISO balancing authority area. The phase 1 scope also includes examining if there may be circumstances in which mitigation applies to other resource offers within the EIM footprint.

6 Background

6.1 Competitiveness, market power, and market power mitigation

The CAISO operates a competitive energy market where energy is priced based on marginal cost. Market power is the ability of a supplier to artificially raise market clearing prices above marginal cost by physically or economically withholding supply from the market. Suppliers that exercise market power undermine efficient market operations and efficient energy price formation. The CAISO market includes features to automatically detect structurally uncompetitive conditions and mitigate submitted energy offers to estimated cost-based levels.

Suppliers have the potential to exercise market power when overall market conditions are uncompetitive. The CAISO measures competitiveness in its energy market by assessing whether supply that is not controlled by the largest three suppliers can serve demand.

In LMP-based markets, it is imperative that market operators have the ability to mitigate the potential exercise of market power in transmission-constrained areas when that area is found to be uncompetitive. Otherwise, suppliers located in such areas could be in a position to artificially raise prices above marginal costs due to the lack of competitive alternatives.

The CAISO markets employ a dynamic local market power mitigation process that identifies local areas, identifies when the local area is not competitive, and mitigates local suppliers' offers to the greater of a pre-established estimate of marginal costs or the broader system competitive energy price.

The dynamic local market power mitigation process tests transmission constraints for competitiveness by comparing the demand for counter-flow to a constraint to the available supply of counter-flow. The test employs a "residual supply index," which is the ratio of the supply of counter-flow to the demand for counter-flow. The test assumes some portion of the supply for counter-flow from potentially pivotal suppliers is withheld. A transmission constraint is deemed competitive if the ratio of non-pivotal supply to demand is greater than or equal to one and uncompetitive if less than one. Currently, the test treats the three highest ranked suppliers, in terms of capacity that can be withheld, as potentially pivotal.

The same dynamic local market power mitigation process also assesses individual transmission constraints within balancing authority areas participating in the Western EIM.

In addition to the dynamic local market power mitigation process, each balancing authority area participating in the EIM is also subject to a system-level market power mitigation process.⁸ This mitigation process tests whether demand within the balancing authority area has access to competitive external supply by first finding whether the balancing authority area is import constrained. If the balancing authority area is import constrained, the mitigation process tests whether the internal supply mix is competitive using the residual supply index. If the area is found uncompetitive, the market uses mitigated supply offers inside that area. The CAISO uses mitigated supply offers because suppliers in the constrained area could potentially exercise market power on demand within the constrained area.

Generally, the CAISO mitigates supply offers to the greater of what it calls “default energy bids” or the competitive LMP. Default energy bids are the CAISO’s estimate of resource marginal costs. The competitive LMP is the energy price outside of the constrained area.

6.2 The broader western bilateral market

The CAISO operates the only LMP-based energy market in the western interconnection. Suppliers in the western interconnection that are not participating in the Western EIM may offer their power to the CAISO at its intertie locations or to other buyers through the bilateral market.

One way buyers and sellers engage in bilateral transactions is by bidding for and offering power at various western energy trading hubs. Trading hubs are pricing locations where buyers and seller transact energy. **Figure 1** shows the relationship between various western energy trading hubs and the CAISO.

⁸ The balancing area-wide mitigation process is applied to all balancing areas other than the CAISO.



Figure 1: The relationship between various western energy trading hubs and the CAISO

Suppliers that offer their power to the CAISO at its intertie locations must procure external transmission rights in order to deliver power to the CAISO.⁹ Transmission rights are generally available to all market participants and the quantity of these rights generally exceed the CAISO’s locational import capability.¹⁰ Under open access requirements, all market participants have access to external transmission rights because, even if participants have not procured long-term rights, transmission owners must release unused transmission capacity by the time the CAISO executes its real-time market.

While the CAISO operates an energy market with varying hourly prices, the broader western energy market generally transacts energy blocks of peak and off-peak power. There is one energy price for all hours within the block. Suppliers that offer their power in the broader western interconnected system presumably compare the CAISO’s expected average LMP during the peak or off-peak period to the expected peak or off-peak western trading hub energy prices.

⁹ See e.g., Section 30.5.7 of the CAISO tariff and its subsections, specifying transmission profile E-tagging requirements for different types of intertie bids.

¹⁰ Public data show that there are numerous holders of firm transmission rights to the major interties with California. For instance, nineteen different entities hold transmission rights on the Pacific AC and Pacific DC transmission facilities that connect the Pacific Northwest with California, with thirteen different entities holding more than 100 MW of rights and five different entities holding more than 500 MW of rights. The total firm capacity to deliver external supply to these two locations alone is 7,900 MW – in excess of the approximate 4,800 MW that these locations are generally limited to in the CAISO’s markets.

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When examining 29 high-priced hours¹¹ in 2018, the Market Surveillance Committee found that the day-ahead prices at the external trading hubs were generally in line with or above day-ahead market prices at the corresponding CAISO interties, Malin and Palo Verde.¹² **Table 1** shows the CAISO LMPs for PG&E, SCE, and SDG&E averaged over the on-peak period compared to the bilateral trading hub on-peak prices on those same days.

Table 1: CAISO and Bilateral On-Peak 16-Hour Prices

	Average	Number	LAP Prices			CAISO Intertie Prices			Platts MW Daily		
	Markup	RSI Fail	PG&E	SCE	SDGE	Malin	NOB	Palo Verde	MID C	Palo Verde	COB
21-Feb	4.62	0	48.77	151.78	201.43	47.91	44.83	66.05	38.11	49	48.33
23-Jul	11.94	9	135.09	168.57	176.79	126.31	160.37	155.40	196.23	261.50	222.50
24-Jul	14.32	10	278.65	392.97	396.95	264.85	355.01	357.93	219.37	348.75	294.50
25-Jul	8.12	10	243.06	315.98	379.96	191.75	292.53	291.17	216.54	260.00	251.00
26-Jul	12.22	9	140.99	176.48	188.07	127.50	161.94	161.13	195.57	225.25	228.00
27-Jul	3.90	7	108.65	131.87	143.82	90.21	118.71	117.82	87.24	99.25	95.00
28-Jul	3.09	3	66.56	72.78	74.76	61.97	70.63	67.70	87.24	99.25	95.00
7-Aug	0.37	5	139.33	291.90	292.39	142.58	254.86	266.70	300.00	377.50	310.22
8-Aug	4.19	5	112.64	173.47	176.81	111.45	146.41	156.76	147.66	175.00	148.50
10-Aug	4.16	0	94.79	135.77	149.78	84.53	77.60	61.22	53.41	94.66	65.00

Source: http://www.caiso.com/Documents/MS-C-DraftOpiniononSystemMarketPowerMitigation-Nov5_2019.pdf

6.3 General market power mitigation design elements

The objective of market power mitigation is to provide effective measures against the exercise of market power. Historically, the CAISO has relied on long-term contracting between supply and demand to address system-wide market power and the existing “damage control” bid caps work to limit the pricing exposure should any market participant exercise such market power. Also, the CAISO has not applied a system-level market power mitigation process to its market because it generally has access to large amounts of presumably competitive west-wide power through economic offers at its interties.

To this end, the CAISO carefully considers the question of whether or not suppliers have the opportunity to exercise market power (*i.e.*, when conditions are uncompetitive) because mitigation during actual competitive conditions may discourage supply and demand participation in the market. The CAISO understands that potential mitigation of suppliers during actual competitive conditions may discourage suppliers from participating in the CAISO’s markets altogether as they seek competitive sales elsewhere in the western interconnection rather than risk under-compensation through the CAISO’s market. As for the demand side, potential mitigation of bids during actual

¹¹ The 29 hours over 10 days in 2018 are representative of: (1) the hours in which one or more of the SCE, SDG&E or PG&E load aggregation point (LAP) prices exceeded \$500/MWh and (2) the hours during 2018 in which the California ISO Department of Market Monitoring found a difference of \$20/MWh or more between (i) a simulated integrated forward market (IFM) clearing price calculated using the actual offer prices used to clear the IFM and (ii) a simulated IFM clearing price calculated using the lower of the actual offer price or the default energy bid for each gas-fired resource that was committed in the actual IFM solution.

¹² See Market Surveillance Committee, “Opinion on System Market Power Mitigation,” Appendix A, Table 4, published on November 5, 2019. http://www.caiso.com/Documents/MS-C-DraftOpiniononSystemMarketPowerMitigation-Nov5_2019.pdf

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competitive conditions may discourage demand from participating in the market through price-sensitive bids and engaging in forward energy contracting.

Effective market power mitigation should result in energy prices that approximate the prices that would result in a competitive market (*i.e.*, prices should reflect the marginal cost of the highest cost unit dispatched). Without a market power mitigation process in place, suppliers within constrained areas could exercise market power on demand within constrained areas when conditions within the constrained areas are uncompetitive. This condition would lead to energy prices that are above the prices that would result from a competitive market. To achieve an effective market power mitigation design that does not discourage supply and demand participation, the CAISO's market power mitigation measures include an evaluation of the competitiveness of the supply within the constrained area before mitigating supply offers within the constrained area.

The CAISO's current market power mitigation design reflects these principles by following a three-step process where the CAISO market:

- (1) Identifies a constrained area (or constraint)
- (2) Tests the supplier concentration in the constrained area
- (3) Mitigates offers within the constrained area when the supplier concentration test fails

For example, consider an afternoon in southern California when system conditions are stressed. Transmission lines into southern California from the North and the East are limiting the ability of demand within southern California to access additional competitive supply outside of southern California. In **Figure 2**, the box represents the constrained southern California area. The black circles represent supply within southern California (circle A) as well as supply outside of southern California (circles B and C).¹³ Energy prices within southern California are \$300 while prices outside southern California are \$50 due to the binding constraints into southern California (represented by the red arrows).

¹³ This example is a simplification of the actual local market power mitigation process, which identifies specific constraints and evaluates the ability of resources to provide relief on the specific constraints. Under the actual local market power mitigation process, constrained areas are implicitly defined by the ability of a subset of generators to provide relief on specific constraints. Nonetheless, it remains that a constrained area is identified, competitiveness is tested, and resources within the constrained area may be mitigated.

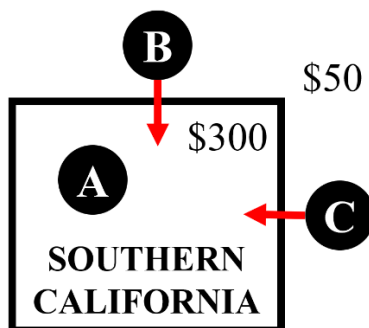


Figure 2: A constrained southern California on a stressed afternoon

The CAISO does not mitigate offers in southern California unless it first finds that the constrained area is potentially uncompetitive. Supplier A may be able to exercise market power in southern California if the supply mix inside southern California is found to be uncompetitive. The CAISO tests competitiveness using a residual supply index that tests whether demand within the constrained southern California can be served without the largest three suppliers in the constrained southern California. The CAISO mitigates supplier offers within southern California only when this test fails.

The CAISO does not mitigate offers from suppliers B and C because neither supplier B nor supplier C could exercise market power on demand within southern California. Both supplier B and supplier C are located in an unconstrained competitive area. If supplier B or supplier C would try to exercise market power by raising their offer prices above their marginal costs, they would risk losing the sale to another supplier in the unconstrained competitive area. Supplier A, on the other hand, may be able to exercise market power by raising its offer prices above its marginal costs, because demand in southern California cannot access cheaper sources of power due to the transmission constraints.

The CAISO applies the same design pattern to EIM balancing authority areas at a local level (*i.e.*, on specific transmission constraints within the balancing authority area) as well as at an EIM balancing authority area system-level.¹⁴ The CAISO balancing authority area is the only participating EIM balancing authority area to which the CAISO does not apply a system-level market power mitigation process.

¹⁴ See *California Indep. Sys. Operator Corp.*, 148 FERC ¶ 61,222 (2014) (available at: http://www.caiso.com/Documents/Sep22_2014_Order_EIMEnhancements_ER14-2484.pdf)

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This section outlines the CAISO's proposed approach to implement an automated system-level market power mitigation process in the real-time market. The CAISO proposes that the system-level market power mitigation process only mitigates offers for resources located within the CAISO balancing authority area. This initiative's intent is to address system-level market power within the CAISO's balancing authority area.

The CAISO proposes that the market would trigger the system-level market power test only when there are indications that suppliers could exercise market power. The trigger is important because the three-pivotal supplier test is only an approximate indicator that suppliers may be able to exercise market power and there could be significant adverse impacts of system-wide mitigation when the test fails but market power is not actually being exerted (i.e., false positives). Consequently the CAISO proposes that the market will trigger the system-level market power test only in market intervals when there are indications that market prices in the CAISO balancing authority may be elevated above competitive levels. Using the trigger to limit the application of the pivotal supplier test will limit the potential for false positives.

The CAISO proposes that the market will only trigger the system-level market power test when both of the following two conditions are met. First, the CAISO balancing authority area must be in the highest priced import transfer-constrained EIM region. Second, the CAISO balancing authority area marginal energy cost is greater than all internal CAISO and external proxy cost calculations that approximate the costs of a gas peaker based on current gas prices.

The CAISO proposes that the system-level market power test will be based on a system-level residual supply index calculation using three pivotal suppliers, also termed a "pivotal supplier test." The pivotal supplier test will assess whether energy supply offers from non-pivotal suppliers¹⁵ in the constrained region the CAISO is in are sufficient to meet the region's demand without three pivotal suppliers (i.e., suppliers whose energy is required to meet demand) that potentially could exert market power.

The CAISO does not propose any changes to the market power mitigation processes for EIM balancing authority areas. The EIM already effectively applies a system-level market power mitigation process for balancing authority areas outside the CAISO because for them it mitigates energy offers for potential market power at the balancing authority area level.¹⁶ It does not currently do this for the CAISO balancing authority area.

The CAISO proposes to enhance the pivotal supplier test used for system-level market power mitigation relative to that used for existing local market power and EIM mitigation

¹⁵ In its determination of whether or not a constraint is competitive, the CAISO considers suppliers to be "non-pivotal" as those suppliers internal to the constraint that is not controlled by the identified potentially pivotal suppliers that provide counter-flow to the transmission constraint. See existing section 39.7.2.2 (B)(b). The CAISO proposes to apply the same principles in identifying the whether a resource is fringe as it does today.

¹⁶ See *California Indep. Sys. Operator Corp.*, 148 FERC ¶ 61,222 (2014) (available at: http://www.caiso.com/Documents/Sep22_2014_Order_EIMenhancements_ER14-2484.pdf)

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processes. This enhancement will increase the pivotal supplier test's accuracy by reducing net-seller potentially pivotal supply quantities to account for load-serving obligations, rather than relying on a static net-seller designation that assumes all of the net-seller's supply is potentially pivotal.

Relative to the CAISO's existing mitigation processes, this proposal improves the precision of offer mitigation by only mitigating resource offers from suppliers whose supply is pivotal to meeting demand. The CAISO is proposing this because non-pivotal suppliers do not have an incentive to economically withhold supply from the market. This improvement is important for a system-level market power mitigation process because otherwise the process would mitigate offers from a larger segment of suppliers with no ability to exercise market power.

Finally, the proposed approach counts economic import offers at the CAISO's import scheduling locations using a quantity that considers that the various import scheduling limits may prevent all import offers from clearing the market, rather than assuming all un-cleared import supply in the market power mitigation pass is not available.

The CAISO discusses each element of this proposal in the following sections:

- **Section 7.1** discusses the CAISO's proposal to only apply system-level market power mitigation to the real-time market in this initial phase of developing an automated system-level market power mitigation process in the CAISO market.
- **Section 7.2** discusses the CAISO's proposal to only perform a three pivotal supplier test when the CAISO balancing authority area marginal energy cost is greater than internal and external proxy peaker prices and the CAISO balancing authority area is in the highest priced transfer-constrained EIM region
- **Section 7.3** discusses the CAISO's proposal to use a three pivotal supplier test to determine if pivotal suppliers in the CAISO balancing authority area could potentially exercise market power in the constrained region.
- **Section 7.4** discusses the CAISO's proposal to calculate the competitive LMP when the CAISO balancing authority area fails the system-level market power mitigation test.
- **Section 7.5** discusses the CAISO's proposal to only mitigate energy bids for supply resources with pivotal supply offers within the CAISO balancing authority area when the pivotal supplier test fails.
- **Appendix A: System-Level Market Power Mitigation High-Level Business Requirements (Preliminary)** provides a preliminary draft of the high-level business requirements that summarizes this proposal and a summary of the steps of the system-level market power mitigation process.

7.1 Implement system market power mitigation in the real-time market only

The CAISO proposes to apply the system-level market power mitigation process to only its real-time market in this initial phase of developing and implementing system-level market power mitigation.

In developing this proposal, the CAISO ultimately decided not to, at least initially, implement system-level market power mitigation processes in its day-ahead market in addition to the real-time market. The CAISO currently plans to work with stakeholders to consider whether it would be appropriate to extend system-level market power mitigation to the day-ahead market in subsequent stakeholder initiatives. The CAISO is pursuing a phased approach, aiming to mitigate the potential to exercise system-level market power while avoiding unnecessary offer mitigation that would discourage supply and demand participation in the CAISO markets. If the interaction between the day-ahead and real-time markets is efficient, it should reduce the need to apply a system-wide market power mitigation to the day-ahead market.

By concentrating on system-level market power mitigation in the real-time market in this initiative, the CAISO and stakeholders will have more time and experience to consider system-level market power mitigation in the day-ahead market. Also, by implementing system-level market power mitigation in the real-time market first, the CAISO will be able to monitor system-level mitigation performance for adverse effects. Finally, applying system-level market power mitigation in the real-time market only, will allow the CAISO to implement system-level mitigation in-place sooner than could be accomplished if it were also implemented in the day-ahead market.

The real-time market is the priority because it is likely more susceptible to market power than the day-ahead market for two reasons. First, the real-time market clears supply against the CAISO's demand forecast, rather than clearing against demand bids like the day-ahead market does. Because load serving entities do not bid the price they are willing to pay for energy in the real-time market, a supplier in an uncompetitive area may exercise market power and increase prices irrespective of the price load serving entities are willing to pay. Second, the real-time market lacks a mechanism for virtual supply to apply competitive pricing pressure on physical suppliers. Without competitive pressures from virtual supply, suppliers may increase the market prices above marginal costs without risking losing the sale of its energy because they submitted a bid price above marginal costs.

Although the real-time market is more vulnerable to the exercise of market power, the CAISO recognizes that there could be drawbacks to its initial real-time-only approach. In a recent opinion, the CAISO's Market Surveillance Committee highlighted some risks to a real-time-only approach. The application of system-level market power mitigation in the real-time market only, may allow some level of market power to be exercised in the day-ahead market when real-time supply elasticities diverge from day-ahead supply elasticity. However, the Market Surveillance Committee supported the approach to

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implement system-level market power mitigation initially in the real-time market only because it would address market power in the real-time market while somewhat constraining (although not completely precluding) the market power in the day-ahead market and the CAISO could implement it quickly without delaying other projects.¹⁷

¹⁷ See Market Surveillance Committee, “Opinion on System Market Power Mitigation,” Appendix B, published November 5, 2019. http://www.caiso.com/Documents/MS-C-DraftOpiniononSystemMarketPowerMitigation-Nov5_2019.pdf

7.2 Pivotal supplier test trigger

From the beginning of this initiative, the CAISO has taken a cautious design approach because system-wide market power mitigation has potentially very broad and consequently significant market impacts. Broadly applying system market power mitigation when there is not actually the potential for market power could discourage supply and demand participation in the market or lead to market clearing prices that do not support suppliers' real operating costs. It could also discourage demand from engaging in long-term contracting, which is a fundamentally essential protection against market power. The CAISO believes it should only intervene in the market in such a broad way when it is reasonably concerned about market outcomes.

The CAISO proposes several elements of the system-level market power mitigation process so that it will only mitigate offers when it is likely market power is present. First, the CAISO proposes the market would conduct the market power test only in the real-time market's hour-ahead scheduling process because only that market run can account for the competitive pressure hourly-block imports place on suppliers submitting offers for resources in the CAISO balancing authority area. Second, the CAISO proposes to only apply the mitigation process when it is reasonably concerned that its balancing authority area is in a constrained region of the western interconnection. This is necessary because suppliers in constrained regions may exercise market power. Finally, the CAISO proposes to apply the mitigation process only when market prices rise high enough to indicate that suppliers could be exercising market power.

In this section, the CAISO proposes that the hour-ahead scheduling process will execute a system-level pivotal supplier test over each fifteen-minute interval when market conditions indicate that the CAISO balancing authority area could be uncompetitive. To account for potential limited access to competitive import supply the CAISO balancing authority area's marginal energy cost must be greater than all external proxy peaker prices and the CAISO balancing authority area must have the highest marginal energy cost in the EIM. To avoid potentially harmful intervention in the market during conditions when suppliers are unlikely to exercise system market power the CAISO balancing authority area marginal energy cost also must be greater than and internal CAISO proxy peaker price.

Perform the system-level three pivotal supplier test in the hour-ahead scheduling process

The CAISO proposes to perform the pivotal supplier test only in the hour-ahead scheduling process because this process fully accounts for the competitive pressure that hourly block import supply places on internal suppliers. In developing this proposal, the CAISO considered whether it should perform a system-level three-pivotal supplier test in the fifteen-minute and five-minute markets in addition to the hour-ahead scheduling process. For a given hour in the real-time market, all suppliers must submit supply offers to the CAISO prior to the hour-ahead scheduling process. Suppliers

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cannot change their offering behavior in response to the hour-ahead scheduling results, and aggregate system conditions are not anticipated to dramatically change between the hour-ahead scheduling process and the fifteen-minute and five-minute markets. Consequently, the pivotal supplier test should consider all of the supply offers submitted for an hour, which are the offers used by the hour-ahead scheduling process.

At a system-level, the hour-ahead scheduling process fully accounts for the competitive pressure that hourly block import supply places on internal suppliers, while subsequent markets would undervalue this competitive pressure. The hour-ahead scheduling process compares hourly block import offers to the internal supply offers to clear the most economic supply to meet demand. When the supply available in the hour-ahead scheduling process passes the system market power mitigation test, it shows that there was a structurally competitive supply mix offered into the market in that hour. After the hour-ahead scheduling process is complete, the market then converts the cleared hourly block imports to self-scheduled supply in the fifteen-minute and five-minute market and the market does not make the remaining uncleared hourly block import offers available to subsequent sub-hourly markets. Similarly, the market does not make un-cleared fifteen-minute dispatchable offers available to the five-minute market. This causes subsequent sub-hourly markets to see a much lower quantity of available non-pivotal supply than actually competed with internal supply. If the mitigation test were to only evaluate the cleared import supply in the fifteen-minute market, it would undervalue the competitive pressure that the actual higher volume of hourly block import supply places on internal suppliers.

Also, suppliers cannot strategically use offers to exercise market power in subsequent sub-hourly markets because suppliers cannot change their offers in the real-time market after they submit their offers to the hour-ahead scheduling process.

Finally, system conditions will not typically change significantly enough between the hour-ahead scheduling process and the fifteen-minute market to assume in the fifteen-minute market that there was not previously enough competitive pressure from hourly block import supply in the hour-ahead scheduling process to overcome these differences. This is in contrast to the significant changes that can occur between the day-ahead and real-time markets.

Although the CAISO proposes to trigger the pivotal supplier test only in the hour-ahead scheduling process, the system market power mitigation process will use the mitigated energy offers in each fifteen-minute market interval that failed the pivotal supplier test. The five-minute real-time dispatch will also use the mitigated offers in the corresponding five-minute market intervals. The CAISO trigger will be based on the binding fifteen-minute intervals of the hour-ahead scheduling process (i.e. the intervals for which the hour-ahead scheduling process produces import and export schedules.)

Price criteria to trigger system-level pivotal supplier test

The CAISO proposes that the system-level market power mitigation process applies the pivotal supplier test in the hour ahead scheduling process fifteen-minute intervals that meet all of the following criteria:

- There are indications that the CAISO balancing authority area is import constrained:
 - The CAISO balancing authority area's marginal energy cost is greater than a proxy cost calculation of the costs of a hypothetical external gas-fired peaker based on current gas costs.
 - The CAISO balancing authority area's marginal energy cost is the highest marginal energy cost in the EIM and the CAISO balancing authority area is in an import constrained region in the EIM. This comparison will not consider EIM balancing authority areas whose marginal energy costs are elevated above the CAISO's marginal energy cost administratively due to a failure of the upward Flex Ramp Sufficiency Test.
- CAISO prices indicate that suppliers could potentially exercise market power:
 - The CAISO balancing authority area's marginal energy cost is greater than the proxy cost calculations of hypothetical internal CAISO gas-fired peakers based on current gas costs

Conditions causing the CAISO to be reasonably concerned that the CAISO balancing authority area is import constrained

The CAISO balancing authority area has two sources of energy from outside its balancing authority area: EIM transfers resulting from the EIM's resource-specific dispatch and imports from import bids at the CAISO's interties. When EIM transfers between balancing authority areas are binding, the higher priced balancing authority areas cannot access additional 15-minute supply through the EIM. In addition to these transfers, the CAISO has access to import supply offered directly at its intertie scheduling locations. The supply offered at CAISO's interties may be limited directly by CAISO's intertie scheduling limits or by broader transmission and supply limitations.

For a CAISO market participant to exercise market power, the CAISO has to have limited access to either of these sources of external supply. Referencing an external proxy peaker price captures conditions when a transmission limitation prevents the CAISO balancing authority area from being able to access additional external supply. Ensuring the CAISO has the highest marginal energy cost in the EIM within a

constrained area captures conditions when the CAISO is unable to access additional supply, regardless of price, from EIM participating resources.

CAISO constrained from accessing additional non-EIM imports

The supply offered at CAISO's interties may be limited directly by CAISO's intertie scheduling limits or by broader transmission and supply limitations. The CAISO proposes to compare the CAISO balancing authority area marginal energy cost to external proxy peaker prices to determine if it is import constrained from other balancing authority areas in the western interconnection. If CAISO's prices rise above external proxy peaker prices, it is likely some external limitation is preventing more supply from getting to CAISO's interties because the CAISO would expect profit-seeking marketers to offer to deliver cheaper external supply to CAISO's interties.

The CAISO proposes to trigger the pivotal supplier test when the CAISO balancing authority area's marginal energy cost is greater than the proxy cost of an external hypothetical gas-fired peaker, described in further detail below. The comparison to external proxy peaker prices is intended to capture conditions where lower cost supply is available in the western interconnection but the CAISO is unable to access this supply due to a limitation beyond the CAISO's boundary. When these price differences arise, it indicates the CAISO (or the CAISO as part of a broader geographic area) is import constrained from competitive external supply. The CAISO proposes to use the proxy peaker price to represent peaking supply in the western interconnection that may be available to be imported into the CAISO. The CAISO recognizes there is a potential for anomalous isolated gas events to influence this calculation, which may prevent the pivotal supplier test from being applied, however we believe these events are infrequent and unlikely to correspond to periods when there exists a likelihood for the exercise of system market power in the CAISO.¹⁸

External proxy peaker price calculation

The CAISO proposes to calculate the external proxy peaker price in a similar manner as the proxy peaker price for the CAISO balancing authority area, except that the external proxy peaker price will also incorporate commitment costs. It proposes to include commitment costs in the external proxy peaker price because offers to import power into the CAISO balancing authority area and bilateral prices outside of the CAISO presumably incorporate these costs. They incorporate these costs because CAISO imports and bilateral transactions use a single offer price. There is no separate offer for commitment costs.

The CAISO proposes to incorporate start-up costs into the proxy peaker's fuel costs by developing a multiplier to account for start-up costs that would be applied to the proxy peaker's incremental fuel costs. The CAISO would develop this multiplier by determining the typical percentage of start-up fuel to a typical peaker's overall fuel

¹⁸ Historically, CAISO market prices have been tame during times when external areas experience isolated anomalous gas supply events.

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costs. It would do this using the assumption the proxy peaker operates at Pmax and that start-up costs are amortized over one hour. The CAISO proposes one hour because the CAISO market can accept an import bid for a single hour only. The default startup operations and maintenance cost for a combustion turbine will also be included as an adder.

Similar to the internal peaker price calculation, the external peaker price will also include the other elements of variable cost default energy bids. However, because operations and maintenance costs attributable to each hour of operation are typically included in minimum load costs, the external peaker price will also include the default hourly operations and maintenance for a combustion turbine.

CAISO constrained from accessing additional EIM imports

In addition to the supply accessed bilaterally from the western interconnection in the previous section, the CAISO has access to supply from the EIM. To meet the triggering threshold for the three pivotal supplier test the CAISO balancing authority area must be in the highest priced region of the EIM and this highest priced region is transfer constrained from other balancing authority areas in the EIM. The CAISO will exclude balancing authority areas whose marginal energy prices are greater than CAISO's and administratively set due to a failure of the upward Flex Ramp Sufficiency Test. Ensuring the CAISO balancing authority area is in the highest-priced EIM region extends the existing EIM market power mitigation principles to the CAISO balancing authority area, allows the mitigation process to consider the full geographic scope of the area which CAISO suppliers may exercise market power, and allows the CAISO to design a competitive LMP that will not interfere with pricing in other balancing authority areas.

In the EIM, the CAISO executes a pivotal supplier test only in balancing authority areas that have system prices elevated above the CAISO system price. Similarly, this screen for CAISO's system-level market power mitigation ensures that the CAISO prices are elevated above other EIM balancing authority area prices. The CAISO will also use the balancing authority area marginal energy costs to define the geographic scope of the region to test whether suppliers in the CAISO balancing authority area could potentially exercise system-level market power. By ensuring that the CAISO balancing authority area is in the most expensive region in the EIM, this screen also allows the CAISO to base its competitive LMP calculation in part on broader EIM conditions. Finally, this screen limits the application of the system market power mitigation process to only situations where CAISO balancing authority area demand has limited access to additional EIM transfers.

Energy prices become different on opposite sides of transfer constraints when the market has access to less supply on one side of the constraint because the constraint is limiting energy flow from the lower-priced region to the higher-priced region. In the real-time market, both imports and EIM energy transfers compete for the same transmission

capacity into the CAISO balancing authority area. Energy prices in the EIM converge with the same power balance constraint shadow price when transfer constraints between the areas do not limit supply transactions.

The CAISO calculates a marginal energy cost for each balancing authority area in the EIM. The balancing authority area marginal energy cost is the cost to serve the next increment of load in the balancing authority area given the various transfer constraints between balancing authority areas. When import transfer constraints are binding into a balancing authority area, that balancing authority area has a higher marginal energy cost reflecting the import-constrained condition. When transfer constraints are not binding between balancing authority areas, they all have the same balancing authority area marginal energy cost.¹⁹

Balancing authority areas, or groups thereof, can become import constrained when import or EIM transfer constraints limit the flow of energy between them. For example, the figure below shows six balancing authority areas in the EIM. The figure shows that the CAISO balancing authority area is included in the highest priced region with balancing authority area 1 and balancing authority area 2. The CAISO balancing authority area resides within the import constrained region shown with the dashed red line. Demand within the import constrained region cannot access the lower cost energy in the neighboring balancing authority areas due to transfer limitations. When one group of balancing authority areas have a marginal energy cost higher than other balancing authority areas, the group can no longer transfer more 15-minute energy from other balancing authority areas through the EIM.

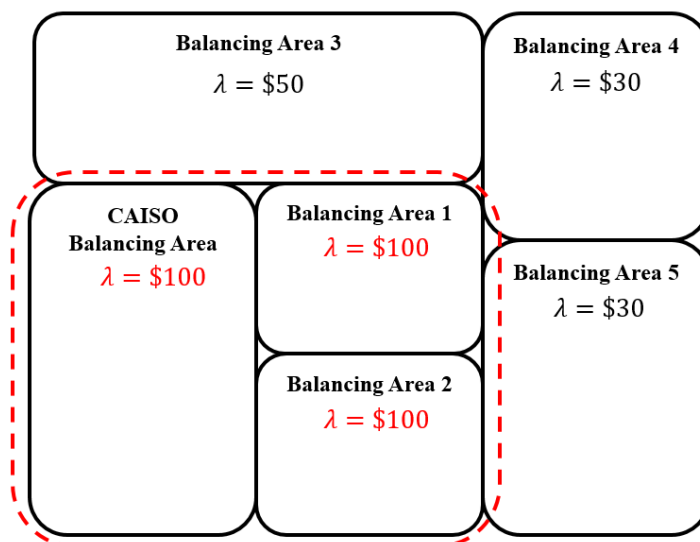


Figure 3: The CAISO's import constrained region in the EIM

When the CAISO balancing authority area no longer has access to external supply at its interties and is in the highest priced region in the EIM it is reasonable to assume that it is import constrained. In this situation, with the restricted access to competitive external

¹⁹ Localized transmission constraints can still result in varying LMPs within balancing areas.

supply, resources in the CAISO balancing authority area may be able to exercise market power.

CAISO prices indicate that suppliers could potentially exercise material market power

The final criterion that must be met to trigger the pivotal supplier test is that the CAISO balancing authority area's marginal energy cost must be greater than a CAISO proxy cost calculation of hypothetical gas-fired peakers based on internal CAISO gas costs, described in further detail below.

By requiring the CAISO balancing authority area marginal energy cost to be greater than internal CAISO proxy peaker prices before potentially intervening with system market power mitigation, the CAISO will limit its potential market intervention to periods when there is a reasonable risk of suppliers exercising market power. As discussed above, a benefit of the CAISO market is that it *reveals* the marginal cost of operations by efficiently optimizing resource dispatch over a large and complex system. Too frequent an intervention in the real-time market, by mitigating offers to potentially inaccurate administrative estimates of resource costs, could undermine this benefit.²⁰ During peak periods, the CAISO expects its prices to be generally around what it would cost an internal CAISO natural gas peaker resource to operate because these resources are typically on the margin. When market prices rise above hypothetical peaker resource costs, given recent natural gas costs and a reasonable assumed heat rate, it indicates that the overall system is constrained and suppliers may have more opportunities to raise market clearing prices above competitive levels.

Internal proxy peaker price calculation

The CAISO proposes to calculate the proxy peaker price for the CAISO balancing authority area based on a proxy peaker's incremental energy cost. This price will not include resource commitment costs because the market power mitigation process will compare this price to the CAISO balancing authority area's marginal energy cost that does not directly reflect commitment costs. It is only based on incremental energy offers because commitment costs are bid separately in the CAISO market.

This incremental energy cost will be based on the same calculation used to calculate variable cost default energy bids. The heat rate used for this proxy peaker price will be the heat rate of a typical peaker as reported by the U.S. Energy Information Agency (this is the same heat rate that will be used for the external peaker price and is the same heat rate used in the gas floor component of the CAISO's hydro default energy

²⁰ The CAISO Market Surveillance Committee's noted in its "Opinion on System Market Power Mitigation" dated November 5, 2019 that one great advantage of competitive markets is their ability to reveal, through the behavior of their participants, the true underlying costs of various resources under various conditions. If administrative estimates of costs are not sufficient to cover a resource's actual marginal costs, the resulting market dispatch can create inefficiencies and potentially reliability concerns. Over the longer-run, persistent and chronic mitigation of resources could distort the incentives of resource owners with respect to investment and operational efficiencies of their plants. http://www.caiso.com/Documents/MS-C-DraftOpiniononSystemMarketPowerMitigation-Nov5_2019.pdf

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bid.) The gas price used will be the same gas price used for other applications in the CAISO market.

In addition to fuel costs, this proxy price will include the other cost components that are in variable cost default energy bids including operations and maintenance costs, grid management charge, greenhouse gas emissions costs, and the 10% adder. The operations and maintenance costs will be the default operations and maintenance costs for a combustion turbine as determined in the guidelines being developed in the CAISO's Variable Operations and Maintenance Cost Review initiative.

7.3 Pivotal supplier test application

The CAISO proposes that the hour-ahead scheduling process of the real-time market will execute a system-level pivotal supplier test by calculating a residual supply index using three pivotal suppliers in component fifteen-minute market intervals in which the pivotal supplier test is triggered (based on the criteria described above in **Section 7.2**).

This pivotal supplier test is modeled after the CAISO market's existing local market power mitigation process that determines when the market within a transmission constrained region is uncompetitive. The existing test calculates whether the market can meet demand in a constrained region without the resources controlled by the three suppliers that control the three largest amounts of supply submitted to the market, termed the "potentially pivotal suppliers." Suppliers are considered "pivotal" when the supply they control is needed to meet demand.

The pivotal supplier test fails based on if its "residual supply index" metric is less than one, calculated as non-pivotal supply offers divided by demand. The market power mitigation process assumes the market is uncompetitive in a constrained region and pivotal suppliers have the potential to exercise market power in market intervals when the pivotal supplier test fails. The market power mitigation process assumes that non-pivotal suppliers cannot exert market power.

For example, if there are 15,000 MW of supply offers, but the potentially-pivotal suppliers control 5,000 MW, the 10,000 MW of supply offers for resources not controlled by the potentially-pivotal is the non-pivotal supply. The pivotal supplier test would compare the 10,000 MW of non-pivotal supply to the demand in the constrained region to determine if the constrained region is competitive. If demand is greater than 10,000 MW, the test considers the area uncompetitive because pivotal suppliers are needed to meet demand. If demand is less than or equal to 10,000 MW, the test considers the region competitive.

The CAISO proposes that the system-level pivotal test will calculate pivotal supply offers, non-pivotal supply offers, and demand based on a constrained region consisting of the CAISO balancing authority area and any other balancing authority areas that are in the constrained EIM region along with the CAISO. The scope of the constrained region will be defined based on EIM balancing authority area marginal energy costs.

This proposed system-level pivotal supplier test for the CAISO that tests supply and demand based on a constrained region consisting of more than one balancing authority area is different than the existing pivotal supplier test the market performs for the other balancing authority areas in the EIM. The existing test for the other balancing authority areas in the EIM considers only the supply and demand in each balancing authority area, irrespective of whether it is in a constrained region along with other balancing authority areas. Ideally the existing test would consider the supply and demand in the entire constrained region and the CAISO plans to consider modifications to do so in a future market initiative. The CAISO ruled out pursuing these modifications in this

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initiative because without more extensive modifications this approach would expose EIM participants to additional market power mitigation. For example, more extensive modifications would be needed to accurately calculate each EIM participant's supply net of its load serving obligations.

A supplier's potentially pivotal supply will be calculated based on its offers for resources within the CAISO balancing authority area and its economic import offers at CAISO interties. Supply offers submitted for EIM participating resources in other balancing authority areas that are in the constrained region along with the CAISO will be considered non-pivotal supply. Net EIM transfers into the constrained EIM region will also be considered non-pivotal supply.

The pivotal supplier test will include a supplier's economic import offers as potentially pivotal supply so that pivotal suppliers cannot circumvent the test by offering large amounts of import supply. In deciding whether economic import supply should count as potentially pivotal supply, the CAISO considered whether a supplier would offer less import supply for fear of becoming pivotal and therefore being subject to offer mitigation. Since each MW of import supply offered by pivotal and non-pivotal suppliers also increases both the total supply and the supplier's potentially pivotal supply by a MW, accounting for supplier import offers will not result in non-pivotal suppliers becoming pivotal by offering more economic import supply.

The system-level pivotal supplier test will consider offers for EIM participating resources in other balancing authority areas in the CAISO's constrained region as non-pivotal supply. This includes offers for resources that are controlled by a supplier that also controls resources within the CAISO balancing authority area. The CAISO proposes to consider EIM offers as non-pivotal supply for several reasons. First, EIM participating resources are likely contracted to serve demand in the adjoined EIM balancing authority area. The supplier would not have the incentive to exert market power for supply under contract and the CAISO has no ability to determine this amount. Second, all of the balancing authority areas adjacent to the CAISO are controlled by vertically-integrated utilities. Third, unlike imports at the CAISO interties, considering EIM participating resource supply as potentially pivotal supply could incent suppliers to limit their offer quantities to avoid becoming a pivotal supplier and making its internal CAISO supply subject to offer mitigation.

In this revised draft final proposal, the CAISO proposes two additional features of the system-level pivotal supplier test that are different than the existing pivotal supplier test that is used for local market power mitigation and EIM balancing authority area-level mitigation²¹:

Accounting for load-serving obligations

The CAISO proposes to adjust each suppliers pivotal supply quantities to account for

²¹ The CAISO is not proposing to modify the pivotal supplier test that will continue to be used by the local market power mitigation process (including EIM balancing area level mitigation.)

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their load-serving obligations. Suppliers that also have load-serving obligations do not have an incentive to exercise market power for the amount of supply needed to serve their load because any increased supply revenue would be offset by increased costs to serve their corresponding load. For example, a supplier that controls 5,000 MW of supply and must serve 4,900 MW of load does not have the incentive to exercise market power for any more than 100 MW of supply. Any additional amount would result in an offsetting price increase for its load.

The market power mitigation will calculate an estimated load-serving obligation for each supplier that is also a load-serving entity based on their recent load. The load-serving obligation will be calculated for each hour using the three-month average of their load in the corresponding hourly final settlement quality load meter data. The mitigation process will then calculate a ratio of this value compared to all other load-serving entity obligations to scale it to the CAISO real-time market demand forecast. This method will allow the mitigation process to recognize that individual load-serving entities have different daily load patterns.

Accounting for intertie scheduling limits

As described earlier, the CAISO proposes that the system-level pivotal supply test consider net import offers for the CAISO's intertie scheduling points as non-pivotal supply. However, it will limit this quantity to the amount that the market could potentially schedule on each intertie based on the various intertie scheduling limits. For example, if there are 1,200 MW of energy offers submitted at an intertie with capacity to schedule 1,000 MW of imports, the pivotal supplier test will only consider 1,000 MW as non-pivotal supply. This calculation will consider exports as netting against imports on each intertie.

7.4 Energy offer mitigation

In the event the pivotal supplier test triggers system-level market power mitigation, the CAISO proposes that the market power mitigation process will mitigate energy offers for jointly-pivotal supplier resources within the CAISO balancing authority area to the greater of the resource's default energy bid or a system-level competitive LMP.²²

The CAISO does not propose to mitigate import offers. Also, although supply offers for participating resources in balancing authority areas other than the CAISO in the EIM will continue to be subject to the current EIM mitigation process, they will not be mitigated as a result of the system-level market power mitigation process this document describes.

Only mitigate offers from jointly-pivotal suppliers

The CAISO proposes the system-level market power mitigation process mitigate only the resource offers from suppliers controlling enough supply to be pivotal for serving demand in a constrained area that includes the CAISO. This means that the system-level market power mitigation process will only mitigate resource offers from the two suppliers controlling the largest amounts of supply plus the offers of each of the other suppliers whose supply that in conjunction the two largest suppliers is required to meet the demand.

In other words, any supplier controlling enough supply to be the third pivotal supplier causing the residual supply index test to fail, will have its resources' offers mitigated. Because of this, when triggered, the system-level market power mitigation process will mitigate the offers of at least three suppliers, and potentially more than three suppliers.

At a system-level, this process should only mitigate offers from pivotal suppliers with an incentive to raise offer prices. At the broader system-level, with the potential for a large amount of non-pivotal suppliers and the consequential potential of broad mitigation of many suppliers, it is beneficial for the system-level market power mitigation process to first identify which suppliers could actually be pivotal at a system-level before mitigating resource offers.

The CAISO's current local and EIM balancing authority area-level market power mitigation processes mitigate all suppliers that are in the constrained area, even though non-pivotal suppliers do not have an economic incentive to raise their offer prices to try to economically withhold from the market. The existing simplification of mitigating all resource offers in the constrained area in the much more complicated *local* market power mitigation process is a reasonably cautious approach because local constraints often have very limited supply of counter-flow, which would lead to most suppliers in the constrained area being pivotal anyway. However, this simplification may not be

²² The mitigation process will not mitigate resource offers to values greater than the resource's offer price. This should be interpreted as: $\min[\text{Resource Bid}, \max(\text{Resource DEB}, \text{Competitive LMP})]$.

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reasonable at a system-level, where there is the potential for a large number of non-pivotal suppliers within the constrained area with no incentive to exercise market power.

Only mitigate offers from resources inside the CAISO balancing authority area

Because the purpose of the test is to determine if suppliers within the CAISO balancing authority area have the opportunity to exercise market power, the CAISO proposes that the system-level market power mitigation process will only mitigate offers for resources inside the CAISO balancing authority area.

This initiative is focused on extending similar system-level market power mitigation checks already performed in the EIM to suppliers in the CAISO balancing authority area. The CAISO does not propose to mitigate import offers because an import supplier could simply not offer import supply to the market if it were trying to withhold supply, rather than economically withholding the supply. The CAISO should not mitigate offers from resources in balancing authority areas in the EIM that are included with the CAISO balancing authority area in the highest priced region because they likely represent non-pivotal supply.

The CAISO does not propose to mitigate import offers because external supply sourced from a presumably competitive bi-lateral market in the western interconnection must compete with other importers for limited import capacity in order to clear into the CAISO market. If importers try to raise energy offers at the CAISO's intertie scheduling locations, other lower priced offers sourced from the same competitive bi-lateral market in the western interconnection will clear on CAISO's limited import transmission instead. In this way, the imports should already be competitively offered to the CAISO. For this same reason, the mitigation process also will not mitigate import supply offers affiliated with internal CAISO suppliers.

Do not mitigate offers for participating resources in adjoined EIM balancing authority areas

Supply offers for resources participating in the EIM that are in balancing authority areas included with the CAISO in the highest priced region should also not be mitigated because they are likely non-pivotal supply. EIM suppliers that control generation outside California generally also have load-serving obligations.²³ These entities have a limited ability to withhold supply from the market in order to sell power at inflated prices because withholding supply from the market could raise the costs of meeting their own obligations or very slightly raise prices with large proportionate reductions in small net sales. The overall result would be that the supplier could make an extremely small profit at best and the supplier would increase its own costs at worst. Furthermore, the CAISO's estimate of an EIM supplier's load serving obligation would likely be unreasonably inaccurate.

²³ The Market Surveillance Committee discussed shortcomings of the pivotal supplier test in Section IV.A of its opinion on system market power mitigation published on November 5, 2019. http://www.aiso.com/Documents/MS-C-DraftOpiniononSystemMarketPowerMitigation-Nov5_2019.pdf

The mitigation process also will not mitigate supply offers from participating resources in an adjoined EIM balancing authority area controlled by suppliers that also control resources within the CAISO balancing authority area. As discussed in the proposed pivotal supplier test design, these resources are likely contracted to serve demand in the adjoined EIM balancing authority area and these suppliers could simply not voluntarily offer its resource's energy into the EIM if it were attempting to exercise market power. In addition, mitigating offers for these resources could provide an incentive for suppliers controlling these resources to limit their offer quantities to avoid being classified as a pivotal supplier.

Do not mitigate resource adequacy import offers

Some stakeholders have suggested that the CAISO should consider mitigating import bids for imports that have been shown as resource adequacy capacity. While there may be merits to the view that these imports are needed to meet CAISO balancing authority area load and should be treated like internal supply, the CAISO is not proposing to subject resource adequacy imports to system-level market power mitigation. Imports are sourced from a presumably competitive bilateral market in the western interconnection and must compete to clear on limited intertie capacity into the CAISO markets.

Stakeholders have been concerned that some resource adequacy importers are economically withholding from the energy market by bidding at or near the \$1,000/MWh energy bid cap. These stakeholders recommend the CAISO mitigate resource adequacy import bids to remedy this apparent economic withholding. However, this behavior is most likely attributable to resource adequacy suppliers selling resource adequacy capacity to load-serving entities with no physical resource dedicated to backing it up at the time of the capacity sale (i.e. "paper capacity"). If this is the case, then the submission of import resource adequacy supply offers at or near the \$1,000/MWh cannot be economic withholding because the seller has no underlying supply to withhold. The CAISO and the California Public Utilities Commission are currently considering rule changes in other stakeholder initiatives that will address the "paper capacity" issue and the associated submission of high-priced import bids to avoid delivering energy.

7.5 Competitive locational marginal price (LMP)

The CAISO proposes that the system-level market power mitigation process will calculate a system-level specific competitive LMP to use as part of system-level mitigation. Consistent with the CAISO's existing local market power mitigation process, the CAISO proposes that the system market power mitigation process mitigate energy offers to the higher of the competitive LMP or the resource's default energy bid.

The CAISO proposes to calculate the system-level competitive LMP to be a value that will ensure that resources are not dispatched up at mitigated bid prices to export energy to other balancing authority areas. One principle the CAISO follows in all of its market power mitigation designs to ensure that the mitigation process does not mitigate resource offers in potentially uncompetitive areas beyond the amount needed to address market power in the potentially uncompetitive area. The competitive LMP design described in this section ensures the system-level market power mitigation does not over-mitigate supply offers by setting a mitigated price floor that accounts for potential exports at intertie locations and via EIM transfers to other balancing authority areas. The market power mitigation pass of the real-time market will therefore only affect price and dispatch within the constrained region that was found to be potentially uncompetitive.

The CAISO's existing market power mitigation processes use competitive LMP as a price floor on mitigated offer prices of mitigated resources to ensure offers are not mitigated beyond the amount needed to address potential market power. It represents the competitive price for energy outside of the constrained area. For the local market power mitigation process, it is calculated by removing the non-competitive congestion components from the LMP. As part of the balancing authority area level market power mitigation in the EIM performed for balancing authority areas other than the CAISO, it is calculated as the CAISO's system marginal energy price. Using this offer floor, the output of a resource subjected to offer price mitigation will likely not be increased relative to its output in the unmitigated market process beyond the output needed to relieve binding and potentially non-competitive constraints.

The CAISO proposes that the system-level competitive LMP be calculated as the greater of the following:

- The second highest balancing authority area marginal energy cost in the EIM in the same market interval (the CAISO has the highest cost when mitigation is triggered).
- The highest import offer cleared on a constrained intertie.

Using these two components ensures that the mitigation process will not mitigate resource offers beyond the amount needed to address market power in the constrained area. There are two ways in which mitigated energy would be exported from the constrained region if the mitigation process were to over-mitigate resource offers. The

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first way would be if the EIM transfers between the highest cost EIM region (which includes the CAISO) and the second highest cost EIM region were to decrease as a result of mitigation. The second way would be if the net import offers cleared at CAISO's constrained interties were to decrease as a result of mitigation.

The first component the CAISO proposes to use to calculate the system-level competitive LMP, the second highest balancing authority area marginal energy cost in the EIM, will ensure that the mitigation process does not mitigate resource offers to the point that mitigated energy is supplied to balancing authority areas outside of the constrained region where CAISO supply offers are mitigated.

The second component the CAISO proposes to use to calculate the system-level competitive LMP, the highest import offer cleared on a constrained CAISO intertie, will ensure that the mitigation process does not mitigate resource offers to the point that mitigated energy is supplied to the broader western region outside of the constrained region where CAISO supply offers are mitigated. This component only considers cleared offers on constrained interties because those offers are clearly outside of the constrained area and cannot affect price within the constrained area.

Using the highest import offer cleared on a constrained intertie will also allow the CAISO to account for scarcity premiums to some degree. Import suppliers with legitimate opportunities to sell energy in bi-lateral markets outside the CAISO at prices that include scarcity premiums include these costs in their economic import offers. To the extent that the CAISO market clears such import offers behind a constrained intertie, including that offer price in the competitive LMP will ensure CAISO prices do not fall below a going-rate for energy outside the CAISO's constrained area that may include a scarcity premium.

The CAISO recognizes one potential drawback to this approach would be if the second highest cost EIM region includes only a small balancing authority area with little net supply. If this were to occur, although the second highest cost EIM region may be lower cost than the constrained EIM region that the CAISO is in, its prices may also be elevated above a level that would result from a structurally competitive supply mix. The CAISO considered alternative designs that would resolve this concern, however each design implicated the existing EIM market power mitigation design and would have to be considered more holistically than allowed under the scope of this initiative. For now, the CAISO believes the proposed design will bring benefits to the market compared to today. It also believes that the benefits of ensuring that this phase 1 approach does not over-mitigate resource offers outweighs the risk that suppliers within the CAISO could exercise market power over both its constrained EIM region and the next highest cost region.

This system-level competitive LMP should only have a small impact on EIM entities other than the CAISO. The market will continue to use the CAISO's system marginal energy price as the competitive LMP when other balancing authority areas fail their existing balancing authority area system-level market power mitigation tests. When the

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CAISO balancing authority area does fail its system-level market power mitigation test, the calculated competitive LMP may still impact other entities in the EIM to the extent that individual local constraints in their balancing authority areas are simultaneously binding and uncompetitive. The local market power mitigation processes will continue to calculate resource-specific competitive LMPs that include all congestion from competitive constraints. However, the resource-specific competitive LMP calculation will use this new system-level competitive LMP in place of the CAISO system marginal energy cost because the CAISO system marginal energy cost was determined to be uncompetitive.

8 Energy Imbalance Market Governing Body Role

This initiative proposes to implement a system-level market power mitigation for the CAISO balancing authority area. The rules that govern decisional classification indicate 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 March 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.”

At this stage of the initiative, it does not appear it would satisfy the first test, because the rules to implement the proposed changes would not be EIM-specific. Rather, the new rules would apply only to the CAISO balancing authority area. The logic for price mitigation in EIM balancing authority areas would remain unchanged: they would use the greater of the competitive LMP from the CAISO balancing authority area when the CAISO’s LMP is found to be competitive or the default energy bid. Moreover, the primary driver for pursuing this initiative is not an issue that is specific to the EIM balancing authority areas.

This EIM classification reflects the current state of this initiative and may change as the stakeholder process is completed. If any stakeholder disagrees with this proposed classification, please include in your written comments a justification of which classification is more appropriate.

9 Stakeholder engagement

The schedule for stakeholder engagement is provided below. The CAISO will present its proposal to the Energy Imbalance Market Governing Body at its November 2020 meeting and to the Board of Governors' at its November 2020 meeting.

Date	Event
November 13, 2019	Board of Governors meeting (briefing)
December 4, 2019	Energy Imbalance Market Governing Body (briefing)
December 11, 2019	Publish straw proposal
December 16, 2019	Stakeholder meeting
January 10, 2019	Comments on straw proposal due
April 7, 2020	Publish revised straw proposal
April 13, 2020	Stakeholder conference call
May 4, 2020	Comments on revised straw proposal due
June 15, 2020	Publish draft final proposal
June 24, 2020	Stakeholder conference call
July, 14 2020	Comments on draft final proposal due
September 18, 2020	Publish revised draft final proposal
September 25, 2020	Stakeholder conference call
October 5, 2020	Comments on revised draft final proposal due
October/September 2020	Tariff and BRS development
October 2020	Publish final proposal
October 2020	Comments on final proposal due
November 4, 2020	Energy Imbalance Market Governing Body meeting
November 18-19, 2020	Board of Governors meeting
Prior to Summer 2021	Implementation

Stakeholders should attend the stakeholder conference call on September 25, 2020 and provide written comments to initiativecomments@caiso.com by October 5, 2020.

Appendix A: System-Level Market Power Mitigation High-Level Business Requirements (Preliminary)

Timing

- The real-time market system market power mitigation process will execute the pivotal supplier test only in the hour ahead scheduling process.
- Based on the results of the pivotal supplier test executed in the hour ahead scheduling process, the system market power mitigation process will mitigate energy bids used in the hour ahead scheduling process for the fifteen-minute intervals that fail the pivotal supplier test. The real-time market will also use these mitigated bids in the corresponding fifteen-minute market interval and the corresponding real-time dispatch intervals.

Pivotal supplier test trigger

- The CAISO balancing authority area's marginal energy cost must be greater than a proxy cost calculation of the costs of a hypothetical external gas-fired peaker based on current gas costs.
- The CAISO balancing authority area's marginal energy cost is the highest marginal energy cost in the EIM and the CAISO balancing authority area is in a constrained area in the EIM. This comparison will not consider EIM balancing authority areas whose marginal energy costs are elevated above the CAISO's marginal energy cost administratively due to a failure of the upward Flex Ramp Sufficiency Test.
- The CAISO balancing authority area's marginal energy cost is greater than the proxy cost calculations of the costs of hypothetical internal CAISO gas-fired peaker based on current gas costs.

Pivotal supplier test

- The hour-ahead scheduling process of the real-time market will perform the pivotal supplier test in component fifteen-minute market intervals in which the pivotal supplier test is triggered.
- The pivotal supplier test will evaluate whether demand in the highest priced tier that includes the CAISO balancing authority area can be served without the largest three suppliers in the highest priced tier.

- The test will consider the following suppliers potentially pivotal:
 - **Supplier affiliate groups that control resources within the CAISO balancing authority area** that the test determines to be net sellers taking into account their load-serving obligations
 - The test will not consider **EIM entity scheduling coordinator affiliate groups** as potentially pivotal.
- For supplier affiliate groups controlling resources within the CAISO balancing authority area, the calculation of the potentially pivotal supply will take account of resource ramping constraints, resource commitment constraints, ancillary service obligations, self-scheduled quantities, and load-serving obligations.
 - Each resource's potentially pivotal supply will be the difference between the maximum achievable output within its economic bid range and the minimum achievable output within its economic bid range from the interval prior to the test interval. Resource ramp rate, startup, and shutdown times will determine the maximum and minimum achievable output from the interval prior to the test interval.
 - The supplier's total potentially pivotal supply will be limited by the supplier's load-serving obligation. If the sum of the minimum achievable output for resources affiliated with the supplier is lower than the supplier's load-serving obligation, the amount of supply lower than the supplier's load-serving obligation and higher than the sum of the minimum achievable output for resources affiliated with the supplier will not be considered potentially pivotal supply.
 - The supplier affiliate group's load-serving obligations will be the entity's hourly rolling three month average demand as a ratio of all other load-serving entity hourly rolling three month average demand multiplied by the CAISO demand forecast for the tested interval.
- The test will not consider EIM entity scheduling coordinator affiliate groups potentially pivotal.
- The test will assume all supply in adjoined EIM balancing authority areas is non-pivotal.
- The test will assume that net EIM transfers into the highest priced tier in the EIM are non-pivotal supply.

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- The test will assume that import supply offered at the CAISO's intertie scheduling locations is potentially pivotal
 - This potentially pivotal supply will be limited by the total available import capacity on an intertie by intertie basis.

Resources to mitigate

- The system market power mitigation process will only mitigate resource offers if the pivotal supplier test fails.
- The system market power mitigation process will only mitigate offers for resources within the CAISO balancing authority area.
- **Mitigate offers from jointly pivotal suppliers.** The system market power mitigation process will only mitigate resource offers from the two largest internal CAISO pivotal suppliers and any other internal CAISO supplier when in combination with the two largest pivotal suppliers is required to meet demand.
- The process will not mitigate participating resource offers from resources in an adjoining EIM balancing authority area that are affiliated with an internal CAISO supplier.
- The process will not mitigate import supply offers, including import RA, at the CAISO intertie scheduling locations.

Competitive locational marginal price (LMP)

The competitive LMP will be calculated as the greater of:

- The second highest balancing authority area marginal energy cost in the EIM in the same market interval (the CAISO has the highest cost when mitigation is triggered).
- The highest import offer cleared on a constrained intertie. If no interties are constrained, disregard this term.