



California ISO

System Market Power Mitigation Revised Straw Proposal

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Table of Contents

1	Executive summary.....	3
2	Stakeholder comments and changes to this proposal.....	5
3	Issue	9
4	Principles	11
5	Scope.....	13
5.1	Implement in real-time market.....	13
5.2	Pivotal supplier test trigger.....	13
5.3	Pivotal supplier test application.....	13
5.4	Energy offer mitigation	14
6	Background.....	15
6.1	Competitiveness, market power, and market power mitigation	15
6.2	The broader western bi-lateral market	16
6.3	General market power mitigation design elements	18
7	Proposal.....	21
7.1	Implement in real-time market.....	23
7.2	Pivotal supplier test trigger.....	25
7.3	Pivotal supplier test application.....	29
7.4	Competitive locational marginal price.....	33
7.5	Energy offer mitigation	36
8	Energy Imbalance Market Governing Body Role	40
9	Stakeholder engagement.....	41

1 Executive summary

In this document, the CAISO discusses its phase 1 proposal to apply system-level market power mitigation to energy offers for resources within the CAISO balancing authority area.¹ Phase 2 will include consideration of expanding system-level market power mitigation to the CAISO day-ahead market and to the EIM areas in the real-time market. Phase 2 will be aligned with the day-ahead market enhancements and extended day-ahead market enhancements design.

The CAISO proposes to implement this automated system-level market power mitigation process in its real-time market. The mitigation process will perform a residual supply index test using three pivotal suppliers when there are import constrained regions in the energy imbalance market and the CAISO balancing area is in the highest priced region. This occurred in approximately 28 percent of all fifteen-minute market intervals in 2019. It will determine a competitive locational marginal price, used as part of the market power mitigation process, using energy imbalance market prices and import supply offer prices when the CAISO balancing area is uncompetitive. It will only mitigate energy bids submitted for resources within the CAISO balancing area controlled by pivotal suppliers.

This approach has a number of changes relative to the previous proposal that were driven by points stakeholders raised in their written comments. The most significant change is the method to determine the circumstances when demand in the CAISO balancing area loses access to competitive supply and consequently there could be the potential for a supplier to exercise system-level market power. The approach outlined in this document performs the residual supply index test using three pivotal suppliers in market intervals when there are import constrained regions in the energy imbalance market and the CAISO balancing area is in the highest priced region.

The CAISO concluded that its previous proposal that identified when the CAISO balancing area is import constrained directly based on three major interties being scheduled up to their transmission capacity was less accurate because the CAISO retains access to energy imbalance market supply and to a portion of economic import offers at unconstrained interties most of the time. Instead, this proposal uses the energy imbalance market energy prices to identify when the CAISO balancing area is in a transmission constrained region and to identify the full geographic scope of this constrained region, not limited to the CAISO balancing area boundary.

This proposal also includes enhancements to the pivotal supplier test proposed for system-level market power mitigation that it will more accurately find instances in which pivotal suppliers could exercise market power. This proposal (1) allows un-cleared, but otherwise cost-effective energy imbalance market resource offers to count as fringe supply in the test, (2) allows for un-cleared, but otherwise cost-effective import offers to count as fringe supply in the test, (3) takes account of load-serving obligations to reduce the amount of potentially pivotal supply from net sellers with large load-serving

¹ The remainder of this document refers to the NERC-defined Balancing Authority Area as “balancing area.”

System Market Power Mitigation
Revised Straw Proposal

obligations, and (4) allows price-taking supply from potentially pivotal suppliers to count as fringe supply in the test. The last three of these changes were in response to CAISO Market Surveillance Committee observations that it is especially important for a system-level market power mitigation methodology to accurately calculate pivotal supply and only mitigate offers in intervals when there is actually potential for market power because system-level market power mitigation has a wide market impact.

The proposal also improves the precision of offer mitigation by only mitigating resource offers from suppliers whose supply is pivotal to meeting demand under a three pivotal supplier test. The previous proposal would have mitigated all resource offers within the CAISO balancing area even though non-pivotal suppliers (*i.e.*, fringe 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 much larger segment of non-pivotal suppliers with no incentive to exercise market power.

2 Stakeholder comments and changes to this proposal

In the previous straw proposal for this initiative, the CAISO proposed to trigger the test for system-level market power in market intervals when the CAISO balancing area's three major interties² are at their scheduling limits. The CAISO proposed this based on the consideration that it does not have evidence that the broader western interconnection's bilateral energy market is uncompetitive. Consequently, it reasoned that there cannot be system-level market power when interties are not at their scheduling limits because demand in the CAISO market should still have access to competitive imports. The CAISO proposed to trigger the system-level market power mitigation process based on only three major interties binding, as opposed to all of them, because the smaller interties may not always have sufficient available external transmission to have sufficient bids for their scheduling limits to bind.

Stakeholders argued that relying only on the three largest import locations to indicate when the CAISO balancing area is import-constrained was either too strict a criteria or not strict enough. Some argued that the CAISO cannot assume its balancing area is import constrained based on import locations where the CAISO receives only 60% of import offers because there are still 40% of import offers available to the demand in the CAISO. Others argued that the CAISO may be in an uncompetitive sub-area of the broader western interconnection when supplies are limited from perhaps only one import location.

The CAISO believes both arguments question whether strictly defining the CAISO balancing area boundary as the potentially uncompetitive area is actually representative of the true underlying market conditions. Under most conditions, the CAISO still has access to energy imbalance market supply and to a portion of economic import offers at non-binding import scheduling locations. Depending on the geographic scope of the actual constrained boundary within the western interconnection, conditions could or could not actually be competitive. This observation led the CAISO to develop a more accurate approach to determine when suppliers in the CAISO balancing area may have the opportunity to exercise market power.

The energy imbalance market prices can be used to define the geographic scope of the constrained area in which suppliers may have the opportunity to exercise market power. Energy imbalance market transfers and economic import offers at CAISO's import locations compete for the same underlying transmission capacity. Thus, differences in energy imbalance market prices likely shows if either or both of economic import offers and energy imbalance market transfers are transmission constrained.

In **Section 7.2**, the CAISO describes its proposal to use the energy imbalance market prices, which directly interact with CAISO internal and import prices, to determine when to trigger the system-level market power mitigation process and to determine the geographic scope of that test.

² Malin, NOB, and Palo Verde

System Market Power Mitigation **Revised Straw Proposal**

Some stakeholders maintain that the CAISO does not need to be import constrained in order for suppliers to have the opportunity to exercise system-level market power. For example, the non-CAISO western interconnection could be competitive with external suppliers offering small amounts of fringe supply to the CAISO markets while pivotal suppliers within the CAISO could economically withhold enough energy to arbitrarily raise prices above marginal cost. Under this situation, the CAISO does not necessarily need to be import constrained in order for pivotal suppliers to have the ability to exercise market power.

The example describes a situation where the western interconnection, including the CAISO balancing area, is uncompetitive with no binding transmission constraints throughout, and the western interconnection-wide pivotal suppliers are within the CAISO's balancing area. Under this situation, mitigating would arrest any attempt by suppliers within the CAISO to exercise western interconnection-wide market power, having a positive impact on market prices.

The CAISO believes that the current proposal (described in **Section 7.2**) to use the energy imbalance market prices to identify the geographic scope of the CAISO's constrained region within the western interconnection will go a long way towards resolving its system-level market power concerns. Stakeholders describe a relatively rare opportunity for suppliers to exercise market power. While the scenario described is technically possible, the CAISO believes the much more likely opportunity for suppliers to exercise system-level market power will involve the CAISO balancing area at elevated prices in a transmission constrained region with few, if any, other balancing areas.

In the straw proposal, the CAISO proposed to eliminate using its system energy price as the price floor for resource offer mitigation in the energy imbalance market when the CAISO balancing area fails its pivotal supplier test. In such situations, all resource offers would be set to their default energy bids. The CAISO reasoned that its balancing area, having failed a market competitiveness test, cannot be used as a reference point for determining system-wide competitive prices.

Some stakeholders argued that the CAISO should develop a different competitive locational marginal price to use in the energy imbalance market when the CAISO fails its competitiveness test. They are generally concerned that using default energy bids alone will not result in market clearing prices that are reasonably competitive across the western interconnection. Some stakeholders suggested that the CAISO design an administrative competitive price that would incorporate the value of out-of-market actions and incorporate commitment costs in addition to energy bid prices.

Section 7.4 describes a new proposal to calculate a competitive locational marginal price for use in CAISO balancing area system-level market power mitigation. Under this proposal, the market power mitigation process will calculate it as the lower of its next constrained un-cleared economic import offer or the next highest power balance

System Market Power Mitigation ***Revised Straw Proposal***

constraint shadow price of the balancing areas in the energy imbalance market. This value is the price demand in the CAISO balancing area would pay for the next increment of energy from the broader system if it were not constrained by the CAISO's import limitations and the energy imbalance market transfer limitations. Under this proposal, this competitive price floor will only be applied to pivotal suppliers within the CAISO balancing area.³

The CAISO is proposing that import offers will not be subject to system-level market power mitigation.

In comments on the straw proposal, a few stakeholders argued that the CAISO should mitigate resource adequacy import bids when it triggers system-level market power mitigation. They believe that resources with bilateral capacity contracts, receiving capacity compensation from internal demand, should have comparable rules to internal supply consistent with the notion that the capacity purchaser generally expects these resources to perform when needed.

The CAISO is not proposing to mitigate import bids because when the system-level market power mitigation process triggers, the CAISO balancing area will be in the highest priced import constrained region where, generally, import offers and energy imbalance market transfers into the region are all priced lower than supply in the constrained region.

The CAISO is also not proposing to mitigate import bids because import bids likely represent fringe supply that is unable to exert market power. This initiative is focused on the concern that suppliers controlling large amounts of divested generation within the CAISO balancing authority area could exercise system-level market power.

In any case, even in the unlikely circumstance that an import supplier is pivotal, a supplier voluntarily offering import supply could simply not offer import supply to the market to raise prices, rather than offering the supply at high prices to economically withhold from the market.

While this may not be true for resource adequacy imports, an important practical consideration is that there is not currently a methodology for the CAISO to calculate default energy bid for imports. While the CAISO and stakeholders could conceivably develop an import default energy bid for imports if it was determined to be needed, this could not occur within the implementation timeline of this initiative. As outlined later in this document, the CAISO is planning a phased implementation of system-level market power mitigation to have it in place by summer 2021, when tight supply conditions are anticipated to occur. Thus, a default energy bid for imports could potentially be taken up in the second phase of this initiative, if determined to be needed.

³ This is because the CAISO proposes to only trigger system market power mitigation in market intervals in which the CAISO balancing area has the highest-priced power balance constraint shadow price. Balancing area level mitigation is not triggered for other balancing areas in this situation.

System Market Power Mitigation
Revised Straw Proposal

Lastly, many stakeholders commented that they do not feel a system-level market power mitigation initiative is necessary at this time. They are generally concerned that the CAISO is prioritizing a “narrow and prospective” system market power concern over other existing and more pressing price formation topics.

This initiative focuses on fundamental market conditions in which the CAISO would be concerned that suppliers could exercise market power on a system-level. The CAISO remains concerned that these fundamental market conditions may materialize in the coming years and therefore it has the obligation to ensure energy prices remain just and reasonable if they do. The CAISO is also pursuing price formation topics related to stakeholder concerns in its *Flexible Ramping Product Enhancements* initiative. In that initiative, it plans to complete policy development by the end of 2020.

3 Issue

The CAISO's current approach to measures to address system-level market power in the CAISO balancing area based on past assumptions that the CAISO market is competitive at the balancing area (*i.e.*, "system") level. Because of this, the only mitigation for system-level market power in the CAISO balancing 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 area. Also because of this assumption, the market power processes used for both the CAISO balancing area as well as the other balancing areas in the Western Energy Imbalance Market ("energy imbalance market") use a "competitive locational marginal price" calculated based on the prices within the CAISO balancing area.

In recent analyses, the CAISO and the Department of Market Monitoring found that conditions in the CAISO balancing 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.⁴ The Department of Market Monitoring completed a similar analysis, finding the supply mix was potentially uncompetitive in 272 hours in 2018.⁵ 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 2019.⁶

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.⁷

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:

- Retirement and mothballing of gas capacity in the CAISO balancing area.

⁴ "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>

⁵ 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

⁶ See Department of Market Monitoring, "2019 Third Quarter Report on Market Issues and Performance," Section 3.5.2, published on December 5, 2019.

⁷ Market Surveillance Committee, "Opinion on System Market Power Mitigation," Section II, November 5, 2019.

System Market Power Mitigation
Revised Straw Proposal

- 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.⁸ 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.⁹ 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."¹⁰

Consequently, the CAISO proposes to use the following market power mitigation design principles when considering whether the current provisions are sufficiently adequate to address any degradation of the competitiveness of energy markets and whether the CAISO must adopt additional market power mitigation process measures 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

⁸ MRT Transmittal Letter, FERC Docket No. ER06-615, at p. 40, <http://www.caiso.com/Documents/MRTUTransmittalLetter.pdf> (February 9, 2006).

⁹ 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.

¹⁰ MRTU September 21, 2006 Order, Docket ER06-615, at P 1020 (116 FERC ¶ 61,274) (available at: http://www.caiso.com/Documents/September21_2006FERCOrderAcceptingCaliforniaISOComplianceFilinginDocketNo_ER02-1656-024_Amendment44-MRTU_.pdf)

System Market Power Mitigation
Revised Straw Proposal

supply has market power.

- 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 sooner than it could implement more comprehensive enhancements. A second phase would allow time to address more complex and/or contentious policy issues and more extensive system development.

The CAISO outlines below its proposed scope for the phase 1 implementation. The proposed preliminary approach for each scope item is based on the principles described in **Section 4**. This reflects the CAISO's preliminary thinking and is subject to modification and refinement in the stakeholder process.

5.1 Implement in real-time market

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

5.3 Pivotal supplier test application

The CAISO proposes that 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 the CAISO and stakeholders will need to consider. Within the phase 1 scope, the CAISO may also consider whether a supplier's load serving obligations should be subtracted from its

System Market Power Mitigation
Revised Straw Proposal

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 CAISO proposes that the phase 1 scope considers that system-level market power mitigation would only apply to energy offers for resources within the CAISO balancing area. Within the phase 1 scope, the CAISO also intends to examine if there may be circumstances in which it must apply offer mitigation to other resource offers within the energy imbalance market 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 locational marginal priced-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 areas participating in the Western Energy Imbalance Market.

System Market Power Mitigation Revised Straw Proposal

In addition to the dynamic local market power mitigation process, each balancing area participating in the energy imbalance market is also subject to a system-level market power mitigation process.¹¹ This mitigation process tests whether demand within the balancing area has access to competitive external supply by first finding whether the balancing area is import constrained. If the balancing 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 locational marginal price. Default energy bids are the CAISO’s estimate of resource marginal costs. The competitive locational marginal price is the energy price outside of the constrained area.

6.2 The broader western bi-lateral market

The CAISO operates the only locational marginal price-based energy market in the western interconnection. Suppliers in the western interconnection that are not participating in the Western Energy Imbalance Market 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.

¹¹ 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.¹² Transmission rights are generally available to all market participants and the quantity of these rights generally exceed the CAISO’s locational import capability.¹³ 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 locational marginal price during the peak or off-peak period to the expected peak or off-peak western trading hub energy prices.

¹² 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.

¹³ 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.

System Market Power Mitigation
Revised Straw Proposal

When examining 29 high-priced hours¹⁴ 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.¹⁵ **Table 1** shows the CAISO locational marginal prices for PG&E, SCE, and SDG&E averaged over the on-peak period compared to the bi-lateral trading hub on-peak prices on those same days.

Table 1: CAISO and Bi-Lateral 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

¹⁴ 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 LAP prices exceeded \$500 and (2) the hours during 2018 in which the California ISO Department of Market Monitoring found a difference of \$20 or more between (i) a simulated 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.

¹⁵ See Market Surveillance Committee, “Opinion on System Market Power Mitigation,” Appendix A, Table 4, published on November 5, 2019.

System Market Power Mitigation Revised Straw Proposal

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).¹⁶ 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).

¹⁶ 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.

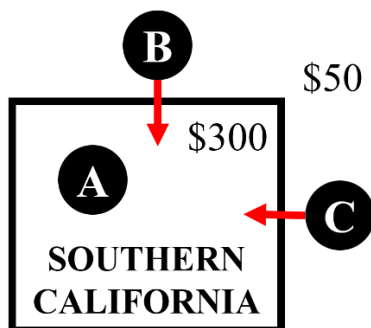


Figure 2: A constrained southern California on a stressed afternoon

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 energy imbalance market balancing areas at a local level (*i.e.*, on specific transmission constraints within the balancing area) as well as at an energy imbalance market balancing area system-level.¹⁷ The CAISO balancing area is the only participating energy imbalance market balancing area to which the CAISO does not apply a system-level market power mitigation process.

¹⁷ See *California Indep. Sys. Operator Corp.*, 148 FERC ¶ 61,222 (2014) (available at: http://www.caiso.com/Documents/Sep22_2014_Order_EIEnhancements_ER14-2484.pdf)

7 Proposal

Based on the concerns and principles outlined in the previous sections, the CAISO proposes to apply system-level market power mitigation to energy bids for resources within the CAISO balancing area. The CAISO proposes to implement this automated system-level market power mitigation process in its real-time market. This section outlines this approach.

Under this approach, the market will execute a system-level residual supply index test using three pivotal suppliers (pivotal supplier test) in market intervals when the balancing area power balance constraint shadow prices separate in the real-time market's energy imbalance market, indicating constrained transfer conditions, and the CAISO balancing area is in the highest priced region. The pivotal supplier test will assess whether energy supply offers from fringe competitive suppliers¹⁸ in this highest priced region are sufficient to meet the region's demand while three pivotal suppliers (*i.e.*, suppliers whose energy is required to meet demand) withhold their supply. The test will consider resources within the CAISO balancing area and in other balancing areas in the same price region, as well as imports at CAISO interties. The CAISO proposes to only mitigate bids for resources located within the CAISO balancing area based on this new system-level market power mitigation test.

The CAISO does not propose any changes to the market power mitigation processes for energy imbalance market balancing areas. The CAISO already applies a system-level market power mitigation process to energy imbalance market balancing areas.¹⁹ The CAISO balancing area is the only participating energy imbalance market balancing area to which the CAISO does not apply a system-level market power mitigation process.

This proposal improves the precision of offer mitigation by only mitigating resource offers from suppliers whose supply is pivotal to meeting demand because non-pivotal suppliers (*i.e.* fringe 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 much larger segment of non-pivotal suppliers with no ability to exercise market power.

This proposal improves the accuracy of the pivotal supplier test by adjusting pivotal supply quantities to account for large load-serving obligations. Large suppliers that also have large load-serving obligations do not have an incentive to withhold supply below the amount of their load-serving obligations because it may increase their overall costs.

¹⁸ In its determination of whether or not a constraint is competitive, the CAISO considers suppliers to be "fringe" 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.

¹⁹ 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)

System Market Power Mitigation **Revised Straw Proposal**

The CAISO also proposes to count economic import offers at the CAISO's import scheduling locations as fringe competitive supply considering that the various import scheduling limits may prevent those offers from clearing the market. For instance, if import suppliers offer 1,200 MW of energy to the market behind a 1,000 MW import constraint, the pivotal supplier test will only consider 1,000 MW to count as fringe supply, ignoring any surplus. This is an improvement to the test to reflect that there may be cost-effective yet un-cleared import offers available to the market.

The market will use a new calculated competitive locational marginal price when it applies system-level market power mitigation. If the pivotal supplier test fails and system-level market power mitigation is applied, the competitive locational marginal price will be calculated as the lower of the next constrained un-cleared economic import offer or the power balance constraint shadow price of the next highest-priced group of balancing areas in the energy imbalance market. This competitive locational marginal price should not impact energy imbalance market entities (other than the CAISO) because it is only calculated when the CAISO balancing area is in the highest priced region.

When the pivotal supplier test fails, the system-level market power mitigation process will only mitigate energy bids submitted for resources within the CAISO balancing area controlled by pivotal suppliers. Resource offers will be mitigated to the higher of the resource's default energy bid or competitive locational marginal price specifically calculated for the system market power test.

- In **Section 7.1**, the CAISO discusses its proposal to apply system-level market power mitigation to the real-time market only in this initial phase of developing an automated system-level market power mitigation process in the CAISO market.
- In **Section 7.2**, the CAISO discusses its proposal to only perform a three pivotal supplier test when the CAISO balancing area price separates from other balancing areas into the highest priced region in the energy imbalance market.
- In **Section 7.3**, the CAISO discusses its proposal to use a three pivotal supplier test to determine if pivotal suppliers in the CAISO balancing area could potentially exercise market power in the constrained region.
- In **Section 7.4**, the CAISO discusses its proposal to calculate the competitive locational marginal price when the CAISO balancing area fails the system-level market power mitigation test.
- In **Section 7.5**, the CAISO discusses its proposal to only mitigate energy bids for supply resources with pivotal supply offers within the CAISO balancing area when the pivotal supplier test fails.

7.1 Implement in real-time market

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. As part of this proposal, the CAISO will implement it in all the real-time market processes including the short-term unit commitment (STUC), real-time pre-dispatch (RTPD), and five-minute real-time dispatch (RTD) process. Implementing it in RTPD includes implementing it in the hour-ahead scheduling process (HASP) and the fifteen-minute market (FMM).

The CAISO will work with stakeholders to consider extending system-level market power mitigation to the day-ahead market in subsequent stakeholder initiatives. The CAISO proposes a phased approach, aiming to mitigate the potential to exercise system-level market power while avoiding unnecessary bid mitigation that would discourage supply and demand participation in the CAISO markets. If the interaction between the day-ahead and real-time markets works efficiently, 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. This will also allow coordination with the on-going *Day-Ahead Market Enhancements* and *Extended Day-Ahead Market* CAISO policy development initiatives. Also, by implementing system-level market power mitigation in the real-time market first, the CAISO will also be able to monitor system-level mitigation performance for adverse effects. Finally, applying system-level market power mitigation in the real-time market only gets 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 a couple of 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 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-

System Market Power Mitigation
Revised Straw Proposal

ahead market when real-time supply elasticities diverge from day-ahead supply elasticity. However, the MSC supported the approach to 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.²⁰

²⁰ See Market Surveillance Committee, “Opinion on System Market Power Mitigation,” Appendix B, published November 5, 2019.

7.2 Pivotal supplier test trigger

The CAISO proposes that the real-time market will execute a system-level pivotal supplier test, and potentially mitigate submitted energy supply bids, in market intervals when balancing area power balance constraint shadow prices separate in the real-time market's energy imbalance market, indicating constrained transfer conditions, and the CAISO balancing area is in the highest priced region. The CAISO balancing area may be in the highest priced region alone or along with other energy imbalance market balancing areas. This is appropriate because this "price separation" indicates that the highest priced region where the CAISO balancing area resides is import constrained and the market is limited in its access to presumably competitive external supply.

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 area. Energy prices in the energy imbalance market converge with the same power balance constraint shadow price when transfer constraints between the areas do not limit supply transactions.

The CAISO models a power balance constraint for each balancing area in the energy imbalance market. The price of this constraint is the cost to serve the next increment of load in the balancing area given the various transfer constraints between balancing areas. When import transfer constraints are binding into a balancing area, that balancing area has a higher price reflecting the import-constrained condition. When transfer constraints are not binding between multiple balancing areas, they all have the same power balance constraint shadow price.²¹

At a time when there are no binding import or energy imbalance market transfer limitations, demand in the CAISO balancing area has access to lower cost supply in another balancing area. Demand can be served through the minimum cost optimization, unencumbered by transmission limitations. All suppliers throughout the energy imbalance market and import suppliers compete to sell energy.

For example, the figure below shows six balancing areas in the energy imbalance market. Lambda (λ) represents the power balance constraint shadow price for each balancing area, which is the marginal price of energy in each balancing area. The figure shows that all balancing areas have the same energy price.

²¹ Localized transmission constraints can still result in varying LMPs within balancing areas.

System Market Power Mitigation
Revised Straw Proposal

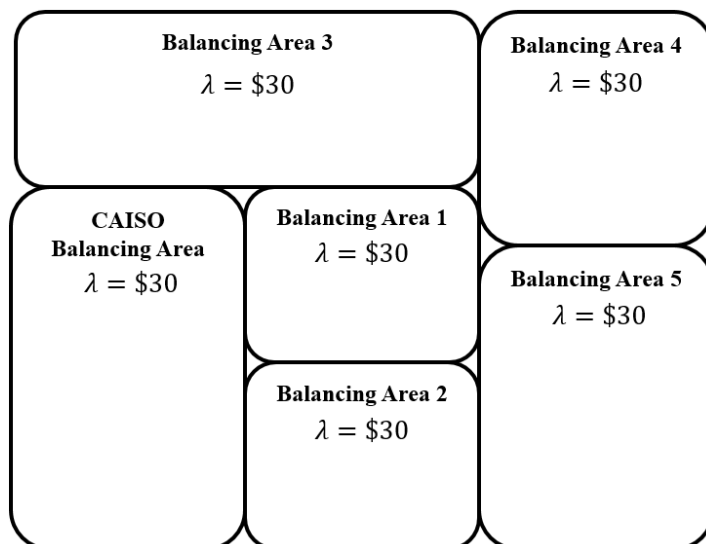


Figure 3: No import constrained regions in the energy imbalance market

Balancing areas, or groups thereof, can become import constrained when import or energy imbalance market transfer constraints limit the flow of energy between them. For example, the figure below shows six balancing areas in the energy imbalance market. If the price in the CAISO balancing area is \$100 while the price in all other balancing areas is \$30, the CAISO balancing area is import constrained. In the figure below, the import constrained region is shown with the dashed red line.

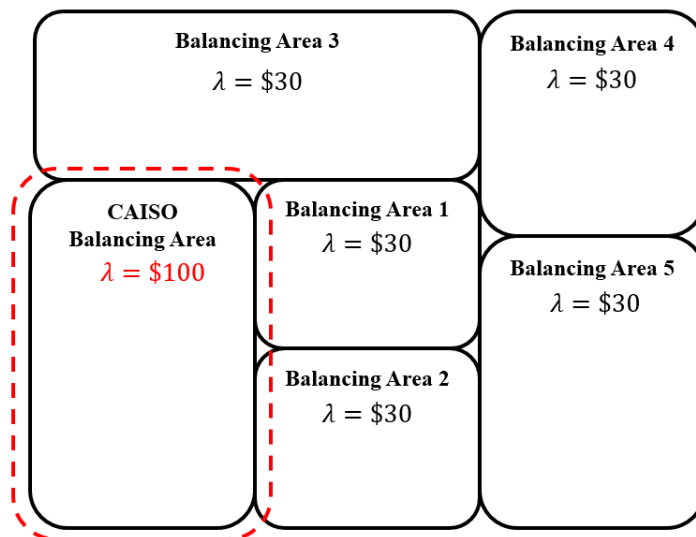


Figure 4: The CAISO balancing area is import constrained relative to the rest of the energy imbalance market

When the CAISO balancing area’s power balance constraint shadow price increases above other balancing areas, its transfer constraints are binding. This occurs when the real-time market clears imports at CAISO interties and/or energy imbalance market resource bids resulting in energy imbalance market energy transfers in quantities up to the intertie scheduling limits. This occurs because energy imbalance market transfers

System Market Power Mitigation
Revised Straw Proposal

and economic import offers at CAISO's import locations compete for the same underlying transmission capacity. When that transmission capacity is full, the price separates as the CAISO balancing area can no longer access lower cost supply from outside its balancing area.

In addition, because of energy imbalance market transfers, the CAISO balancing area can be import constrained in a group with other balancing areas in the energy imbalance market. In this case, the CAISO balancing area's power balance constraint shadow price will be the same as the other balancing areas it is grouped with, which will be higher than the power balance constraint shadow prices of the rest of the balancing areas in the energy imbalance market.

Transmission constraints directly at the CAISO balancing area boundary likely rarely completely limit demand's access to additional import supply. The CAISO system has a lot of import transmission capacity that is never simultaneously full. However, this does not mean that large suppliers in the CAISO balancing area are unable to exercise market power over demand.

The CAISO balancing area is normally part of a larger constrained geographic region that includes at least one other balancing area. Pivotal suppliers in the CAISO balancing area may be able to exercise market power over demand in the CAISO balancing area when there is limited supply available to serve demand in the CAISO's constrained region in the market. This could occur when the CAISO is import constrained directly at its balancing area boundary, it could occur when the CAISO is included into a larger region that is import constrained at its boundary, or it could occur when import constraints into the CAISO balancing area are not binding but supply across the west is so limited that suppliers within the CAISO control enough supply to successfully raise prices by bidding above marginal cost.

For example, the figure below shows six balancing areas in the energy imbalance market. The figure shows that the CAISO balancing area is included in the highest priced region with balancing area 1 and balancing area 2. The CAISO balancing 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 areas due to transfer limitations.

System Market Power Mitigation
Revised Straw Proposal

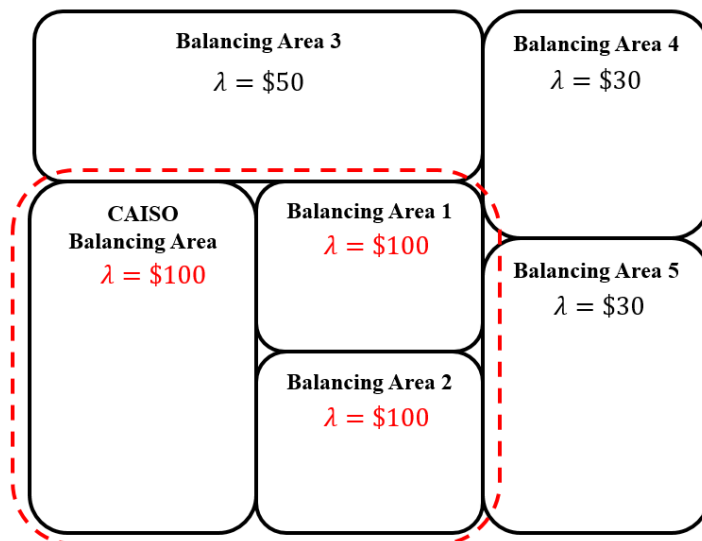


Figure 5: The CAISO's import constrained region in the energy imbalance market

In summary, there must be price separation in the energy imbalance market for demand to be in a constrained area. Absent any price separation, demand in the CAISO balancing area has access to potentially lower cost energy through transfers from other balancing areas or from imports at its import locations. All suppliers throughout the energy imbalance market and suppliers from outside the energy imbalance market compete to sell energy. However when prices separate there will exist a smaller region where demand has lost access to lower cost import supply.

When the CAISO balancing area is in the highest priced region in the energy imbalance market, demand in the CAISO balancing area is in a constrained region without access to lower cost supply from outside the region. There is lower cost energy available in the energy imbalance market that demand in the CAISO balancing area cannot access.

As described earlier, the CAISO proposes to trigger the pivotal supplier test for system-level market power mitigation when prices separate in the energy imbalance market, indicating constrained conditions, and the CAISO balancing area is in the highest priced region. The CAISO was in the highest priced constrained region in approximately 28 percent of all fifteen-minute market intervals in 2019.

7.3 Pivotal supplier test application

The CAISO proposes that the real-time market processes will execute a system-level pivotal supplier test by calculating a residual supply index using three pivotal suppliers in real-time 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 transmission constraints are uncompetitive. In this proposal, the test calculates whether the market can meet demand in a constrained area without the resources controlled by the three pivotal suppliers that control the largest amounts of resource capacity. The test fails when the residual supply index, which is essentially fringe competitive supply divided by demand, is less than one. Suppliers are considered "pivotal" when the supply they control is needed to meet demand. In this situation the assumption is that the market is uncompetitive and there is the potential for market power to be exercised. The market power mitigation process assumes that fringe competitive supply cannot exert market power.

For example, if there is 15,000 MW of supply, but the three largest suppliers control 5,000 MW, the 10,000 MW not controlled by the three largest suppliers is the fringe competitive supply. The pivotal supplier test would compare the 10,000 MW of fringe competitive supply to the demand in the constrained area to determine if the constrained area is competitive. If demand is greater than 10,000 MW, the test considers the area uncompetitive. If demand is less than or equal to 10,000 MW, the test considers the area competitive.

The CAISO proposes to use the pivotal supplier test to compare fringe supply offers in the highest priced region of the energy imbalance market to the demand in that region. The test will only consider suppliers within the CAISO balancing area as potentially pivotal suppliers. In addition to internal fringe supply, the test will consider resource offers from participating resources in energy imbalance market balancing areas within the highest priced region of the energy imbalance market as fringe supply. The test will also consider import offers at the CAISO import scheduling locations, limited by the various inter-related import constraints, as fringe competitive supply.

If there is not enough fringe competitive supply to serve demand within the highest price region, pivotal suppliers within that region may be able to exercise market power and should be flagged for potential bid mitigation. The group of balancing areas in the highest price region is import constrained from the rest of the energy imbalance market. Demand in balancing areas in this region does not have access to lower cost supply from balancing areas in the energy imbalance market outside the region due to the energy imbalance market transfer limitations.

This proposal offers the following improvements to the pivotal supplier test compared to the existing practice.

Accounting for load-serving obligations. The CAISO proposes to adjust pivotal supply quantities to account for large load-serving obligations. Large suppliers that also have large load-serving obligations do not have an incentive to withhold supply below the amount of their load-serving obligations because it may increase their overall costs. For example, a supplier that controls 5,000 MW of supply and must serve 4,900 MW of demand would be seen as a potentially pivotal supplier controlling 5,000 MW. However, the supplier does not have the incentive to exercise market power with any more than 100 MW of supply.

The CAISO will calculate each load-serving entity's load-serving obligation using each scheduling coordinator's 12-month rolling average final settlement quality load meter data. Because scheduling coordinators do not bid load into the real-time market, the CAISO proposes to use historical meter data to estimate the load-serving obligation of each scheduling coordinator. The CAISO propose to calculate each scheduling coordinator's load obligation as the product of the CAISO demand forecast and the scheduling coordinator twelve-month rolling meter value in proration to all scheduling coordinators' twelve-month rolling meter value. The CAISO will calculate a twelve-month rolling average meter value for each scheduling coordinator based on final settlement quality Load meter data submission.

Accounting for un-cleared cost-effective import offers. The CAISO proposes to count economic import offers at the CAISO's import scheduling locations as fringe competitive supply to the extent that the various import scheduling limits would not prevent those offers from clearing the market. For instance, if import suppliers make 1,200 MW of energy offers available to the CAISO behind a 1,000 MW import constraint, the pivotal supplier test will only consider 1,000 MW as fringe competitive supply. This is an improvement to the test to reflect that there may be cost-effective yet un-cleared import offers available to the CAISO. In the previous proposal, the CAISO proposed to only count net cleared economic import offers even though there may still be un-cleared import offers that are still relatively cost-effective.

Accounting for offers from EIM resources in the CAISO's constrained region. The CAISO proposes to count resource offers from participating resources in energy imbalance market balancing areas within the highest priced region of the energy imbalance market as fringe competitive supply. Energy imbalance market suppliers that control large amounts of generation outside California generally also have large load-serving obligations.²² These entities likely have a limited incentive to exert market power because it could raise the costs of meeting their own load.

²² 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

Pivotal supplier test calculation overview

This section describes the pivotal supplier test calculation which determines whether the highest price region that includes the CAISO balancing area is competitive. In summary, the calculation proceeds as follows:

1. **Calculate the amount of supply each resource could provide to the market in the test interval if it is not controlled by a pivotal supplier.** This is an upper limit for the supply schedule for every resource (using previous interval dispatch, capacity limits, ramp rates, and interval length). It is the amount of supply the resource can ramp up to from the previous interval, limited by its supply offer and the resource maximum output constraint.
2. **Calculate the amount of supply each resource would provide to the market if it is controlled by a pivotal supplier trying to economically withhold the resource.** This is a lower limit for the supply schedule for every resource (using previous interval dispatch, capacity limits, ramp rates and interval length). It is the amount of supply the resource can ramp down to from the previous interval, accounting for its self-schedule and the resource maximum output constraint.
3. **Account for a supplier's load-serving obligation in the amount of supply it would provide to the market if it is controlled by a pivotal supplier trying to economically withhold supply.** Apply a load-serving obligation limitation to the lower supply schedule (from step 2) after summing up the lower supply schedules per supplier affiliate group. If the sum of the lower supply schedules (from step 2) over all resources associated with a supplier affiliate group is less than the supplier affiliate group's load-serving obligation, set the lower supply schedule equal to the load-serving obligation.
4. **Determine the three largest pivotal suppliers.** Calculate the maximum supply a supplier affiliate group can withhold from the market as the difference between upper supply schedules for each resource calculated in step 1 summed over the supplier affiliate group and the lower supply schedules for the affiliate group calculated in step 3. The supplier affiliate groups controlling the three largest amounts of supply are to be considered pivotal suppliers for purposes of this pivotal supplier test. The resources of all other supplier affiliate groups will be considered non-pivotal.
5. **Calculate the total fringe competitive supply as the sum of the following values.**

System Market Power Mitigation
Revised Straw Proposal

- Calculate the ***non-pivotal supplier fringe supply*** as sum of the maximum supply schedules from step 1 on non-pivotal supplier resources determined in step 4.
 - Calculate the ***pivotal supplier fringe supply*** as the sum of the minimum supply schedules from step 2 on pivotal supplier resources determined in step 4.
 - Calculate the ***energy imbalance market fringe supply*** as the net energy imbalance market transfers into the high priced region.
 - Calculate the ***import fringe supply*** as the net import offers to the CAISO balancing area as limited by the intertie transfer constraints.
6. **Calculate the residual supply index using three pivotal suppliers.** Divide the total fringe competitive supply from Step 6 by the demand in the high priced region. If the residual supply index is less than 1, then the constrained area is not competitive in the test interval.

7.4 Competitive locational marginal price

The CAISO proposes to use a new calculated competitive locational marginal price when it fails its system-level market power mitigation pivotal supplier test.

The CAISO proposes to calculate the competitive locational marginal price as the lower of its next constrained un-cleared economic import offer or the lowest power balance constraint shadow price outside the highest priced region of balancing areas in the energy imbalance market.

The market power mitigation processes use a competitive locational marginal price to ensure that the market does not dispatch more energy at mitigated prices than what is needed to address market power. It reduces a resource's bids to the higher of the price of its default energy bid or the competitive locational marginal price. If it were to reduce bids just to the default energy bid, the market may dispatch more energy from a mitigated resource bid resource than what is needed to address market power in a constrained area. This could result in an importing area becoming an exporting area merely because of market power mitigation.

The mitigation processes impose a price floor on mitigated offer prices of all affected resources. The price floor is the competitive price that is determined in the market power mitigation process. For the CAISO's local market power mitigation process, it is calculated by removing the non-competitive congestion components from the locational marginal price. For balancing area level market power mitigation process in the energy imbalance market, it is calculated as the CAISO's system marginal energy price. Using this bid 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.

Another common view is that the competitive locational marginal price is a prevailing price for energy outside of the constrained area. Suppliers attempting to exercise market power in the constrained area would try to elevate the price in the constrained area above the going rate for energy. In this context, the mitigated offer price floor ensures resources are not forced to sell energy below the going rate for energy.

In the specific scenarios where the proposed system-level market power mitigation processes could mitigate supply offers, demand does not have access to cheaper energy at the going rate outside the constrained area. Under this proposal, the system-level market power mitigation process will evaluate competitiveness and potentially mitigate supply offers when prices separate in the energy imbalance market, indicating constrained conditions, and the CAISO balancing area is in the highest priced region. When this occurs, demand in the CAISO balancing area is in a constrained region where it has lost access to cheaper energy at the prevailing price for energy outside of the constrained region. Demand does not have access to cheaper economic import offers behind binding import constraints and it does not have access to cheaper energy

System Market Power Mitigation Revised Straw Proposal

imbalance market supply from balancing areas in lower priced regions. These prices can form the basis of the competitive locational marginal price.

The competitive locational marginal price should be calculated as the lower of the next constrained un-cleared economic import offer or the lowest power balance constraint shadow price outside the highest priced region of balancing areas in the energy imbalance market. This value is the price demand in the CAISO balancing area would pay for the next increment of energy if it were not constrained by the CAISO's import limitations and the energy imbalance market transfer limitations.

This competitive locational marginal price should only have a small impact on energy imbalance market entities other than the CAISO. The new competitive locational marginal price will not impact entire fleets of resources in other energy imbalance market balancing areas because it will only be used when the CAISO is in the highest priced region. Under this scenario, the market will not trigger system-level mitigation of other energy imbalance market balancing areas, because it is only triggered for other balancing areas when they have higher prices than the CAISO balancing area. The new locational marginal price may have a small impact on individual participating resources in the energy imbalance market that can provide relief on individual uncompetitive transmission constraints within other balancing areas. When individual transmission constraints are uncompetitive, the competitive locational marginal price calculated for individual resource mitigation will use this new competitive locational marginal price as the CAISO's system marginal energy cost. The individual participating resource competitive locational marginal prices will still include all of the congestion from competitive constraints.

Competitive locational marginal price calculation

The CAISO proposes to use the following competitive locational marginal price when it fails its system-level market power mitigation pivotal supplier test.

First, the CAISO will find the set of import scheduling limits that bind in the market power mitigation pass. Next, the CAISO will evaluate the un-cleared economic import offers at its binding import scheduling locations to find the lowest un-cleared economic import offer (**Competitive Import Price**). If no import scheduling limits are binding, suppliers are theoretically offering imports inside the constrained area and those offers cannot be used to set the going rate for energy outside of the constrained region. The **Competitive Import Price** will be set to a high value so that the final competitive locational marginal price calculation will resolve to the **Competitive EIM Price** described below.

Next, the CAISO will find the power balance constraint shadow price of the next highest priced group of balancing areas within the energy imbalance market (**Competitive EIM Price**).

System Market Power Mitigation
Revised Straw Proposal

Finally, the CAISO will set the competitive locational marginal price as the lower of the ***Competitive Import Price*** and the ***Competitive EIM Price***.

7.5 Energy offer mitigation

In the event system-level market power mitigation is triggered by failing the pivotal supplier test, the CAISO proposes to mitigate energy bids for resources within the CAISO balancing area to the higher of the resource's default energy bid or the newly calculated competitive locational marginal price. The CAISO does not propose to mitigate import offers. Also, although participating resources in EIM balancing areas in the energy imbalance market will continue to be subject to the current energy imbalance market mitigation procedures, they will not be mitigated as a result of the CAISO's application of the system market power mitigation.

The CAISO proposes to mitigate only the resource offers from suppliers controlling enough supply to be pivotal for serving demand in the constrained area. This means that the system-level market power mitigation process will mitigate resource offers from the two largest supplier affiliate groups plus any other supplier affiliate group that is required (i.e. pivotal) 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' resource offers mitigated.

Bids for resources inside constrained areas

In general, the CAISO's market power mitigation processes are designed to identify circumstances when suppliers could realistically exercise market power. They are designed this way because the CAISO does not believe that a supplier should be forced to sell power below its offer price if it cannot exercise market power. At the local level in the entire energy imbalance market footprint and at a system-level for non-CAISO balancing areas participating in the energy imbalance market, the CAISO's market power mitigation processes identify transmission constrained areas before mitigating bids for resources in the constrained areas. The CAISO applies this first check for whether an area is transmission constrained because demand in the constrained area is captive to the suppliers in that area. Those suppliers can arbitrarily raise energy prices in the area with impunity. Suppliers in constrained areas can successfully raise market prices because constrained areas lack the capability to bring in more economic external supply. Mitigating submitted bids should be dependent on whether demand in constrained areas has access to competitive supply.

The CAISO's balancing area can also be constrained in a way that limits the ability of demand to access competitive external supply. When the CAISO balancing area is import constrained and its supply mix is potentially uncompetitive, suppliers inside the CAISO balancing area could exercise market power on demand inside the CAISO balancing area. Under these circumstances, it would be appropriate for the CAISO market to mitigate offers from those suppliers whom can raise prices on captive demand (i.e. its internal resource offers).

Pivotal supplier bids

System Market Power Mitigation
Revised Straw Proposal

At the broader system-level, with the potential for a large class of non-pivotal suppliers, the CAISO believes it should first identify which suppliers could actually be pivotal at a system-level before mitigating resource offers. The CAISO's current market power mitigation processes mitigate all suppliers that are in the constrained area, even though fringe competitive suppliers do not have an economic incentive to raise their offer prices to try to economically withhold from the market. The CAISO believes this simplification for 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 a large set of pivotal suppliers for each constraint. However, this simplification may not be reasonable at a system-level, where there is the potential for a large segment of non-pivotal suppliers.

Bids for resources inside the CAISO balancing area

This initiative is focused on extending similar system-level market power mitigation checks already performed in the energy imbalance market to suppliers in the CAISO balancing 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 areas in the energy imbalance market that are included with the CAISO balancing area in the highest priced region because they likely represent fringe competitive supply.

Because the purpose of the test is to determine if suppliers within the CAISO balancing 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 area.

This proposal presents a method to test if suppliers controlling resources within the CAISO balancing area could potentially exercise market power. This methodology is somewhat analogous to balancing authority area level mitigation the market currently performs when energy transfers are constrained into an energy imbalance market balancing authority area other than the CAISO. This design extends those similar market power mitigation checks to suppliers in the CAISO balancing area.

The CAISO is not proposing to mitigate import bids because when the system-level market power mitigation process triggers, the CAISO balancing area will be in the highest priced import constrained region where, generally, import offers and energy imbalance market transfers into the region are all priced lower than supply in the constrained region.

The CAISO is also not proposing to mitigate import bids because import bids likely represent fringe supply that is unable to exert market power. This initiative is focused on the concern that suppliers controlling large amounts of divested generation within the CAISO balancing authority area could exercise system-level market power.

System Market Power Mitigation ***Revised Straw Proposal***

In any case, even in the unlikely circumstance that an import supplier is pivotal, a supplier voluntarily offering import supply could simply not offer import supply to the market to raise prices, rather than offering the supply at high prices to economically withhold from the market. A supplier exerting market power is not necessarily trying to have high priced bids set the price. The supplier may be bidding high so its high-priced offers do not clear the market, resulting in the market clearing further up the supply stack at higher prices, increasing prices for other bids that clear submitted by the same supplier. Import suppliers can achieve this end by simply decreasing import supply they offer to the market.

Finally, an important practical consideration is that there is not currently a methodology for the CAISO to calculate default energy bid for imports. It is currently impractical to do this because imports are not linked to specific sources for which the CAISO has cost information. Furthermore, the CAISO does not model commitment costs for imports so a means to account for these costs would have to be developed. The CAISO and stakeholders are developing a price screening methodology for import bids greater than \$1,000/MWh in that initiative. However, that methodology will not be precise and will only be appropriate for the very rare events when energy prices are greater than \$1,000/MWh. It would not be appropriate for default energy bids used in market power mitigation that would have the potential to impact market clearing prices more frequently (assuming an importer was ever a pivotal supplier). While the CAISO and stakeholders could conceivably develop an import default energy bid for imports if it was determined to be needed, this could not occur within the implementation timeline of this initiative.

Supply offers for resources participating in the energy imbalance market that are in balancing areas included with the CAISO in the highest priced region should also not be mitigated because they are likely fringe competitive supply. Energy imbalance market suppliers that control large amounts of generation outside California also have large 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.

Resource adequacy import bid mitigation

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. As described above, importers are most likely not pivotal suppliers and there is not a default energy bid methodology for import bids that would be needed to mitigate them.

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

System Market Power Mitigation
Revised Straw Proposal

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.

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, 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 September 2020 meeting and to the Board of Governors' at its September 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 2020	Publish draft final proposal
June 2020	Stakeholder conference call
June 2020	Comments on draft final proposal due
June/July 2020	Tariff and BRS development
July 2020	Publish final proposal
August 2020	Comments on final proposal due
September 15-16, 2020	Energy Imbalance Market Governing Body meeting
September 30 - October 1, 2020	Board of Governors meeting
Prior to Summer 2021	Implementation

Stakeholders should attend the stakeholder conference call on April 13, 2020 and provide written comments to initiativecomments@caiso.com by May 4, 2020.