System Market Power Mitigation
Straw Proposal

Comments by Department of Market Monitoring
January 10, 2020

Summary

DMM appreciates the opportunity to comment on the ISO's *System Market Power Mitigation Straw Proposal.*[1] DMM is supportive of the ISO's pursuit of a system market power mitigation stakeholder process and is generally supportive of the straw proposal.

In the straw proposal, the ISO outlines CAISO balancing authority area (BAA) market power mitigation measures for the real-time market only, which may be triggered only if three large CAISO intertie transfer constraints (ITCs) are import constrained.[2] Developing market power mitigation for the day-ahead and real-time markets that more accurately considers CAISO supply and demand as one part of larger constrained WECC and EIM areas will require substantially more design work. The ISO proposes to complete this design work in a second phase of the initiative.

The ISO has indicated that it can implement its Phase 1 proposal for real-time CAISO BAA-level mitigation before the summer of 2021. Despite some clear limitations of the proposal, DMM believes that it may mitigate real-time market power in some situations. Mitigation of market power in the real-time market may also help mitigate market power in the day-ahead market to some degree. Therefore, DMM supports the ISO's general approach in this proposal as an incremental improvement over the current LMPM design which lacks CAISO BAA-level market power mitigation. DMM supports the ISO's continued development of system-level market power mitigation measures for the day-ahead and real-time markets in Phase 2 of the initiative.

DMM encourages the ISO to carefully consider all conditions which may lead to market power at the CAISO BAA level when determining when to apply CAISO BAA market power mitigation. There may be times — particularly in the real-time market — when the CAISO import ITC constraints are not binding, but uncompetitive conditions exist because additional supply of competitive imports is limited in a given interval.

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[1] *System Market Power Mitigation Straw Proposal*, California ISO, December 11, 2019: http://www.caiso.com/InitiativeDocuments/StrawProposal-SystemMarketPowerMitigation.pdf

[2] In the real-time market, CAISO is one BAA out of many in the Western EIM. In Phase 1 of this initiative, CAISO is proposing a design for testing for market power in the CAISO BAA and mitigating resources in the CAISO BAA. It is not considering a mitigation design that would test for market power in the entire Western EIM system. Nor is CAISO considering a mitigation design that would test for market power in groups of Western EIM BAAs, including CAISO, that are separated from the rest of the Western EIM system by transfer constraint congestion. The ISO has stated that it will develop this kind of system market power mitigation in Phase 2 of this initiative. Therefore, throughout these comments we refer to the mitigation proposed in Phase 1 as CAISO BAA-level mitigation rather than system mitigation.

The competitive LMP is used as a floor in bid mitigation under local market power mitigation (LMPM). DMM agrees that when the CAISO BAA is found to be uncompetitive, the competitive LMP is no longer competitive or appropriate for use in LMPM due to its dependence on a CAISO system price. The ISO proposes to address this issue by using only resource default energy bids (DEBs) in LMPM when the CAISO BAA is found to be uncompetitive. DMM encourages the ISO to consider potential unintended consequences of this change, and whether it may be possible to retain the use of a competitive LMP constructed using a different approach.

Finally, DMM proposes some minor adjustments to the proposed CAISO BAA-level residual supplier index (RSI) calculation. We provide additional detail on this and the other issues summarized above in the following sections of these comments.

I. Mitigation in the real-time market only

In the straw proposal, the ISO outlines CAISO BAA-level market power mitigation measures for the real-time market only. DMM supports this approach as an incremental improvement that may also help mitigate market power in the day-ahead market to some degree. Mitigation of the real-time market can result in indirect mitigation of market power exercised in the day-ahead market and may also reduce the impacts of real-time market power on day-ahead prices.

Although real-time market power mitigation does not directly affect the day-ahead market, mitigation of the real-time market can have an indirect effect of partially mitigating system market power in the day-ahead market. This concept was discussed in earlier DMM comments, with more detailed discussion by the Market Surveillance Committee (MSC).[3,4]

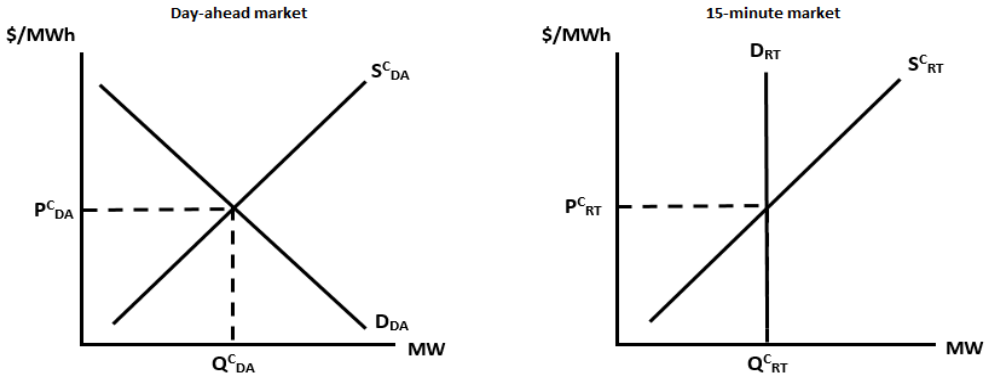
The following examples illustrate how applying mitigation only to the real-time market can partially mitigate market power in the day-ahead market. Examples also illustrate how virtual demand bids can transform the exercise of real-time market power into higher day-ahead market prices. Real-time market power mitigation can reduce this effect by reducing expected real-time prices. Because of the potential for these market dynamics, DMM supports the ISO's proposal to mitigate only the real-time market as an incremental step forward in the development of system market power mitigation.

[3] *Comments on CAISO's Analysis of Structural System-Level Competiveness*, Department of Market Monitoring, May 20, 2019. See "Discussion – Virtual Bids", p. 4. http://www.caiso.com/Documents/DMMComments-SystemMarketPowerAnalysis.pdf

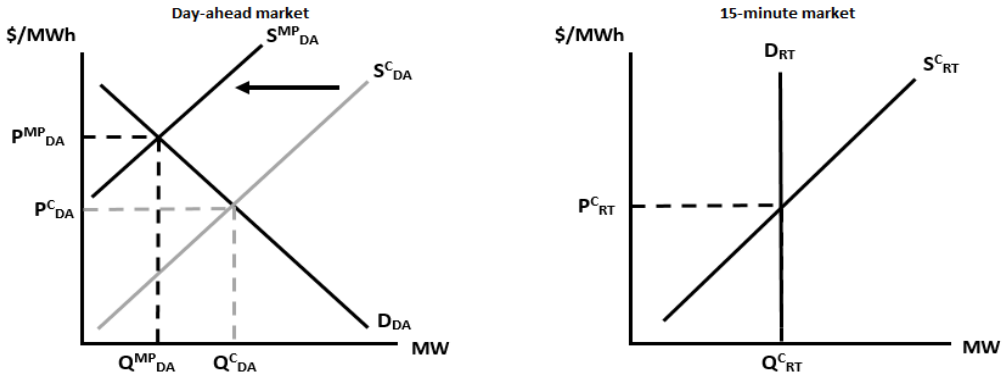
[4] *Opinion on System Market Power Mitigation*, Members of the Market Surveillance Committee of the California ISO. November 5, 2019. See Appendix B "Market Power Mitigation in the Real Time Market Does Not Completely Mitigate IFM Market Power If RT Supply Elasticity is Smaller than IFM Supply Elasticity", B.F. Hobbs. http://www.caiso.com/Documents/MSC-DraftOpinionSystemMarketPowerMitigation-Nov5_2019.pdf

Real-time mitigation in conjunction with virtual supply bidding may partially mitigate market power in the day-ahead market

To illustrate the manner in which system market power mitigation of the real-time market can partially mitigate system market power in the day-ahead market, consider the following highly simplified example of a competitive day-ahead and 15-minute real-time market. In this case, all resources submit bids at marginal cost. Prices in the day-ahead and real-time markets are competitive and converged ($P^{C}_{DA} = P^{C}_{RT}$):



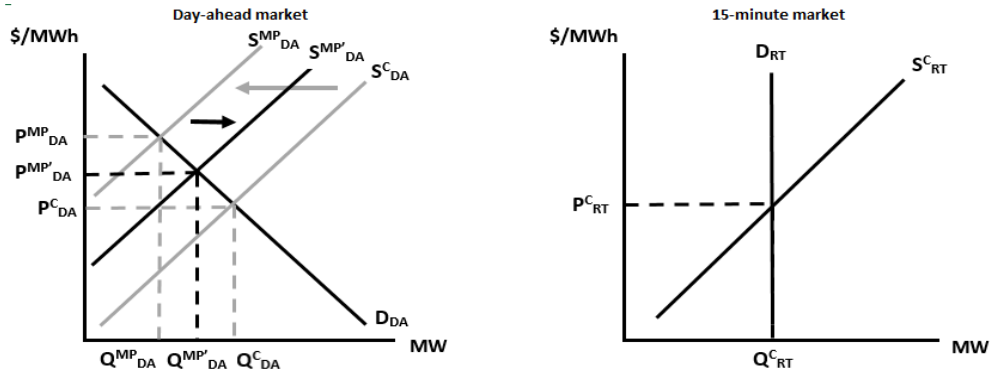
Now assume that both markets are uncompetitive, but that system market power mitigation is applied to the 15-minute real-time market and effectively preserves a competitive outcome. The exercise of market power in the day-ahead market results in a lower quantity of cleared load and a higher uncompetitive price (P^{MP}_{DA}). Because system market power mitigation is applied in real-time, the expected real-time price is lower than the non-competitive day-ahead price ($P^{MP}_{DA} > P^{C}_{RT}$). In this scenario, prices in the day-ahead and real-time markets are no longer converged:



The consistent exercise of market power in the day-ahead market and application of system market power mitigation in the 15-minute market would establish an expectation of price divergence between these markets, creating an incentive for virtual supply bidders to arbitrage the price difference. An increased quantity of virtual supply bids increases competitive supply

in the day-ahead market. This partially mitigates the exercise of day-ahead market power and drives day-ahead market outcomes back toward a competitive solution.[5]

The day-ahead price that results under partial mitigation from virtual supply is $P^{MP'}_{DA}$:



As shown in the example above, virtual supply only partially mitigates market power in the day-ahead market since virtual bidders do not have an incentive to offer enough virtual supply to keep the day-ahead prices ($P^{MP'}_{DA}$) equal to an expected real-time price reflecting competitive market conditions or effective real-time market power mitigation (P^{c}_{RT}).

This example above is consistent with past market performance as well as economic theory. Although virtual bidding has generally helped reduce the difference between average prices in the ISO's day-ahead and real-time markets, the last few years have been marked by extended periods in which day-ahead prices have tended to exceed real-time prices despite large volumes of net virtual supply bids routinely clearing the day-ahead market.

In practice, virtual bidders do not have an incentive to offer enough virtual supply to keep the day-ahead prices equal to real-time prices for several reasons:

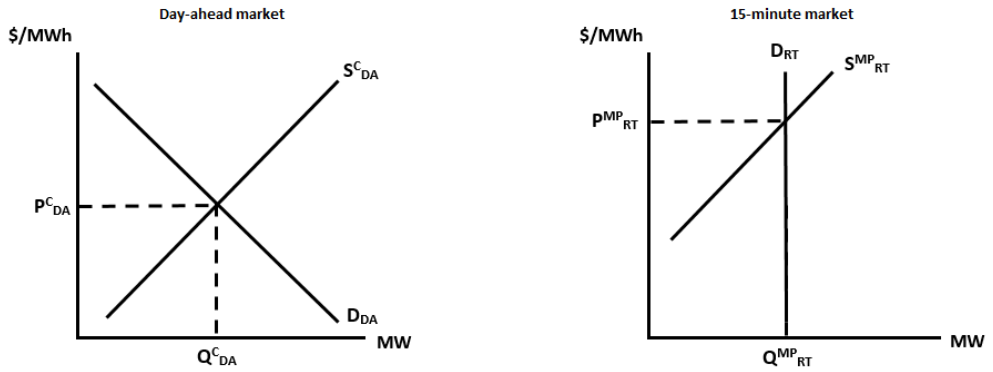
- First, virtual supply clearing the day-ahead market can be assessed uplift charges from residual unit commitment that may have been made due to a high volume of net virtual supply clearing the day-ahead market. These charges can significantly reduce the profit margin on virtual supply clearing the market and may cause bidders to increase virtual supply bid prices accordingly.

[5] As noted by the MSC, in the simplest case the effectiveness of virtual supply in mitigating day-ahead market power depends on the difference between day-ahead and real-time elasticity of supply, with a greater difference in elasticity leading to lower effectiveness. See B.F. Hobbs as referenced in Footnote 3 above. In practice, effectiveness may be reduced by other factors such as uncertainty of price divergence, and related real-time price risk associated with virtual supply, as well as relatively high prices of virtual supply offers.

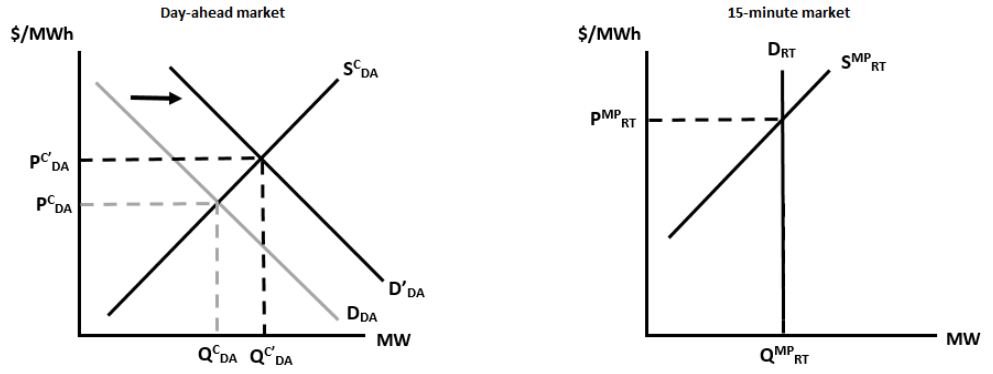
- In addition, the more virtual supply lowers the day-ahead price relative to real-time prices, the lower the profit margin from this virtual supply. Some virtual suppliers may include a relatively high opportunity cost or risk premium on virtual supply bids submitted in the day-ahead market. For example, even if a bidder believes there is a very high probability that average day-ahead prices will exceed real-time prices, the possibility of real-time price spikes up to $1,000/MWh may represent a significant financial risk for virtual suppliers.

Real-time mitigation may help prevent uncompetitive day-ahead prices that can result from virtual demand bidding

When market power may otherwise be exercised in real-time, system market power mitigation in the real-time market can also reduce impacts of higher real-time price expectations on day-ahead market outcomes. For example, consider the following case where the day-ahead market is competitive, but 15-minute prices are higher due to the exercise of system market power:



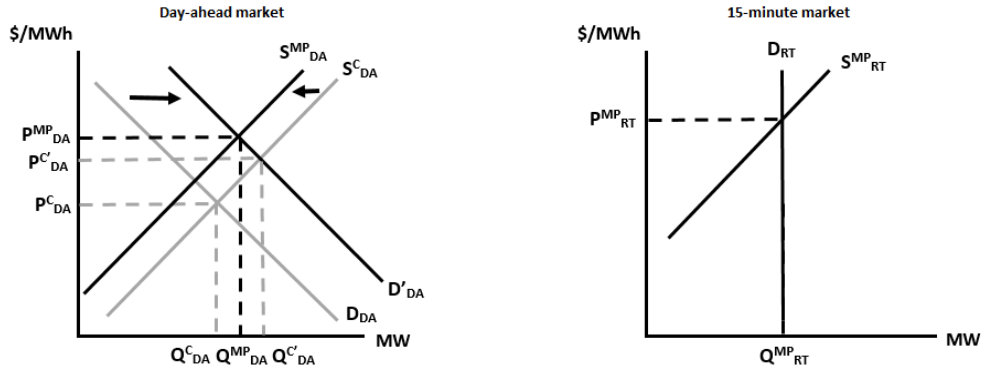
Under conditions where the consistent exercise of real-time system market power creates an expectation of real-time prices exceeding day-ahead prices in a given hour, virtual demand has incentive to arbitrage the expected price difference. This has the impact of increasing total demand in the day-ahead market, with significant quantities of virtual demand being bid in the range of the expected real-time price. In this scenario, the day-ahead clearing price is increased (from P^{C}_{DA} to $P^{C'}_{DA}$) by virtual demand bids reflecting an expectation of higher real-time prices due to the exercise of market power (P^{MP}_{RT}).



The likelihood of potentially uncompetitive real-time system conditions and real-time prices that exceed day-ahead prices due to potential exercise of market power may be especially elevated during the highest expected net load hours. These hours offer the greatest incentive for virtual demand and the least incentive for virtual supply. Further, these are the hours most susceptible to pivotal suppliers in both day-ahead and real-time markets.

To the extent that a pivotal supplier can anticipate the impact of virtual demand in the day-ahead market on these days, the supplier may exercise a degree of market power in the day-ahead market. The ability of virtual supply to mitigate this market power is limited due to the reduced incentives to offer virtual supply under these conditions and the higher price of virtual supply offers driven by expected real-time prices.

The result in this scenario is a further elevated day-ahead market clearing price that is influenced by both virtual bids and potential exercise of market power by pivotal suppliers:



To the extent that expectations of real-time prices are driven up by the exercise of real-time system market power through uneconomic bidding, mitigation applied to only the real-time market should ultimately result in lower real-time price expectations.[6] This should in turn reduce incentives for virtual demand and decrease the price at which virtual supply may be offered in the day-ahead market. Again, this reduces – but does not eliminate – the ability of pivotal supply to exercise market power in the day-ahead. However, the expected outcome is a day-ahead clearing price that more closely reflects competitive outcomes in both day-ahead and real-time markets.

II. Only applying mitigation when CAISO ITC constraints are binding

The straw proposal currently only considers mitigating the CAISO BAA when a set of CAISO intertie transfer constraints (ITCs) are binding in the import direction. This approach is also an incremental improvement, but it is not likely to capture the full extent of potentially

[6] The exercise of real-time market power through uneconomic bidding is only one potential contributor to expected real-time prices. Real-time system market power mitigation will not be effective in reducing real-time price expectations that are influenced by the nature of the ISO's real-time software, an expected level of forced real-time generation outages, or other factors unrelated to the competitiveness of real-time supply bids.

uncompetitive CAISO BAA conditions. DMM suggests that the ISO carefully consider the details of how such an approach may be implemented. Further, DMM suggests that the ISO consider other circumstances that may be uncompetitive and in which market power could be exercised at the CAISO BAA level independent of binding intertie transfer constraints, particularly in the real-time market.

The ISO proposes to consider triggering CAISO BAA-level market power mitigation only during intervals where all of the three major interties into the CAISO are binding (Malin, Palo Verde, and NOB). As an initial point on implementation, the ISO needs to consider how it would handle the circumstance where one of these paths is completely out of service.

For example, during a period in October and November 2019, the Pacific DC Intertie (PDCI) was completely out of service outside of the ISO. The path limit was 0 MW, and the corresponding NOB ITC limit for the ISO was also set to 0 MW. In this period, the NOB ITC was not binding, but imports from this path to the CAISO and elsewhere were completely eliminated. In terms of available import supply, this is effectively the same as having a binding constraint, but the ISO process for testing CAISO BAA competitiveness needs to be robust enough to capture such circumstances.

The Straw Proposal also notes the possibility that it may be appropriate to assess the potential competitiveness of a given intertie before determining whether that constraint needs to bind in order to trigger CAISO BAA-level mitigation. This follows the idea of considering mitigation in circumstances where the CAISO does not have access to competitive west-wide supply. The ISO proposes assessing whether there are regularly enough offers at a particular intertie to result in the import constraint binding as one possible analysis. If there are consistently not enough offers for the intertie to bind over an extended time period, this may indicate a lack of competitive access outside of the ISO. [7]

DMM agrees with this approach and encourages the ISO to assess whether a particular intertie may not be competitive before requiring that it bind before triggering CAISO BAA market power mitigation. DMM also suggests that the ISO could consider the concentration of participants offering imports on a particular intertie over some period of time when determining the potential competitiveness of a particular intertie. If there are only offers from a small number of entities, even if the volume of offers is sufficient to result in the intertie binding, this may be another potential indicator of uncompetitive access to the intertie.

Further, as noted in the December 16 ISO stakeholder meeting, the ISO needs to determine whether this evaluation of which constraints need to bind for mitigation should be static or dynamic. It may be appropriate to consider on a periodic basis that the interties providing competitive import supply to the ISO could change.

[7] See Straw Proposal, pg. 25. This issue was also discussed in the December 16, 2019 stakeholder meeting. See presentation, slide 12: http://www.caiso.com/InitiativeDocuments/Presentation-SystemMarketPowerMitigation-StrawProposal.pdf

DMM also encourages the ISO to consider all circumstances in which import supply may be unavailable. Such circumstances may also contribute to potentially uncompetitive conditions under which pivotal suppliers could exercise market power. For example, in a given 15-minute or 5-minute interval of the real-time market, the ability to commit new resources is limited. In addition, the vast majority of imports are offered on an hourly basis and have no incremental availability in the interval. Intertie scheduling timelines must be satisfied, and the quantity of import offers that can be dispatched on a 15-minute basis is limited.

Under these conditions, the ISO is effectively cut off from the majority of available import supply for the interval even when ITCs are not binding. This outcome is driven by the intertie scheduling rules and practices of the WECC rather than a binding transmission constraint. On a 15 or 5-minute basis, this creates a potential source of market power for generation resources that are committed and rampable within the interval.

III. Considering CAISO as part of larger constrained areas in WECC or EIM

The section above describes how the proposed CAISO BAA-level mitigation will miss mitigating market power when the CAISO ITCs are not binding because only limited supply can get to CAISO borders due to transmission or intertemporal constraints beyond CAISO's jurisdiction. In both the day-ahead and real-time markets, CAISO is part of a larger WECC system that has constraints that will at times make CAISO part of a constrained region that is larger than CAISO itself. Therefore, it is important that CAISO reconsider its proposal to only trigger CAISO BAA-level mitigation when ITCs at CAISO's boundary are binding.

In the real-time market, the ISO explicitly models CAISO as being connected through EIM transfers to the many BAAs in the Western EIM. The ISO's Phase 1 proposal does not attempt to assess market power in the areas consisting of CAISO combined with surrounding EIM BAAs connected through unconstrained EIM transfer constraints. This would entail a much more complicated design. Therefore DMM understands that it would likely not be possible to design and implement this more sophisticated system market power mitigation by the summer of 2021. DMM appreciates the ISO's commitment to developing a more robust system market power mitigation design in Phase 2 of this initiative; DMM supports the ISO proceeding with a more limited proposal for CAISO BAA-level mitigation in Phase 1 that can be implemented before the summer of 2021.

IV. Competitive LMP when CAISO is non-competitive

Current local market power mitigation (LMPM) measures depend on the use of a competitive LMP (CLMP) calculated for each node. When local market power mitigation is triggered, resource bids are mitigated to the greater of the CLMP or the resource's default energy bid. Thus, the CLMP essentially sets a floor below which bids of individual resources being mitigated may be lowered. Because the CLMP used in LMPM assumes the CAISO BAA is competitive,

DMM supports the ISO's proposal to modify the application of CLMP in local market power mitigation when the CAISO BAA is deemed uncompetitive.

The CLMP is comprised of the system marginal energy component (SMEC), which is assumed competitive, as well as the loss component of LMP at the node, and the portion of the congestion component of LMP deriving from competitive constraints. The SMEC is the price at the reference bus, which in the market power mitigation run is the Midway or Vincent bus in the CAISO BAA. Given this construct, if the CAISO BAA is deemed uncompetitive, then the SMEC and therefore CLMP are also uncompetitive. For this reason, DMM supports a modified application of CLMP in local market power mitigation when the CAISO BAA is determined to be uncompetitive.

The ISO proposes to eliminate the use of the CLMP when the CAISO BAA is uncompetitive, making all mitigation to the level of default energy bids. Although DMM agrees that the CLMP is not appropriate to use in system market power mitigation as constructed, the ISO's proposed approach may have unintended outcomes, particularly in instances when a resource's DEB may not fully represent its marginal cost. DMM suggests that the ISO carefully consider these possible outcomes, and whether there is a workable alternative approach to calculating a CLMP that would be appropriate when the CAISO BAA is uncompetitive.

V. Residual supply index for CAISO BAA-level mitigation

The ISO proposes to use a three pivotal supplier test to determine if resources within the CAISO BAA can competitively supply the CAISO demand that is being met by internal CAISO resources when the three largest ITCs are import constrained. While the pivotal supplier test is recognized to be an imperfect measure of competitiveness, this is the test currently used in CAISO's LMPM. DMM supports the general approach of using a pivotal supplier test to detect uncompetitive market conditions. The sections above describe issues with the ISO's proposal that require more substantial design work. This section provides some recommendations and asks for clarity on some details of the ISO's proposed RSI calculation for CAISO BAA-level mitigation.

Including transmission losses and CAISO load conformance in RSI demand

The ISO proposes to directly include a value for CAISO BAA demand in the denominator of its CAISO BAA-level RSI calculation. This is very different from how demand for counterflow is calculated in the RSI calculation for constraints in LMPM. Demand for counterflow in the LMPM RSI calculation is determined by summing up the effective dispatch from every resource that provides counterflow to the constraint. This dispatch includes power to account for transmission losses.

The demand value the ISO proposes for the denominator of its CAISO BAA-level RSI does not include all power that must be produced by the fringe and pivotal suppliers considered in the numerator of its RSI. In particular, the ISO should add to the denominator of its proposed RSI:

1) CAISO load conformance, and
2) Transmission losses from all internal CAISO resources dispatched in the mitigation run.

Ancillary service supply and demand

In the current RSI design for LMPM, supply of counterflow from suppliers is capped by each resource's self-scheduled ancillary service awards. A slightly more nuanced treatment may be warranted for CAISO BAA-level mitigation. This is because a portion of the energy bids being considered in the numerator of the proposed RSI may be used to meet ancillary service demand.

In order to account for this in the CAISO BAA-level RSI, DMM recommends that the ISO consider adding regulation up, spin and non-spin demand to the RSI denominator in Phase 2 of this initiative. When the ISO adds this demand to the denominator, it should also include bids (and self-schedules) for regulation up, spin, and non-spin that do not overlap with energy bids in the numerator of the RSI.

DMM recognizes that this may add some implementation complexity. DMM understands that the vast majority of real-time ancillary service demand is met by day-ahead ancillary service awards self-scheduled in real-time. Therefore, continuing to simply use self-scheduled ancillary service awards to cap resource supply in the RSI numerator should resolve most of this issue for real-time market power mitigation proposed in Phase 1. However, DMM recommends that the ISO revisit how it handles ancillary service supply and demand when it designs day-ahead system market power mitigation in Phase 2.

Clarification of supply from potentially pivotal suppliers

In the straw proposal presentation, the ISO describes pivotal supply offers from resources within the CAISO in the calculation of RSI as offers from pivotal supplier resources constrained by downward ramping capability.[8] Appendix B of the Business Practice Manual for Market Operations defines the supply of counter flow from each potentially pivotal supplier that gets included in the numerator of the RSI used in the real-time market's dynamic competitive path assessment.[9] The equation in Appendix B limits the supply from each resource of a potentially pivotal supplier to the MW level that the resource cannot be dispatched below, given the resource's ramp rate and dispatch level in the previous real-time market run. DMM asks that

[8] *System Market Power Mitigation*, California ISO, December 16, 2019, slide 14: http://www.caiso.com/InitiativeDocuments/Presentation-SystemMarketPowerMitigation-StrawProposal.pdf

[9] See the "Supply counter flow from potential pivotal supplier" row in the "RTM" column of Appendix B at page 29 of *Appendices_Market Operations_V55_clean*: https://bpmcm.caiso.com/Pages/BPMDetails.aspx?BPM=Market%20Operations

the ISO confirm that it is proposing to use the same method to cap the supply from potentially pivotal supplier resources in the RSI for CAISO BAA-level mitigation.