Opinion on
Commitment Costs and Default Energy Bid Enhancements (CCDEBE)

by

James Bushnell, Member
Scott M. Harvey, Member
Benjamin F. Hobbs, Chair

Members of the Market Surveillance Committee of the California ISO

March 5, 2018

1. Introduction and Summary of Recommendations

The collection of costs associated with starting a generation unit and positioning it to provide at least its minimum amount of electrical energy are known as commitment costs. There is a potential for the exercise of market power through inflated commitment cost offers. Inflated commitment cost offers have the potential to impact the market in two ways. First, they can serve to economically withhold capacity, driving up energy prices when transmission constraints bind and the high cost of committing a resource causes a resource to not be committed and in turn causing energy prices to be set by high cost incremental energy offers of another resource. Besides higher prices, the result can be unnecessarily high resource costs in meeting load because load would not be met by the least-cost set of resources. Second, inflated commitment cost offers can also raise consumer costs through high bid-cost recovery (BCR) or exceptional dispatch (ED) payments required to cover inflated as-bid costs that are incurred when a resource must be committed to relieve a transmission constraint.

The California ISO (CAISO) has addressed these possibilities by either of two ways. Either resources could be scheduled based on commitment costs calculated by the CAISO, rather than using offer prices submitted by the resource operator, or commitment costs are submitted by the market participant, with the allowed offers being subject to caps calculated by the CAISO based on the CAISO's cost estimates.

The CAISO's commitment cost mitigation approach relies upon an assumption that the CAISO can estimate the true costs of most or all resources with reasonable accuracy. In particular, such approaches rely upon the availability of accurate *ex ante* measures of the natural gas costs that would be incurred by generators in order to generate incremental power. As CAISO markets have expanded to regions in which not all gas-fired generation is located at liquid trading points for gas with published indexes and may in the future include more unconventional generation, the assumption about the visibility of marginal costs to the CAISO is becoming less reliable.

The current CAISO design for mitigation of commitment costs has contributed to market problems as the western gas market has become more volatile and as the need has grown for the CAISO to improve its utilization of use-limited resources to balance short-term variations in net load. This design has also become less workable because of the expansion of the CAISO real-time market to include the EIM region. This expansion has taken the CAISO market design into

regions dominated by vertically integrated, regulated, utilities and with a wide diversity of supply situations for gas fired generation. The challenge is that the CAISO now needs to estimate commitment costs for an expanded set of gas-fired resources with a greater diversity of supply alternatives.

The CAISO has therefore proposed a comprehensive reform of its rules considering commitment cost offers and how the CAISO mitigates potential market power in those offers.[1] The Market Surveillance Committee (MSC) has been asked to prepare this Opinion on this proposed reform, which is called the Commitment Costs and Default Energy Bid Enhancements (CCDEBE). The MSC has participated extensively in the CCDEBE development process, including discussions addressing principles and detailed implementation issues that have taken place at several MSC public meetings over the past two years.[2] Moreover, this is not the first time that the MSC has considered the issues involved in designing a commitment cost bidding system that is both cost-reflective and safe from the exercise of market power. The MSC has written over 10 opinions since 2007 (summarized in Section 2) addressing those issues in response to the initial MRTU design as well as subsequent proposed changes.

In general, the CCDEBE proposal attempts to focus mitigation of commitment costs on a subset of units deemed to possess local market power using a dynamic test, and to allow more flexibility for market offers of these costs to other units. This philosophy closely mirrors that applied by CAISO in the mitigation of energy cost bids. For reasons discussed below, the implementation of this approach is more complicated with commitment costs than it is with energy bids. However, we agree that this is an important and necessary initiative to undertake. In brief, we agree that the volatility of gas prices and the need to encourage resources to make flexible offers into the market mean that it is desirable that the CAISO implement a more flexible system that allows resources to offer commitment costs that better reflect recent and anticipated costs particularly during periods of gas price volatility. Further, we agree, and have previously recommended, that dynamic market power tests be implemented that would give resources without market power more flexibility to bid their costs during periods while protecting consumers against the exercise of market power in those locations and at those times that there is a significant risk of that exercise. We believe the proposal will also enable the CAISO to coordinate a more efficient market across the broader EIM region and better accommodate the diverse gas supply situations of utility generation across the west.

Therefore, we recommend that the CAISO move forward with the development, testing and implementation of its design for dynamic mitigation of commitment costs as proposed. We also make the two additional recommendations for alternative implementations that may have some advantages, and should be considered if computational performance of the market software or the frequency of "false positives" becomes an issue. One is to combine market power tests on binding non-competitive constraints for energy and commitment cost offers; this would be more efficient computationally, and could reduce false positives. The second is to use after-the-fact

[1] California ISO, Commitment Cost and Default Energy Bid Enhancements, Revised Draft Final Proposal, January 31, 2018, www.caiso.com/Documents/RevisedDraftFinalProposal-CommitmentCosts-DefaultEnergyBidEnhancements.pdf

[2] Presentations and discussions on CCDEBE occurred in MSC meetings held June 17 and Nov. 18, 2016; and May 5, July 10, Sept. 8, and Dec. 1, 2017.

mitigation of commitment cost offers if a resource that is not committed in the market power run also does not impact binding noncompetitive constraints, but would significantly affect nonbinding critical constraints.

Additional conclusions include the following. Overall, we support the transition to commitment cost reference levels that can be based on negotiated values or supplier updated cost information, consistent with the changes that have been introduced in the overall market power mitigation design of other ISOs over the past 5-7 years. With the greater ability of suppliers to reflect their actual costs in reference prices, it is appropriate to reduce the general mitigation threshold for commitment costs from 125% to the same 110% used for other resources. Finally, we continue to support the efforts by the CAISO and its Department of Market Monitoring (DMM) to base offer price mitigation on updated gas price information when available and sufficiently reliable.

We note that this is a very complex proposal with many features that stakeholders have commented extensively on. We have not expressed views on every issue raised; we instead emphasize the MSC's long-standing support for the general ideas of dynamic mitigation tests for commitment cost offers, and address a subset of particular implementation issues for which our views may offer a distinctive perspective. We have focused on evaluating whether the CCDEBE proposal addresses the major problems with the current design. We do not discuss other possible designs, such as a conduct-and-impact paradigm that might have some advantages but would entail much larger changes relative to the current design. Such more radical reforms of the commitment cost bidding and mitigation system might be worth considering in the future should the CCDEBE reforms turn out to be less effective than intended in adding flexibility while protecting against the exercise of market power.

This Opinion is organized as follows. In the following section, we provide background on the proposal by reviewing past market issues that motivated previous revisions of the CAISO procedures for making and mitigating commitment cost offers, and recent developments that have led the ISO to revisit those procedures. We also summarize the recommendations of previous MSC opinions on commitment cost costs and mitigation; the principles underlying the CCDEBE proposal are broadly consistent with those recommendations. Then in Section 3, we summarize the CAISO's general goals in designing this initiative. In Sections 4-6, we discuss issues associated with three core elements of the CCDEBE proposal:

- market-based offers for commitment costs (Section 4),
- dynamic mitigation of commitment cost offers (Section 5), and
- revised definition procedures for reference prices (Section 6).

2. Background and Previous MSC Opinions

2.1. Past Market and Operational Problems

The cost of supplying electric power is characterized by non-convexities, such as prohibited zones of operation and the expense of starting up or operating at minimum load. As a result, a fundamental issue in designing power markets is that it may not be possible to calculate a price that clears the market. That is, there may be no price that results in supply equaling demand, while supporting the overall least-cost solution (i.e., resulting in the social least-cost schedule being the same as the profit-maximizing schedule for each resource, given the prices). This results

in a fundamental difficulty, which is that clearing prices in the CAISO markets do not always fully cover the as-bid costs of all generators, even when they are selected as part of the least-cost market solution. To address this problem, in the CAISO's market design, as well as all other organized U.S. markets, generators can submit offers that include commitment costs and prohibited zones, and the market operator makes side-payments if clearing prices would not cover the as-bid costs of accepted supply offers, called bid cost recovery. This leads to several conceptual and practical challenges, such as how to allocate the resulting uplift as well as concerns that the market price may not adequately incent investment.

The concern addressed in this proposal is the potential for market power in commitment cost offers, in which resources would be able to increase their revenues by submitting commitment cost offers that materially exceed their costs. Such inflated offers might be able to increase net revenues by raising local marginal prices (LMPs), either for the resource making the offer or for other resources in a supplier's portfolio, or by increasing BCR payments to the resource. This increase in commitment cost offers can directly increase costs to consumers by raising their energy prices or allocated uplift, and also can inflate the resource cost of meeting load by shifting dispatch and commitments away from the least-cost schedule.

The risk of these cost shifts and distortions has been a central concern in the Market Redesign and Technology Upgrade (MRTU) from the very beginning of its design process after the 2000-01 crisis. There were several objectives in designing market rules that govern bidding of commitment costs. One is that bids must be able to fully reflect all the costs faced by resources so that suppliers can be assured that their costs will be covered; to do otherwise provides incentives to offer inflexibly ("self-schedule") or to not offer at all, which reduces the ability of the operator to reach a reliable and economic market solution and increases consumer costs. The second objective is to avoid exercise of market power to the detriment of market efficiency and consumers. Other objectives include transparency and simplicity of administration, avoiding slowing down the market clearing process, and minimizing the total amount of uplift so that market value and costs are reflected in market prices as much as possible.

A central tradeoff in applying market power mitigation to commitment cost bidding systems is between the risks of false negatives versus false positives. False negatives occur when bids should have been mitigated, but weren't, and the result is the exercise of market power and its attendant distortions. In contrast, false positives occur when bids were mitigated, but didn't need to be because the resource owner did not exercise market power. If the CAISO can confidently and accurately estimate the actual commitment costs of all resources, then market inefficiencies are unlikely to result from over-mitigation. This has heretofore been the philosophy of the CAISO's commitment cost bidding system. Its key feature has been that *all* commitment cost bids are subject to a bid cap determined by the ISO, without regard to the application of a market power test (which bore similarities to the design in PJM at the time the MRTU market power mitigation design was developed). The approach was simple, and provided strong assurance that the exercise of market power would be avoided.

Since the design and implementation of MRTU, the CAISO has revisited and adjusted its commitment cost bidding procedures multiple times. Table 1, below, summarizes in reverse chronologic order twelve MSC opinions that address fundamental issues and/or details of implementation of those procedures.

Table 1: Summary of MSC Opinions Addressing Commitment Costs (Left Column), Their Mitigation (Right Column), or Both

<table>
<tr><th>Commitment Cost Offers and Cost Calculations</th><th>Mitigation of Commitment Cost Offers</th></tr>
<tr><td colspan="2">Bidding Rules & Commitment Cost Bidding Enhancements (2016):[3] The purpose of the Commitment Cost Enhancements 3 and BRE initiatives was to improve the CAISO's calculation of commitment costs so that commitment cost bids will better reflect actual resource costs, including opportunity costs, while still effectively mitigating the potential for the exercise of market power. The MSC strongly supported calculation and inclusion of opportunity costs. The proposal also provided a safety valve in case commitment cost bid caps do not fully cover incurred fuel costs, by giving resources a right to file at FERC for recovery of those costs, which the MSC supported if used rarely. The MSC repeated earlier recommendations that a dynamic local market power test be used to limit mitigation of commitment cost offers to units possessing such market power.</td></tr>
<tr><td>Reliability Services Phase 1 & Commitment Costs Enhancements Phase 2 (2015):[4] The MSC recommended that opportunity costs implemented in commitment cost calculations in the near future. In the interim, it supported restricting use-limited designations to resources with physical or regulatory constraints.</td><td>LMPM Implementation in EIM (2014):[5] The MSC supported modification of the LMPM framework to deal with market structures that are quite different than inside the CAISO balancing authority. Among other differences are the degree concentration and the lack of a must-offer obligation in these other markets.</td></tr>
<tr><td rowspan="2">Commitment Cost Enhancements (2014):[6] The volatile 2013-14 natural gas market exposed limitations in procedures for adapting the CAISO's commitment cost estimates to changing conditions. Lags in updating costs resulted in underestimation of minimum run costs, and ensuing distortions in dispatch. The MSC agreed with the CAISO proposal to increase the cap on start-up and minimum load offers to 125% of the calculated cost, because it will reduce mitigation of offer prices of suppliers lacking market power. The MSC reiterated the urgency of including opportunity costs in cost estimates, which was not part of this proposal.</td><td>Appropriateness of the 3 Pivotal Supplier Test & Other Competitive Screens (2013):[7] In response to a FERC request, the MSC analyzed CAISO data, and concluded that there is no compelling justification for changing the three pivotal supplier screen in the LMPM competitive path assessment. Potential ways were identified for improving the definition of path competitiveness and the determination of DEBs in order to decrease the likelihood of false negatives and false positives.</td></tr>
<tr><td>Mitigation Measures for Bid Cost Recovery (2012):[8] The MSC supported a simple and transparent approach to monitoring persistent real-time deviations from dispatch instructions.</td></tr>
</table>

[3] J. Bushnell, S. Harvey and B. Hobbs, Opinion on Commitment Cost Bidding Improvements," March 10, 2016, www.caiso.com/Documents/MSC_Opinion_CommitmentCostBiddingImprovements-Mar10_2016.pdf

[4] J. Bushnell, S. Harvey, B. Hobbs, and S. Oren, Opinion on Reliability Services Phase 1 and Commitment Costs Enhancements Phase 2, March 23, 2015, www.caiso.com/Documents/ Decision_ReliabilityServicesPhase1-MSC_Opinion-Mar2015.pdf

[5] J. Bushnell, S. Harvey, B. Hobbs, and S. Oren, "Opinion on LMPM Implementation in the Energy Imbalance Market," July 7, 2014, www.caiso.com/Documents/FinalOpinion-LocalMarketPowerMitigation-Implemenation-EnergyImbalanceMarket-July7_2014.pdf

[6] J. Bushnell, S. Harvey, B. Hobbs, and S. Oren, "Opinion on Commitment Cost Enhancements," Sept. 8, 2014, www.caiso.com/Documents/MSC_FinalOpinionCommittmentCostEnhancements-Sept2014.pdf

[7] J. Bushnell, S. Harvey, B.F. Hobbs, and S. Oren, Report on the Appropriateness of the Three Pivotal Supplier Test and Alternative Competitive Screens, June 27, 2013, www.caiso.com/Documents/Report-Appropriateness-ThreePivotalSupplierTest-AlternativeCompetitiveScreens.pdf

[8] J. Bushnell, S. Harvey, B.F. Hobbs, and S. Oren, "Opinion on Mitigation Measures for Bid Cost Recovery," Dec. 5, 2012, www.caiso.com/Documents/ FinalOpinionBidCostRecoveryMitigationMeasures.pdf

TABLE 1, Continued **Commitment Cost Offers and Cost Calculations**	**Mitigation of Commitment Cost Offers**
BCR Mitigation Measures and Commitment Costs Refinement (2012):[9] The MSC supported its major features, including the modified day-ahead metered energy adjustment factor; the real-time performance metric; and the persistent uninstructed energy (PUIE) check, subject to careful monitoring and tuning. It also supported inclusion of several categories of costs, and *ex post* recovery of operational flow order-related costs	
Renewable Integration, Final Product Review (2011):[10] The MSC supported these proposals, which lowered of the bid floor in two stages, quantified additional categories of costs, and revised the bid cost recovery mechanism (BCR) to allow for separate calculation of BCR in the day-ahead and real-time markets. The MSC recommended that opportunity costs be considered, and careful review of the persistent uninstructed energy (PUIE) check.	
Changes to Bidding and Mitigation of Commitment Costs (2010):[11] This opinion expressed support for most of the elements of the ISO's proposal to change start-up, minimum load, and transition costs for multistage generators (MSGs). The MSC supported the ISO's recommendations not to consider opportunity cost bidding at that time, and to retain a 30 day minimum time period between changes in registered costs.	
Changes to Bidding Start-Up and Minimum Load (2009):[12] The MSC supported removal of barriers to reflecting verifiable commitment costs in offers. These costs could include opportunity costs. The MSC recommended that the ISO proceed with more frequent bidding only if improved mitigation procedures were put in place.	*LMPM & Dynamic Competitive Path Assessment (2011):*[13] The MSC endorsed the proposal because it would allow the LMPM process to consider all demand and supply bid into the day-ahead market (including virtual bids); eliminate the potential for anomalous outcomes arising from the two-pass approach; and speed up the process, potentially allowing on-line (dynamic) competitive path analysis.
	Start-Up & Minimum Load Bid Caps Under MRTU (2007):[14] The MSC concluded that, in the long run, the most suitable approach for mitigating SU/ML bids would be an extension of the MRTU LMPM mechanism to encompass all bids submitted by generators, not just energy bids.

[9] J. Bushnell, S. Harvey, B.F. Hobbs, and S. Oren, "Opinion on Bid Cost Recovery Mitigation Measures and Commitment Costs Refinement," May 7, 2012, www.caiso.com/Documents/MSCFinalOpinion-BidCostRecoveryMitigationMeasures_CommitmentCostsRefinement.pdf

[10] J. Bushnell, S. Harvey, B.F. Hobbs, "Final Opinion on Renewable Integration: Market Product Review, Phase 1," Dec. 11, 2011, www.caiso.com/ Documents/MSC_Final_Opinion_RenewableIntegrationMarket-ProductReviewPhase1.pdf

[11] F. Wolak, J. Bushnell, B. Hobbs, "Opinion on Changes to Bidding and Mitigation of Commitment Costs", June 4, 2010, www.caiso.com/Documents/FinalOpinionon Changes-BiddingandMitigation-CommitmentCosts.pdf

[12] F. Wolak, J. Bushnell, B. Hobbs, "Comments on Changes to Bidding Start-Up and Minimum Load," July 9, 2009, www.caiso.com/Documents/DraftOpinionon Start-UpandMinimumLoadBiddingRules.pdf

[13] J. Bushnell, S. Harvey, and B. Hobbs, "Opinion on Local Market Power Mitigation and Dynamic Competitive Path Assessment," July 1, 2011, www.caiso.com/Documents/ 110713Decision_LocalMarketPowerMitigationEnhancements-MSC%20Opinion.pdf

[14] F. Wolak, J. Bushnell, B. Hobbs, "Opinion on Start-Up and Minimum Load Bid Caps Under MRTU," Aug. 2007, www.caiso.com/Documents/FinalOpinionon Start-upandMinimumLoadBidCapsUnderMRTU.pdf

Four of these principles, most of which have been discussed in several of the previous opinions as well as opinions concerning other aspects of the CAISO market design, include the following:

1. *ISO markets need to reward flexibility, preferably through spot market revenues.* This principle has been promoted by the MSC in its discussion of other market issues such as the energy bid floor, flexible ramp product, regulation pay-for-performance, and flexible resource adequacy requirements. The markets need to ensure that generators will have incentive to offer flexibly, which means that BCR and bid mitigation systems must allow recovery of all variable costs.

2. *There is a tradeoff between needs for cost recovery and to prevent market power.* The MSC has often discussed the frequency and consequences of false positives vs. false negatives. For this reason, the MSC has argued for dynamic market competitiveness tests that reflect up-to-date costs and market conditions that determine whether or not a particular resource has market power, and that give flexibility to resources lacking such market power to bid their costs as they see them. The CCDEBE proposal would implement such a test.

3. *Start-up and minimum-load (SU/ML) bid caps are needed, but tight caps should be imposed only where the market is insufficiently competitive to prevent exercise of market power.* For instance, in 2007 (Table 1, above), the MSC recommended that a variant of LMPM be used to identify market power in commitment cost bids, based on pivotal-type tests on supply to relieve congestion. Then, loose constraints on allowable bid levels and frequency of changes could be allowed where markets were likely to be competitive. On the other hand, tighter constraints on bids would then be imposed where exceptional dispatch, load pocket conditions, or other constraints limit contestability. The MSC recognized that dynamic tests are harder to define and implement for SU/ML bids due to lumpiness, and it suggested using results of transmission constraint generation in market software to identify paths of interest

4. *SU/ML bid caps should reflect all variable costs.* This means that when cost estimates are used to define mitigation thresholds and default bids, they should include all significant categories of costs, such as wear-and-tear, opportunity costs, fuel costs, operational flow orders (OFO). The MSC recognized that these can be very hard to estimate reliably. Examples of difficult-to-estimate costs include: the relevance of resource adequacy revenues to opportunity costs; intra-day gas prices, gas imbalance penalties; and expected OFO costs, gas prices for resources remote from liquid gas trading hubs, and the opportunity costs of start or emission limited resources. So, the MSC guardedly supported negotiated caps on bids, and after-the-fact review and recovery of costs that were unrecovered. Significant attention was paid to updating cost estimates as gas prices fluctuated, and the MSC proposed an approach based on daily gas indices for fuel cost-dominated components of costs, and slower changes for other cost components.

Based on these principles, the MSC has made a number of specific recommendations over the years for improving the commitment cost bidding and mitigation system, and has made note of emerging issues. Examples of recommendations and new issues include the following, as well as others in Table 1:

1. Adjustments to BCR calculation procedures in order to improve incentives to bid, and protect against market power. For instance, the separation of BCR for the day-ahead and real-time

markets; the calculation of opportunity costs of starts, energy, and operating hours based on multiweek or longer look-aheads; and design of "Performance Measure and Persistent Uninstructed Energy Check" procedures to discourage strategic behavior aimed at increasing BCR without greatly penalizing normal deviations.

2. In response to a charge from the Federal Energy Regulatory Commission to the MSC in FERC's MRTU Order, the MSC assessed and recommended retaining the three pivotal supplier test.

3. High gas price volatility will often mean that commitment cost estimates used in the CAISO market power mitigation system become rapidly outdated. This directly led to the Winter 2013-14 difficulties, where the commitment costs estimated by the CAISO were grossly understated relative to energy price bids submitted by market participants, since the latter could be updated to reflect more current market conditions. This in turn caused the market software to inefficiently operate many generators at their minimum output levels, inflating actual system costs, inflating gas demand for power generation on a winter day with high gas demand, thereby endangering both gas and electric system reliability.[15]

4. Generator use plans have become a highly inefficient way of managing opportunity costs of units that have limited numbers of starts or operating hours, or limited energy availability. Because such plans give the operator little flexibility to change their usage in response to changing conditions they are no longer suited to the CAISO's needs for balancing load and generation, given its current and prospective resource mix. A much better way is to quantify opportunity costs and allow their inclusion in SU/ML and energy offers. This is now being implemented by the CAISO.

5. Market power mitigation in the Energy Imbalance Market (EIM) is challenging because participation is voluntary, non-CAISO balancing authorities have high concentrations of suppliers, and gas-fired generation is often not located at liquid gas trading points with published indexes. The application of market power mitigation in the EIM is also more challenging because there is a greater diversity of gas supply situations, differing abilities to use storage, and a greater variety of supply constraints and options than in the CAISO footprint.

2.2. Emerging Problems

Questions concerning how to respond to gas price volatility, and how to mitigate market power in the EIM are examples of issues concerning mitigation of commitment costs that have become more urgent recently. An example of the challenges for the current mitigation design is provided by the Aliso Canyon situation, in which the limited operability of a gas storage facility in southern California has tightened gas imbalance requirements and has increased price volatility for Southern California gas-fired generation.

Another increasingly important issue is the use of gas price indices for mitigating market power for Monday bids. Mitigation of Monday offer prices is based on the Weekend/Monday gas in-

[15] See CAISO, Commitment Costs Enhancement, Revised Draft Final Proposal, Aug. 21, 2014, p. 3, www.caiso.com/Documents/RevisedDraftFinalProposalCommitmentCostEnhancements.pdf

dex, which can provide a poor measure of the cost of buying gas for Monday because gas demand is lower over the weekend. Moreover, neither the weekend index for trades on Friday nor an index based on prior week Monday-only ICE trades would reflect changes in gas market conditions over the weekend as can be the case with changing weather forecasts. The California ISO DMM has conducted an analysis that has shown that understated gas prices on the first work day of the week has become fairly frequent over the past few years.[16] Similar issues with the accuracy of gas price indices exist around holidays, when the transactions used to compute the index can occur several days prior to the flow date for the gas, creating the potential for a significant difference between the gas price index and the cost of buying gas on the holiday for delivery on the day following the holiday,

The final issue of increasing importance is the prospect of increased natural gas price volatility. The exit of coal generation and a resulting increased reliance on gas fired generation to meet load appears to be increasing gas price volatility.[17] This trend of coal generation being replaced with gas and intermittent resources could continue, which could lead to further increases in gas price volatility in both day-ahead and intra-day gas markets.

The increasing risks posed to market efficiency and reliability by these emerging issues indicate that the present commitment cost mitigation system, in which all offers are mitigated, needs to be replaced by a more flexible bidding system. Such a system would dynamically identify and mitigate market power and allow bids to quickly reflect changes in gas prices. The CAISO has responded by developing the CCDEBE proposal, whose goals we discuss next.

[16] Figure 3.11 in the CAISO DMM's 2016 "Annual Report on Market Issues and Performance" compares the same day trade prices to next day index over the period June –December 2016. It shows that the proportion of trades at prices in excess of 110% of the next day index was much higher on the first trade day of the week. The same pattern is portrayed in Figure 3.2 of DMM's 3Q 2017 "Report on Market Issues and Performance," which compares same day trade prices to an updated same day average.

[17] An apparent increase in gas price volatility can be seen in successive CAISO DMM reports. Figure 3.12 in the 2016 "Annual Report on Market Issues and Performance" compares the next-day trade price to the next day index from the prior day for the SoCal City gate over the period June –December 2016. It shows that there were no trades at more than 125% of the prior day's next day index. The similar Figure 3.2 for the third quarter of 2017 in DMM's Q3 "Report on Market Issues and Performance" shows a few trades at more than 125% of the prior next day price, and it appears to show many more at more than 110% of the prior next day price than had been the case in 2016. Figure 3.8 in DMM's recently released 4Q Report on Market Issues and Performance not only shows an apparent increase in trades at slightly more than 125% of the prior day's next day index, but shows a distribution of next day trade prices extending up to several hundred percent of the prior next day price.

3. CCDEBE Goals and Summary of Mitigation Procedures

3.1. Overall Market Design Goal

In summary, the CAISO seeks to develop a market design that will allow market-based bidding of commitment costs while applying market power mitigation to prevent the exercise of locational market power that can decrease market efficiency and raise consumer costs by either materially raising market prices above the competitive level or inflating BCR payments.

3.2. Practical Complications

The application of market power mitigation to commitment costs is more complicated than the mitigation of energy offers because it needs to consider the impact of inflated commitment costs on BCR and ED payments as well as on market clearing energy prices.

Another complication is the lumpiness of commitment decisions. Unlike the dispatch of energy, which can be done in small increments, the commitment of a unit adds discrete blocks of energy to the market to accommodate the minimum operating level of that unit. As a result, a resource could be committed to solve a constraint that would have bound had the resource not been committed, but is non-binding in the dispatch with the resource on-line. Such a resource could submit inflated offers that would entitle it to large BCR or ED payments if the only way to avoid overloading a particular transmission constraint was to commit that resource. Therefore, a constraint may have bestowed locational market power on a resource, even if it is non-binding after the market solution is resolved. [18]

A third complication is the expansion of CAISO dispatch to EIM, which has introduced many additional gas procurement situations that need to be addressed in determining reference prices for mitigation. The increased potential for calculating erroneous reference prices increases the importance of limiting application of mitigation to situations in which there is a potential for significant exercise of locational market power. Not only does the EIM expansion make the likelihood of a false positive finding of inflated costs higher, but the consequences of the ensuing mitigation for market efficiency are greater when gas prices are opaque. The negative impact of "over-mitigation" is limited if the CAISO has highly accurate information about the marginal costs of the plants it is mitigating. The stakes are greater when the cost data available to the CAISO may not accurately reflect supplier costs.

---

[18] Such outcomes reflect the lumpiness of the unit commitment decision due to the minimum load block of the resource, whether or not commitment cost offers equal actual costs. As a trivial example, there may be several costly 25 MW units in a load pocket, each of which has a 18 MW minimum operating level (Pmin). If the load in the pocket is 80 MW and the transfer capability into that load pocket is 50 MW, then it is necessary to have at least 30 MW of local generation, which might be most cheaply achieved by committing two local units and operating them at their minimum levels. This implies 36 MW of local generation, so that 44 MW more needs to be imported; consequently, the 50 MW transfer limit is slack. The resulting LMP in the load pocket may be the system price, and those two units will require bid cost recovery.

However, market participants might deliberately structure offer prices to achieve such an outcome, perhaps in an attempt to evade triggering a pivotal supplier test on a constraint. That possibility motivates the first and second features of the proposed CCDEBE mitigation process (Sections 5.1 and 5.2, *infra*.).

3.3. CCDEBE Mitigation Procedure: Summary

As background, we provide here a brief synopsis of the CCDEBE mitigation procedure. Then in the next three sections (Sections 4-6), we summarize some issues associated with three core elements of the CCDEBE proposal (market-based commitment cost offers, commitment cost offer mitigation, and reference price modifications).

We start our synopsis by first noting that there are three basic steps for checking for market power and in defining market schedules and prices when the running the CAISO day-ahead and 15 minute real-time markets:

- Step 1: Using the unmitigated energy and commitment cost offers for all resources, execute the "Market Power Mitigation" (MPM) run, and determine which noncompetitive constraints are binding or, alternatively, sufficiently close to binding to be considered "critical constraints".

- Step 2: All resources, whether committed or not in the MPM run, are then subjected to various tests to determine whether they should be mitigated. In the case of commitment cost bids, the tests are summarized below, and result in each resource being placed in one of six categories; for three of those categories, the resource's start-up, transition, and minimum load bids are mitigated to the reference level. These categories include resources that affect congestion on noncompetitive binding constraints or that could provide significant relief to near-binding ("critical") constraints, as defined by the new CCDEBE tests, as well as resources that could potentially affect minimum on-line constraint congestion. On the other hand, if the resource is placed in one of the other three categories, then its commitment cost offers are not mitigated.

- Step 3: Market runs (scheduling and pricing) are executed using mitigated energy and commitment cost bids.

We now summarize the logic of the procedure for determining whether commitment cost offers are mitigated or not, which results in classifying each resource into one of six categories.[19] If the resource winds up in categories (1)(A) ("***MOC+***"), (2)(A) ("***Binding+***"), or (3)(A)(i)(a) ("***Non-binding/Committed/DispatchExcess+***"), then the commitment cost offers are mitigated. On the other hand, a resource that winds up in the other possible categories (3)(A)(i)(b), (3)(A)(ii), or (3)(B) is not mitigated.

Procedure:

(1) *Start:* Does the resource in question contribute to meeting any minimum on-line constraint (which is automatically deemed noncompetitive)?

(A) If yes, then mitigate commitment cost offers ("***MOC+***"). *Stop.*

(B) If no, then go to (2)

[19] This summary is based on our interpretation of information in the CCDEBE proposal (op. cit.) and other information provided by ISO staff. However, the responsibility for any errors is ours.

(2) Does the resource affect any noncompetitive constraint that is binding in the MPM run by the new CCDEBE pivotal supplier test? (In particular, does a resource have negative shift factor for any non-competitive binding constraint?)

(A) If yes, then mitigate commitment cost offers ("***Binding+***"). *Stop.*

(B) If no, then go to (3)

(3) Does the resource affect any critical noncompetitive nonbinding constraints by the new CCDEBE pivotal supplier test? (In particular, does a resource have negative shift factor for any non-competitive non-binding constraint?) (Given that the resource doesn't fall under categories (1) or (2), above, a "yes" here implies that energy prices aren't affected (*i.e.*, the local LMP equals system price, plus any adjustments for binding competitive constraints), but its bid cost recovery or exceptional dispatch payments might be.) Possible outcomes include:

(A) If yes, then check whether the resource committed in the MPM run? Possible outcomes:

(i) If committed, then check if the resource's dispatch in the MPM run is equal to or in excess of the unloaded capacity of the critical noncompetitive nonbinding constraint. Possible outcomes of this check:

(a) If yes, then mitigate commitment cost offers because its output is needed to satisfy that constraint ("***Nonbinding/Committed/DispatchExcess+***"). *Stop.*

(b) If no, then do not mitigate, since it is assumed that its dispatch is a result of it being competitive relative to system resources. *Stop.*

(ii) If not committed, then do not mitigate. (Note that it is possible that in the subsequent Step 3 market runs, the resource might be committed. [20] If it turns out that its scheduled dispatch is greater than the unloaded capacity of a critical nonbinding noncompetitive constraint, then a false negative has occurred; the resource should have been mitigated when it wasn't.) *Stop.*

(B) If the answer is no to (3) (the resource doesn't affect a critical noncompetitive nonbinding constraint by the CCDEBE test), then do not mitigate. *Stop.*

We now turn to a discussion of issues associated with the three core elements of the proposal.

[20] If the MPM and market dispatch are carried out in the same software run, such an outcome should be very rare with minor impacts, as the offer prices of other resources in the market run should be less than or equal to the offer prices in the MPM run. Such an outcome is possible as a result of solution differences due to MIP gap or changes in congestion when lower cost resources are committed due to mitigation in the market pass.

4. Market-Based Commitment Cost Design Issues

There are three core elements to the CCDEBE proposal, and we discuss several of their features in this and the following two sections. The first element is to allow market-based offers for commitment costs. We address issues concerning two features of this element in the following subsections. One is the proposed transition of the commitment cost bid cap from 200% to 300% if no problems emerge. The other is whether start-up cost offers should be allowed to vary within a day, consistent with the ISO's proposal for minimum load cost offers. In Section 5, we consider issues associated with the second core element, which is the proposed dynamic mitigation of commitment cost offers. Section 6 considers the third element, which is the revised definition procedures for reference prices. At the close of each section, we summarize our conclusions.

4.1. Transitional Cap on Commitment Cost Offers

The CAISO proposes to gradually shift to market-based bidding of commitment costs.[21] Even when not mitigated for local market power, commitment costs bids will be limited by a "damage control" cap. Market-based commitment cost bids will initially be capped at no more than 200% of the estimated reference level costs, with this cap rising to 300% after 18 months if there are no material unanticipated problems arising from the increased offer price flexibility.[22] The damage control cap on commitment costs could presumably be adjusted further in the future, but the proposal does not address this.

There are at least two rationales for the transitional cap on commitment cost offers. First, the 200% cap provides a limit on offer prices and market impacts in the event some element of the market power mitigation design that is implemented does not operate as intended. Second, the cap will limit offer prices and market impacts in the event that there are flaws in other elements of the CAISO market design that have been masked by the current bid constraints and which therefore will need to be modified to accommodate market-based commitment cost offers.

The DMM, on the other hand, recommends that the CAISO continue to cap all market participant commitment cost offers at 200% of the CAISO's estimated commitment costs until another stakeholder process is conducted to consider this issue.[23] The DMM's rationale for this recommendation is that

> *"(t)his would allow stakeholders to demonstrate and justify the parameters for a reasonable level after they have some experience with the design of these new market features. A new stakeholder process is also more likely to result in a thorough evaluation of the functioning of the mitigation design."*[24]

Some of the considerations that are relevant to whether or not the cap should be raised automatically if no problems occur include the following:

---

[21] See CCDEBE Revised Draft Final Proposal, *op. cit.*, Section 5, p. 15.

[22] *Ibid.*, Section 5.1.1, pp. 17-18.

[23] See California ISO, Department of Market Monitoring, Comments on CC DEB Initiative December 21, 2017 Stakeholder Call, January 11, 2018, p. 4.

[24] *Ibid.*, p. 4.

1. While DMM and the CAISO support the pivotal supplier test, it may turn out to not be a very good method for testing the application of market power involving commitment costs. If so, this would require changes in the limits on offers submitted by resources that are able to relieve a potentially binding transmission constraint.

2. Even if the pivotal supplier test is found to have weaknesses that require changes in the test design together with retention of or lowering of the 200% cap on the commitment cost offers of resources able to relieve a potentially binding transmission constraint, this would not warrant retaining that cap for resources whose output does not relieve any binding or potentially binding transmission constraint.

3. Unlike mitigation designs in other ISOs, the 200% and 300% caps would apply to any level of commitment costs; that is, there is no lower bound on dollar per megawatt hour or dollar per start offers to which the cap or mitigation would apply.

The CAISO proposes that the default caps on commitment cost offers would rise from 200% to 300% of the cost estimated by the CAISO after 18 months unless the CAISO files with FERC to defer this increase. We support this design as it allows the CAISO to defer the change in caps if market issues are identified during the first 12 months that provide reason for delay. The alternative of requiring a new stakeholder process before implementing the second increase would delay the increase in the cap regardless of whether there are any performance issues warranting such a delay. This alternative would also require that the CAISO and stakeholders devote resources to an unnecessary stakeholder process during a period when the CAISO and stakeholders will likely have a number of other complex initiatives that will need to be discussed.

4.2. Within-Day Variation of Commitment Cost Offers

Another issue with the commitment cost caps proposed by the CAISO is that while the CAISO proposes to allow market-based minimum load costs to vary by hour, market-based start-up and transition costs offers would be daily values.[25] While some market participants have pointed out the desirability of being able to vary start-up and transition cost offers over the day in response to changes in fuel prices or other factors impacting these costs,[26] it is our understanding that the current CAISO market software lacks the ability to readily accommodate start-up cost offers that vary over the day within a single software run.

Earlier CAISO proposals outlined work-arounds that would enable the submission of hourly start-up and transition cost offers, but the CAISO DMM has pointed out potential unintended consequences that could arise with implementation of those workarounds.[27] It appears to us that these concerns have likely been addressed by design in the Revised Draft Final Proposal which provides for a single start-up cost value to be used in the day-ahead market and a single value to be in effect in real-time.[28]

---

[25] See CCDEBE Revised Draft Final Proposal, Section 5.1, pp. 16-22.

[26] See Comments of NV Energy, January 11, 2018.

[27] CAISO DMM, Comments on CC DEB Initiative December 21, 2017 Stakeholder Call, *op. cit.*, p. 4.

[28] See CCDEBE Revised Draft Final Proposal, p. 16.

While this may not be an ideal resolution, market participants will be able to resubmit updated start costs each hour, which would be sufficient to reflect changes in gas costs over the day.

4.3. Conclusion

As stated above, we support the CAISO's design for a gradual transition to market-based commitment cost offers.

5. Local Market Power Mitigation (LMPM) Commitment Cost Design Issues

The second core element of the CAISO design is the implementation of a local market power mitigation design that would be applied to test for the need to apply market power mitigation to commitment cost offers.[29] The CAISO market power mitigation design has several significant features that have been a source of discussion among market participants, DMM, and CAISO staff. We review four of these features and their current status below.

5.1. Identification of Transmission Constraints Potentially Causing Unit Commitments

The starting point in the application of the CAISO's design for mitigating locational market power is identification of the transmission constraints that could potentially facilitate the exercise of locational market power. The CAISO has for several years applied a process for identifying binding transmission constraints as part of its LMPM design for energy offers. However, as discussed above, the complication that will be introduced with the application of LMPM to commitment costs is the potential for transmission constraints to bind in the unit commitment process and cause a resource to be committed, yet the transmission constraint might not bind in the dispatch schedule that the market software reports.

Hence, a resource could have been committed in order to solve a constraint that became non-binding with the resource committed. It is necessary to identify such constraints because although they do not directly affect energy market prices in the final market solution (because they are not binding), such constraints could have caused a resource to be committed even if it submitted non-competitive commitment cost offers that would entitle the resource to large BCR or ED payments. Further, such commitments are likely to affect market prices, meaning that non-binding constraints can indirectly affect energy prices.

While such a constraint would not be a binding constraint in the *final* dispatch solution, the iterative nature of the market model solution process means that any transmission constraint that impacts the commitment would be identified in an *earlier* pass and would remain in the constraint set of the final iteration of the process.[30] In the Siemens software these are referred to as "critical

[29] *Ibid.*, Section 5.2, pp. 24-31.

[30] That is, in a given iteration, a generation schedule is yielded by the optimizer, which has only included the subset of constraints included in the critical constraint set. A load flow model is then run in which the flows implied by the schedule are then checked against all constraints, including those not explicitly enforced in the market optimizer. If any omitted constraints are violated or have a flow that is within a given threshold of the flow limit, they are added to the critical set in the market optimization model, and it is run again. This process of "constraint generation" is repeated several times until all violated constraints are included or an iteration limit is reached.

constraints." Importantly, once an iteration identifies a constraint, and it is included in the set of critical constraints, it remains in the critical constraint set in all subsequent dispatch passes. This software structure is not an accident, as it is necessary to avoid cycling in the software due to a constraint dropping in and out of the critical set from iteration to iteration.

The critical constraint set is also defined to include all constraints with flows on the monitored element or elements that are within a specified threshold of the limit. This structure in which constraints enter the critical set without an actual overload is designed to improve solution efficiency by including potentially binding constraints in the optimization at an earlier iteration than they would be if they were only included after they were violated.

Because a resource could not have been committed to solve a transmission constraint unless the transmission constraint was included in the critical constraint set, the CAISO can determine whether a resource might have been committed in order to solve a non-binding constraint on which it had market power by assessing whether the resource had negative shift factors on any non-binding transmission constraint in the critical set.[31] In other words, the test looks at units that provide counterflow to critical constraints, binding or not. The CAISO design will use this information to identify transmission constraints that could potentially have allowed the exercise of locational market power by resources potentially eligible for BCR payments. If a resource would not relieve any of the binding or non-binding constraints in the critical set, there is no need for the application of market power mitigation to its commitment cost bids.

The CAISO's approach based on the critical constraint set is conservative and avoids the uncertainties and potential mitigation gaps associated with other approaches the CAISO considered.

5.2. Application of the Pivotal Supplier Test to Commitment Costs

The CAISO will continue to apply pivotal supplier tests to binding transmission constraints. Separate tests are proposed to be applied for energy bids (the existing local market power mitigation system) and commitment cost bids (the new CCDEBE procedures). If the test is failed, the CAISO should mitigate the offers of resources relieving the constraint. A market design question is whether separate tests are necessary and useful.[32]

The new feature of the CAISO design considered here is its proposal to apply a pivotal supplier test to constraints that are included in the critical constraints but are not binding in the final dis-

[31] The reference bus used to define shift factors will have to be appropriately defined for this test to ensure that this test operates as intended.

[32] The CAISO proposes to apply separate and slightly different pivotal supplier tests for incremental energy and commitment cost offers to test for the presence of locational market power and trigger the possible application of mitigation. It is likely that the tests will both trigger mitigation when there is a potential for the exercise of locational market power, but there is no need to apply two versions of the pivotal supply test in order to trigger potential mitigation of resources whose output would relieve binding transmission constraints. If a supplier has locational market power on a binding transmission constraint, we recommend that all of its offer prices should be evaluated for mitigation.

The CAISO also proposes to implement a variety of minor improvements in the current 3 pivotal supplier test that we do not discuss in this opinion.

patch, as well as to binding constraints. The application of the pivotal supplier test to non-binding constraints included in the critical constraint set requires that the CAISO account for the unloaded capacity on the non-binding constraint. The reason for this is to avoid mitigating relatively small units for providing counterflow to a constraint with more unloaded capacity than the mitigated unit is providing counterflow for. This accounting will necessarily be a rough calculation in the CAISO mitigation design, which does not redispatch the system without the capacity being tested for pivotality and instead relies on *ad hoc* rules to calculate the flows and use of otherwise unloaded capacity on the non-binding constraint that result from dispatching up of identified resources.

The design needs to identify and test all resources able to relieve a non-binding critical constraint because the level of uplift payments is not necessarily related to the congestion component at locations impacted by non-binding constraints. Hence the CAISO design will not apply the competitive constraint congestion component decomposition that is utilized by the present mitigation system in applying mitigation to resources able to relieve congestion on binding constraints. Instead, the CAISO design will test for the potential ability to exercise locational market power by all resources able to relieve congestion on any constraint in the critical set.[33]

5.3. Application of Mitigation to BCR or Exceptional Dispatch Payments

The market power testing and mitigation procedure for commitment costs summarized in Section 3.3 involves entirely "before-the-fact" tests.[34] As described in the previous section, market

[33] It is unclear how useful and accurate the application of the pivotal supplier test proposed by the CAISO will be when applied to non-binding constraints for the purpose of commitment cost mitigation. The proposed test would almost always indicate a potential for the exercise of market power because it would compare (1) the sum of fringe capacity and potentially pivotal supplier capacity that cannot be physically withheld that would be available for dispatch to (2) the market power mitigation run's dispatch of capacity providing counterflow on the constraint; it then compares the output of the individual resource relative to the unloaded transmission capacity to which BCR mitigation would be applied. The pivotal supThe plier test may introduce so many false positives that it does little to limit the inappropriate application of mitigation [Note – the design performs the resource test of DOP>=unloaded capacity to address the potential for false positives of the PST so that the output is compared relative to unloaded trans capacity. We thought that mitigated false negatives based on our earlier discussions.] while weaknesses in the pivotal supplier test could fail to indicate the need for mitigation in some circumstances. The CAISO may find after implementing this design that it would be preferable to simply assume that resources able to relieve a non-binding constraint should be tested for whether commitment could have caused the constraint to become non-binding regardless of the amount of capacity available to commit, without applying a pivotal supplier test.

[34] An "after-the-fact" mitigation is in principle possible for BCR payments which are calculated after the fact depending on overall "as-bid costs" and revenues, and if that mitigation does not impact market clearing energy or reserve prices, which would be the case if the constraint does not bind in the dispatch or if the resource being tested was committed based on its unmitigated offer prices. (This is Section 3.3's mitigation category (3)(A)(i)(a) "***Nonbinding/Committed/DispatchExcess+***".)

There are several potential advantages to using such after-the-fact mitigation. First, it could simplify and speed execution of the market scheduling and pricing software by delaying some operations until later. Second, it could lessen the risk of "false negatives". As mentioned in Section 3.3, there is a risk of

power mitigation would need to be applied before-the-fact (prior to the final market scheduling and pricing runs) to commitment cost offers of resources whose output would relieve binding constraints and which would not be committed based on their uncommitted offer prices. Then if mitigation results in the resource being committed, any BCR that is required would be based on mitigated bids, as just described.

Therefore, as summarized in Section 3.3, the test for BCR mitigation would need to be applied to resources that: (1) were committed, (2) whose output relieved a transmission constraint, and (3) had commitment cost offers that exceeded the reference levels. The purpose in applying the test to these resources would be to assess whether there is a significant potential for the exercise of locational market power by these resources. The test would be to assess whether any of the critical constraints relieved by the resource being tested could have required the commitment of the resource. This would necessarily be the case for resources relieving binding constraints. In the case of constraints that did not bind in the dispatch, this conceptually requires testing of whether there is sufficient unloaded capacity on the constraint in the dispatch solution such that the transmission constraint would not have bound even if the resource being tested had not been committed. If this is the case, the constraint could not have required commitment of the resource. On the other hand, if the constraint would have bound had the resource not been committed, then mitigation would be applied to the energy and commitment costs used to calculate BCR and ED payments. Then BCR and ED payments will be determined based on those mitigated bids.

A practical complication in applying this test to non-binding constraints is that whether the constraint would have been binding had the resource not been committed depends not only on the shift factor of the resource being tested on the constraint, but also on the shift factors of the resources that would have been dispatched up or committed to replace the resource's output if it had not been committed. For such non-binding constraints, the CAISO proposes to apply a simple test of whether the total output of the resource being tested exceeds the unloaded capacity on

---

a false negative if the market power mitigation run (Step 1 of the market model) does not commit a resource and it the test does not find it is needed to satisfy a nonbinding critical constraint, but then the actual market scheduling run (Step 3) commits the resource (category (3)(A)(ii) in Section 3.3). If that resource inflated its commitment cost bid, then it could receive more BCR than it should be entitled too. After-the-fact mitigation could detect and mitigate such instances. Third, if a resource is not committed but doesn't impact noncompetitive binding constraints, there will be no BCR payments to mitigate, and no adverse market impacts from the application of mitigation based on inaccurate reference prices. Market prices for energy would not be affected because of the fact that the resource faces competitive energy prices. Fourth, after-the-fact mitigation of BCR payments also allows the CAISO to make use of market data that was not available in the timeframe of the day-ahead market or real-time dispatch, such as additional gas price transaction data. Finally, it will likely also reduce the need to apply the tests as there is no need to apply the test to resources that are not entitled to BCR if it turns out that they recover their commitment costs in their energy market margins.

We have been informed by ISO staff that after-the-fact alternative was considered but not adopted due to settlement complications and some stakeholder desires for all mitigation to take place prior to the market run. However, we suggest that it be considered in the future if either execution times or such false negatives become an issue.

the transmission constraint being evaluated.[35] Any resource that is committed would fail this test in the case of a binding constraint, so the test is only meaningful in the case of critical constraints that do not bind in the dispatch. A more complex test would be to rerun the dispatch step without the resource's output and test if the constraint would have bound. However, this would increase solution times and latency. Therefore, we support the CAISO's application of a simple test, as long as its performance is monitored carefully after implementation.

5.4. Application to Load Serving Entities

Another difference relative to the present system of energy market price mitigation is that mitigation of BCR payments needs to be applied to offers by LSEs who can be net buyers of energy. This is because even if the LSE would be adversely impacted by increases in energy market prices, it could also benefit from the receipt of additional BCR payments.[36] The CAISO proposes to apply commitment cost mitigation to the commitment cost offers of all resources able to relieve a potentially binding constraint, regardless of whether the resource is owned by an load serving entity that is a net buyer in the energy market. We support this element of the CAISO's design.

The test for the exercise of market power by net energy buyers (i.e., LSEs) only needs to be applied, however, to the impact of commitment cost offers on BCR and exceptional dispatch payments, not their impact on energy market prices. This is the approach taken by the CAISO's proposed design.

5.5. Conclusion

Overall, we support these elements of the CAISOs dynamic market power design and believe it will both enable the CAISO to provide more offer price flexibility to gas-fired resources within the CAISO during periods of gas price volatility and will also enable the CAISO to coordinate a more efficient market across the broader EIM region and better accommodate the diverse gas supply situations of utility generation across the west.

We have made two general suggestions for alternative implementations that may have some advantages, and should be considered if computational performance of the market software or the frequency of "false positives" becomes an issue. One is to combine market power tests on binding non-competitive constraints for energy and commitment cost offers; this would be more efficient computationally, and could conceivably avoid false negatives in which the energy offer prices is mitigated but commitment cost offers are not. The second would be to apply mitigation to BCR payments in an after-the-fact process if a resource that is not committed in the market power run also does not impact binding noncompetitive constraints, but is committed in the market run and would significantly affect nonbinding critical constraints.

---

[35] See CCDEBE Revised Draft Final Proposal, Section 5.2.1, Table 2, pp. 25-26 and Appendix E, Section 7.2, p. 71.

[36] *Ibid.*, p. 25.

6. Mitigation Threshold and Reference Price Issues

In this section, we address three sets of issues associated with the definition of reference prices and thresholds for mitigation, which represent the third core element of the CCDEBE proposal. These three issues include: the consistency of thresholds for incremental energy and commitment costs (as a multiple of estimated costs); adjustment by offerors of reference cost values if the 110% threshold is insufficient, and procedures for reimbursement of those costs; and use of gas prices indices in reference price calculations. We support the ISO's proposed approaches to these issues, although we note some specific potential issues that should be monitored during implementation.

6.1. Thresholds for Mitigation

The CAISO currently allows market participants to submit incremental energy offers up to 110% of the cost calculated by the CAISO without triggering mitigation. For commitment cost offers, however, the threshold is presently 125% of the cost calculated by the CAISO that is allowed without triggering mitigation. The CCDEBE initiative proposes as part of these changes to adopt a common 110% threshold for both incremental energy and commitment cost offers. The reduction in the mitigation threshold for commitment cost offers would not be implemented initially but will be phased in with other adjustments after the new design has been in operation for 18 months.[37]

Part of the reason for the reduction in the mitigation threshold for commitment costs is that the CAISO will modify the calculation of commitment costs to include costs currently not included in commitment costs. These include minimum load costs for run hours not associated with energy output and the inclusion of eligible opportunity costs.[38] In addition, the tighter threshold would only be applied to resources whose output relieved a critical constraint.

6.2. Reference Level Adjustments

In addition to modifying the current default threshold for commitment cost offers in excess of the calculated costs, the CAISO proposes several mechanisms that would allow offers that exceed the calculated costs by more than the 10% threshold when a resource's commitment cost bids would otherwise be subject to mitigation (Section 3.3), when such offers are necessary to reflect actual costs. These will be implemented by adjusting the reference price for a resource to include:

- extending the option for negotiated reference levels that is currently available for incremental energy offers to allow negotiated reference levels for commitment cost offers,[39] and

[37] *Ibid.*, pp. 33-34.

[38] *Ibid.*, pp. 34-35.

[39] *Ibid.*, pp. 35-36.

- supplier-submitted adjustments to reference levels based on cost changes not reflected in the CAISO's cost calculation.[40]

Supplier-submitted reference level adjustments that are within a specified volatility threshold of the CAISO's cost calculation will be reflected in the unit commitment, impacting market clearing prices, and will also be reflected in BCR and exceptional dispatch payment calculations.[41] These thresholds are *ad hoc* simple percentage thresholds based on the CAISO and CAISO Department of Market Monitoring's comparison of gas trade prices on electronic exchanges to various types of gas price indexes for the same location. It is possible that it will be found over time that the CAISO will need to establish wider thresholds for resources not located close to liquid gas trading locations, that the width of thresholds will need to be increased or could be reduced because of changes in gas market price volatility, and/or that the width of the threshold could be conditioned on pipeline or other conditions that the CAISO can observe. The CAISO proposal also provides for resource-specific feedback loops.[42] The volatility thresholds proposed by the CAISO are a reasonable starting point given the data on current gas market volatility relied upon by the CAISO.

Supplier-submitted reference level adjustments in excess of this threshold will be eligible for after-the-fact recovery of incorrectly mitigated actual costs.[43] This design is consistent with the practice of other ISOs that apply market power mitigation to market-based commitment costs.[44] These supplier-submitted adjustments are not simply an increase in the 10% default threshold. They must reflect actual costs and are subject to verification.[45] The DMM has stated a concern that suppliers that have been "determined to have market power" (as determined by a three pivotal supplier test) should not be "automatically" compensated for costs in excess of threshold.[46]

Our understanding of the CAISO's provisions for *ex post* recovery of as-bid costs that were not recovered in market prices as a result of incorrectly mitigated offer prices is that the market participant will request this *ex post* recovery and the CAISO will make a determination of whether it will be provided. If the CAISO does not provide the make whole payment, the market participant will be able to make a FERC filing seeking recovery.[47] This does not describe a process for "automatic recovery" of as-bid costs in excess of the various thresholds, but rather provides for appropriate recovery of as-bid costs in excess of a threshold. Moreover, we do not agree that suppliers that fail the 3 pivotal supplier test have been determined to have market power. The 3

[40] *Ibid.*, pp. 33-43.

[41] *Ibid.*, p. 33.

[42] *Ibid*, p. 40

[43] *Ibid.*, pp. 42-43.

[44] See MISO Tariff, Module D, Section 67; NYISO Market Services Tariff, Attachment H Sections 23.3.3.3.1, 23.3.3.3.2, and 23.6.

[45] See CCDEBE Revised Draft Final Proposal, *op. cit.*, Section 5.4.1, pp. 37-38.

[46] See CAISO DMM, Comments on CC DEB Initiative December 21, 2017 Stakeholder Call, *op. cit.*, p. 2

[47] See CCDEBE Revised Draft Final Proposal, *op. cit.*, Section 5.4.3, pp. 42-43.

pivotal supplier test is by design a very conservative test of competition, reflecting the many approximations in its application that could result in false negatives. The impact of this conservatism, however, is that it can produce many false positives. Rather than reflecting a finding that a market participant possesses market power, a failure to pass the three pivotal supplier test reflects a possibility that the supplier would possess market power.[48] In our opinion, there is no basis for the apparent position of DMM that costs above the threshold should never be recovered by suppliers that have otherwise been determined to have market power, even if the offers are clearly consistent with market conditions and other arms-length transaction prices. It is doubtful that such a policy will be acceptable to regulators in other states when applied to their utilities.

Another feature of the proposed reference price determination process is that the volatility threshold for gas fired resources will initially be set at 110% of the reference gas price for weekends and weekdays other than Monday's or weekdays following holidays. The threshold for the Mondays or weekdays following holidays will initially be set at 125%. These supplier-submitted cost adjustments would be used as the reference levels and the 110% (or, until changed, 125%) default threshold would be applied to cap offer prices.

An important rationale for this more relaxed threshold for the start of the work week is as follows. In assessing the need for suppliers to be able to make use of the volatility adjustment, it is important to recognize that the most often-used approach to comparing trade prices to an index is a comparison of transactions on the ICE to the index being used for the comparison at the same location. This calculation does not reflect the difference between the cost of purchasing gas over the weekend (most of which is purchased off-ICE) to the Friday gas price index. This calculation also does not reflect the difference between the gas index at a particular trading hub and the cost of acquiring gas delivered to gas fired generation not located at or near a reported gas trading point.

6.3. Gas Prices and Reference Price Calculations

The CAISO also proposes to continue making use of the best available data to estimate the gas prices that would be the starting point for the application of energy and commitment cost mitigation in the day-ahead market.[49]

This updating of the gas price indexes used for mitigation in the day-ahead and real-time markets based on transaction prices on electronic exchanges has been consistently recommended by the CAISO Department of Market Monitoring.[50] This updating is an important component of an improved bidding and market power mitigation design. This updating, however, is not a substitute for the elements of the CCDEB design which will enable gas fired generators to submit their own

[48] See J. Bushnell, S. Harvey, B.F. Hobbs, and S. Oren, Report on the Appropriateness of the Three Pivotal Supplier Test and Alternative Competitive Screens, June 27, 2013, www.caiso.com/Documents/Report-AppropriatenessThreePivotalSupplierTest-AlternativeCompetitiveScreens.pdf

[49] Ibid., Section 5.3.1, p. 22.

[50] See CAISO DMM, Comments on CC DEB Initiative December 21, 2017 Stakeholder Call, *op. cit.*, p. 1.

offer prices when they lack market power. There are no gas price data on electronic exchanges—updated or otherwise—for gas purchased for delivery at locations that are not trading points on the electronic exchanges or for transactions carried out on the phone on weekends when there is little trading activity on electronic exchanges.[51]

6.4. Conclusions

Overall, we support the transition to commitment cost reference levels that can be based on negotiated values or supplier updated cost information, consistent with the changes that have been introduced in the overall market power mitigation design of other ISOs over the past 5-7 years. With the greater ability of suppliers to reflect their actual costs in reference prices, it is appropriate to reduce the general mitigation threshold for commitment costs from 125% to the same 110-% used for other resources. Finally, we continue to support the efforts by the CAISO and DMM to base offer price mitigation on updated gas price information where this is available and sufficiently reliable.

[51] Monday-only transaction prices from the prior week will not reflect gas market conditions over the weekend when the weather forecast is changing.