

**Opinion on
Mitigation Measures for Bid Cost Recovery**

by

**James Bushnell, Member
Scott M. Harvey, Member
Benjamin F. Hobbs, Chair
Shmuel S. Oren, Member**

Members of the Market Surveillance Committee of the California ISO

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1. Introduction

The Market Surveillance Committee (MSC) of the California Independent System Operator has been asked to provide an opinion on the ISO's proposals for mitigation measures to be applied to bid cost recovery (BCR).¹ Mitigation of BCR has been the subject of several MSC meetings over the past few years, and a previous version of the most recent proposal was discussed at the Oct. 19, 2012 MSC meeting in Folsom. In addition, MSC members have participated in stakeholder calls and have reviewed stakeholder comments submitted to the ISO. The MSC has considered BCR mitigation in two recent opinions. These included the Dec. 9, 2011 opinion on Phase 1 of the Market Product Review,² and the later May 7, 2012 opinion focusing on BCR mitigation³, which addressed the ISO's earlier draft proposal of April 6, 2012.

Our major recommendation is that we support the simple and transparent approach to monitoring persistent real-time deviation from dispatch instruction. Previous proposals for mitigating the adverse effect of persistent uninstructed deviations on real-time BCR payments attempted to scale the payment by using scaling factors that try to track uninstructed energy and scale the BCR payments accordingly. The intent of such scaling was to produce a strategy-proof payment scheme that will incentivize participation in the real-time market while neutralizing opportunities to inflate BCR payments through adverse behavior. Unfortunately, that approach was too complicated and non-transparent. Furthermore, from a theoretical perspective, a strategy-proof payment scheme may be impossible when the bidders' strategy space allows them to adjust both bid

¹ California ISO, *Third Revised Draft Final Proposal on Bid Cost Recovery Mitigation Measures*, Draft of Nov. 26, 2012, www.caiso.com/Documents/ThirdRevisedDraftFinalProposal_BidCostRecoveryMitigationMeasuresNov26_2012.pdf

² Market Surveillance Committee of the CAISO, *Final Opinion on Renewable Integration: Market Product Review, Phase 1*, Dec. 9, 2011, www.caiso.com/Documents/MSCFinalOpinionRenewableIntegrationMarket-ProductReviewPhase1.pdf

³ J. Bushnell, S. Harvey, B.F. Hobbs, and S. Oren, *Opinion on Bid Cost Recovery Mitigation Measures and Commitment Costs Refinement*, Market Surveillance Committee of the CAISO, May 7, 2012, www.caiso.com/Documents/MSCFinalOpinion-BidCostRecoveryMitigationMeasures_CommitmentCostsRefinement.pdf

price and delivered quantity. Auction theory is based on the premise that awarded quantities in an auction are binding, and market clearing rules and payments designed so as to incentivize truthful bidding and efficient outcomes. We are not aware of any theory which addresses the possibility of winning bids not supplying the quantities awarded to them in the auction. Two-settlement systems (day-ahead and real-time) and various ad hoc heuristics implemented by various ISOs were designed to minimize strategic manipulation through bid price and uninstructed deviations but there is no theoretical gold standard to guide such rules. Consequently, a simple enforcement mechanism that penalizes noncompliance with respect to quantity delivery seems a reasonable solution. However monitoring and appropriate parameter tuning in response to that monitoring are essential, based on observed behavior. If persistent uninstructed deviations occur that inflate BCR and yet escape mitigation, then structural change to the mitigation system may be required.

The opinion is organized as follows. The next section presents some background on the development of this BCR proposal, and summarizes the previous MSC opinions addressing BCR and mitigation. In Section 3, the salient features of the most recent CAISO proposal are reviewed, and we offer some observations on those features. Our recommendations are presented in Section 4.

2. Background

The BCR proposal is part of the ISO's initiative to provide incentives for increased flexibility in real-time markets to help integrate sources of variable renewable power into the ISO markets. As part of that initiative, the ISO Board approved two elements of Phase I of the Renewable Integration: Market and Product Review⁴ at the December 2011 board meeting. These elements included lowering of the bid floor along with revision of the BCR mechanism to permit a separate calculation of BCR in the day-ahead and real-time markets. Among other elements, the proposal included a feature to detect and disqualify persistent uninstructed energy deviations from BCR. This is because the current ISO BCR design can provide incentives for generators to offer very high energy bids for part of their capacity output range and then deviate from real-time instructions in a way that would result in high energy-as-bid costs and, ultimately, inflated BCR.

The MSC submitted an opinion to the Board in December 2011 that offered general support for those proposals.⁵ In the opinion, the MSC cautioned that the performance of the revised BCR mechanism would depend on specific parameter choices, and that the system should be subjected to extensive testing before parameter values are selected and the system is implemented. In particular, we were unable at that time to conclude with confidence that the Performance Measure and Persistent Uninstructed Energy Check features in the proposal would function as intended. We stated that additional detail regarding the parameter values that would be used in applying these features along with additional testing data would be needed to allow us to reach a conclusion about their effectiveness. We also said that it would be important to ascertain that those fea-

⁴ www.caiso.com/Documents/DraftFinalProposal-RenewableIntegrationMarket-ProductReviewPhase1.pdf

⁵ *Op. cit.*, Note 2, *supra*.

tures are (1) effective in discouraging strategic behavior aimed at increasing BCR payments, while (2) not inadvertently yielding large decreases in BCR payments for normally expected deviations from dispatch instructions. Such decreases would undermine the goal of encouraging more resources to participate in the real-time dispatch by submitting economic offers. We noted that testing might indicate that significant changes to the basic features as proposed would be necessary to accomplish these goals.

In our May 7, 2012 opinion focusing on BCR,⁶ we commented on the April 6 draft final BCR mitigation proposal, in which the ISO presented details of a proposed mechanism, including parameters to be used in its implementation. In particular, we expressed general support for its major features, including the modified day-ahead metered energy adjustment factor; the real-time performance metric; and the persistent uninstructed energy (PUIE) check. We also stated our opinion that careful study is needed to justify particular parameters used in these procedures to avoid false negatives (not mitigating when instead mitigation should take place) and false positives (mitigating when unnecessary). That proposal was not submitted to the Board, and further analysis and discussions with stakeholders have resulted in the Nov. 26, 2012 draft final proposal that we are discussing in this opinion.

3. The Revised CAISO Proposal for BCR Mitigation

In its third revised draft final proposal of November 26, 2012, the CAISO proposes several modifications of its previously proposed mitigation measures, targeted at behaviors that could inflate BCR payments in the day-ahead and real-time markets as well as payments for residual energy. The CAISO proposes that the new mitigation measures applicable to BCR be put in place at the same time that the BCR calculations for day-ahead and real-time are separated, since the separation could exacerbate the potential for inefficient bidding strategies.

The proposed mitigation measures attempt to strike a fine balance between three basic objectives:

1. Enabling eligible resources to appropriately recover as-bid costs when following CAISO dispatch instructions;
2. Reducing or eliminating incentives for inefficient market behavior and bidding strategies that are designed to increase uplift payments; and
3. Preserving incentives for suppliers to provide economic bids into the real-time market, which has been the motive for the separation of BCR calculation for the day-ahead and real-time markets.

Specifically, the proposed mitigation measures address three types of payments: (1) BCR for day-ahead market schedules, (2) BCR for real-time dispatch, and (3) payments for residual energy produced when resources are ramped from their initial state to the instructed level (during intervals when the price paid for such energy is less than the resource's offer price for that output level during the reference hour). The new CAISO proposal bases energy BCR on the resource's

⁶*Op. cit.*, Note 3, *supra*.

economic bid, as long as the resource follows its dispatch instruction within a prescribed tolerance level that is set forth in the proposal. The CAISO is also proposing to pay for residual energy as-bid, with exceptions for persistent deviations and ramping from exceptional dispatches and minimum load rerates.

In general, we support the CAISO proposal of using economic bids as a benchmark for BCR (when a resource follows dispatch instructions), since the resources' economic bids (which have presumably passed the market power mitigation screen) are accounted for in the optimization algorithm that determined their dispatch instructions for the interval under consideration. Further mitigation of these economic bids (e.g., replacement with default energy bids (DEB)), as suggested in earlier proposals, is not warranted *if* the resource is in compliance with its dispatch instructions.

But at the same time, it should be recognized that the starting point for the dispatch optimization in an interval could be the result of a series of prior deviations so that even if a unit follows dispatch instructions within an interval, it could be compensated for energy resulting from its initial state arrived at by upward deviations from instructions in prior intervals. The DMM has expressed concern regarding potential multi-interval deviation strategies that can inflate BCR and we concur with that concern and recommend close monitoring of whether such adverse behavior is occurring. For the situation just mentioned, as will be discussed in more detail below, a strategy of deliberate upward deviations could be motivated by the possibility of earning large make-whole payments in subsequent intervals if the energy bid in those intervals is well above the LMP. This was the concern that motivated the previous PUIE proposal. However, given the complexity of that PUIE proposal, we understand (and some of the MSC members support) the ISO's dropping of the proposed PUIE mechanism in favor of a simpler and more transparent approach to meeting the stated goals of this proposal.

The CAISO proposes that mitigation would be applied to the offers used to calculate BCR payments for the real-time market only when a resource is not in compliance with real-time dispatch instructions in a manner that would inflate BCR payments. This occurs when a resource over-generates when being dispatched above its day-ahead schedule or under-generates when being dispatched below its day-ahead schedule without being instructed to do so by the ISO. In the day-ahead market, the main concern expressed in the CAISO proposal is that a resource that is scheduled based on its day-ahead bids will collect BCR for its day-ahead schedule even if it does not deliver all of the scheduled energy in real-time. To address this concern, the existing CAISO BCR rules prorate costs and revenue components in the day-ahead BCR calculation by applying in each interval a metered energy adjustment factor (MEAF) that derates the scheduled energy by the amount of energy above the minimum load block that is delivered in real-time. However, the updated MEAF calculation in the new proposal will not penalize a resource for following dispatch instructions (within a tolerance band) in intervals in which the CAISO dispatches the resource downwards from its day-ahead schedule. This modification of the current day-ahead MEAF is an improvement and will reduce the likelihood of unintended adverse effects from the application of the MEAF, such as discouraging real-time decremental bids.

It is not obvious to us, however, that uninstructed reductions in output below the day-ahead schedule provide an economic justification for prorating day-ahead BCR payments calculated

based on the day-ahead schedule. The day-ahead schedule is financially binding and a unit would have to replace any energy shortfall from day-ahead schedule with purchases in the real-time market (paying the real-time LMP) whether they receive BCR or not. Prorating BCR payments to resources committed uneconomically in the day-ahead market based on deviations from day-ahead schedule implies that units receiving BCR are not just financially liable for their day-ahead schedules but also have a physical obligation to adhere to that schedule. The DMM suggests that such an obligation may be justified on reliability grounds. However, even if reliability is indeed the motive for such proration of BCR payments, we see no economic reason to treat units receiving BCR any different than other units with regard to deviations from day-ahead schedules. Nonetheless, in any case, the proposed application of the MEAF is an improvement over the current rules.

The new proposed mitigation of the real-time BCR payments is based on compliance criteria that attempt to categorize the persistency of deviation from dispatch instructions. The mitigation is applied by replacing economic bids in the BCR calculation with the lowest of:

- the LMP,
- the economic bid submitted by the unit, and
- the default energy bid (DEB).

The deviation metric for each interval is based on changes in metered energy in successive intervals relative to the instructed change. When the metered change deviates from the instructed change by a prescribed tolerance (10%) in a direction that could inflate BCR payments, the interval is flagged. The persistency metric is based on the number of flagged intervals within a two hour moving time window and is categorized into two zones;

1. Below a low threshold of flagged intervals (3 intervals), then deviations are forgiven;
2. Above a certain upper threshold (4 intervals), deviations are instead deemed persistent and the mitigation is applied to all offers within the entire two hour window.

Under the new CAISO proposal, the above mitigation rules for energy bid cost recovery will also be applied to residual energy produced by a resource while ramping from its state at the beginning of an interval to its instructed state.

The CAISO proposal also addresses real-time behavior that is designed to prevent shutting down of a unit; this strategy involves deviating from dispatch instructions so as to stay above the minimum load level, which would trigger a mandatory shut-down. Likewise, the proposal addresses uninstructed start up of units. Absent the proposed rules, both types of deviations from CAISO dispatch instructions could result in inflated BCR payments. The CAISO proposes to treat such units in effect as self-dispatched, which would disqualify them from collecting BCR on their minimum load costs.

The DMM had raised two main objections to the mitigation procedure as proposed in earlier versions of the proposal. The first objection was the use of LMP in the cost base for BCR calculation, on the grounds that such use may encourage adverse bidding behavior attempting to manipulate the LMP. If, on the other hand, real-time BCR was determined interval-by-interval and not

netted across multiple intervals (with appropriate allocation of start-up costs among intervals), this would not be a problem.⁷ We strongly support such separation which is essential to incentive economic real-time bids in every interval. Netting across intervals so that profits in one interval are deducted from the real-time BCR in another interval will undermine the original purpose of separating the day-ahead BCR from real-time BCR payment in order to encourage resources to participate in the real-time dispatch throughout the day. This would be a particular problem for resources that might be started up and shut down more than once in a day.

We understand that the DMM concern over this issue has at least been partially dealt with in the latest draft proposal,⁸ where the thresholds for the number of intervals in the persistency metric have been modified. However, our concern over the incentive effects of calculating real-time BCR over the entire day remain, and we would prefer a finer-grained resolution for calculation of BCR in order to encourage energy offers into the real-time market.

The second DMM concern is that the proposed approach does not address multi-period strategies aimed at inflating real-time BCR payments, as we described above. We agree with that concern, in particular one may envision a strategy such as that depicted in Figure 1 below in which a high bid unit ramps up for two intervals although it was instructed to ramp down, but after those two intervals follows instructions to ramp down. According to the proposed rules such behavior will not incur any penalty (since two intervals deviation is below the mitigation threshold) and yet it produces a strip of excess energy⁹ that will be remunerated as-bid. Unfortunately, the original PUIE proposal, which attempted to address such behavior, turned out to be too complex and non-transparent and led to the current proposal for simpler metrics for monitoring persistent deviations. We support this simpler approach in spite of this limitation because it is not clear that in practice such a bidding and operating strategy can be profitably applied within the thresholds of the California ISO proposal. However, we recommend vigilant monitoring to detect the use of such multiperiod deviation strategies. If such strategies are indeed a problem, adjustment of parameters may be required or the entire approach may need to be revisited and modified.

⁷Alternatively, BCR could be calculated over a single start-up/shut-down cycle, so that if a unit is started up twice in a day the real-time pre-dispatch, real-time BCR would be calculated separately over each cycle (B. Hobbs, “Bid Cost Recovery”, MSC Meeting, March 18, 2011, www.caiso.com/Documents/Bid-CostRecovery-MSCPresentation.pdf).

⁸ Note 1, *supra*.

⁹This is instructed energy from the perspective of that interval (the operator has requested this level of operation), and is so classified for the purposes of settlement. This renders that energy eligible for BCR. However, considering the previous several intervals, this energy is, economically speaking, uninstructed, because it results directly from the upward deviations from instructions in previous intervals.

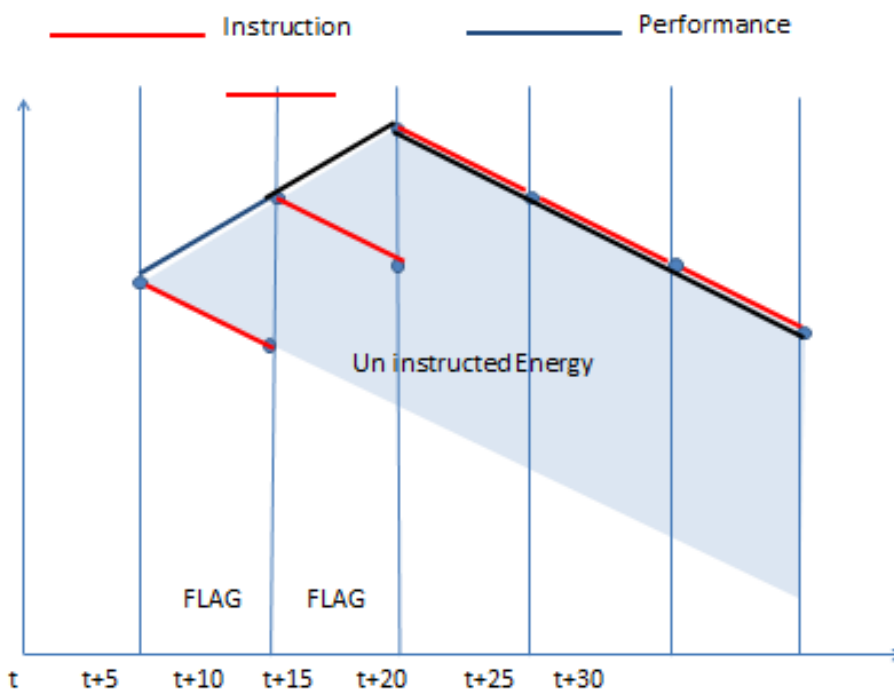


Figure 1: A multi-interval deviation strategy to create uninstructed energy

4. Recommendation on Mitigation and BCR

We support the new and transparent approach proposed by the ISO for monitoring persistent real-time deviations from dispatch instruction and subsequent mitigation of adverse impact of these deviations on real-time BCR payments. We also support the proposed treatment of behavior aimed at avoiding shut-down or initiating uninstructed start-up in order to inflate BCR payments.

It should be recognized, however, that the choice of parameters such as the 10% tolerance band and the upper and lower thresholds for the deviation persistency metric is ad hoc. The ultimate goal of these parameter choices should be to strike a balance between the economic consequences of type 1 and type 2 errors in mitigation—that is, over mitigation that may deter participation in the real-time market vs. missing adverse behavior that results in inflated BCR payments.¹⁰ Therefore, it is important that the implementation of the proposed methodology be monitored closely over a trial period, say one year, and that the setting of the parameters be re-evaluated at the end of that period based on statistical evidence regarding real-time market participation, frequency of mitigation and real-time BCR payments.

¹⁰ In the most recent BCR draft proposal (Note 1, *supra.*), the frequency of flagging was estimated based on Sept. 2012 data. Out of approximately 94,000 generating unit operating hours in that month, three or more intervals were flagged in 2.5% of them.

Furthermore, given some of the concerns we have mentioned about multi-period strategies to inflate BCR (see Figure 1, above), we further recommend that the CAISO monitor the implementation of the proposed rules from the beginning to assess whether there are problems occurring resulting from such strategies. If this is the case, then the CAISO should address it with rule changes as soon as practical. Such rule changes should not be limited to changing parameter choices in the currently proposed methodology and should consider other approaches to identifying multi-period strategies for inflating BCR if appropriate depending on the behavior observed.

Compared to earlier versions of the BCR mitigation proposal, the CAISO's current proposal has narrowed the scope of the remedies by focusing only on the possibility of inflating BCR payments. Consequently the persistent deviation metric only flags deviations from dispatch in directions that can result in inflated BCR. However, uninstructed deviations from dispatch in any direction could degrade the outcome of the optimization. It can be argued that the economic justification for any BCR uplift is to provide a side payment from consumers to producers when producers are being dispatched against their economic interest in order to support a socially optimal solution. However, this justification for BCR payments becomes inapplicable if a resource does not follow dispatch instructions which can undermine the social gain from dispatching that resource. Unless the deviation relaxes an overly conservative constraint assumed in the dispatch optimization, it is inherently suboptimal. While it may be difficult to determine the social cost due to uninstructed deviation by resources, the cost of corrective regulation can provide a rough estimate of the uninstructed deviation cost. In any case, it can be argued that uninstructed deviations beyond a tolerance band should disqualify a resource from receiving BCR payments, as will happen in the case of real-time BCR payments under the real-time performance metric under this proposal. On the other hand the general problem of penalizing uninstructed deviations is a very broad issue, and reaches beyond the scope of this proposal which focuses on inflated BCR payments. Therefore, we accept the CAISO approach to only flag deviations that have the potential to inflate BCR.

With regard to proration of day-ahead BCR when units underperform relative to their day-ahead schedules, it appears that the proration may impose significant costs on resources that are uneconomically scheduled for energy above minimum load (which is what is subject to the DA MEAF), beyond the cost of settling deviations between their day-ahead schedules and real-time output at the real-time price. We support the CAISO proposal as an improvement over the current design. If there is an issue in the CAISO real-time prices such that settling deviations between day-ahead schedules and real-time output at real-time prices provides insufficient incentive for resources to adhere to their day-ahead schedules, then any changes to address such a reliability concern should be applied to all resources with day-ahead schedules, not just those who receive BCR because they were committed uneconomically in the day-ahead market.

Finally, we support the proposed mitigation of BCR payment for units who try to avoid shut down by maintaining output above their Pmin level contrary to ISO instructions, or who start up uninstructed.