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*Revised Draft Final Proposal*

# Bid Cost Recovery Mitigation Measures

**September 4, 2012**

# Revised Draft Final Proposal Bid Cost Recovery Mitigation Measures

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## 1 Introduction

The ISO market optimization considers the costs for starting up a generating resource, the costs of operating the resource at minimum load, and the resource's marginal cost of producing energy. However, because only the incremental energy cost is reflected in the locational marginal price, it is possible that a generator's revenue from energy paid at locational marginal price (LMP) is not enough to cover its minimum load and start-up costs. In addition, energy payments at the LMP may not cover a resource's energy bid costs because the ISO market must ramp resources up or down at their ramp rate. Bid cost recovery (BCR) is the process by which the ISO pays scheduling coordinators for resources' start up, minimum load and bid costs, in the event these costs are not covered by energy payments at locational marginal price.

Currently, the bid cost recovery calculation is performed over the entire trade day and netted across the day-ahead and real-time markets for that trade day. The ISO has proposed as part of phase 1 of the renewable integration market and product review (RI-MPR) initiative to change the bid cost recovery rules so that bid cost recovery amounts calculated for the day ahead and real-time markets, respectively, are not netted together. This change, which was approved by the ISO Board in December 2011, is an important element of the RI-MPR Phase 1 proposal because it will provide increased incentives to provide economic bids in the real-time market. More economic bids in the real-time market, and fewer self-schedules, will be vital to managing the grid reliably as more variable energy resources come online.

This change to the bid cost recovery calculation will increase the incentive for submitting economic bids to the real-time market because it will tend to increase resources' eligibility for real-time bid cost recovery. However, increasing resources' eligibility for real-time bid cost recovery can also provide an incentive for adverse market behavior because real-time bid cost recovery payments will no longer be reduced by revenues earned in excess of bid costs in the day-ahead market.

As a result, the ISO is proposing several mitigation measures as part of this initiative to stem the incentives to engage in such adverse market behavior. In addition, to ensure bid cost recovery is not paid for dispatched energy that is not delivered, the ISO is proposing changes based on the "metered energy adjustment factor" used as part of the existing bid cost recovery design.

In developing the recommended mitigation measures, the ISO has employed the following design principles:

- Bid cost recovery should enable eligible resources to appropriately recover bid costs.
- Bid cost recovery mitigation measures should remove incentives for adverse market behavior to increase uplift payments.
- Bid cost recovery mitigation measures should preserve incentives to provide economic bids into the real-time market.

## 2 Cost Recovery at other North American ISOs and RTOs

Cost recovery, is offered by almost every one of the major ISOs in North America. PJM, New York ISO, Midwest ISO, New England ISO, Ontario IESO, ERCOT, and Alberta Electric System Operator all offer similar cost recovery provisions to guarantee that a resources recovery at least their bid costs from the electricity market.

The larger ISOs – PJM, New York ISO, New England ISO and Midwest ISO – all have cost recovery provisions similar to the California ISO. That is, they offer their market participants cost recovery in both the day ahead and real-time markets. However, only the California ISO has its current provisions for netting cost recovery between the day ahead and real-time markets.

The other ISO/RTOs also have provisions to ensure bid cost recovery is only paid for delivered energy and to mitigate adverse incentives. For example:

- Midwest ISO cost recovery rules were recently adapted so that payments are deducted from the higher of the day ahead or real-time market energy bids rather than the day ahead market energy bid alone thus mitigating incentives to bid above marginal cost in the real-time market.
- PJM requires a generator to closely follow dispatch instructions in order to be eligible for a cost recovery payment.
- ERCOT has the authority to claw back 100 percent of real-time market revenues if a generator does not participate in the day-ahead market.

### 3 Background

In the first half of 2011, the ISO made two emergency filings with the Federal Energy Regulatory Commission (FERC) to mitigate observed adverse market behavior involving bid cost recovery. There were actually several strategies being employed, all aimed at inflating bid cost recovery payments. Recently, on August 28, 2012 the ISO made a filing with FERC to address residual imbalance energy, as well as price mitigation for certain exceptional dispatches. A summary of the three filings is provided below.

#### *March 25, 2011 Emergency Bid Cost Recovery Filing*

In the March 25 filing, the ISO identified a bidding strategy that inflated bid cost recovery payments.<sup>1</sup> This strategy consisted of bidding resources into the day-ahead market in a manner that essentially forced the market to commit the resources at maximum capacity. The resources were subsequently bid into the real-time market in such a way that the ISO decrementally dispatched the resources to their minimum load. Because the metered energy adjustment factor (MEAF) neared zero when the resources were decremented by the ISO in the real-time market, the bid cost recovery calculations under-accounted for day-ahead market revenues, and bid cost recovery payments were inflated.

In response to this market behavior, the ISO modified its bid cost recovery calculation to account for day-ahead market revenues based on scheduled (rather than delivered) energy for decremented resources. In short, the day ahead MEAF is no longer applied to day-ahead market revenues when the ISO dispatches a resource downward from its ISO committed schedule in the day-ahead market.

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<sup>1</sup> [http://www.caiso.com/Documents/March25\\_2011Errata-March18\\_2011TariffAmendment-ModifyMarketSettlementRulesinDocketNo\\_ER11-3149-000.pdf](http://www.caiso.com/Documents/March25_2011Errata-March18_2011TariffAmendment-ModifyMarketSettlementRulesinDocketNo_ER11-3149-000.pdf)

*June 22, 2011 Emergency Bid Cost Recovery Filing*

Subsequent to the March 25 filing, the ISO observed continued bidding strategies that inflated bid cost recovery payments. This prompted the ISO to develop rule changes to remove the incentives for these and an additional related potential strategy.<sup>2</sup>

The first of the observed strategies consisted of a continuation of the strategy addressed in the March 25, 2011 filing. The ISO addressed this strategy by modifying the bid cost recovery rules to no longer apply the MEAF to bid costs in the case bid costs were negative.

The second of the observed strategies involved bid cost recovery payments for uneconomic bids such that the ISO market was forced to ramp a resource down in the real-time market from a day ahead market schedule for the previous day that was near the resource's maximum operating level. The potential strategy the ISO identified was similar but involved ramping a resource down, or up to, self-schedules combined with uneconomic bids in the hours between the self-schedules. The ISO addressed these strategies by first identifying periods in which the ISO instructs a resource to ramp at its full ramp rate due to the uneconomic bids. For such full ramp periods, the net day-ahead market energy shortfall is not included in day-ahead market bid cost recovery calculations.

*Post-Emergency Bid Cost Recovery Filing Review*

In the initial March 25, 2011 filing, the ISO committed to "conduct a stakeholder process to provide stakeholders an opportunity to comment and raise any further changes or refinements to the ISO's proposed tariff amendments."

That stakeholder initiative provided stakeholders with a forum through which any residual issues related to the two filings could be discussed. That initiative provided a forum through which rule changes needed to address strategic market behavior to inflate bid cost recovery could be developed.

The following issues were raised through the Post-Emergency Bid Cost Recovery Filing Review stakeholder process:

- The need for changes to the cap for the registered cost option for start-up and minimum load costs.
- The need for increased granularity in bid cost recovery monitoring reports.
- The need to assess potential increases in bid cost recovery payments through strategic use of resource identification numbers for intertie resources.
- The need to address increased bid cost recovery due to deviations from dispatch by resources with forbidden operating regions, as well as inefficiency of ancillary services procurement from such resources.
- The need to clarify a tariff provision related to the minimum load tolerance band for resources receiving a residual unit commitment (RUC) award.

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<sup>2</sup> [http://www.caiso.com/Documents/2011-06-22\\_Amendment\\_ModBCRules\\_EDEnergySettRules\\_ER11-3856-000.pdf](http://www.caiso.com/Documents/2011-06-22_Amendment_ModBCRules_EDEnergySettRules_ER11-3856-000.pdf)

Descriptions of these issues, stakeholder feedback on them, and the ISO's proposal on each item are discussed in the final proposal for that initiative.<sup>3</sup> Also discussed in that initiative, as well as in the RI-MPR Phase 1 effort, was the need for mitigation measures to address strategic market behavior that may be exacerbated by the separation of the netting of the real-time/RUC and day-ahead bid cost recovery calculations. These mitigation measures are addressed in this revised draft final proposal.

*August 28, 2012 Emergency Filing Addressing Exceptional Dispatch Mitigation and Residual Imbalance Energy*<sup>4</sup>

In addition to addressing price mitigation of certain exceptional dispatches, the ISO is proposing to change the settlement of residual imbalance energy. Residual imbalance energy is energy attributable to a resource ramping down from a real-time dispatch at the end of a previous hour or ramping up to a real-time dispatch at the beginning of an upcoming hour. As described in more detail in Section 7.1, below, the ISO proposed in the August 28 filing to settle residual imbalance energy at a resource's default energy bid or the LMP. In addition to being consistent with the price basis of mitigated exceptional dispatches, this change will also address a potential opportunity to inflate residual imbalance energy payments by deviating from dispatch. This issue was previously being addressed as part of this *Bid Cost Recovery Mitigation Measures* initiative.

## 4 Overview of the revised draft final proposal

This section provides an overview of the mitigation measures addressed in this revised draft final. It also summarizes stakeholder feedback received on the draft final proposal previously released and describes changes from the draft final proposal.

In summary, the ISO proposes the mitigation measures listed below be put in place simultaneously with the separation of the netting of day-ahead and real-time bid cost recovery calculations, and the lowering of the energy bid floor

### Section 5 – Modified day-ahead metered energy adjustment factor:

The ISO proposes to apply a modified day-ahead metered energy adjustment factor (MEAF) to the energy portion of the day-ahead market bid cost recovery calculation. Unlike the current MEAF, this modified MEAF will not reduce day-ahead bid cost recovery for resources that are dispatched downward by the ISO in the real-time market.

### Section 6 – Real-time performance metric:

The ISO proposes to implement a real-time performance metric (PM) which will scale components of the real-time bid cost recovery calculation in the case of under-delivered incremental or decremental energy and will replace the current real-time metered energy adjustment factor (MEAF).

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<sup>3</sup> [http://www.caiso.com/Documents/DraftFinalProposal\\_Post-EmergencyBidCostRecoveryFilingReview.pdf](http://www.caiso.com/Documents/DraftFinalProposal_Post-EmergencyBidCostRecoveryFilingReview.pdf)

<sup>4</sup> <http://www.caiso.com/Documents/August282012ExceptionalDispatch-ResidualImbalanceEnergyMitigationTariffAmendment-DocketNoER12-2539-000.pdf>

### Section 7 – Cost and revenue basis for energy bid cost recovery:

The ISO proposes the following changes to the calculation of a resource's costs and revenues as part of the bid cost recovery calculations.

- The ISO proposes to use a resource's default energy bid (DEB) rather than using the submitted energy bid in the bid cost recovery calculations. Under this proposal, cost recovery for energy eligible for bid cost recovery will be consistent with the settlement of residual imbalance energy that was detailed in the August 28, 2012 filing with FERC.<sup>5</sup> This change obviates the need for the persistent uninstructed imbalance energy (PUIE) check to identify instances in which persistent uninstructed imbalance energy is inflating bid cost recovery for energy and to claw-back the portion of this bid cost recovery attributable to these deviations. Since energy bid cost recovery would be based on a resource's actual costs under this proposal, rather than the submitted bid, there would no longer be an incentive for resource's to deviate to inflate bid cost recovery payments

The ISO proposes to include residual imbalance energy settlements in the calculation of bid cost recovery for the real-time market. This change will not affect the settlement of residual imbalance energy as proposed in the ISO's August 28, 2012 FERC filing but will allow residual imbalance energy payments (or charges) to be considered in calculating whether a resource as a revenue shortfall for the purpose of bid cost recovery payments.

### Section 8 – Start-up and shutdown instructions:

The ISO proposes several measures to address the potential for strategic behavior to inflate bid cost recovery payments by ignoring a real-time market shutdown instruction, over-generating so that the real-time market does not issue a shutdown instruction when it otherwise would have, or starting up without receiving an ISO instruction. The measures to mitigate the potential for this behavior are:

- Resources issued a binding shutdown instruction by the ISO's automated dispatch system (ADS) will not be eligible for bid cost recovery after the effective time of the shutdown instruction.
- To address the potential for resources strategically over-generating to avoid ADS issuing a binding shutdown instruction, the ISO proposes to implement a metric to identify this behavior and to subsequently disqualify the resource from minimum load cost recovery. More details are provided in the section detailing this element of the proposal.
- The ISO intends to clarify in the tariff that a period in which a resource starts up without an ISO instruction to do so will not be considered an ISO commitment period, and thus will not be eligible for cost recovery.

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<sup>5</sup> <http://www.caiso.com/Documents/August282012ExceptionalDispatch-ResidualImbalanceEnergyMitigationTariffAmendment-DocketNoER12-2539-000.pdf>

## 5 Modified day ahead MEAF

As part of phase 1 of the renewable integration market and product review (RI-MPR) initiative, the ISO recommended basing day-ahead market bid costs used in the bid cost recovery calculations on scheduled energy instead of delivered energy, i.e., not apply the day-ahead metered energy adjustment factor (MEAF) in the day ahead market bid cost recovery calculations. The rationale for this proposal was that it was consistent with the ISO's proposal to eliminate the netting of costs and revenues in the day-ahead market against those in the residual unit commitment process and the real-time market. One of the stated goals in this initiative is to ensure that bid cost recovery provides the proper incentive for the targeted bidding behavior. As discussed in this paper's introduction, to limit disincentives to submit economic bids in the real-time market, it is important to decouple the markets and eliminate the netting of costs and revenues across them.

Notwithstanding the reasoning described above, in the draft final proposal the ISO refined its proposal to include the application of a modified version of the day ahead MEAF. The impetus for this change was the ISO's identification of an adverse incentive created by having the day ahead market cost recovery calculations for a resource be completely isolated from its actual performance in real-time.

Specifically, a resource could have the incentive to bid in such a way as to get bid cost recovery in the day-ahead market, and then not deliver its day-ahead schedule in real-time. In this case the resource would still receive its day-ahead bid cost recovery including minimum load cost recovery, but not participate in the real-time market. This is not consistent with the intended interaction of the day ahead and real-time markets. The day-ahead market runs in order to set up feasible schedules. The real-time market, in turn, makes incremental changes to these schedules. Thus, this bidding practice described could have negative market and reliability impacts.

The ISO proposes to address this potential adverse incentive through a modified day ahead MEAF. This MEAF will not impact day ahead bid cost recovery if the ISO dispatches a unit downward from its day ahead schedule in the real-time market, but will reduce day ahead bid cost recovery if a unit operates below its day ahead schedule in real-time without being dispatched down by the ISO. The lowering of the cap on the registered cost option for minimum load, recently approved by the ISO board under a separate stakeholder initiative, will also address this adverse incentive.<sup>6</sup> A lower registered cost cap for minimum load would reduce the incentive to engage in a strategy that leaves the resource running at minimum load in the real-time.

The current day ahead MEAF is calculated using the following formula (simplified from actual):<sup>7</sup>

$$DA\ MEAF = \frac{Metered\ Energy - DA\ ML\ Energy}{DA\ Sched\ Energy - DA\ ML\ Energy}$$

<sup>6</sup> <http://www.caiso.com/informed/Pages/StakeholderProcesses/CommitmentCostsRefinement2012.aspx>

<sup>7</sup> The two emergency bid cost recovery filings modify the rules to set the day ahead MEAF equal to 1 for revenues in the case of decremental real-time dispatch and sets the day ahead MEAF equal to 1 for costs in the case of negatively priced energy bids.



The modified day ahead MEAF proposed by the ISO is shown below:

$$Modified\ DA\ MEAF = \min \left\{ 1, \left| \frac{Metered\ Energy - DA\ ML\ Energy - Regulation\ Energy}{\min\{TEE, DA\ Sched\ Energy\} - DA\ ML\ Energy} \right| \right\}$$

Table 3.1-1 summarizes how the ISO proposes to apply the modified day ahead MEAF:

**Table 3.1-1: Application of the modified day ahead metered energy adjustment factor**

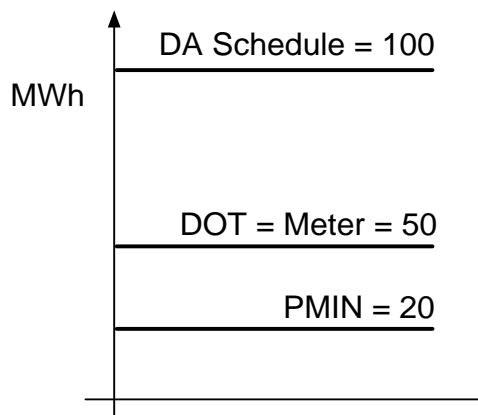
Costs *	Revenues	Apply modified day ahead MEAF to...
+	+	Costs
+	-	Costs & Revenues
-	+	n/a
-	-	Revenues

\* “Costs” refer to day ahead energy bid costs, and “Revenues” refers to revenues for the day ahead schedule above minimum load.

Note: There are circumstances not captured by the simple formula above. However, the same intent of the policy will be applied in such circumstances.

The simplified example below shows the difference between the current day ahead MEAF and the proposed, modified day ahead MEAF. The example shows the current calculation of the day ahead MEAF would result in a scaling of elements of the day-ahead bid cost recovery calculation in the case that a generating resource has a day-ahead schedule of 100 MWh and then heads the ISO’s decremental dispatch to 50 MWh in the real-time market. Under the modified approach, the day ahead bid cost recovery calculation would not be scaled in such a case because, as shown in the formula above, metered energy is evaluated relative to the lower of the day ahead scheduled energy and the real-time ISO dispatch rather than simply the day ahead scheduled energy. This is compatible with the RI-MPR Phase 1 design intent to provide incentives to follow real-time decremental dispatch instructions.

**Figure 3.1-1: Simplified example of current day ahead MEAF and proposed modified day ahead MEAF in the case of a decremental real-time dispatch**



$$\text{Current DA MEAF} = (50 - 20) / (100 - 20) = 0.375$$

$$\text{Modified DA MEAF} = \min [1, \text{abs}((50-20) / (\min(50, 100) - 20))] = 1$$

The original FERC order for MRTU addressing day-ahead bid cost recovery specified that the ISO should not pay bid cost recovery for day-ahead energy that was not delivered in real-time. Previously this was accomplished through the day-ahead MEAF. Under the modified day ahead MEAF, undelivered day ahead energy will not receive bid cost recovery if the ISO did not issue a decremental instruction to not deliver the day ahead scheduled energy in real-time. However, the modified day ahead MEAF will not reduce day-ahead bid cost recovery payments if, in real-time, the ISO dispatches the unit down below its day-ahead scheduled energy and the unit delivers the dispatched energy. (It will also not affect bid cost recovery payments if a resource is dispatched upward in the real-time market.) This is to accomplish the over-arching goal of encouraging decremental energy bids in the real-time market. Market participants will have stronger incentives to submit real-time bids if being dispatched downward in real-time does not reduce day-ahead bid cost recovery payments. The ISO believes that this balances the intent of the original FERC order with today's increasing need for real-time dispatch responsiveness.

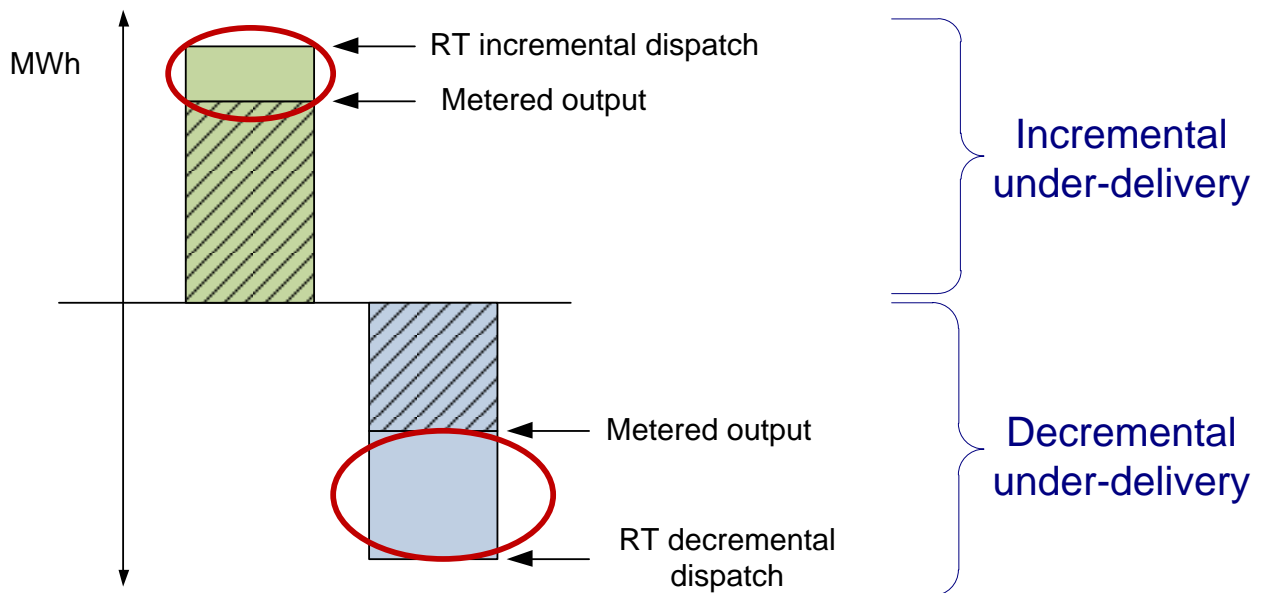
The day-ahead minimum load costs, start-up costs and multi-stage generators' transition costs will be still subject to the same rules as today. The modified day-ahead MEAF will not impact these costs.

In comments on the ISO's draft final proposal, CDWR-SWP, Calpine, GenOn, NRG, PG&E, SCE, and Six Cities expressed support for the proposed modified day ahead MEAF. Calpine made a few points of clarification regarding implementation of the modified day ahead MEAF which the ISO will address these through the implementation process.

## 6 Real-time performance metric

The ISO proposed in its straw proposal for this initiative to apply a real-time performance metric that would reduce real-time market bid cost recovery payments in instances of energy under delivery and over delivery. Based on further analysis and stakeholder feedback to the revised straw proposal, the ISO modified its proposal such that the performance metric will be applied in only the case that a resource under-delivers on its real-time ISO instruction. Note, though, that this applies to instances in which incremental energy is under-delivered and to cases in which decremental energy is under-delivered. These circumstances are pictured in the figure below. The areas in red designate undelivered incremental or decremental energy for which the performance metric will apply.

**Figure 3.2.2-1: Incremental and decremental under delivery**



This change to the ISO’s proposal is based on stakeholder feedback that, because resources are not eligible for bid cost recovery for over-delivered energy, reducing bid cost recovery for over-delivery was not justified as a bid cost recovery mitigation measure. Calpine, GenOn, and NRG pointed out this measure seemed more broadly targeted at uninstructed deviations in general.

SCE disagrees with the premise that of this change and states that “[t]hough uninstructed deviations are not eligible for bid cost recovery, they may have a material impact on reliability, which will become increasingly important with the integration of additional variable energy resources (VERs).” The ISO agrees that uninstructed deviations may be an increasingly important issue as responsive generation is crucial to balancing load and generation as more variable energy resources come online. However, the ISO maintains that scaling bid cost recovery payments for over-delivery of energy, when the over-delivered energy is not itself potentially eligible for bid cost recovery, is inconsistent with cost causation. In addition, it is not an effective methodology to disincent uninstructed deviations because a resource may not even be potentially eligible for bid cost recovery in a dispatch interval.

The proposed real-time performance metric is distinct from the current real-time MEAF in the following two ways:

1. The real-time performance metric applies to residual unit commitment or real-time minimum load costs in addition to the energy portion of the real-time bid cost recovery calculation.
2. A tolerance band, described in the following section, is applied around the real-time performance metric.

The ISO is proposing that the real-time performance metric (PM) be calculated for each resource in each settlement interval in the following manner:

$$\text{Performance Metric} = \min \left\{ 1, \left| \frac{\text{Metered Energy} - \text{DA Energy} - \text{Regulation Energy}}{\text{Total Expected Energy} - \text{DA Energy}} \right| \right\}$$

Note 1: Regulation energy is “deemed delivered” since it is provided by a resource under the ISO’s control via direct electronic signal. For this reason, regulation energy is excluded in the performance metric calculation. Furthermore, and for the same reason, regulation energy is not included in the calculation of total expected energy. And so, by subtracting regulation energy from metered energy in the performance metric formula, it is ensured that the numerator and denominator are capturing like terms.

Note 2: The performance metric will only be applied to the incremental or decremental real-time schedule. It is for this reason that, in the above formula for the real-time performance metric, the day ahead market scheduled energy is subtracted out of both the numerator and denominator.

Note 3: There are circumstances not captured by the simple formula above. However, the logic of the policy is unchanged in these circumstances. For examples,

- If an incremental instruction is issued, and the resource deviates downward from its day-ahead schedule, the PM would equal 0. The same would be true in the opposite case in which a resource issues a decremental instruction deviated to a level above its day ahead schedule.
- If the metered energy were equal to the day-ahead schedule and the total expected energy, the performance metric would equal 1.
- If either metered energy was equal to the day ahead schedule, or total expected energy were equal to the day ahead schedule, then the performance metric would equal 0.

The following table shows the quantity, either costs, revenues or both depending on the signs of their values to be adjusted under the real-time bid cost recovery performance metric approach. Because negative revenues are essentially like costs in that they can contribute to a shortfall which could result in a cost recovery uplift payment, the performance metric will be applied to those as well. Likewise, negative costs can contribute to a shortfall and so, in the event of a shortfall in this situation, the real-time performance metric will be applied to revenues in that

settlement interval. Note that when the performance metric describes the portion of the output that is instructed. When the real-time performance metric is applied to the bid cost recovery calculation components below, these quantities are multiplied by performance metric.

**Figure 3.2.2-2: Application of the real-time performance metric**

Costs *	Revenues	Apply PM to...
+	+	Costs
+	-	Costs & Revenues
-	+	n/a
-	-	Revenues

\* In the case of the real-time performance metric, “Costs” refer to real-time market energy bid costs, and RUC/real-time market minimum load costs. The real-time performance metric is also applied to day ahead market minimum load cost only in the case that a resource is committed by the ISO in day ahead and de-committed by the ISO in real-time as noted above. “Revenues” refers to the real-time energy market revenues including those for minimum load energy. The ISO proposes that the real-time performance metric also be applied to pumped storage and demand response resources.

The current 3%/5 MWh tolerance band performance measurement that compares a resource’s metered output with its Pmin (resource-level or multi-stage generator configuration) will remain in the day ahead market bid cost recovery calculations for commitments made by the day ahead market. An exception will be in the in the event that a resource is de-committed in the real-time market that was originally committed in the day ahead market. Under the 3%/ 5MWh tolerance band performance measurement, a resource is not eligible to have minimum load, startup, or multi-stage generator transition costs included in the bid cost recovery calculations, if the resource does not operate within the tolerance band of its Pmin. However, the ISO proposes not to apply this standard 3%/5 MWh tolerance band performance measurement to the minimum load cost used in the day-ahead market bid cost recovery calculations, in the case a unit is committed in the day-ahead market but de-committed in the real-time market. In this case, the ISO proposes to instead apply the real-time bid cost recovery performance metric to the day-ahead market minimum load cost. The rationale for this is the 3%/5MWh tolerance band performance measurement could provide incentives not to follow ISO dispatch instructions to shut-down or stay off-line. Instead, by applying the real-time BCR performance metric to the day-ahead market minimum load costs, elements of the bid cost recovery calculation will be scaled back if the resource were to disregard the ISO instruction to shut-down in real-time. In addition, it is equitable to include minimum load costs in the day-ahead market bid cost recovery calculations in the event a resource is de-committed in real-time because the resource’s savings in avoiding these costs is included in the real-time market bid cost recovery calculations.

The ISO has proposed that, in the case of an exceptional dispatch, a generating resource is paid based on rules specific to those circumstances. Bid cost recovery, and thus the real-time performance metric, is not applicable in such circumstances. In comments on the draft final proposal, GenOn expressed the concern that the proposal “inadequately explains how a

resource that is committed by exceptional dispatch after the day ahead Market is protected from the application of the performance metric.” The ISO clarifies that the performance metric will not impact exceptional dispatch energy because exceptional dispatch energy is not subject to bid cost recovery.

GenOn also contends that the proposal “appears to unduly discriminate against a resource that is committed through RUC,” and requests that the ISO clarify whether or not “minimum load energy associated with a RUC start-up instruction will be exempt from the performance metric.” The ISO clarifies that minimum load energy associated with residual unit commitment is included in real-time bid cost recovery and is subject to the real-time performance metric. The reason for this is that, when a resource is committed in the residual unit commitment process, the minimum load energy is part of the bid cost recovery calculations for the real-time market, and real-time market bid cost recovery is subject to the real-time performance metric. The rationale for grouping the residual unit commitment process and real-time together, which was discussed as part of the RI-MPR Phase 1 stakeholder initiative, is that residual unit commitments are made based on forecasted real-time conditions; the two are thus linked in a fundamental way.

PG&E supports the real-time performance metric as proposed with minor implementation clarifications.

## 6.1 Tolerance band for the real-time performance metric

The ISO proposes the following real-time performance metric tolerance band to not reduce real-time market bid cost recovery payments for small deviations from dispatch that may legitimately be due to ramping constraints or other such operational constraints.

$$\begin{aligned}
 & \sim \text{if} \sim \\
 & | \text{Metered Energy} - \text{Regulation Energy} - \text{Total Expected Energy} | \leq \\
 & \quad \max \left\{ \frac{5 \text{ MWh}}{6}, \frac{(0.03 * p_{\max})}{6} \right\} + \text{Ramping Tolerance} \\
 & \sim \text{where} \sim \\
 & \quad \text{Ramping Tolerance} \\
 & = | \text{Total Expected Energy based on Dispatch Operating Point} \\
 & \quad - \text{Total Expected Energy based on Dispatch Operating Target} | \\
 & \sim \text{then} \sim \\
 & \quad \text{Performance Metric is not Applied}
 \end{aligned}$$

The reason for dividing the elements of the maximum function in the criteria above by 6 is that the performance metric is applied by settlement interval. Therefore, the MWh values should likewise be consistent with those 10-minute intervals.

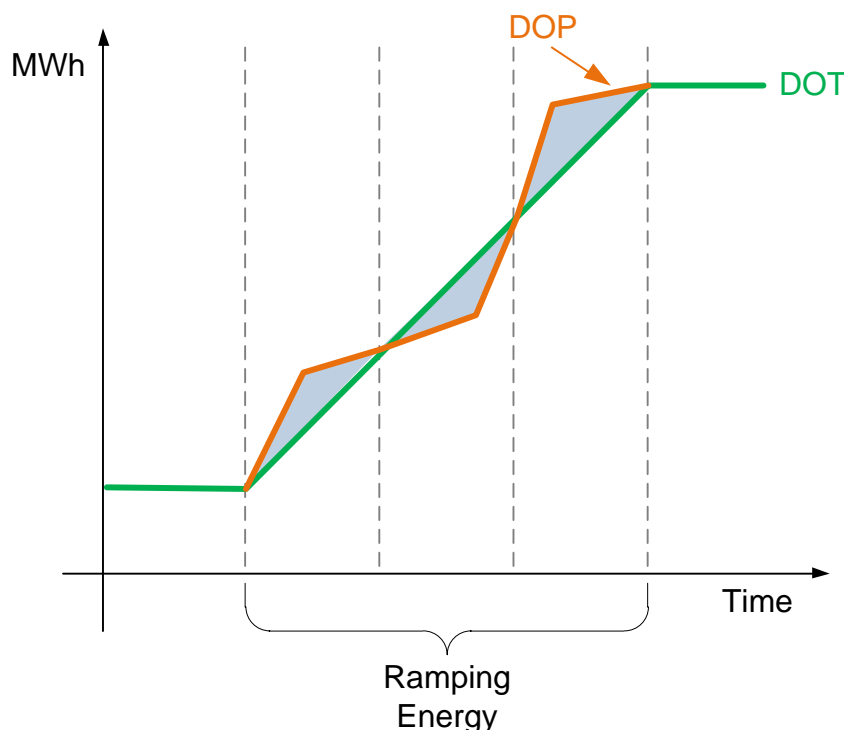
As noted in the straw proposal, the ISO proposes that this boundary is based on the maximum of 3% of the resource  $p_{\max}$  (instead of being based on a calculated performance metric of 3%) and 5 MWh. Calpine, GenOn, and PG&E expressed support for this element of the proposal.

The threshold values of 5 MWh and 3% are consistent with our current market performance and our experience with realistic and justifiable deviation around dispatch and the ISO has employed the “5 MWh or 3%” thresholds even prior to the launch of the LMP market in April 2009. The ISO has used these thresholds for other operating performance by a generating resource such as when the plant-level or configuration-level minimum operating level has been achieved. These values also reflect justifiable deviations that result from the modeling of resource ramp rates as four-segment “curves” rather than as continuous or smooth curves as they are in actuality.

In addition to the threshold value, the performance metric will not be calculated during the startup, shutdown, MSG transition periods, or during crossing periods over a forbidden operating region as long as the resource is in fact in the instructed operation. This is out of recognition that the output of a resource cannot be controlled exactly during these events. Calpine expressed support for this element of the proposal.

The ISO considers the time periods that the market uses in instructing those events. As long as the unit follows the instruction, there is no performance metric applied in these cases. The current rules for early or late shut-up, shut-down, and transition still apply.

As part of the performance metric threshold, the ISO further proposes increase the real-time performance metric threshold by an additional ramping tolerance amount. The ramping tolerance criterion is designed to accommodate instances in which the resource’s ramp rate can change over the course of the interval. When the ISO issues an instruction for a generator to ramp to a different output level, the expected energy based on the new target output level – the dispatch operating target (DOT) – can differ from the expected energy based on the dispatch operating point (DOP) which reflects the generator’s actual expected incremental movements minute-by-minute toward the target output level. This difference will exist whenever there is a ramp-rate change within the 5-minute interval window. A stylized depiction of a difference between expected energy based on the dispatch operating point and that based on the dispatch operating target is shown in the diagram below.

**Figure 3.1-2: Ramping Tolerance**

$$\text{Ramping Tolerance} = | \text{TEE based on DOP} - \text{TEE based on DOT} |$$

In the above diagram, the green line shows the ISO instruction from current output to the dispatch operating target while the orange line shows the resources incremental output levels calculated as part of the expected energy calculations used for energy settlement as it moves toward the dispatch operating target. The area under the green line is total expected energy (TEE) based on the dispatch operating target, and the total expected energy as calculated for use in energy settlement based on DOP would be the area under the orange line. The differences between these two calculations of expected energy are related to the physical operation of the generating resource and so the ISO proposes to increase the real-time performance metric threshold by the amount of this ramping tolerance. That is, by the amount of the blue shaded areas as depicted in the above diagram.

GenOn expressed support for this element of the proposal.

## **7 Cost and revenue basis for energy cost recovery**

The bid cost recovery settlement provisions and the residual imbalance energy settlement provisions are the two mechanisms in the ISO market that guarantee resources recover costs for energy above minimum load. As previously described, the bid cost recovery settlement provisions ensure a resource recovers its costs if revenues are less than costs as calculated over an entire day. Residual imbalance energy provides for a resource to be paid its cost for



ramping as a result of a bid dispatched in an adjacent hour. It is not subject to a daily revenue shortfall.

In response to the potential that residual imbalance energy payments could be inflated by high-priced bids associated with over-generation under the current market design, the ISO filed with FERC on August 28, 2012 to change the settlement of residual imbalance energy. As described below, the ISO is proposing that residual imbalance energy be settled based on a resource's default energy bid or the LMP.

A similar potential exists to inflate bid cost recovery payments by persistently over-generating in conjunction with high-priced bids above a resource's marginal costs. This potential is limited under the current market because real-time market revenue shortfalls are currently netted against day-ahead surpluses, meaning profits from the strategy would not flow directly to the resource. However, because the potential to inflate bid cost recovery in the real-time market will increase once the bid cost recovery calculations no longer net the day-ahead and real-time markets together as part of the RI-MPR Phase 1 changes, the ISO is proposing to calculate bid cost recovery based on a resource's default energy bid, similar to the method it has proposed for residual imbalance energy. Although the ISO is proposing to make this change when the day-ahead and real-time markets are no longer netted together for bid cost recovery, the ISO is prepared to act sooner should it observe the adverse behavior occurring.

The following sections discuss the ISO's recent filing to change the settlement of RIE and the changes to the cost basis for bid cost recovery the ISO is now proposing.

## 7.1 Summary of the August 28, 2012 emergency filing

Residual imbalance energy (RIE) is a real-time market settlement provision that settles energy attributable to ramping down from a dispatched bid at the end of a previous hour or ramping up to a bid dispatched at the beginning of an upcoming hour. In other words, RIE is ramping energy going into or out of an hour. RIE has been settled at the bid that the resource is being ramped down from or up to the adjacent hour's dispatch level (as determined by the "reference bid").

As described in the background section of this paper, the ISO submitted a tariff amendment to FERC on August 28, 2012 that included a change to the settlement of residual imbalance energy.<sup>8</sup> This filing proposes to settle residual imbalance energy as follows:

- Incremental residual imbalance energy (i.e., above day-ahead scheduled energy) will be settled at the greater of (1) the dispatch-interval LMP, or (2) the lesser of (a) the resource's default energy bid price or (b) its reference hour bid price.
- Decremental residual imbalance energy (i.e., below day-ahead scheduled energy) will be settled at the lesser of (1) the dispatch-interval LMP, or (2) the greater of (a) the resource's default energy bid price or (b) its reference hour bid price.

As related to this *Bid Cost Recovery Mitigation Measures* initiative, these changes were prompted by the potential for resources to inflate residual imbalance energy payments by the exercise of market power and over-generating. Prior to the rule changes in the August 28 filing, when a resource was exceptionally dispatched, the associated residual imbalance energy was

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<sup>8</sup> <http://www.caiso.com/Documents/August282012ExceptionalDispatch-ResidualImbalanceEnergyMitigationTariffAmendment-DocketNoER12-2539-000.pdf>

settled at the unmitigated bid price even if the exceptional dispatch itself was mitigated. This created the opportunity for the exercise of market power and the unilateral expansion of residual imbalance energy payments based on such behavior. Also, a resource deviates from its instructions that are initialized by dispatch levels in the previous hour, residual imbalance energy may be inappropriately increased by over-generation similar to the persistent uninstructed imbalance energy described above for bid cost recovery. If the residual imbalance energy is based on a high bid price, this could inappropriately inflate residual imbalance energy payments.

## 7.2 Inclusion of residual imbalance energy in bid cost recovery

The ISO proposes to include residual imbalance energy payments (or charges) in the calculation of whether a resource has a daily revenue shortfall and is consequently eligible for bid cost recovery for the real-time market. The ISO is not proposing to make payment for residual imbalance energy contingent on a resource having a revenue shortfall over the day and is not proposing any changes from its August 28 FERC filing. Nevertheless, the ISO is including this issue in this *Bid Cost Recovery Mitigation Measures* stakeholder initiative because the ISO believes it is appropriate to include residual imbalance energy payments (or charges) in calculating whether a resource has a daily revenue shortfall for the purpose of determining whether a resource is eligible for bid cost recovery. The ISO did not include this issue in the August 28 filing because the changes proposed in that filing were adequate to address the residual imbalance energy issues that were described. In addition, addressing it as part of this initiative will allow more time for stakeholder comment.

## 7.3 Energy bid cost recovery

As described above, the ISO is proposing to calculate a resource's cost for bid cost recovery based on the resource's default energy bid, rather than its submitted bid. The ISO proposes to use the maximum of (a) the LMP and (b) the minimum of the default energy bid and the bid price, rather than using the energy bid in the cost side of the bid cost recovery calculations for incremental energy. This would apply to the bid cost recovery calculations for both the day-ahead and real-time markets. For decremental energy, the ISO proposes to use the minimum of (a) the LMP and (b) the maximum of the default energy bid and the bid price.

For incremental energy, the cost that will go into the bid cost recovery calculation will be as follows:

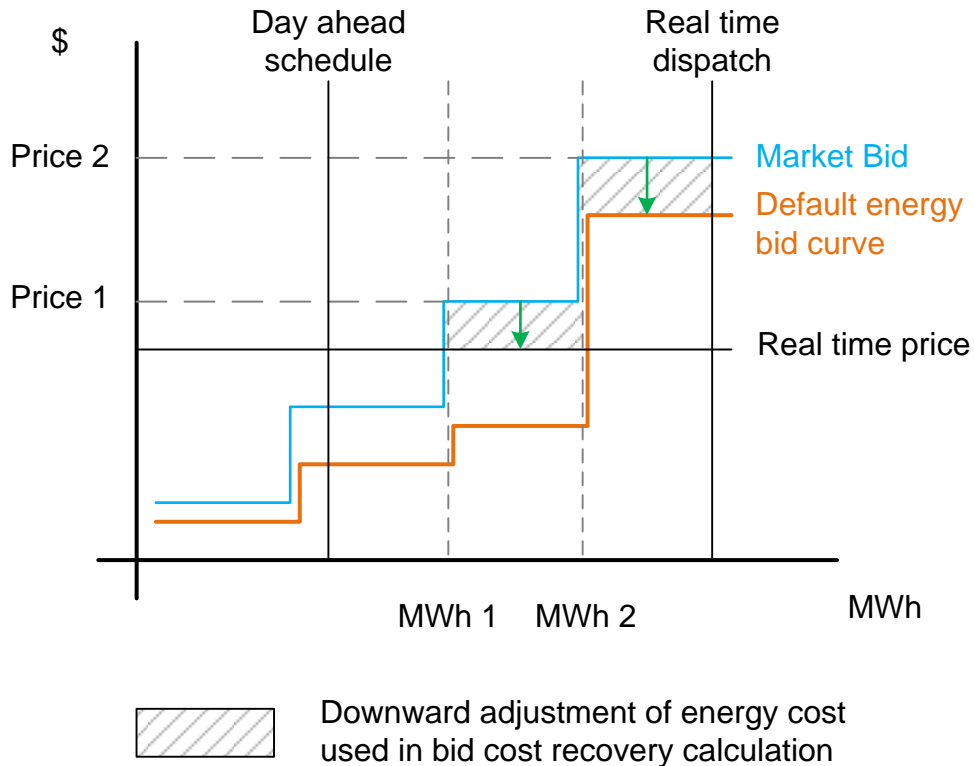
$$\max\{\textit{locational marginal price}, \min(\textit{default energy bid}, \textit{bid price})\}$$

For decremental real-time energy, the cost that will go into the bid cost recovery calculation will be as follows:

$$\min\{\textit{locational marginal price}, \max(\textit{default energy bid}, \textit{bid price})\}$$

Figure 7.3-1 illustrates this calculation for incremental energy in the real-time market. As figure 7.3-1 shows, if the market bid submitted by the resource is greater than the default energy bid for a particular segment, then the bid cost used in the bid cost recovery calculations will be reduced to the default energy bid. However, if the real-time LMP is less than the market bid but greater than the default energy bid, then the market bid will only be reduced to the LMP (this is shown the segment from MWh 1 to MWh 2).

**Figure 7.3-1: Downward adjustment of energy cost used in bid cost recovery calculation**



The ISO is proposing this change for the following reasons:

- It will eliminate the incentive for resources to deviate from dispatch instructions as part of a strategy to inflate bid cost recovery payments. Under the proposed change, bid cost recovery will be based on costs so there will not be the potential to increase profits through inflated bid cost recovery payments.
- It will provide for equitable recovery of costs as cost recovery will be based on a resource’s default energy bid. For incremental energy, if the LMP is higher than the price for a particular default energy bid segment, then the cost for that segment used in the bid cost recovery calculation will be the LMP. This ensures that energy costs are not calculated based on a value that is less than the LMP which represents the value of the energy. Decremental energy will be treated symmetrically.
- It eliminates the need for the PUIE checked applied to energy above minimum load as it eliminates the ability for resource’s to profitably inflate residual imbalance energy payments by deviating from dispatch. Moreover, market participants had complained that the PUIE metrics were overly complex and would put them at risk of bid cost recovery claw-back for what might be inadvertent or unavoidable deviations. They also pointed out that this risk might decrease the incentive to submit bids to the real-time market or might cause them to reduce resource’s ramp rates to mitigate the risk. Both

of these outcomes would be contrary to the RI-MPR Phase 1 goal of increasing real-time bids and dispatchability in the real-time market.

- Cost recovery for optimal energy will be consistent with the ISO's proposal to settlement residual imbalance energy, as detailed in the August 28, 2012 FERC filing.

Table 7.3-1, below, quantifies the impact of this change for incremental energy in the real-time market over the last year. The data are provided by bid-price category. This serves to show that the proposal targets the bids in the highest bid range that are well above marginal costs and have would significantly increase real-time bid cost recovery payments once the day-ahead and real-time markets are no longer netted as part of the bid cost recovery calculations.

**Table 7.3-1: Change in real-time cost basis for incremental optimal energy under the proposed change**

July 1,2011 till June 30 2012				
Incremental Optimal Energy Only				
Bid Price	Actual OE MWh	Actual OE Bid Cost	Proposed Bid Cost	Change in Bid Cost
<\$0 or None	\$ 11,696.05	\$ (56,504.92)	\$ (56,504.92)	\$ -
\$0- \$10	\$ 99,617.26	\$ 210,009.18	\$ 209,343.44	\$ (665.74)
\$10- \$25	\$ 742,885.82	\$ 15,611,138.06	\$ 15,408,971.08	\$ (202,166.99)
\$25- \$50	\$ 1,306,056.83	\$ 43,780,919.34	\$ 42,152,610.86	\$ (1,628,308.48)
\$50- \$75	\$ 39,987.08	\$ 2,309,682.33	\$ 1,785,110.18	\$ (524,572.16)
\$75- \$100	\$ 10,528.07	\$ 957,947.58	\$ 581,341.48	\$ (376,606.10)
\$100- \$200	\$ 6,458.43	\$ 835,937.63	\$ 379,422.07	\$ (456,515.56)
\$200- \$300	\$ 984.22	\$ 277,544.73	\$ 121,823.59	\$ (155,721.14)
\$300- \$400	\$ 826.03	\$ 268,650.57	\$ 138,080.11	\$ (130,570.46)
\$400- \$500	\$ 246.67	\$ 122,851.10	\$ 52,171.28	\$ (70,679.82)
\$500- \$600	\$ 0.38	\$ 209.01	\$ 122.39	\$ (86.63)
\$600- \$700	\$ 15.83	\$ 11,077.97	\$ 6,222.69	\$ (4,855.27)
\$700- \$800	\$ 5.39	\$ 4,311.05	\$ 0.06	\$ (4,310.99)
\$800- \$900	\$ 5.72	\$ 5,145.04	\$ 1,930.19	\$ (3,214.85)
\$900- \$1000	\$ 2,146.11	\$ 2,134,904.70	\$ 527,717.02	\$ (1,607,187.68)

Table 7.3-1 shows that the proposed change is effective at reducing bid cost recovery for resources bidding well above marginal costs, while only minimally impacting lower-priced bids. For bid prices between \$900 and \$1,000, this change would reduce the cost basis used for bid cost recovery from \$2,134,904 to \$527,717, a 75 percent reduction. Meanwhile, this change would decrease the cost basis less than 4 percent for the bid range of \$25-\$50.

## 8 Minimum load cost recovery and start-up and shut-down instructions

### 8.1 Uninstructed energy to avoid a shut-down instruction

A resource could potentially generate at a level above real-time dispatch instructions to avoid a shut-down instruction by the ISO and thereby recover minimum load cost when otherwise the real-time market would have shut the unit down. Specifically, a generator could position itself consistently at a MW level from which it takes more than one real-time pre-dispatch (RTPD) interval to ramp down the minimum load level for shutdown. By doing so, the generator would be able to avoid a binding shutdown instruction issued through real-time pre-dispatch dispatch (RTPD) and would continue to be online at level above the minimum load.

In response to this concern, the ISO proposes the measures outlined below. Although the ISO is proposing to implement these measures when the day-ahead and real-time markets are no longer netted together for bid cost recovery, the ISO is prepared to act sooner should it observe adverse behavior occurring.

#### *Communication of advisory schedules from real-time pre-dispatch*

Currently, the ISO sends four 15-minute real-time pre-dispatch (RTPD) advisory schedules for the HASP trading hour via the CAISO Market Results Interface (CMRI) from the hour-ahead scheduling process (HASP) run. The ISO proposes to convey all additional advisory schedules for all RTPD runs via CMRI.

#### *Shutdown instruction state variable*

The ISO proposes to calculate a shutdown instruction state variable. This after-the-fact state variable will keep track of positive uninstructed imbalance energy once an advisory shutdown instruction is issued. In so doing, the shutdown instruction state variable will yield the counter-factual MW level had the generator followed the instruction.

This shutdown state variable will begin accumulating uninstructed imbalance energy as soon as the advisory schedule has a zero MW dispatch within the real-time dispatch horizon. The state variable continues to accumulate the uninstructed imbalance energy as long as the most recent real-time pre-dispatch has a zero MW schedule within the real-time dispatch horizon.

Once a resource is issued an advisory schedule of zero MW dispatch, the real-time dispatch will dispatch the generator within a limited range consistent with the advisory shutdown instruction. Should the generator not follow the RTD downward dispatch instruction, this state variable will continue to grow until the dispatch operating point minus the value (in MW) of the state variable is equal to or less than the Pmin. This represents the counter-factual situation that the generator is at the Pmin level and thus could have followed a binding shutdown instruction issued in ADS. From that point forward, minimum load cost will be disqualified from the bid cost recovery calculation. Specifically, minimum load costs will be disqualified (that is, not included) in the day ahead bid cost recovery calculation if the resource was committed in the day ahead, and minimum load costs will be excluded from the real-time bid cost recovery calculation.

The state variable will be reset to zero when the most recent RTPD run no longer has a zero MW dispatch within the RTD horizon or the generator is offline.

### 8.2 Real-time dispatch binding shutdown instruction

In addition to the issue described in which a resource deviates to avoid a shutdown instruction, there are potential situations in which a resource could receive a binding shutdown instruction

through ADS, not follow the instruction, yet continue to be eligible to receive minimum load costs through bid cost recovery. To address this, the ISO proposes that, in the event that ADS issues a binding shutdown instruction, a resource not be eligible for recovery of minimum load costs from the point of the shut-down instruction forward for the maximum of the duration of the resource's registered minimum down time. This is in addition to the current rules detailed in the Market Operations BPM.<sup>9</sup> In addition, the ISO proposes that, if a resource ignores the binding shutdown issued by ADSRTD and it has a day-ahead schedule, that it not be eligible for minimum load cost recovery in the day-ahead bid cost recovery calculation for the minimum of 1) the resource's minimum down time, and 2) the day ahead commitment period.

### 8.3 Uninstructed start-up

The ISO proposes to clarify that a period in which a resource starts up without an ISO instruction to do so will not be considered an ISO commitment period, and thus the resource will not be eligible for cost recovery. This change is proposed in order to forestall a market participant from starting up a resource and running at minimum load in order to receive minimum load cost recovery. Only the time period in which the ISO has committed the resource economically will be considered an ISO commitment period.

## 9 Schedule

Date	Event
February 22, 2012	Straw proposal posted
March 7	On-site stakeholder meeting
March 20	Stakeholder comments due *
April 6	Draft final proposal posted
March 30	Market Surveillance Committee meeting
April 12	Stakeholder conference call
April 19	Stakeholder comments due *
April 27	Addendum posted
May 3	Stakeholder conference call
May 8	Stakeholder comments due *
September 4	Revised draft final proposal posted
September 11 (9-noon)	Stakeholder conference call
September 27	Stakeholder comments due *
November 1-2	ISO Board of Governors meeting

\* Please submit written comments to [BCRMitigation@caiso.com](mailto:BCRMitigation@caiso.com)

<sup>9</sup> The Market Operations BPM is available at the following link. <https://bpm.caiso.com/bpm/bpm/version/000000000000175>. In particular, note rules detailed in Appendix D of the BPM.

## **10 Conclusion**

The ISO will conduct a stakeholder conference call to review this revised draft final proposal on September 11. The ISO appreciates stakeholder comments. Please send your comments by close of business on September 27 to [BCRMitigation@caiso.com](mailto:BCRMitigation@caiso.com).