California ISO
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## Market Issues Bulletin

# Residual imbalance energy settlement and ramp rate changes for self-scheduled variable energy resources

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# Revision History

| Date | Version | Description | Author |
|---|---|---|---|
| 2015-03-10 | 1.0 | Description of RIE settlement and ramp rate changes for self-scheduled VERs | CAISO |

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## Contents

## Executive Summary

This market issues bulletin details the impact of the persistent deviation metric on residual imbalance energy settlement for all resources after May 1, 2014. Additionally, this paper documents the actions the CAISO has and will take under current tariff authority to appropriately account for the ramp rates of self-scheduled variable energy resources.

## Background

In the *Bid Cost Recovery Mitigation Measures*[1] initiative, the CAISO developed various measures to eliminate any incentive to inflate bid cost recovery payments through adverse strategic market behavior. A key element of this initiative was the persistent deviation metric (PDM), which evaluates whether a resource is deviating from its dispatch in order to inflate real-time bid cost recovery or residual imbalance energy payments. Bid cost recovery (BCR) is the mechanism by which the CAISO ensures resources recover at least their start-up, minimum load, and bid costs when scheduled or dispatched through the ISO markets. There is no bid cost recovery for a resource's self-schedule. Residual imbalance energy (RIE) is the ramping energy that occurs when a unit is ramping up or down to or from a dispatch in the upcoming or previous hour and is settled based on the resource's reference hour bid or the locational marginal price. RIE is not included in BCR.

If triggered, the PDM mitigates a resource's bid energy bid costs that are used for BCR or RIE settlement. The PDM evaluates each 5-minute interval based on threshold criterion described in tariff[2] section 11.17.1.1.

**Figure 1**
**Persistent deviation metric formula**

$$\frac{Metered\ Energy(t-1) - Metered\ Energy(t)}{Metered\ Energy(t-1) - Total\ Expected\ Energy(t) - Regulation\ Energy(t)}$$

- The first threshold condition considers the ratio shown in Figure 1.

[1] http://www.caiso.com/informed/Pages/StakeholderProcesses/CompletedStakeholderProcesses/BidCostRecoveryMitigationMeasures.aspx

[2] Tariff Section 11.17.1.1 Persistent Deviation Threshold Conditions

The ratio compares the difference in metered energy in two adjacent 5-minute intervals, *t-1* and *t*, to the difference between metered energy in the first interval, *t-1*, and total expected energy and the regulation energy in the second interval, *t*. The threshold for the ratio is 110% or 90% depending on the incremental or decremental nature of the real-time energy and the ramping direction of the denominator quantity.

- The second threshold condition considers the deviation of the MW corresponding to the metered energy of the current interval, *t*, from the MW corresponding to the total of regulation energy plus the total expected energy. The threshold is 10% of the MW amount the resource can be dispatched at full ramp over the 5-minute interval.

If both thresholds are exceeded, the settlement interval is flagged. If 7 or more 5-minute intervals are flagged over two adjacent hours, the mitigation mechanism will be triggered for the two hours for BCR and RIE energy settlement calculations.

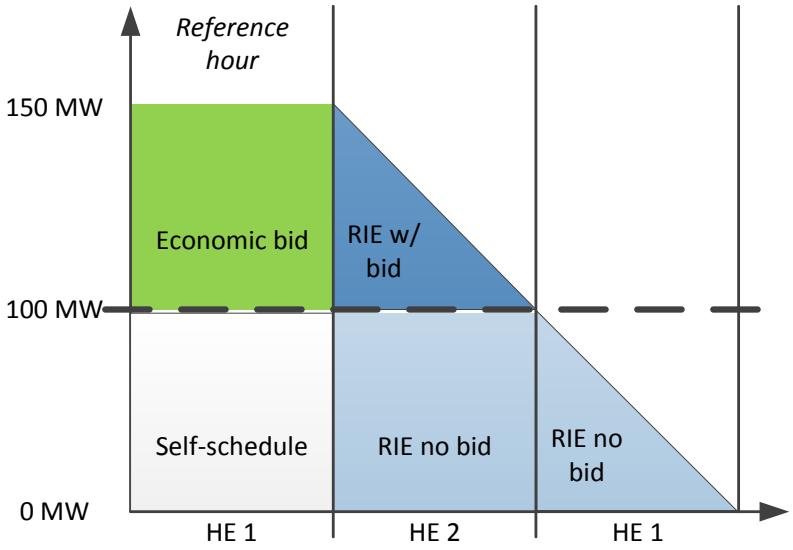
For a resource passing the PDM-based evaluation criterion for a given hour, the bid cost of energy eligible for BCR and RIE settlement is calculated using the energy bid of the reference hour, or the LMP for settlement of RIE if there in no energy bid in the reference hour. For a resource failing the PDM-based evaluation criterion, the bid cost of energy eligible for BCR and RIE settlement is the minimum of the following three values: the resource's default energy bid, the resource's submitted bid as may have been mitigated through local market power mitigation, or the locational marginal price. For RIE, the mitigated bid is the bid, as may have been mitigated through local market power mitigation, of the associated reference hour.

### *Residual imbalance energy settlement*

The current expected energy algorithm is appropriately determining energy due to ramping across hours as RIE. Figure 2 below shows the difference in RIE accounting based on whether or not a bid exists in the reference hour. In the reference hour, the energy from 0 MW to 100 MW is self-scheduled energy and does not have a bid. From 100 MW to 150 MW is energy with a bid. As the resource ramps across hours down from the reference hour, the energy above 100 MW is considered RIE with a bid (based on the reference hour bid) whereas the energy below 100 MW is considered RIE with no bid.[3]

[3] Some market participants have erroneously considered this energy not associated with a bid as real-time self-scheduled energy, which was replaced by optimal energy without bid with the introduction of the fifteen minute market (FMM) under the ISO's FERC Order No. 764 market design changes. To the contrary, the ISO classified this energy as RIE even before the ISO implemented its FERC Order No. 764 market design changes.

**Figure 2**
**RIE settlement example**




The following tariff provisions specify the settlement of energy that is classified as "Residual Imbalance Energy." Appendix A defines RIE as:

> Extra-marginal IIE produced or consumed at the start or end of a Trading Hour outside the hourly schedule-change band and not attributed to Exceptional Dispatch. Residual Imbalance Energy is due to a Dispatch Instruction in the previous Trading Hour or a Dispatch Instruction in the next Trading Hour. Residual Imbalance Energy may overlap only with Day-Ahead Scheduled Energy. Residual Imbalance Energy does not apply to Non-Dynamic System Resources (including Resource-Specific System Resources). Residual Imbalance Energy is settled as bid, based on the Real-Time Energy Bid of the reference hour, as described in Section 11.5.5 and it is not included in BCR as described in Section 11.8.4.

Section 11.5.5 states that:

> **11.5.5 Settlement Amount for Residual Imbalance Energy**
> For each Settlement Interval, Residual Imbalance Energy settlement amounts shall be the product of the MWh of Residual Imbalance Energy for that Settlement Interval and the Bid, as mitigated pursuant to Section 39.7 that led to the Residual Imbalance Energy from the relevant Dispatch Interval in which the resource was dispatched, subject to additional rules specified in this section below and in Section 11.17. The relevant Dispatch Interval and Bid that led to the Residual

> Imbalance Energy may occur prior or subsequent to the interval in which the relevant Residual Imbalance Energy occurs and can be contiguous, or not, with the applicable Trading Hour in which the relevant Residual Imbalance Energy Settlement Interval occurs. For MSS Operators the Settlement for Residual Imbalance Energy is conducted in the same manner, regardless of any MSS elections (net/gross Settlement, Load following or opt-in/opt-out of RUC). When a Scheduling Coordinator increases the Minimum Load amount for a resource through SLIC, for the Settlement Interval(s) during which the affected resource is ramping up towards or ramping down from such a Minimum Load change, the Residual Imbalance Energy for the applicable Settlement Interval(s) will be re-classified as Derate Energy and will be paid at the applicable RTD Locational Marginal Price.

This tariff provision indicates that the settlement of RIE is settled based on the bid that drove the RIE from a preceding or subsequent trading hour, except that if the resource is deemed to be persistently deviating pursuant to the rules in Section 11.17, as specified in Section 11.17.1.2.2, will be cost based settlements.[4] Section 11.17 provides the conditions under which the resource will be deemed to have deviated persistently and specifies that this determination will be based on the application of the Persistent Deviation Metric for four different cases, as specified therein. Each case specifies decreasing bandwidths of permissible deviations beyond which trigger a flag for the applicable settlement interval that designates the interval as having exceeded the threshold. Section 11.17.1.1.1, addresses the first case for which a flag will trigger for the interval if, among other things specified therein, "the Metered Energy, less Regulation Energy, less the Expected Energy in that Settlement Interval (t) is greater than ten (10) percent of the amount the resource can be Dispatched at full ramp over the Settlement Interval (t) and the Persistent Deviation Metric is greater than one hundred and ten (110) percent." Each case has the same condition with different threshold amounts. This requires that the CAISO flag the interval based on the application of the persistent deviation metric based on a measure of the "amount the resource can be Dispatched at full ramp over the Settlement Interval."

The tariff further specifies that the settlement of Residual Imbalance Energy will vary based on whether or not the resource submitted an economic bid or not. These long standing tariff provisions in Section 34.17.4 and 34.17.5 precede the Spring 2014 release and were not modified with the adoption of the new settlement rules for residual imbalance energy on May 1, 2014. Section 34.17. 4 and 34.17.5 state:

[4] Specifically Section 11.17.1.2.3 states: "… Residual Imbalance Energy above the Day-Ahead Scheduled Energy will be based on the lesser of the applicable Default Energy Bid price, the relevant Energy Bid Price, as mitigated, or the applicable RTD Locational Marginal Price, and (ii) Residual Imbalance Energy below the Day-Ahead Scheduled Energy will be based on the greater of the applicable Default Energy Bid price, the relevant Energy Bid Price, or the applicable RTD Locational Marginal Price. Residual Imbalance Energy as specified in Section 11.5.5 (i) for Residual Imbalance Energy above the Day-Ahead Scheduled Energy will be based on the lesser of the applicable Default Energy Bid price, the relevant Energy Bid Price, as mitigated, or the applicable RTD Locational Marginal Price, and (ii) Residual Imbalance Energy below the Day-Ahead Scheduled Energy will be based on the greater of the applicable Default Energy Bid price, the relevant Energy Bid Price, or the applicable RTD Locational Marginal Price."

34.17.4 Inter-Hour Dispatch Of Resources With Real-Time Energy Bids

Dispatch Instructions associated with the ramp between the Real-Time Market Bid in one hour and the Real-Time Market Bid in the immediately succeeding Trading Hour shall be determined optimally by the SCED if the CAISO has Bids for either or both relevant Operating Hours. For any Operating Hour(s) for which Bids have been submitted Dispatch Instructions will be optimized such that the Dispatch Operating Point is within the Bid range(s). For any Operating Hour without submitted Bids, Dispatch Instructions will be optimized such that the Dispatch Operating Point conforms to the Schedule within the Operating Hour. Energy resulting from the Standard Ramp shall be deemed Standard Ramping Energy and will be settled in accordance with Section 11.5.1. Energy resulting from any ramp extending beyond the Standard Ramp will be deemed Ramping Energy Deviation and will be settled in accordance with Section 11.5.1. Energy delivered or consumed as a result of CAISO Dispatch of a resource's Energy Bid in one Operating Hour to a Dispatch Operating Point such that the resource cannot return to its successive Operating Hour Schedule or to an infra-marginal operating point by the beginning of the next Operating Hour is Residual Imbalance Energy and shall be settled as Instructed Imbalance Energy as provided for in Section 11.5.1 and also may be eligible for recovery of its applicable Energy Bid Costs in accordance with Section 11.8. Similarly, Energy delivered or consumed as a result of CAISO Dispatch of a resource's Energy Bid in a future Operating Hour to a Dispatch Operating Point different from its current Operating Point prior to the end of the current Operating Hour is also considered Residual Imbalance Energy and shall be settled as Instructed Imbalance Energy as provided for in Section 11.5.1 and also may be eligible for recovery of its applicable Energy Bid Costs in accordance with Section 11.8. When Ramping Energy Deviation and Residual Imbalance Energy coexist within a given Dispatch Interval, the Ramping Energy Deviation shall be the portion of Instructed Imbalance Energy that is produced or consumed within the Schedule-change band defined by the accepted RTM Bids of the two consecutive Settlement Periods; the Residual Imbalance Energy shall be the portion of Instructed Imbalance Energy that is produced or consumed outside the Schedule-change band.

34.17.5 Inter-Hour Resources Dispatch Without Real-Time Energy Bids

Dispatch Instructions shall be issued for each Dispatch Interval as needed to prescribe the ramp between a resource's accepted Self-Schedule in one Trading Hour and its accepted Self-Schedule in the immediately succeeding Trading Hour. Such Dispatch Instructions shall be based on the lesser of: (1) the applicable Operational Ramp Rate as provided for in Section 30.7.7 and (2) the Ramp Rate associated with the Standard Ramp. The Dispatch Instructions for Ramping of Generating Units without Real-Time Energy Bids in both Operating Hours shall ramp the resource between hourly Schedules symmetrically to the extent possible subject to the Regulation Ramping limitations across hourly boundaries in twenty (20) to sixty (60) minutes assuming Congestion can be resolved utilizing Economic Bids. The minimum twenty (20)-minute ramp is required for smooth hourly Schedule changes and is consistent with Intertie scheduling agreements between Balancing Authority Areas. Energy resulting from the Standard Ramp shall be deemed Standard Ramping Energy and will be settled in accordance with Section 11.5.1.

Energy resulting from any ramp extending beyond the Standard Ramp will be deemed Ramping Energy Deviation and will be settled in accordance with Section 11.5.1.

These two sections are intended to address two scenarios where in one case the resource has submitted an economic bid (Section 34.17.4) by referring to resources with "Energy Bids" and the second case in which the resource either has submitted no bid at all or a self-schedule (34.17.5) by re-offerring resources to the day-ahead schedule position without real-time energy bids. These two sections further instruct that the settlement in the first case were the resource has an economic bid will be as specified in Section 11.5.1 which then points to settlement of residual based on 11.5.5. But section 34.17.5 specifies that resources without energy bids will be settled differently but also as specified in Section 11.5.1. The application of these rules did not change with the changes adopted in Spring 2014 release and the CAISO continued to settle Residual Imbalance Energy without an energy bid (either no bid at all or self-scheduled) at the applicable Locational Marginal Price as all Imbalance Energy is settled under Section 11.5.1. Some market participants have asserted that the CAISO used to classify this energy as Real-time Time Self-Scheduled Energy and with Spring 2014 release commenced settling these amounts as Residual Imbalance Energy. That is incorrect. The CAISO did not change the classification of Residual Imbalance Energy with spring release and the replacement of the Real-Time Self-Scheduled Energy category by optimal energy without bid did not alter the classification or definition of Residual Imbalance Energy.

Because market participants can actually submit economic bids, real-time energy self schedules that can be different from the day-ahead schedules, and a combination of economic bids and energy self schedules, the energy classifications and their settlement rules for residual energy and ramping energy deviation are further defined and clarified in the Business Practice Manual for Market Operations Appendix which states that:[5]

| | |
|---|---|
| Ramping Energy Deviation (RED) | IIE produced or consumed due to deviation from the standard ramp because of ramp constraints, Start-Up, or Shut-Down. RED may overlap with SRE, and both SRE and RED may overlap with DASE, but with no other IIE subtype. RED may be composed of two parts: a) the part that overlaps with SRE whenever the DOP crosses the SRE region; and b) the part that does not overlap with SRE. The latter part of RED consists only of *extra-marginal* IIE contained within the hourly schedule change band and not attributed to Exceptional Dispatch or derates. RED does not apply to Non-Dynamic System Resources (including Resource-Specific System Resources). RED is paid/charged the Real-Time LMP as reflected in Section 11.5.1 of the CAISO Tariff and it is included in BCR only for market revenue calculations as reflected in Section 11.8.1.4.5 of the CAISO Tariff. |

[5] The formula and graphs are also in the appendix to describe the classification of expected energy.

| | |
|---|---|
| Residual Imbalance Energy (RIE) | Extra-marginal IIE produced or consumed at the start or end of a Trading Hour outside the hourly schedule-change band and not attributed to Exceptional Dispatch. RIE is due to a Dispatch Instruction in the Trading Hour before the current Trading Hour or a Dispatch Instruction in the Trading Hour after the current Trading Hour. RIE may overlap only with DASE. RIE does not apply to Non-Dynamic System Resources (including Resource-Specific System Resources.) RIE is settled as bid, based on the RT Energy Bid of the *reference hour*, or at the Real-Time LMP if there is no Bid as reflected in Section 11.5.1 of the CAISO Tariff, and it is not included in BCR as reflected in Section 11.8.4 of the CAISO Tariff. The *reference hour* is 1) the Trading Hour before the current trading hour that causes the residual energy, if RIE occurs at the start of a Trading Hour, or 2) the Trading Hour after the current trading hour that causes the residual energy, if RIE occurs at the end of a Trading Hour. |

In the definition for residual energy, it states that "RIE is settled as bid, based on the RT Energy Bid of the reference hour, or at the Real-Time LMP if there is no Bid as reflected in Section 11.5.1 of the CAISO Tariff, and it is not included in BCR as reflected in Section 11.8.4 of the CAISO Tariff."[6] Section 11.5.1 of the CAISO tariff further divides RIE settlement into the fifteen minute market and real-time dispatch market. Only the real-time dispatch LMP applies because deviations due to ramping is calculated on a 5 minute basis. Therefore, RIE with a bid is settled on the reference hour bid and RIE with no bid therein is settled at the real-time dispatch LMP of the current interval.

One change that came with the Spring 2014 release did, however, alter the settlement of RIE. Consistent with the new section 11.17 the CAISO commenced the application of the persistent deviation metric and changed the settlement of RIE in all cases – whether it has or does not have an Economic bid. Therefore, for intervals that are deemed to fail the thresholds specified in Section 11.17, the CAISO settles RIE not based on the reference bid or the applicable LMP, but rather based on the resource's Default Energy Bid price, its Energy Bid Price, or the applicable RTD Locational Marginal Price, as applicable.

## Issue: ramp rates for self-scheduled variable energy resources

As discussed above, the calculation of the PDM depends in part on an evaluation of the resource's ramping capability and its performance to ensure that it is not deviating from dispatch in order to inflate BCR or RIE payments. After the implementation of Spring 2014 release, market participants raised concerns regarding the application of the PDM through the settlement disputes process. The complaint is that their delivered energy from VERs are paid as zero instead of LMP due to the PDM application. Market

[6] CAISO, Market Operations Business Practice Manual, Attachment C: Expected Energy Calculation, page C-3 to C-4.

Particiants submitted the dispute on 05/27/2014 claiming that they see this issue starting from Trade Date 05/01/2014. Consequently, the CAISO filed an internal market issue assessment form on 06/09/2014 to document the complaint.

After preliminary investigations, the CAISO determined that the PDM was falsely triggered because the CAISO deployed the incorrect ramp rate for purposes of determining the "amount the resource can be dispatched at full ramp over the Settlement Interval." In the initial implementation, the CAISO used the equivalent ramp-rate that the CAISO real-time market uses when calculating available operating reserve. However, this ramp-rate is not the same as the maximum ramp-rate that the CAISO uses in considering the resource's full ramp. In fact, using the available operating reserve ramp rate effectively set the ramp rate to zero. The CAISO corrected this discrepancy and applied the Maximum Ramp rate instead of the rate based on the operating reserve quantity to calculate the amount by which the resource can be dispatched over the settlement interval. The CAISO settlements team fixed this ramp rate issue in the December release as part of PRR 799 and deployed this fix to production starting from 12/01/2014. This has been communicated to the market participants on 12/03/2014. The updated SaMC Configuration Output file will be utilized to calculate the following trade dates and statements going forward:

**Table 1**
**Schedule for calculating statements**

| Trade Date | Statement |
|---|---|
| 12/02/2014 | T+3B Initial |
| 11/16/2014 | T+12B Recalculation |
| 09/23/2014 | T+55B Recalculation |
| 03/14/2014 | T+9M Recalculation |
| 06/11/2013 | T+18M Recalculation |
| 01/10/2012 | T+35M Recalculation |

After further inquiry by market participants and reports of anomalous RIE settlements the CAISO conducted further investigations to understand why the self-scheduled VERs violated both threshold conditions of the persistent deviation metric. As described in the Background section, the two conditions are:

- The first threshold is a ratio comparing the difference in metered energy in two adjacent 5-minute intervals, *t-1* and *t*, to the difference between metered energy in the first interval, *t-1*, and total expected energy and the regulation energy in the second interval, *t*. The threshold for the ratio is 110% or 90% depending on the incremental or decremental nature of the real-time energy and the ramping direction of the denominator quantity.

- The second threshold condition considers the deviation of the MW corresponding to the metered energy of the current interval, *t*, from the MW corresponding to the total of regulation energy plus the total expected energy. The threshold is 10% of the MW amount the resource can be dispatched at full ramp over the 5-minute interval.

The CAISO determined that the resources were violating the second condition because the CAISO used the ramp rate in the Master File for VERs that have not submitted an economic bid. The CAISO determined that this was also erroneous because that ramp rate does not reflect the "amount the resource can be dispatched at full ramp over the Settlement Interval." The use of the ramp rate registered in the Master File for purposes of Section 11.17 led to the false triggering of PDM for self-scheduled VERs.

Self-scheduled VERs also violated the first threshold condition because the denominator of the ratio quantity is the change from the previous interval metered energy to the current interval total expected energy minus regulation energy. Since the real-time market will dispatch the VER at the most recent measured level, the denominator will very likely be extremely small if not exactly zero. As such, due to the "divide by zero (or almost zero)" condition, the evaluation of the ratio most likely violated the relevant 90% or 110% threshold.

This resulted in VERs failing the PDM-based evaluation criterion as they exceed both thresholds of the two conditions, resulting in flagging a high number of, if not all, settlement intervals within each hour. Consequently, the mitigation rule for the energy payment is triggered where the energy payment will be based on the minimum or maximum, as applicable, of the default energy bid, mitigated bid and LMP for payment calculation.

In the case of VERs that have not submitted an economic bid and have submitted a self-schedule or no schedule at all, the CAISO does not use the ramp rate in the master file to ramp the resources. Rather the CAISO dispatches the VERs based on the forecast provided for the resource.[7] Therefore, the CAISO

[7] *See* Section 34.1.6.1 "The CAISO shall use the forecast provided by the Scheduling Coordinator to establish MWh quantities to be cleared for that resource in the FMM if the resource has submitted only a Self-Schedule to the RTM. If a Scheduling Coordinator for a Variable Energy Resource submits an Economic Bid to the RTM (either with or without a Self-Schedule), then the CAISO receives and processes all Variable Energy Resources forecasts (as selected by CAISO) which establishes the upper economic limit for that resource in the FMM." Section 34.1.6.2 "For Participating Intermittent Resources for which Scheduling Coordinators have elected to use the output

does not determine the resource ramp according to a Master File value but rather based on their forecasts. The actual ramp rate is implied from the forecasts and hence is the reflection of the actual output of the VER. Therefore for a self-scheduled VER, the fundamental difference is that, CAISO dispatch is used to reflect the actual movement of the unit instead of dispatching the unit based on a registered ramp-rate. To reflect this natural difference, the CAISO will be making a further correction for self-scheduled VERs to use a ramp rate of "9999." This correction will be applied to all self-scheduled VERs and will likely prevent the resource from violating the second threshold criteria. For all other generators and VERs with economic bids, the CAISO will continue to use the maximum ramp rate from the Master File.

### *Financial Impact*

The CAISO estimates that the original settlement impact of this error for all resources combined was approximately $23 million from May 2014 through January 2015, as shown in Table 2 below. The CAISO only estimated the impact amount for self-scheduled VER resources. The column labeled "Should Be Amount" is the settlement amount that should have been calculated if the PDM was not triggered. This is calculated as the RIE quantity multiplied with the RTD LMP assuming the the PDM is not triggered. Note that a negative amount is a payment to the Scheduling Coordinator. The next column labeled "Current Amount Settlement" is the current mitigated settlement amount when the PDM is 1. The last column is the difference between these two and calculated as the "Should Be Amount" minus the "Current Amount Settlement."

forecast provided by the CAISO and have selected such a flag in their Master File, the CAISO will use the MWh forecast data the CAISO produces for such a resource at 37.5 minutes prior to the applicable FMM as follows: (a) as the MWh amounts to be to cleared for that resource in the FMM if only a Self-Schedule is submitted, and (b) as the upper economic limit for that resource in the FMM if an Economic Bid with or without a Self-Schedule is submitted."

**Table 2**
**Estimated settlement error for VERs with self-schedules (before dynamic ramp rate change)**

| MONTH | VER | Should Be Amount | Current Amount Settlement | Delta |
|---|---|---|---|---|
| May-14 | Y | ($4,016,452.51) | ($326,592.43) | ($3,689,860.08) |
| Jun-14 | Y | ($4,245,921.36) | ($243,142.90) | ($4,002,778.46) |
| Jul-14 | Y | ($3,335,212.07) | $227,197.28 | ($3,562,409.35) |
| Aug-14 | Y | ($3,462,091.20) | $409,580.38 | ($3,871,671.58) |
| Sep-14 | Y | ($2,962,036.81) | $669,070.89 | ($3,631,107.70) |
| Oct-14 | Y | ($968,716.78) | $563,084.72 | ($1,531,801.50) |
| Nov-14 | Y | ($1,147,708.19) | $595,987.96 | ($1,743,696.15) |
| Dec-14 | Y | ($76,360.41) | $1,076,896.98 | ($1,153,257.39) |
| *Jan-15 | Y | ($224,692.60) | $112,110.68 | ($336,803.28) |
| TOTAL | | **($20,439,191.93)** | **$3,084,193.56** | **($23,523,385.49)** |

Table 2 does not reflect the impact of changing the ramp rate from the available operating reserve to the resource's maximum dynamic ramp rate from the Master File as implemented in the December 2014 release and described in PRR 799. The December change would reduce the $23 million total shown in Table 2 by approximately half because correcting for the zero ramp rate reduces the instances that the second threshold condition is triggered and the mitigation settlement for RIE is used.

## Issue: RIE without energy bid not settled at applicable LMP when resource PDM is triggered with 1.

Under the CAISO tariff, resources that are price takers because they have no bid or self-schedule or because they are self-schedules are settled at the applicable LMP for the intervals consistent with section 11.5.1 of the CAISO tariff.

As discussed above, the CAISO continued to settle Residual Imbalance Energy without an energy bid (either no bid at all or self-scheduled) at the applicable Locational Marginal Price as all Imbalance Energy is settled under Section 11.5.1. When there is no bid price available, the RIE bid price is currently replaced with the real-time LMP.

The CAISO will make an additional change when a resource is self-scheduled without an energy bid When a resource is found to be persistently deviating consistent with the rules in Section 11.17, the PDM flag is set to 1, RIE is settled as the minimum or maximum of the: 1) default energy bid, 2) bid as mitigated, or 3) LMP. In CAISO's current implementation, the second component is erroneously replaced with zero when there is no bid. This is erroneous, because for a resource that self-schedules,

without a bid, the applicable bid price should be the LMP, indicating the resource's willingness to be a price take and be paid the LMP, rather than a $0/MWh bid.. The CAISO will also implement a correction so that the bid price for resources self-scheduled without an energy bid will be the LMP rather than $0/MWh. Therefore effectively, the minimum or maximum of default energy bid, mitigated bid, and LMP will then become the respective minimum or maximum of default energy bid and LMP for those resources that do not have a bid price or have a self-schedule.

## Next Steps

The CAISO will correct the erroneous application of the Master File rate to VERs without an economic bid (no bid at all or with a self-schedule) prospectively as of trade day 05/01/2014. Settlement changes will be deployed in production as part of the Spring release on 04/01/2015. Therefore the trade day from 05/01/2014 to current day will be corrected based on CAISO's established settlement calendar T+3, T+12, T+55, T+9months.

Settlements is planning to fix these issues as part of spring release on April 2015 with effective trade date of 05/01/2014.

As part of configuration release, the CAISO will communicate the required details to the market participants.

In addition to the change in ramp rate for self-scheduled VERs, the CAISO will consider future additional policy changes to the settlement of RIE and the application of PDM for VERs.