



California ISO

MARKET ISSUES BULLETIN

Fifteen Minute Schedules Settlement

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Executive Summary

This market issue bulletin details the erroneous implementation of FMM Schedule Energy for variable energy resources for all resources, including Energy Imbalance Market (EIM) resources. The market issues bulletin explains the settlement statement adjustments for FMM Schedule Energy of variable energy resources for Trade Period May 1st, 2014 to current. The CAISO will fix the erroneous expected energy calculation for variable energy resources in the Fifteen Minute Market (FMM).

Background

On May 1, 2014, the ISO implemented the FMM, which procures energy and ancillary services schedules for internal generation, variable energy resources, dynamic system resources, and non-dynamic system resources based upon the FMM Load Forecast, incremental Ancillary Service Requirements, and Real-Time Market bids. In addition, the ISO modified the existing Real-Time Dispatch Market (RTD) to dispatch internal generation, variable energy resources, and dynamic system resource to meet the RTD Load Forecast Imbalances. Under this new paradigm, a resource's FMM Energy Schedules and RTD Dispatches, relevant to Day-Ahead Schedules, are settled as FMM Instructed Imbalance Energy and RTD Instructed Imbalance Energy at the relevant FMM Locational Marginal Price (LMP) or RTD LMP.

In conjunction with the introduction of the FMM, the CAISO began to utilize the latest relevant 15-minute forecast to update a variable energy resource's FMM energy schedule when optimizing each FMM market run. The CAISO also began using the latest relevant 5-minute forecast or telemetry to dispatch a variable energy resource in RTD.

If the variable energy resource submits an economic bid (with or without a self-schedule) to the Real-Time Market (RTM), the CAISO will utilize the relevant 15-minute and 5-minute forecast to establish the resource's upper economic limit and dispatched the resource accordingly in the FMM and RTD. If the variable energy resource submits a self-schedule to the RTM, the CAISO uses the relevant forecast to establish MWh quantities to be cleared for that resource in the FMM. The variable energy resource's FMM Energy Schedules and RTD Dispatches, relevant to Day Ahead Schedules, shall be settled as FMM Instructed Imbalance Energy and RTD Instructed Imbalance Energy at the relevant FMM LMP or RTD LMP.

34.1.6.1 Eligible Intermittent Resources using their own Forecast

For Eligible Intermittent Resources, including Participating Intermittent Resources, that have elected to use the resource's own forecast as specified in Section 4.8.2.1.1, the responsible Scheduling Coordinator must submit to the CAISO its forecast for the binding interval by 37.5 minutes prior to flow (the start of the applicable FMM



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optimization for the binding interval). If such Scheduling Coordinator does not provide such forecast to the CAISO, the CAISO will use the resource's direct telemetry MW output for Dispatch purposes. 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. Participating Intermittent Resources may elect not to use the forecast provided by the CAISO, in which case they must be certified to use their own forecast as provided in Section 4.8.2.1.1. In addition, the CAISO will not utilize the forecast it produces for the Participating Intermittent Resources using their own forecast. As provided in Section 4.8.2.1.1, the Scheduling Coordinator may submit such forecast in fifteen or five minute granularity. If the Scheduling Coordinator submits the forecast in five-minute granularity, the CAISO will use the average of the three five-minute forecasts provided by the Scheduling Coordinator to determine the MWh to be cleared in the FMM for that resource.

34.1.6.2 Eligible Intermittent Resources using the CAISO Forecast

Eligible Intermittent Resources that have elected to use the CAISO forecast as specified in Section 4.8.2.1.2 are not required to submit a forecast for the binding interval by 37.5 minutes prior to flow. For Participating Intermittent Resources for which Scheduling Coordinators have elected to use the output 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 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. The forecast used by the CAISO will be in fifteen-minute granularity. Scheduling Coordinators representing Participating Intermittent Resources whose output is designated to satisfy a Resource Adequacy requirement must submit Variable Energy Resource Self-Schedules in the RTM in accordance with the output forecast provided by the CAISO, or an Economic Bid.

On October 1st, 2014, the California ISO implemented the EIM, which provides participating balancing authority areas the opportunity to sell energy to or purchase energy from other participating balancing authority areas at the most cost efficient manner. Participating balancing authority areas submit base schedules as well as energy bids of resources who are willing to adjust their energy output to resolve its own internal demand forecasts variations as well as



other participating balancing authority areas demand forecast variations. Based upon market conditions, the EIM will award energy schedules in FMM to resources to resolve EIM area FMM Load Forecast variations. In addition, the EIM will dispatch resources in RTD to resolve EIM Area RTD Load Forecast variations. These FMM Energy Schedules and RTD Dispatches, relative to Day Ahead Schedules or Base Schedules, shall be settled as FMM Instructed Imbalance Energy and RTD Instructed Imbalance Energy at the relevant FMM LMP or RTD LMP.

During the initial implementation of EIM, the CAISO agreed to settle non-participating EIM resource's FMM Energy Schedules as 15-minute block FMM Instructed Imbalance Energy at the FMM LMP. On October 1st, 2015, the CAISO promoted the EIM Year 1 enhancements initiative to production. As part of the EIM Year 1 enhancements initiative, the CAISO removed the specialized treatment of EIM 15-minute block FMM Instructed Imbalance Energy settlement for non-participating resources. FMM Schedules awarded to non-participating resources would be treated in a similar fashion as resources that only submit self-schedules in the Real-Time Market. In other words, the CAISO would calculate standard ramping energy, ramping energy deviation, and residual imbalance energy if a non-participating resource is moving from one operating point to another based upon Base Schedule changes, FMM Energy Schedule variations, and/or RTD dispatches. Standard ramping energy, ramping energy deviation, and residual imbalance energy would settle at the RTD LMP. Within the non-participating resources, the new FMM Instructed Imbalance Energy settlement was most noticeable in variable energy resources which received updated FMM Energy Schedules based upon latest 15-minute forecast.

Market Issue

After the implementation of the EIM Year 1 Enhancement initiative, EIM participating balancing authority areas submitted questions, inquires, and disputes regarding the calculation of standard ramping energy, ramping energy deviation, and residual imbalance energy attributed to updated FMM Energy Schedules. This inquires implied that this energy was erroneously settling at the RTD LMP.

During the research of an particular inquiry associated with the calculation of expected energy for a non-participating variable energy resource, which was increasing it's energy output across a two-hour period due to updated forecasts, it became apparent that the expected energy calculation was anomalous. Almost all the resource's FMM Schedules were being considered extra-marginal and reclassified as RTD Instructed Imbalance Energy which settled at the RTD LMP.

Although some of the FMM Schedule Energy should be considered standard ramping energy, ramping energy deviation, or residual imbalance energy, the expectation is that a portion of the FMM Schedule Energy, which is the amounts set in the FMM, should be considered marginal energy and settle at the FMM LMP. In other words, when a variable energy resource with a



Base Schedule or Self-Schedule receives a dispatch to increase or decrease its output in consecutive intervals and does not have an economic bid, the resource's FMM Schedule Energy is settling as RTD Instructed Imbalance Energy at the RTD LMP. After reviewing the expected energy calculations and systems applications more closely, it became apparent that while SiBR was treating self-scheduled energy consistent with sections 34.1.6.1 and 34.1.6.2, the expected energy calculation was not considering the self-scheduled energy modified pursuant to the applicable forecast as optimal energy. This is inconsistent with sections 34.1.6.1 and 34.1.6.2, which indicates that the forecasted amounts are optimized in the FMM.

Remedial Actions:

The expected energy calculations will be modified as follows:

1. Non-EIM variable energy resources that submit a RTM Self-Schedule, RTM Self-Schedule with an economic bid, or just economic bid, should expect the FMM Schedule Energy attributed to forecast changes to settle as FMM Optimal Energy at the FMM LMP.
2. EIM variable energy resources that submit a Base Schedule, a RTM Self-Schedule, a RTM Self-Schedule with an economic bid, or just economic bid, should expect the FMM Schedule Energy attributed to forecast changes to settle as FMM Optimal Energy at the FMM LMP.
3. Non-EIM variable energy resources that do not submit a RTM Self-Schedule, RTM Self-Schedule with an economic bid, or just economic bid, are optimized as price takers and will be treated as FMM Self-Schedule Energy, as described in number 1 above.
4. EIM variable energy resources that do not submit a Base Schedule, RTM Self-Schedule, RTM Self-Schedule with an economic bid, or just economic bid, will be treated price takers as described in number 2 above.
5. Items 1-4 will be remedied through the scheduled recalculation settlement statements. For trade dates that follow the implementation of RTD-LMPM enhancements, anticipated on May 2, 2017, all variable energy resources energy will be settled consistent with the changes described above in steps 1-4.
6. The CAISO is scheduling to recalculate and re-settle the Trade Dates during Trade Period May 1st, 2014 to current on the next available relevant Settlement Statements.



Impact Assessment

Based upon a high-level analysis, the erroneous expected energy calculations resulted in underpayments to variable energy resources for energy scheduled in the FMM of approximately \$3 million for the Trade Period of 5/1/14 to 3/31/17. The CAISO will recalculate and re-settle the FMM Schedules for Trade Period May 1, 2014 to current on the next available relevant Settlement Statements.