



**California ISO**  
Shaping a Renewed Future

# **Energy Imbalance Market Year 1 Enhancements**

## **Issue Paper and Straw Proposal**

**November 10, 2014**

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***Table of Contents***

1	Introduction .....	3
2	Plan for Stakeholder Engagement .....	5
3	Settlement of Non-Participating Resources.....	6
4	GHG Flag and Cost Based Bid Adder .....	7
5	Establishment of EIM Transfer Limits Using ATC.....	10
6	Resources Sufficiency Evaluation of ISO and EIM Entities Using ATC .....	12
7	15-Minute Bidding on Intertie Scheduling Points .....	13
8	Modification of EIM Transfer Limit Constraints .....	18
9	Administrative Pricing Rules.....	20
10	Next Steps.....	21

## 1 Introduction

The EIM is a real-time market to dispatch economic bids voluntarily offered by participating resources to efficiently balance supply, transfers between balancing authority areas, and load across its footprint. The EIM is part of the ISO's real-time market and leverages the FERC Order No. 764 market design changes implemented in May 2014. As such, the EIM includes a fifteen minute market and five minute dispatch across the combined network of the ISO and EIM balancing authorities.

The EIM Year 1 Enhancements includes proposed design changes to address FERC compliance, commitments made during the original stakeholder process, and others identified during implementation. The initiative will have two phases. The first phase will address design changes that the ISO believes should be implemented when NV Energy joins the EIM in October 2015. These items are planned for Board decision in March 2015 to allow appropriate time for FERC filings of ISO tariff changes, necessary EIM Entity OATT changes, and design certainty needed to commence implementation activities. The second phase will address items that benefit from six months of operational experience with the EIM.

The following lists the currently planned items in phase 1:

**Settlement of Non-Participating Resources** – The ISO uses several real-time energy categories to account for the operational characteristics of non-participating resources. The ISO will provide additional clarity on these energy categories which will ensure the same calculation of instructed imbalance energy and uninstructed imbalance energy across the EIM area.

**GHG flag and cost based bid adder** – FERC directed the ISO to develop a flag to allow participating resources to opt out of being considered for EIM transfer into the ISO and modify the GHG bid adder to be based upon the actual compliance cost of the participating resource.

**Use of ATC for EIM Transfers** – Based on discussions with NV Energy, it plans to use available transmission capacity (ATC) and not contractual rights to support EIM transfers. Financially binding base schedules are established at T-40 and the final resource sufficiency evaluation is performed. However, firm transmission can be tagged up until T-20 which may change the available transmission capacity to support EIM transfers.

**Resource sufficiency evaluation applied to ISO BAA** – the ISO proposes to extend the flexible ramping test at T-40 to the ISO. In the event, the ISO fails the test, EIM transfers into the ISO will be restricted the same as other EIM BAAs.

**Bidding rules on external EIM interties** – Currently the EIM design allows full discretion to the EIM Entity as to whether real-time economic bidding is allowed on intertie scheduling points with BAAs outside the EIM footprint. The ISO does allow real-time economic bidding on all intertie scheduling points of the ISO, including those intertie scheduling points whose location is equivalently the same as those that support EIM transfers. This may result in inefficient market outcomes when an economic bid on the ISO intertie scheduling point is sourced in or wheels through an EIM Entity.

**Enforcement of EIM Transfer Limits** – The ISO currently enforces EIM transfer limits by restricting the change in net schedule interchange to the transfer capability made available by transmission customers of the EIM Entity. This change would enforce the EIM transfer limit at each intertie scheduling point.

**Administrative pricing rules** – the ISO is clarifying its administrative pricing rules in the event of a market disruption or suspension. In one scenario, the ISO proposes to use the day-ahead price. Since there is not a day-ahead price for EIM Entities, a different administrative price must be selected for this scenario.

The following lists the currently planned items in phase 2. This paper only addresses the phase 1 items and does not include a further discussion of these phase 2 items.

**Potential EIM wide transmission rate** – The ISO committed to review a potential transmission charge based upon six months of operational data. A discussion of potential approaches was included in the EIM Draft Final Proposal.

**Dynamic market power mitigation on EIM transfers** – In the EIM Go-Live Enhancements, the ISO committed to look at an additional dynamic trigger for including EIM transfer constraints into the EIM area in the market power mitigation process. For example, if EIM transfer capability into the EIM area exceeds the historical imbalance needs of the EIM BAA, then in those hours the EIM transfers constraint could be excluded from the market power mitigation process.

**Flow entitlements for base schedules/day-ahead schedules** – The ISO committed to evaluate adding this functionality if there is material impact on the constraints within an EIM BAA from other EIM BAAs or the ISO in the EIM footprint. Currently the real-time congestion offset is based solely upon where the constraint is located. This enhancement would allocate a portion of an EIM BAA's real-time congestion offset to other EIM balancing authority areas if the other EIM BAA's base schedule flows exceed agreed upon flow entitlements.

## 2 Plan for Stakeholder Engagement

Stakeholder input is essential and critical for the success of new initiatives from policy development to implementation. The EIM Year 1 Enhancement stakeholder process will shape the market design and policies through a series of proposals, meetings and written stakeholder comments. Stakeholders should submit comments to [EIM@caiso.com](mailto:EIM@caiso.com). Table 1 below lists the planned schedule for the EIM Year 1 Enhancements stakeholder initiative.

The ISO is committed to provide ample opportunity for stakeholder input into our market design, policy development, and implementation activities.

This initiative assumes a basic understanding on the EIM design which went live on November 1, 2014. Please review the EIM Draft Final Proposal for additional information on the EIM design including: definitions, policy decisions, resources sufficiency evaluation, settlements, and neutrality accounts. The EIM Draft Final Proposal posted at <http://www.caiso.com/informed/Pages/StakeholderProcesses/EnergyImbalanceMarket.aspx>.

Item	Date
Post Issue Paper / Straw Proposal	November 10, 2014
Stakeholder Meeting (Folsom)	November 17, 2014
Stakeholder Comments	December 1, 2014
Post Revised Straw Proposal	December 31, 2014
Stakeholder Meeting (Portland)	January 8, 2015
Stakeholder Comments	January 22, 2015
Post Draft Final Proposal	February 11, 2015
Stakeholder Meeting (Tentative: Las Vegas)	February 18, 2015
Stakeholder Comments Due	February 25, 2015
Board of Governors Decision	March 26-27, 2015
Phase 2 Stakeholder Activities	TBD

**Table 1 - Schedule for EIM Year 1 Enhancements Stakeholder Initiative**

### 3 Settlement of Non-Participating Resources

Currently non-participating resources can receive fifteen minute market (FMM) schedule changes due to manual dispatches or physical changes in the resource known prior to the start of the FMM interval. These FMM schedule changes are considered instructed imbalance energy and the deviation from base schedules is settled at the FMM price. In the real-time dispatch any known manual dispatch different than the FMM schedule known prior to the start of RTD is considered instructed imbalance energy and is settled at the RTD price. Any remaining difference between the FMM schedule and meter is considered uninstructed imbalance energy and is settled at the RTD price. The current implementation treats FMM schedules as block schedules. Block schedules do not reflect the operational characteristics of the non-participating resource, such as the resource's ramp rate.

The current ISO EIM tariff and PacifiCorp OATT, narrowly considers physical changes as forced outages and forecast changes for variable energy resources in FMM only. This is not consistent with the calculation of expected energy from ISO resources who self-schedule their day-ahead award into the real-time market (RTM). ISO resources who self-schedule in the RTM are equivalent to a non-participating resource with a base schedule. As a result of this inconsistency, the determination of uninstructed imbalance energy differs within the ISO BAA and the EIM entity BAA. Uninstructed imbalance energy is used as the denominator when determining the pro-rata share of bid cost recovery uplift and the real-time imbalance energy offset that is transferred between BAAs. The ISO proposes to align the calculation of expected energy across the EIM area by including additional energy categories that apply to ISO resources who self-schedule in the RTM to changes from base schedule of EIM non-participating resources.

Expected energy is the total energy that is expected to be generated or consumed by a resource, based on the dispatch<sup>1</sup> of that resource, as calculated by the RTM, and as finally modified by any applicable Dispatch Operating Point (DOP) corrections. Expected energy includes the energy scheduled in the hourly base schedule and it is calculated "after-the-fact," i.e., after the operating day.

Expected Energy is calculated for Generating Units, System Resources, Resource-Specific System Resources, Non-Generator Resources, and Participating Loads (e.g, pumps). The calculation is based on the hourly base schedule and the DOP trajectory for the three-hour period around the target trading hour (including the previous and following hours), the applicable FMM or RTD LMP for each dispatch interval of the target trading hour, and any manual dispatch. All dispatch intervals are five minutes in duration.

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<sup>1</sup> Non-participating resources, while not providing economic bids, have a dispatch instruction calculated that reflects the physical characteristics of the resource. While the non-participating resource is not responding to the dispatch instruction, the calculated value is used to settle deviations from base schedules.

The following are energy categories<sup>2</sup> used in the FMM and RTD to reflect the operational characteristics of a non-participating resource:

**Standard Ramping Energy (SRC)** - IIE produced or consumed in the first two and the last two dispatch intervals due to hourly base schedule changes. SRE is a schedule deviation along a linear symmetric 20-minute ramp across hourly boundaries.

**Ramping Energy Deviation (RED)** - IIE produced or consumed due to deviation from the standard ramp because of ramp constraints, Start-Up, or Shut-Down.

**Derate Energy (DRE)** - Extra-marginal IIE produced or consumed due to minimum load overrates or maximum capacity derates.

**Manual Dispatch Energy (MDE)** – IIE produced or consumed due to a deviation as a result of an instruction from the EIM Entity.

**Optimal Energy (OE)** - Any remaining IIE after accounting for all other IIE subtypes constitutes OE.

For energy categories Derate Energy, Manual Dispatch Energy, and Optimal Energy, separate expected energy calculations are made for the FMM schedules and RTD dispatch.

Optimal Energy is considered in the determination of Bid Cost Recovery (BCR). Previously the EIM design stated that only participating resources are eligible for BCR. BCR is a make-whole payment to the resource in the event that real-time market costs are greater than real-time market revenues. While non-participating resources do not have an energy bid and consequently no real-time costs, it cannot be guaranteed that a non-participating resource would not receive a BCR payment. Under certain scenarios, the BCR calculation replaces the energy bid with the LMP as the resource's cost. This results in a bid cost that is greater than zero which in rare cases, such as price corrections, could result in a BCR payment. Therefore, the ISO proposes to clarify the tariff that both non-participating resources and participating resource are eligible for bid cost recovery.

#### **4 GHG Flag and Cost Based Bid Adder**

Imports of energy into California and generation of energy within California from greenhouse gas emitting resources are subject to the California Cap on Greenhouse Gas Emissions regulated by the California Air Resources Board (CARB). Energy generated outside of California that is not imported into California is not subject to this regulation.

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<sup>2</sup> For additional information on the calculation of energy types please refer to the Attachment C of the BPM for Market Operations available at [http://bpmcm.caiso.com/BPM%20Document%20Library/Market%20Operations/Appendices\\_Market%20Operations\\_V41\\_clean.doc](http://bpmcm.caiso.com/BPM%20Document%20Library/Market%20Operations/Appendices_Market%20Operations_V41_clean.doc)

The EIM has been designed so that the greenhouse gas compliance costs will not affect the locational marginal price in an EIM BAA. Rather, the market optimization will calculate the marginal cost difference between EIM generation serving load in the ISO and serving load outside of the ISO. This difference will be the marginal greenhouse gas regulation compliance cost and will be the rate the ISO will use to calculate a payment to each generator in an EIM BAA for its output that served ISO imbalances. This payment will be funded through the price paid within the ISO for imbalance energy.

The current EIM design allows a participating resource scheduling coordinator (SC) to submit a GHG bid adder to reflect its willingness to be deemed delivered to the ISO when there is an EIM transfer into the ISO. The GHG bid adder is not mitigated, with the only restriction being that the combined energy bid and GHG bid adder must be less than or equal to the \$1000 energy bid cap. A participating resource SC can submit a high GHG bid adder to reduce the probability that the resource will not be deemed delivered to the ISO. However, a high GHG bid adder does not guarantee that the resource will never be deemed delivered to the ISO and as a result subject to CARB rules.

In the FERC Order approving the EIM design, FERC directed the ISO to include a flag which would allow a participating resource SC to opt out completely from consideration for EIM transfer into the ISO. In addition, FERC directed the ISO to design the GHG bid adder to be based upon the expected cost of GHG compliance obligations. The remainder of this section describes the proposed design of the flag and cost based GHG bid adder.

A participating resource SC can select the flag to not allow energy from the resource to support EIM transfers into the ISO. The flag will be included in the Master File. The flag can be updated through the Master File change process which takes 5-10 business days for the change to be reflected in the market.

For participating resource SC's that elect to allow energy from the resource to be consider for EIM transfer into the ISO, the entire bid range of the resource is eligible to receive a GHG award. Assume a participating resource SC submits energy bids for the full operating range of the resource with the following assumptions 200 MW PMax, 50 MW PMin, and a 100 MW base schedule. Any energy dispatch above its PMin is eligible to be deemed to support an EIM transfer into the ISO and will be compensated and the marginal GHG price. For example, if the resource was dispatched to 75 MW, the resource could be awarded 25 MW even though the resource has been dispatched below its base schedule.

Since the implementation of the flag limits the available MW that can receive a GHG award, there may be instances where the EIM transfer into the ISO may exceed the available bid range of participating resources that have elected to support EIM transfers into the ISO. For example, assume there is only the resource above supporting GHG awards. If the EIM Entity BAA load was 75 MW below the base schedule it may be economic to maintain the resource's base schedule of 100MW and allow the load imbalance to be resolved through an EIM transfer into the ISO of 75 MW. This EIM transfer into the ISO exceeds the bid range of the participating resource, for which the decremental bid range below the base schedule was submitted between Pmin of 50 MW and the base schedule of 100 MW.



In this event, the ISO will award additional GHG awards to the participating resources that have elected to support EIM transfers into the ISO. The additional awards will be given pro-rata based upon the bid range offered from all resources allowing GHG awards, but capped at the full output range of the resource. Thus a resource cannot receive a GHG award in excess of its total output. If these additional awards are insufficient to meet the EIM transfer into the ISO, then the remaining quantity will be awarded pro-rata based upon the available MW capacity available from the remaining participating resources. The marginal price of the GHG awards will be the highest GHG bid adder from all resources that support EIM transfers into the ISO. Table 2 below illustrates the proposal for allocating additional GHG awards.

	Pmax	Pmin	Base	Dispatch	GHG Award			Total
					Step 1	Step 2	Step 3	
Resource A	100	50	75	100	50.0	30.0	10.0	90.0
Resource B	100	25	75	100	75.0	25.0	0.0	100.0
Resource C	100	50	100	100	50.0	30.0	10.0	90.0
					175.0	85.0	20.0	280.0

**Table 2 - Example GHG Awards with an EIM Transfer into ISO of 280 MW**

In the first step of the process each resource receives a GHG award for all energy produced above its Pmin; however, this is less than the total EIM transfer of 280 MW in the interval. The remaining 105 MW is awarded pro-rata to each resource based upon its GHG award in step 1; however, resource B cannot receive its full pro-rata share since this would exceed the total energy output of the resource. In step 3, the remaining 20 MW is awarded equally between resource A and C because each has a Pmin of 50 MW. The GHG awards that support the full EIM transfer have now been distributed among the participating resources deemed to be delivered to the ISO.

The ISO proposes to use a process similar to establishing the greenhouse gas cost adder included in the default energy bids<sup>3</sup> of ISO resources. This includes a variable cost option and a negotiated rate option. The negotiated rate option may be used for new participating resources that do not have a GHG emissions rate authorized by CARB.

Under the variable cost option, on a daily basis, the ISO will calculate a GHG cost adder as the product of the resource's incremental heat rate, the GHG emissions rate authorized by CARB, and the applicable greenhouse gas allowance price. Similar to the default energy bids of ISO resources, there will be a 10% adder to the calculated cost. A participating resource must submit a GHG bid adder equal to or less than its GHG cost adder, but not less than zero. If a participating resource SC submits a GHG bid adder above the GHG cost adder of the participating resource, the GHG bid adder will be set to the calculated GHG cost adder.

<sup>3</sup> For additional information, please review section 39.7.1 of the ISO tariff available at <http://www.caiso.com/rules/Pages/Regulatory/Default.aspx>

## 5 Establishment of EIM Transfer Limits Using ATC

PacifiCorp's current EIM implementation does not require ATC for EIM Transfers. PacifiCorp's EIM implementation relies upon the PacifiCorp Interchange Rights Holder (PIRH) mechanism. An existing transmission customer allows its firm intertie rights to be used for EIM transfers (without charge or compensation). This mechanism was developed in light of the fact that interties between ISO and PACW and PACW and PACE are fully subscribed on a firm basis and have other transmission providers, customers, owners or path operators.

It is anticipated that available transfer capability (ATC) will be used to facilitate EIM transfers between NV Energy (NVE), CAISO and PacifiCorp when NVE joins the EIM in October 2015. This raises some operational timing issues because actual ATC for the upcoming operating hour may not be fully known until T-20 (when all schedules are required to be submitted in WECC), however, final base schedules for the hour are financially binding at T-40 and used for the final resource sufficiency evaluation for the upcoming operating hour.

If there is ATC available on a path, it may be purchased on a firm basis by transmission customers who are then issued a reservation. Once a reservation is issued, the same capacity may not be sold to any other customer on a firm basis for the same period of time as the first customer's reservation. However, the transmission provider (TP) is allowed to sell ATC on a non-firm basis up to the total transfer capability (TTC) of the path. For example, if a path's TTC is 400, and the path is fully subscribed on a firm basis for 400 MW, there is no firm ATC for sale, but the TP can sell up to 400 MW on a non-firm basis. In the West, transmission customers have up until T-20 to schedule their reservation. At T-20, it is always possible that not all of the firm reservations have actually been scheduled and so there would be ATC on the line for non-firm use. In such a case, the TP can allow the non-firm transmission customers' transmission schedules to flow up to the limit of the path, including the firm schedules (TTC). It is also possible that some paths are not fully sold firm, in which case both firm and non-firm schedules can flow and there may even be ATC left over which is not being scheduled or used by anyone.

The ISO currently has a process to ensure that hourly block schedules do not exceed intertie scheduling limits which in turn ensures that SCs are able to obtain transmission for these awards in adjacent BAAs. For example, assume two SCs are bidding on an intertie scheduling point with a scheduling limit of 300 MW. The ISO does not require the potential incremental schedules to be tagged prior to start of the HASP, but cleared schedules must be tagged by T-20. SC #1 is bidding 200 MW at \$50.00 and plans to use firm transmission in an adjacent BAA. SC #2 is bidding 200 MW at \$40.00 and is planning to use non-firm transmission on the same transmission line to the ISO. Assuming the LMP at the intertie scheduling point is \$55.00, the ISO market will award SC #1 a 100 MW import and SC #2 a 200 MW import. When SC #1 submits an e-Tag to support its 100 MW import, it will tag 100 MW of firm transmission on the external line and the external BAA can award 200 MW of non-firm transmission to SC #2 to support its 200 MW import without overselling firm transmission.

Post Order 764 market design changes, the hour ahead scheduling process (HASP) is used to award hourly block schedules; however, the prices are advisory. Hourly block schedules that clear the HASP are considered price takers in the financially binding FMM intervals and settled

at the FMM price. The HASP is a special run of the real-time unit commitment process (RTUC) covering seven 15-minute intervals. The run starts at T-67.5 and provides results at T-52.5. Hourly block schedules cleared in the HASP must be tagged by T-20. If the hourly block import is not tagged, the SC will be paid the FMM price for the first and second FMM interval of the operating hour and charged the RTD price for the first six 5-minute intervals of the operating hour. For the third and fourth FMM intervals, the operational adjustment resulting from the HASP hourly block schedule not being tagged will be reflected in the FMM schedule, thus there is no settlement. However, the SC is subject to the hourly schedules decline charge for the third and fourth FMM intervals.

The ISO considered including the HASP in the EIM as a mechanism to use ATC for establishing the EIM transfer limits, but this would require establishing base schedules earlier than the current EIM deadline of T-40. Finalizing base schedules earlier would not be beneficial because this would reduce the opportunities for the EIM Entity to make adjustments necessary to ensure its BAA passes the resource sufficiency evaluation for the operating hour. There is a concern if ATC is used for the T-40 resource sufficiency evaluation that a BAA could pass, but the actual transmission available at T-20 that is used for the dynamic schedule for EIM transfers differ. The ISO is proposing to apply the resource sufficiency evaluation to its BAA. The same concern above exists between the ISO HASP process and actual tagged block schedules. A mechanism for addressing this concern is discussed in the next section.

The ISO proposes that the EIM Entity submit its ATC at T-40. There is no requirement for the dynamic schedule to support EIM transfers to be tagged at this time. The dynamic schedule to support EIM transfers must be tagged by T-20. The ISO will use the submitted ATC in the first two FMM intervals of the operating hour and the dynamic schedule transmission profile for the last two FMM intervals of the operating hour. Any differences between the ATC used in the FMM and the final dynamic schedules will be resolved in RTD. Since the RTD market optimization for the first 5-minute interval of the operating hour commences at T-7.5, the EIM transfer limits supported by the dynamic schedule are known and enforced. Any imbalance from base schedules is settled with the appropriate EIM participating resource SC or EIM Entity SC. The ISO also proposes to extend the HASP schedules declines charge to operational adjustments made to T-40 base schedules for both non-participating and participating imports/exports of the EIM Entity.

The ISO does not require that hourly base schedules be tagged prior to T-20 although an EIM Entity may require tags prior to final base schedules at T-40. The e-Tag timing requirement for EIM hourly base schedules is the same as ISO hourly block schedules that have cleared the HASP. The ISO also supports additional intertie bidding options such as a single economic schedule change per operating hour and full economic participating in the FMM. In the FMM, the ISO observes the transmission profile of the tag and will not award an FMM schedule not supported by the transmission profile. As a result, intertie bids participating in the FMM must be supported by an e-Tag prior to the start of the first FMM interval of the operating hour or T-40.

The imbalance costs from differences between the hourly base schedule and final tagged schedule are borne by the market participant. The deviations will be settled directly with the

EIM participating resource SC. For non-participating intertie schedules, the deviations will be settled directly with the EIM Entity SC, but then allocated to the market participant according to the rules of the EIM Entity OATT. The EIM Entity SC will have all necessary settlement data to pass through the imbalance energy settlement and hourly schedules decline charges.

The following summarizes the imbalance settlement and hourly schedules decline charges that will occur if the final e-tag submitted at T-20<sup>4</sup> differs from the base schedule:

T to T+30: Difference between the base schedule and e-Tag settle at the RTD price

T+30 to T+60: Difference between base schedule and e-Tag settle at the FMM price

T+30 to T+60: MW difference subject to hourly schedules decline charge

The hourly schedule decline charge is applied separately for imports and exports. The import charge and export charge are determined monthly. The import (exports) schedule decline charge monthly threshold is the highest of 300 MW or 10% of total imports (exports) of the SC. The price applied to the MW above the threshold is the maximum of \$10.00 or 50% of the FMM LMP. The hourly schedules decline charge applies in any FMM interval when the operational adjustment is not settled at the RTD price.

## **6 Resources Sufficiency Evaluation of ISO and EIM Entities Using ATC**

The ISO proposes to apply the flexible ramping test to the ISO BAA at T-40. The test will ensure there is sufficient ramping capability within the ISO to meet 15-minute net load changes following the HASP. In the event, the ISO fails the flexible ramping test additional EIM transfers into the ISO above the FMM interval proceeding operating hour will not be allowed. This is the same treatment for all BAAs in the EIM area.

As discussed in the previous section, the ISO market uses the HASP to clear hourly block schedules prior to the start of the FMM. The hourly block schedule changes are not required to be tagged until T-20. As a result, the assumed hourly block schedules from the HASP which are used in the flexible ramping test may differ from what is actually tagged. When there is a difference, a BAA may at T-20 have insufficient upward or downward ramping capability.

In determining the flexible ramping requirement for an individual BAA, the failure to tag an hourly block schedule at the HASP schedule amount will increase the flexible ramping requirement for that BAA. For example, an import tagged below its ISO HASP schedule will result in an operational adjustment which increases the upward dispatch in RTD. This additional upward dispatch in RTD is included in the historical analysis used to set the upward flexible ramping requirement. If an export is tagged below its EIM base schedule, this will

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<sup>4</sup> If the final tag is submitted prior to the start of the second FMM interval of the operation hour, the last three intervals of the operating hour will settle at the FMM price and be subject to the hourly schedules decline charge.

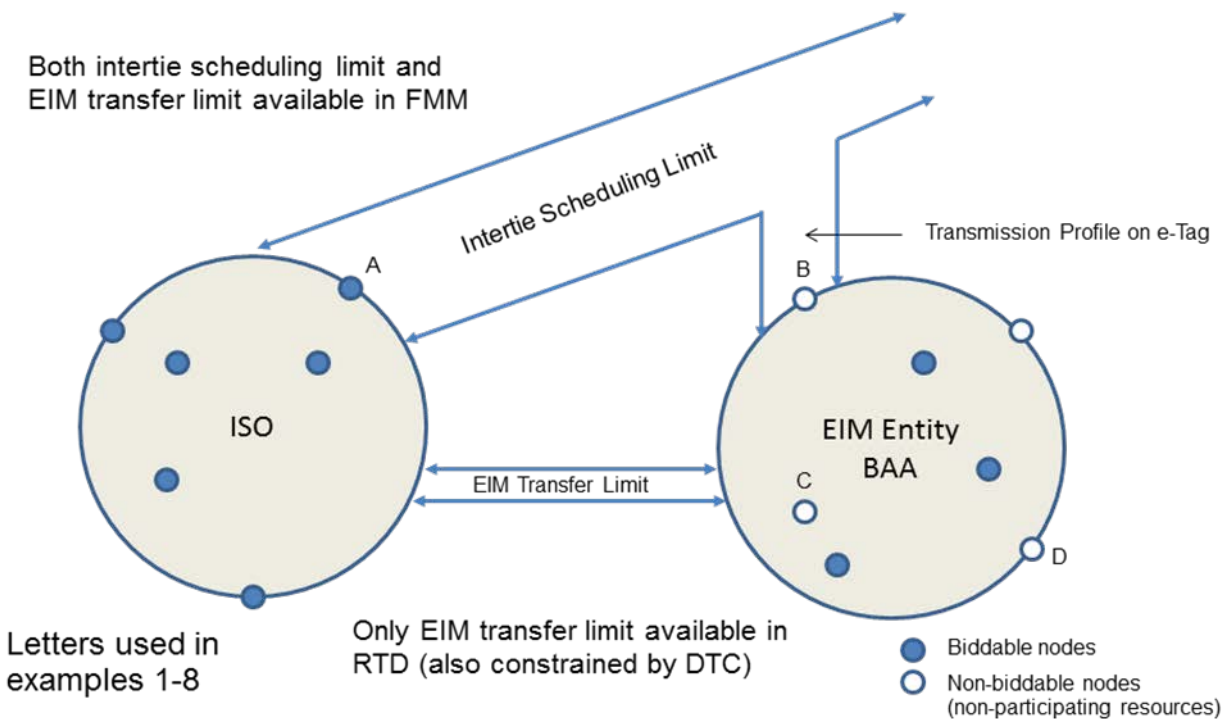
increase downward dispatch in RTD and will be included in the historical analysis used to set the downward flexible ramping requirement.

While operational adjustments are considered in determining the flexible ramping requirements used in the flexible ramping test, the ISO proposes two additional mechanisms to ensure that differences between intertie schedules at T-40 and actually tagged schedule do not allow continued leaning on EIM. First, the ISO proposes to publish for each BAA, the hourly aggregate quantity of imports and exports whose final tag schedules differ from either the EIM base schedule or ISO HASP schedule. This will ensure transparency across the EIM footprint as to the difference between schedules considered in the flexible ramping test and actual tagged schedules. Secondly, if a BAA has historically high operational adjustments, the ISO proposes to add an hourly block difference that must also be met in addition to the ramping requirement between FMM intervals. For example, assume a BAA historically has 100 MW of imports with operational adjustments. The BAA would need to have sufficient upward bid range of participating resources to meet the load forecast plus an additional 100 MW available to replace the potential 100 MW reduction in imports. The ISO seeks stakeholder comments on an appropriate threshold to apply this additional test in the resource sufficiency evaluation.

## **7 15-Minute Bidding on Intertie Scheduling Points**

The following section discusses the implications of one EIM BAA allowing economic participation of imports and exports in the FMM and another BAA in the EIM disallowing economic participation of imports and exports. This currently occurs between the ISO and PacifiCorp. The ISO is seeking stakeholder feedback on whether the EIM Entity should maintain discretion to allow or disallow FMM economic participating on external interties given the interaction between BAAs.

Under the current EIM design, the EIM Entity determines the rules for participation in the EIM of resources located within its BAA. This includes imports and exports on external interfaces with non-EIM BAA. Examples of external interfaces include nodes B and D in Figure 1 below. The ISO allows full economic participation in the FMM on all external interfaces such as node A below. As will be discussed below, the potential different participation rules between the ISO and an EIM Entity may result in multiple settlements at many nodes when in actuality there is a single schedule change at a single node. Due to timing differences between market awards at one node and subsequent schedule changes at related nodes, there will be pricing difference between FMM and RTD that will be settled. In addition, if the actual single node schedule change was made in the FMM, then congestion could be fully resolved in a single market optimization versus resolving any resulting difference in RTD.



**Figure 1 - Example of Modeled Nodes Within the EIM Area**

Differences between FMM market timeline and communication between the ISO and EIM Entity can result in many settlement scenarios for FMM import/export economic bids on ISO intertie scheduling points that are sources or wheel through an EIM Entity. The examples outlined below assume that the EIM Entity does not allow economic bidding on external interties.

The EIM Entity must approve e-Tags and notify ISO of manual dispatches to non-participating resources. If the e-Tag is not approved, intertie deviations can occur which are settled as an operational adjustment in either the ISO BAA and EIM BAA, or both. Manual dispatches are classified as instructed imbalance energy, but the applicable LMP depends on the timing relative to FMM and RTD optimizations. If the ISO is notified prior to start of the FMM optimization, the deviation from base schedule settled at FMM LMP. If the ISO is told after start of FMM optimization, the deviation from base schedule settled at RTD LMP.

The following eight examples illustrate potential settlement scenarios for a FMM economic bid or schedule change made on an ISO intertie scheduling point. The examples use the nodes as illustrated in Figure 1.

**Example 1:** FMM (non-EIM) export bid clears on ISO intertie scheduling point and sinks in EIM Entity BAA

- No manual dispatch communicated prior to FMM to ISO
- EIM Entity BA approves the e-Tag
  - ISO export (A) pays FMM LMP at intertie scheduling point

- EIM Entity import (B) paid RTD LMP at intertie scheduling point
  - This is a deviation from the FMM schedule
- EIM Entity BA does not approve the e-Tag
- ISO export (A) pays FMM LMP at intertie scheduling point
- ISO export (A) paid RTD LMP at intertie scheduling point
- No deviations in the EIM Entity

**Example 2:** FMM export bid clears on ISO intertie scheduling point and sinks in EIM Entity BAA

- Manual dispatch (B & C) equal to FMM ISO export schedule communicated prior to FMM to ISO
- EIM Entity BA approves the e-Tag
  - ISO export (A) pays FMM LMP at intertie scheduling point
  - EIM Entity import (B) paid FMM LMP at intertie scheduling point
  - Resource (C) pays FMM LMP at its location
- EIM Entity BA does not approve the e-Tag
  - ISO export (A) pays FMM LMP at intertie scheduling point
  - ISO export (A) paid RTD LMP at intertie scheduling point
  - EIM Entity import (B) paid FMM LMP at intertie scheduling point
  - EIM Entity import (B) pays RTD LMP at intertie scheduling point
  - Resource (C) pays FMM LMP at its location

**Example 3:** FMM export bid clears on ISO intertie scheduling point and wheels through EIM Entity BAA

- No manual dispatch communicated prior to FMM to ISO
- EIM Entity BA approves the e-Tags
  - ISO export (A) pays FMM LMP at intertie scheduling point
  - EIM Entity import (B) paid RTD LMP at intertie scheduling point
  - EIM Entity export (D) pays RTD LMP at its intertie scheduling point
- EIM Entity BA does not approve the e-Tags
  - ISO export (A) pays FMM LMP at intertie scheduling point
  - ISO export (A) paid RTD LMP at intertie scheduling point
  - No deviations from base schedule in EIM Entity

**Example 4:** FMM export bid clears on ISO intertie scheduling point and wheels through EIM Entity BAA

- Manual dispatch (B & D) equal to FMM ISO export schedule communicated prior to FMM to ISO
- EIM Entity BA approves the e-Tags
  - ISO export (A) pays FMM LMP at intertie scheduling point
  - EIM Entity import (B) paid FMM LMP at intertie scheduling point
  - EIM Entity export (D) pays FMM LMP at its intertie scheduling point
- EIM Entity BA does not approve the e-Tags
  - ISO export (A) pays FMM LMP at intertie scheduling point
  - ISO export (A) paid RTD LMP at intertie scheduling point
  - EIM Entity import (B) paid FMM LMP at intertie scheduling point
  - EIM Entity import (B) pays RTD LMP at intertie scheduling point
  - EIM Entity export (D) pays FMM LMP at its intertie scheduling point
  - EIM Entity export (D) paid RTD LMP at its intertie scheduling point

**Example 5:** FMM import bid clears on ISO intertie scheduling point and sinks in EIM Entity BAA

- No manual dispatch communicated prior to FMM to ISO
- EIM Entity BA approves the e-Tag
  - ISO import (A) paid FMM LMP at intertie scheduling point
  - EIM Entity export (B) pays RTD LMP at intertie scheduling point
    - This is a deviation from the FMM schedule
  - EIM Entity BA does not approve the e-Tag
  - ISO import (A) paid FMM LMP at intertie scheduling point
  - ISO import (A) pays RTD LMP at intertie scheduling point
  - No deviations in the EIM Entity

**Example 6:** FMM import bid clears on ISO intertie scheduling point and sinks in EIM Entity BAA

- Manual dispatch (Both B & C) equal to FMM ISO import schedule communicated prior to FMM to ISO
- EIM Entity BA approves the e-Tag
  - ISO import (A) paid FMM LMP at intertie scheduling point
  - EIM Entity export (B) pays FMM LMP at intertie scheduling point
  - Resource (C) paid FMM LMP at its location
- EIM Entity BA does not approve the e-Tag
  - ISO import (A) paid FMM LMP at intertie scheduling point
  - ISO import (A) pays RTD LMP at intertie scheduling point



- EIM Entity export (B) pays FMM LMP at intertie scheduling point
- EIM Entity export (B) paid RTD LMP at intertie scheduling point
- Resource (C) paid FMM LMP at its location

**Example 7:** FMM import bid clears on ISO intertie scheduling point and wheels through EIM Entity BAA

- No manual dispatch communicated prior to FMM to ISO
- EIM Entity BA approves the e-Tags
  - ISO import (A) paid FMM LMP at intertie scheduling point
  - EIM Entity export (B) pays RTD LMP at intertie scheduling point
  - EIM Entity import (D) paid RTD LMP at its intertie scheduling point
- EIM Entity BA does not approve the e-Tags
  - ISO import (A) paid FMM LMP at intertie scheduling point
  - ISO import (A) pays RTD LMP at intertie scheduling point
  - No deviations from base schedule in EIM Entity

**Example 8:** FMM import bid clears on ISO intertie scheduling point and wheels through EIM Entity BAA

- Manual dispatch (B & D) equal to FMM ISO import schedule communicated prior to FMM to ISO
- EIM Entity BA approves the e-Tags
  - ISO import (A) paid FMM LMP at intertie scheduling point
  - EIM Entity export (B) pays FMM LMP at intertie scheduling point
  - EIM Entity import (D) paid FMM LMP at its intertie scheduling point
- EIM Entity BA does not approve the e-Tags
  - ISO import (A) paid FMM LMP at intertie scheduling point
  - ISO import (A) pays RTD LMP at intertie scheduling point
  - EIM Entity export (B) pays FMM LMP at intertie scheduling point
  - EIM Entity export (B) paid RTD LMP at intertie scheduling point
  - EIM Entity import (D) paid FMM LMP at its intertie scheduling point
  - EIM Entity import (D) pays RTD LMP at its intertie scheduling point

As the examples above illustrate, since intertie bidding is allowed on ISO intertie scheduling points, but may not be allowed by the EIM Entity, the settlement implications are greatly complicated. Rather than bidding on the ISO intertie scheduling point, it would be beneficial to

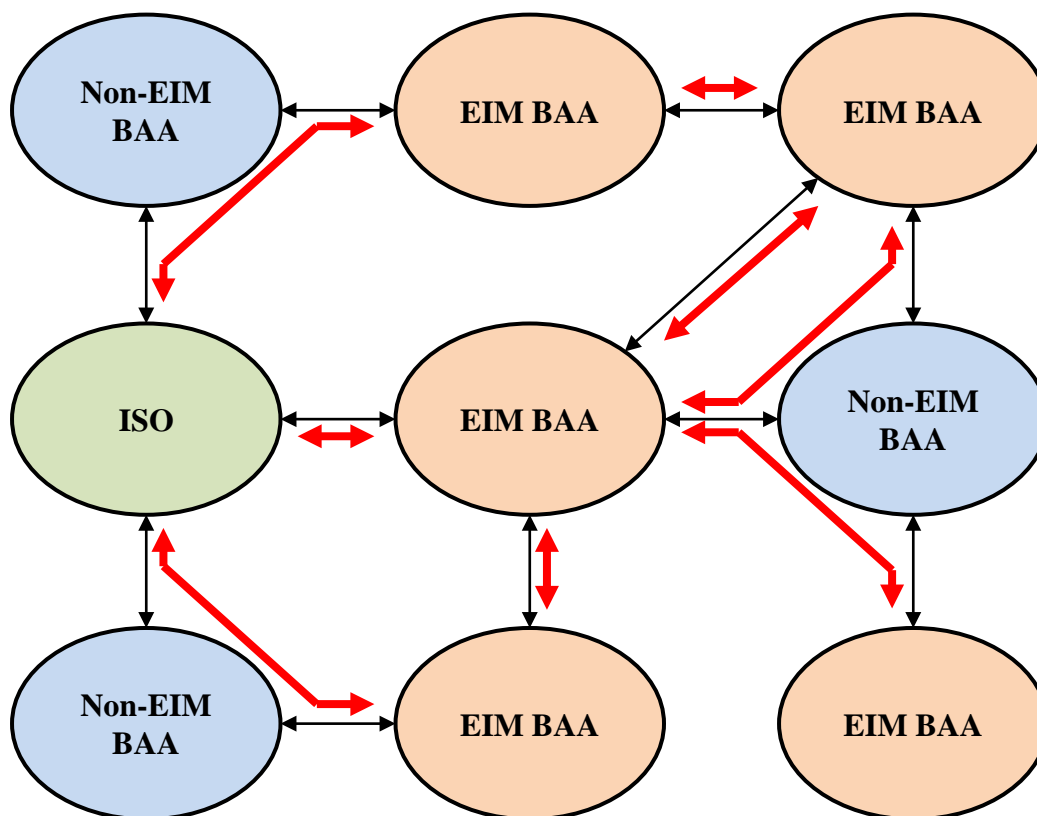
have economic bids offered at either the resource or the node where the schedule exits/enters the EIM Area. This would improve the quality of the FMM market solution versus resolving any unforeseen congestion impact in RTD. In addition, if transmission customs allow counterflows on EIM base schedules with the ISO within the EIM, making this transmission capacity available to support EIM transfers can increase EIM benefits.

The ISO is not proposing at this time to remove the discretion given to the EIM Entity to establish rules for participation in its BAA. The ISO plans to make additional enhancements to its full network model in Phase 2, which will include changes to the ISO intertie scheduling points which will address the settlement of multiple nodes. However, even with these enhancements, economic participation at the actual node will provide improved FMM market results other BAAs in the EIM area besides the ISO.

## **8 Modification of EIM Transfer Limit Constraints**

The current EIM implementation enforces the EIM transfer limit by ensuring the changes in net scheduled interchange schedules between BAAs in the EIM are within the aggregate transmission rights made available to support EIM transfers. This implementation approach is appropriate for the initial implementation with PacifiCorp; however, the ISO believes that as more BAAs join the EIM, the EIM transfer limits should be considered by intertie scheduling point. This will allow for multiple transmission providers to offer EIM transfer capability and to account for the energy schedule changes that must be supported and tagged through several individual dynamic schedules.

EIM BAAs may be interconnected with the ISO directly, through another EIM BAA, through a Non-EIM BAA, or a combination thereof. The EIM Entity for an EIM BAA may have made transmission rights available on a direct interconnection with the ISO, on a direct interconnection with another EIM BAA, or on an indirect interconnection with the ISO or another EIM BAA through one or more non-EIM BAAs. The red arrows in the figure below illustrate such transmission rights. These transmission rights are essential to the EIM Transfers for each BAA in the EIM Area as they both allow and constrain the optimal exchange of imbalance energy among the BAAs in the EIM Area.



**Figure 2 - Potential Transmission Available to Support EIM Transfers**

The EIM Transfer is an algebraic quantity (positive for export and negative for import) for the net energy exchange between a given BAA and the remaining BAAs in the EIM Area. The market optimization must determine energy schedules among the EIM BAAs and the ISO from the optimal EIM Transfers of the BAAs in the EIM Area using the available transmission rights without violating them. These EIM transfers can then be tagged to the relevant interties among the BAAs.

The ISO will provide additional implementation detail with the revised straw proposal. The ISO believe the proposed change will enhance the modeling of the EIM transfer limits when an EIM Entity uses transmission rights made available by EIM transmission customers (PacifiCorp) or uses available transmission capacity (NV Energy).

## 9 Administrative Pricing Rules

The ISO, in a separate stakeholder initiative<sup>5</sup>, is revising its administrative pricing rules. The administrative pricing rules apply to the EIM, but in instances where the proposed rules use ISO day-ahead prices and schedules, a specific rule for the EIM must be developed since EIM is only the real-time market.

Through the pricing enhancements stakeholder process, the ISO is proposing to apply administrative pricing based on the nature of events and the number of market intervals impacted. This tiered approach aligns with practices in other ISOs. When the ISO reaches the point of having a market disruption or suspension, there is a high likelihood that the ISO may not be able to rerun the markets in a manner that would reflect a realistic solution. Under these conditions a rerun of the market will usually not be possible or would require the ISO making assumptions and approximations that will potentially lead to the market rerun results being challenged after the fact. This would actually be detrimental to the market certainty required under these conditions. The ISO pricing is an ex post mechanism, unlike other ISOs that rely on ex ante pricing, because an ex post mechanism may have the option of using the best available data.

The proposal improves price certainty for market participants during a market disruption or market suspension. In addition, the proposal seeks to establish market prices that reflect, to the extent possible, systems conditions during the period when market prices are missing. The process for determining the administrative price for the real-time market considers a three-tier approach; specifically,

1. If FMM prices are missing for three or fewer consecutive intervals or if the RTD market prices are missing for 11 or fewer consecutive intervals, then the ISO will preserve the current administrative pricing of using the last best price for each market accordingly.
2. If the FMM prices are missing for more than three consecutive intervals or the RTD prices are missing for more than 11 consecutive intervals under normal system conditions, then
  - a. If the RTD prices are not available but the FMM prices are available, then missing RTD prices will be filled in with the FMM prices, regardless of how many intervals are missing as long as the missing prices are related to a market disruption and the market is unable to produce prices. Conversely, if the FMM prices are missing but RTD prices are available, the RTD prices will be used to fill in the FMM prices by using the simple average of the three RTD prices.
  - b. If both the FMM and RTD prices are not available, in the ISO day-ahead prices for same period are used. In the EIM, the EIM Entity must provide the ISO with the administrative price, such as a proxy price.

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<sup>5</sup> Additional information is available at <http://www.caiso.com/informed/Pages/StakeholderProcesses/PricingEnhancements.aspx>

Thus, the same administrative pricing calculation will be applied except in the scenario where there are no real-time market prices available. In this event, the ISO will use the proxy price provided by the EIM Entity to settle imbalance within the EIM Entity BAA. For imbalance within the ISO BAA, the ISO will use the day-ahead price.

## **10 Next Steps**

The ISO plans to discuss this issue paper and straw proposal with stakeholders during a stakeholder meeting in Folsom call to be held on November 17. The ISO requests comments from stakeholders on the proposed market design changes described in this straw proposal. Stakeholders should submit written comments by December 1 to [EIM@caiso.com](mailto:EIM@caiso.com).