Energy Imbalance Market
Year 1 Enhancements
Phase 2

Issue Paper & Straw Proposal

June 30, 2015

Energy Imbalance Market Year 1 Enhancements
Phase 2 Issue Paper & Straw Proposal

Table of Contents

1 Introduction 3
2 Plan for stakeholder engagement 5
3 EIM-wide transmission rate 6
4 Flow entitlements for base schedules/day-ahead schedules 10
5 EIM transfer limit congestion treatment 11
6 Dynamic competitive assessment for market power mitigation of EIM transfer limits 13
7 Bidding rules on external EIM interties 14
8 Additional items identified during implementation 19
9 Next Steps 20

1 Introduction

The Energy Imbalance Market (EIM) is a real-time market to dispatch economic bids voluntarily offered by participating resources to efficiently balance supply, transfers between balancing authority areas (BAA), and load across its footprint. The EIM extends 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 real-time dispatch across the combined network of the ISO and EIM entities.

The EIM Year 1 Enhancements initiative includes proposed design changes to address FERC compliance, commitments made during the original stakeholder process, and to address other issues identified during implementation. The initiative will have two phases. The first phase addressed design changes to be implemented when NV Energy joins the EIM in October 2015. These items were approved by the Board in March 2015. The second phase will address items that benefit from six months of operational experience with the EIM and items from phase 1 that required additional discussion.

The following lists the current items planned in phase 2.

Items that require analysis of operational data

Potential EIM-wide transmission rate – The ISO committed to begin a review of a potential transmission charge once it had six months of operational data. Potential approaches were discussed in the original EIM stakeholder process in 2013. The material from the original stakeholder process has been included in this document.

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

Items for Board decision before year end

EIM transfer limit congestion treatment – Currently, the EIM design splits the congestion rents equally between two EIM BAAs for EIM transfer limit constraints. This design change will clarify which BAA should receive the congestion rents for EIM internal interties.

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

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 allows real-time economic bidding on all its intertie scheduling points (which are equivalent to EIM external interties), including those 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.

Additional items identified during implementation – The ISO will also consider additional design changes and clean up items identified. While many of the items in phase 2 require one year of operational data to finalize possible design changes, this does not preclude the ISO from seeking Board approval on other design elements earlier.

Items to be discussed in separate stakeholder initiative

Long-term greenhouse gas (GHG) design change – Several stakeholders requested that the ISO evaluate long-term design changes that may require changes in California Air Resources Board (CARB) regulations. The need for a potential long-term design change could arise if EIM transfers into the ISO BAA are limited by the number of EIM participating resources willing to be deemed delivered to the ISO through their GHG bids. The ISO plans to begin a stakeholder initiative later this year to evaluate if the current EIM methodology to reimburse generation outside California for the portion of their output that is deemed delivered to the ISO BAA needs to be modified should PacifiCorp become a participating transmission owner. As a participating transmission owner, all of PacifiCorp's load and generation will clear in the day-ahead market and become part of the ISO BAA.

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 Enhancements 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. Table 1 below lists the planned schedule for the EIM Year 1 Enhancements Phase 2 stakeholder initiative.

The ISO is committed to providing 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, as well as descriptions of EIM design components such as the resource sufficiency evaluation and EIM settlements. The EIM Draft Final Proposal is posted at http://www.caiso.com/informed/Pages/StakeholderProcesses/EnergyImbalanceMarket.aspx.

Item	Date
Post Issue Paper / Straw Proposal	June 30, 2015
Stakeholder Conference Call	July 8, 2015
Stakeholder Comments Due	July 22, 2015
Post Revised Straw Proposal / Data Analysis	August 5, 2015
Stakeholder Meeting (Bellevue, WA)	August 12, 2015
Stakeholder Comments Due	August 26, 2015
Post Draft Final Proposal	September 17, 2015
Stakeholder Conference Call	September 24, 2015
Stakeholder Comments Due	October 1, 2015
Board of Governors Decision	November 5-6, 2015
Post Final Data Analysis & Recommendation	TBD. 12 Months of Data available November 1, 2015.

Table 1 - Schedule for EIM Year 1 Enhancements Phase 2 Stakeholder Initiative

3 EIM-Wide Transmission Rate

The ISO committed to begin a review a potential transmission charge based upon six months of operational data. The final market design decision will be informed by twelve months of operational data. Potential approaches were discussed in the original EIM stakeholder process in 2013. The material from the original stakeholder process has been included in this document for reference purposes, to continue the previous stakeholder discussion.

3.1 Planned data analysis

The ISO anticipates presenting at least two views of data on transmission usage within the EIM area during the initial year of EIM operations:

1. The final schedules between EIM entities' and the ISO's BAA are the result of both forward scheduling in the day-ahead market and hourly block schedules in the hour-ahead scheduling process, and real-time EIM transfers using fifteen- and five-minute dispatch intervals. Pre-existing transmission charges apply to the forward schedules, while a potential EIM-wide transmission rate would apply only to the EIM transfers. Comparing transmission usage between these market processes will consider the net impact of EIM transfers.

2. A concern of some stakeholders has been that the EIM's use of a different transmission rate structure than forward scheduling could lead market participants to rely on EIM rather than forward scheduling, thus impacting transmission revenues. Comparing the volume of forward scheduling over time may provide information about the likelihood of this occurring.

The ISO also invites proposals for additional analyses, and will consider whether analyses proposed by stakeholders could be completed within the timeframe of this stakeholder process.

3.2 Discussion of Transmission Rate Options

The following is included as background to recognize the discussion related to transmission charges during the EIM Year 1 Enhancements Phase 1 stakeholder process. EIM extends the real-time market footprint to include EIM entities in addition to the ISO's BAA, and thus the concepts of the ISO's transmission access charge (TAC) may guide concepts for the new real-time market footprint including EIM entities. Among the alternatives outlined below, Alternative 1 would simply rely on the ISO's and each EIM entity's existing transmission access charges to collect their transmission revenue requirements, and recognize that EIM's function is to dispatch supply resources within the combined real-time market footprint. Alternative 2 would modify this by taking a step toward a regional transmission rate design, by applying a portion of each entity's transmission revenue requirement as a blended EIM TAC.

For purposes of ongoing consideration of potential transmission service rates, this section also outlines additional potential methods for compensation for transmission use of EIM, and presents a preliminary comparison of principles for their consideration:

- Transmission use is currently available through EIM with no incremental charge for real-time transfers between the ISO and EIM entities. This transmission is made available to EIM by rights-holders in EIM entities with existing transmission rates (which have been set without an EIM existing) continuing in place, Ongoing, separate analyses of EIM's

actual benefits have shown that the initial EIM design have indeed produced benefits as expected, and have not revealed operational problems using this transmission rate alternative. Thus, it should be expected that any adoption of an alternative to this existing approach should be premised on demonstrations that the alternative would be superior to this initial rate design.

- Creation of a EIM footprint-wide transmission access charge could alternatively apply to real-time withdrawals in the ISO and EIM footprints,
- A transmission charge could incorporate a shadow price for transfers between the ISO and EIM entity BAAs, similar to a congestion shadow price, or
- To maintain comparable treatment among all ISO market participants (a) without regard for participation in EIM, and (b) without regard for scheduling in the day-ahead versus real-time market, the ISO's transmission access charge could be revised to apply only to load and to wheeling schedules (not to exports from the ISO).

Further details of these alternatives as transmission rate design options are presented in the following subsections. This discussion then reviews the proposal's implementation for the context of the initial EIM entity, i.e., PacifiCorp.

Alternative 1: Reciprocity in Use of Transmission Made Available by Rights-Holders in EIM Entities:

Not charging for EIM use of transmission reflects reciprocity among the ISO and EIM entities by mutually waiving transmission charges between these areas for the optimized energy dispatches that EIM produces. This is the current mechanism during the initial year of EIM operation, or could be a permanent structure based on reciprocity among the BAAs that comprise EIM. The existing transmission rates of the ISO and EIM entities fully recover their transmission revenue requirements from transmission customers, and were not based on an expectation that an EIM would exist. As a result, transmission revenue recovery will be fully compensated by existing transmission rates, without consideration of additional revenues from EIM transfers across the EIM footprint. The first year of EIM provides initial insights using data on actual EIM usage, and continuing to use this approach can allow further consideration of a transmission recovery mechanism in future years without undermining the expected efficient dispatch benefits that are expected under the EIM.

The ISO and transmission service providers in EIM entities[1] will maintain their current transmission access charges during this period, except for energy dispatched within the ISO and EIM footprints. Similarly, transmission operators and transmission service providers within EIM entity BAAs may maintain their existing transmission rates for deliveries within their BAA and for transactions with BAAs that are not EIM entity BAAs. An EIM entity may require that all participating resources within the EIM entity's BAA (including its dynamic transfers or participating resources that bid into the EIM using its interties with non-EIM BAAs) must be transmission customers (long-term or otherwise, at the discretion of its transmission service provider) of a transmission service provider between the participating resource's location and an intertie to another EIM entity. If an EIM participating resource wishes to bid into EIM beyond its existing transmission rights, the transmission service provider may determine whether or not it would be responsible for non-firm transmission service charges, unreserved use charges, or

[1] A transmission service provider within an EIM entity's BAA could either be within the same organization as the EIM entity or be a separate organization. A transmission service provider within an EIM entity may make its transmission available to EIM in either case.

other charges, subject to its OATT provisions. To encourage formation of new EIM entities, an EIM entity is not required to contract for transmission through another EIM entity BAA.

Alternative 2: EIM Transmission Access Charge:

The second approach would extend the principles of the ISO's current transmission rate design, to a consistent design for EIM transmission service. This approach would consider an access charge to load and exports to BAAs that are not EIM entity BAAs, based on the amount of positive demand deviation consumed in real-time. The access charge could be determined based on the ratio of transmission revenue requirement that is associated with incremental real-time demand versus the total amount of demand. For example, if the volume of incremental instructed and uninstructed demand deviations that are settled through EIM (including real-time dispatch within the ISO's BAA) amounts to 10% of total demand in the ISO and EIM BAAs, one approach would be to recover 90% of each transmission provider's revenue requirement through its otherwise applicable transmission rates; the remaining 10% could be pooled into an EIM-wide revenue requirement for recovery from the instructed and uninstructed demand deviations, using a uniform real-time access charge.

To ensure that this approach does not add risk to transmission providers' revenue recovery due to estimation of the future year's EIM volume in each EIM entity's BAA, revenue from the EIM-wide component of the transmission rate would accumulate its revenue in a tracking account, to be credited to the following year's transmission revenue requirement for transmission providers within the EIM entity. The transmission access charge could be a blended access charge for all real-time incremental ISO and EIM demand, or a regional access charge that would apply only to EIM demand within EIM entities while the ISO demand would remain responsible for paying the ISO transmission and wheeling access charges. Under the access charge approach, the EIM transmission charge would be based on real-time demand deviations, and no charge would be incurred for incremental fifteen-minute or five-minute transfers between the ISO and EIM entity BAAs, or among EIM entity BAAs.

This alternative extends the principles established by the ISO's existing transmission access charge. Under FERC goals that include elimination of rate pancaking and the use of single system access charges, the ISO uses a transmission access charge within its controlled grid that uses a two-tiered structure. A single grid-wide "postage stamp" rate recovers the costs of "high voltage" transmission facilities (at or above 200 kV) from all transmission customers (loads and exports), while the individual participating transmission owners recover the transmission revenue requirements of local "low voltage" transmission facilities (below 200 kV) from the customers in their own service areas. Placing responsibility for the access charge on withdrawals from the ISO controlled grid ensures the least-cost dispatch of supply resources, without hurdles between supply resources affecting their dispatch. The high-voltage transmission revenue requirements of all participating transmission owners are merged, and new high-voltage transmission capital investments by participating transmission owners are immediately included in the grid-wide component. Participating transmission owners convert existing contracts and ownership rights to transmission service on the ISO controlled grid, which reduces the transmission capacity that the ISO must reserve for the exercise of within-the-hour scheduling rights, frees the capacity for scheduling by market participants, and reduces congestion costs. This ensures that no transmission customer pays pancaked rates, and provides access and incentives to expand the regional transmission system. The ISO's transmission access charge does not preclude a utility that pays the grid-wide access charge from adopting different retail rate designs within its service area. A transition mechanism applied over a 10-year period from the original utility-specific rates to the single grid-wide rate.

An advantage of Alternative 2 is that it could enable transmission providers or rights-holders to make their transmission available to the EIM even if they are separate companies from the EIM entity itself. While such transmission providers or rights-holders would continue to use their transmission for scheduling or resale prior to the EIM timeframe, they could be assured of recovering transmission revenues for the portion of their capacity that is made available to and used by EIM.

Alternative 3: Transfer Charge as a Minimum Shadow Price:

The third approach would incorporate a transmission charge based on the amount of transfer from one BAA to another. These transfers could be between the ISO and EIM entity BAAs, or from one EIM entity BAA to another EIM entity BAA. A "soft" transmission constraint across EIM entity BAA boundaries would set a minimum shadow price that would be incurred for inter-BAA transfers to occur, or changes in market flows across BAA boundaries could be calculated and allocated somehow as a transmission access charge, despite being dispatched from a broad pool of resources.

By incorporating the transmission cost into the real-time dispatch optimization, LMPs would reflect the cost of transmission. As a result, rather than allocating the cost for use of transmission, costs would be explicitly incorporated into the LMP energy prices that are settled for EIM's incremental energy. However, this approach would impose a constraint on cost-based dispatch among resources in different EIM entities, and would disadvantage suppliers in one EIM entity's BAA from meeting energy needs in a different EIM entity, due to adding a cost for moving energy between BAAs. Indeed, in studies of the potential benefits of EIM implementation, "friction" on transactions between BAAs is modeled in this way, as a "hurdle rate" in base cases as a proxy to represent conditions without an EIM. Also, attempting to allocate transmission revenue requirements through a mechanism that resembles congestion pricing, by depending on the volume of transfers between EIM entity BAAs, may result in over- and under-collections of the transmission revenue requirements.

Alternative 4: Transmission Access Charge Applicable to Load and Wheeling:

Some stakeholder comments have urged that a foundational principle should be non-discriminatory open access to transmission for all market participants, including across different market timeframes: day-ahead versus real-time versus EIM. The goal of non-discriminatory open access is meaningfully applied between market participants who are similarly situated, but participating resources within the ISO and EIM entity's BAA are not similarly situated as resources in BAAs that are not EIM entities and do not operate within the same market rules as EIM entities.

An argument made in comments to support this alternative is that different treatment across market timeframes would encourage shifting market activity into the market with the lower transmission rate, such as transmission access charges applicable to day-ahead scheduling but not for EIM dispatch. This concern may be diminished by the EIM's multi-faceted approach to ensuring resource sufficiency, in which participants in the EIM must start with pre-arranged base schedules and will face financial settlement consequences if their schedules are infeasible or under-scheduled. Because EIM relies on transmission capacity that remains available in real-time, after forward scheduling is complete, the EIM cannot be counted on to provide incremental supply resources for serving load in real-time.

A remaining concern could be that base schedules could be sub-optimal by including expensive generation in order to reduce transmission costs, which would be replaced by optimized EIM dispatches. Within the ISO's BAA, the existing transmission access charge as well as the rate designs of Alternatives 1 and 2 above avoid incentives to selectively schedule supply resources

to avoid transmission charges. Existing transmission rate designs undoubtedly vary between potential EIM entities, but one structure would expect transmission customers who participate in the EIM to have long-term network service, which again can avoid incentives to selectively schedule supply resources to avoid transmission charges.

Whereas Alternative 3 has the disadvantages of applying what is essentially a "hurdle rate" between the ISO and EIM entities, another way to provide equal access to all market participants in the ISO's market across all market timeframes would be to assess the ISO's transmission access charge only to load within the ISO's BAA and to wheeling schedules (which impose transmission costs but would not otherwise contribute to the ISO's transmission revenue requirement), and not to exports on any intertie in any market. (This alternative does not evaluate how this might apply within EIM entities' BAAs.) The ISO's volume of exports is small compared to its loads, so the percentage impact on the ISO's transmission access charge would be limited. In contrast, the intent would be to promote the efficiency of the overall regional market, and avoid any perception of discrimination between market participants.

Example:

The consideration of these alternatives and principles may be facilitated by considering how a dynamic schedule would function between the market operator if these dynamic schedules represent both the energy for hourly or 15-minute intervals, and imbalance energy dispatched in 5-minute intervals and due to deviations in resource output. Assume that an EIM entity has scheduled an import to the ISO prior to the real-time EIM time horizon, which is the initial energy value in its dynamic e-Tag. Through the EIM, changes in demand and resource output result in (a) an increase in the import to the ISO BAA, (b) a decrease in the import, or (c) enough change in the ISO's and EIM entity's real-time deviations from forward schedules where the final flow between BAAs is an export from the ISO. In each of these cases, there is no difference in the incremental cost per MWh imposed by the EIM's transmission usage that appears in the difference between the e-Tag's initial value and final update. Alternatives 1, 2, and 4 above would apply a uniform transmission rate per MWh of the EIM transmission usage in each case. Alternative 2 could also apply a regional transmission rate. However, Alternative 3 does not ensure that the same incremental transmission rate would apply in each case.

4 Flow entitlements for base schedules/day-ahead schedules

Currently the real-time congestion offset is calculated for each EIM BAA based upon the location of the constraint. Real-time congestion offset costs, due to resolving congestion associated with a constraint, are allocated to the EIM BAA in which the constraint is located. Under the current design, each EIM BAA is responsible for resolving congestion in its hourly base schedules (or day-ahead schedules for the ISO) within its BAA prior to the start of the EIM. While flows from other EIM BAA base schedules may cause congestion in another EIM BAA, the other EIM BAA does not need to modify its base schedules to resolve congestion in another EIM BAA. In the event base schedules have unresolved congestion the EIM will re-dispatch resources to resolve the congestion, resulting in real-time congestion offset costs. Flow entitlements would be a settlement mechanism to allocate a portion of an EIM BAA's real-time congestion offset to other EIM BAAs if the other EIM BAA's base schedule flows exceed agreed upon flow entitlements between the EIM BAAs.

Flow entitlements are not easily implemented. The establishment of the flow entitlements must be determined for each selected transmission path either through historical analysis or

negotiation. However, the values calculated from historical analysis or negotiated between EIM BAAs cannot reflect actual system flows for the operating hour because the flow entitlement cannot reflect changes in system flows caused by transmission or generation outages. The difference between the assumed system flows and actual system flows can undermine the objective of establishing flow entitlements because an EIM BAA is exacerbating the real-time congestion offset in another EIM BAA. Therefore, the ISO would only propose flow entitlements if the benefits of more accurate calculation of real-time congestion offset exceeded the complexity and inaccuracies of enforcing constraints to implement flow entitlements when base schedules are determined.

4.1 Planned data analysis

The ISO plans to perform an initial analysis of the impact of PacifiCorp base schedules on the ISO's real-time congestion offset. In the initial months EIM, the market has not enforced all transmission constraints within PacifiCorp East (PACE) or PacifiCorp West (PACW); therefore, the impact of ISO day-ahead schedules cannot be determined. Since flow entitlements would be negotiated for each pair of EIM BAAs, the analysis will calculate the impact on the ISO real-time congestion offset by PACE and PACW separately.

To estimate the PACE impact on the ISO real-time congestion offset, the ISO will perform three steps:

1. Determine the real-time congestion offset amount by ISO constraint for each operating hour.

2. For all resources in PACE, calculate the theoretical impact on the ISO constraint by multiplying the quantity of the resource's imbalance energy by its shift factor relative to the constraint by the shadow price of the constraint.

3. Calculate the actual impact to ISO real-time congestion offset as the minimum of the amounts determined in steps 1 and 2.

The ISO will perform the same analysis for PACW impact on the ISO. With one year of operational data, the analysis can be completed for all combinations of ISO, PACE and PACW.

5 EIM transfer limit congestion treatment

In the fifteen-minute market (FMM) and five-minute real-time dispatch (RTD), the market enforces intertie scheduling limits to ensure energy schedules do not exceed transmission path scheduling limits. Intertie scheduling limits are similarly applied to EIM external interties, EIM internal interties, and intertie scheduling points that share both EIM external interties and EIM internal interties. The ISO also enforces EIM transfer limits to ensure that the EIM transfers are within the transmission capability made available by the EIM entity.

An EIM external intertie is an interface between an EIM BAA and a non-EIM BAA. An EIM internal intertie is an interface between two EIM BAAs, or between an EIM BAA and the ISO. There are two types of EIM internal interties: an interface directly between two EIM BAAs, and an interface which goes through a non-EIM BAA. The first type of EIM internal interties exists

between the ISO and NV Energy (NVE) and between NVE and PACE. Currently, the second type is done between the ISO and PACW.

For the first case, where an interface is directly between two EIM BAAs, the full intertie scheduling limit is available to support EIM transfers in both the FMM and RTD. Stated differently, the total EIM transfer limit and the intertie scheduling limit are the same constraint. No other transactions exist on these interties, except for the energy transfer schedule between the relevant EIM BAAs. For the second case, the intertie scheduling limit is greater than the EIM transfer limit because the EIM entity has only made available transmission to the intertie scheduling point. An EIM transfer must compete with other market transactions within the intertie scheduling constraint in order for the EIM transfer to cross the intertie scheduling point. In addition, the non-EIM BAA may enforce different limits on the amount of incremental change that can occur in the FMM and RTD. This is the case today with PacifiCorp and Bonneville Power Administration (BPA) and the reason the EIM transfer is tagged as both dynamic and static schedules.

Congestion rents are collected on all constraints: intertie scheduling limits, EIM transfer limits, and rate of change constraints. The current design splits congestion rents on EIM transfer limits equally between the two balancing authorities in the EIM footprint. For example, the congestion rents collected on the EIM transfer from PACW to the ISO is split between the two BAAs. However, the EIM transfer from PACW to the ISO must also compete with other market transactions within the intertie scheduling limit. As a result, congestion rents can occur on both the EIM transfer constraint and the intertie scheduling constraint. Since the congestion rents on the EIM transfer are independent of the intertie scheduling limit, splitting congestion rents equally on the EIM transfer constraint is not appropriate.

The ISO proposes the following settlement of real-time congestion rents for intertie scheduling points and EIM transfer constraints for two BAAs in the EIM as follows:

- EIM external intertie:

  100% to the EIM BAA with which the intertie scheduling point is interconnected

- EIM internal intertie where intertie scheduling limit is equal to the total EIM transfer limit:

  50% to each EIM BAA on each side of the EIM internal intertie

- EIM internal intertie where intertie scheduling limit is greater than the total EIM transfer limit:

  100% of congestion revenue due to EIM transfer limit to the EIM entity tagging the EIM transfer

  100% of congestion revenue due to intertie scheduling limit to the EIM BAA managing the intertie scheduling point

In the event that multiple EIM entities submit EIM transfer limits at a single EIM intertie, the congestion rents will be allocated to each BAA in the same manner as above. For example, assume there are three BAAs. BAA #1 manages the intertie scheduling point with a 1,000 MW intertie scheduling limit. BAA #2 has 200 MW of transmission available to reach the intertie scheduling point. BAA #3 has 300 MW of transmission available to reach the intertie scheduling point. The intertie scheduling limit is 1,000 MW and the congestion rents will accrue to BAA #1. The EIM transfer limit submitted by BAA #2 is 200 MW and congestion rents will accrue to BAA #2. The EIM transfer limit submitted by BAA #3 is 300 MW and congestion rents will accrue to BAA #3. The 200 MW energy transfer schedule limit for BAA #2 does not necessarily restrict the EIM transfer from BAA #2; assuming that there is another intertie where energy transfer schedules can be tagged between BAA #2 and BAA #3 up to a 100 MW limit, there can be up to 300 MW energy transfer from BAA #2 to BAA #1: 200 MW directly on the shared intertie using the scheduling rights of BAA #2 and 100 MW wheeling through BAA #3 on the shared intertie using the scheduling rights of BAA #3.

Constraints on the net EIM transfer for a given BAA would normally not be enforced in the market; only constraints on the energy transfer schedules on specific interties would be enforced to observe the relevant scheduling limits. Nevertheless, the net EIM transfer may be constrained under the following specific scenarios:

a) The BAA is in contingency; in which case the net EIM transfer is constrained to its last optimal schedule to isolate the BAA from the rest of the EIM area while the BAA operator responds to the contingency event.

b) The BAA has failed the flexible ramp sufficiency test, in which case the net EIM transfer is constrained from below (in the import direction) to the optimal 15 min schedule from the FMM for the last 15 min interval before the start of the operating hour to isolate the BAA during that hour.

c) The BAA (only applicable to EIM BAAs) has requested isolation or has initiated separation from the EIM Area.

Constraining the net EIM transfer does not prevent energy transfer wheeling through it. In these scenarios when the net EIM transfer constraint for a BAA is binding, the associated congestion revenues are distributed 100% to that BAA.

6 Dynamic competitive assessment for market power mitigation of EIM transfer limits

In the EIM Go-Live Enhancements initiative, the ISO committed to explore additional dynamic triggers for the inclusion of EIM transfer constraints into the EIM area in the market power mitigation process. A potential example contemplated was if EIM transfer capability into an EIM area exceeds the historical imbalance needs of the EIM BAA. In those hours, the constrained EIM transfers could be excluded from the market power mitigation process. However, if an EIM entity fails the resource sufficiency evaluation, incremental EIM transfers are not allowed in that

operating hour. As a result, the assumption that EIM transfer capability will exceed historical imbalance needs cannot be assumed.

The ISO proposes no modifications to the existing market power mitigation process. EIM transfer limits into an EIM BAA are internal constraints. They are constraints into areas that cannot be characterized as structurally competitive. Therefore, the ISO does not believe these constraints should be treated differently than any other internal constraint with regard to market power mitigation. The ISO proposes that, as with all internal constraints within the ISO and within the EIM BAA, EIM transfer limits continue to be tested for competitiveness when the constraint is binding.

7 Bidding rules on external EIM interties

Under the current EIM design, the EIM entity determines the rules for participation of resources located within its BAA. This includes imports and exports on external interfaces with non-EIM BAAs. 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 shown in the example 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.

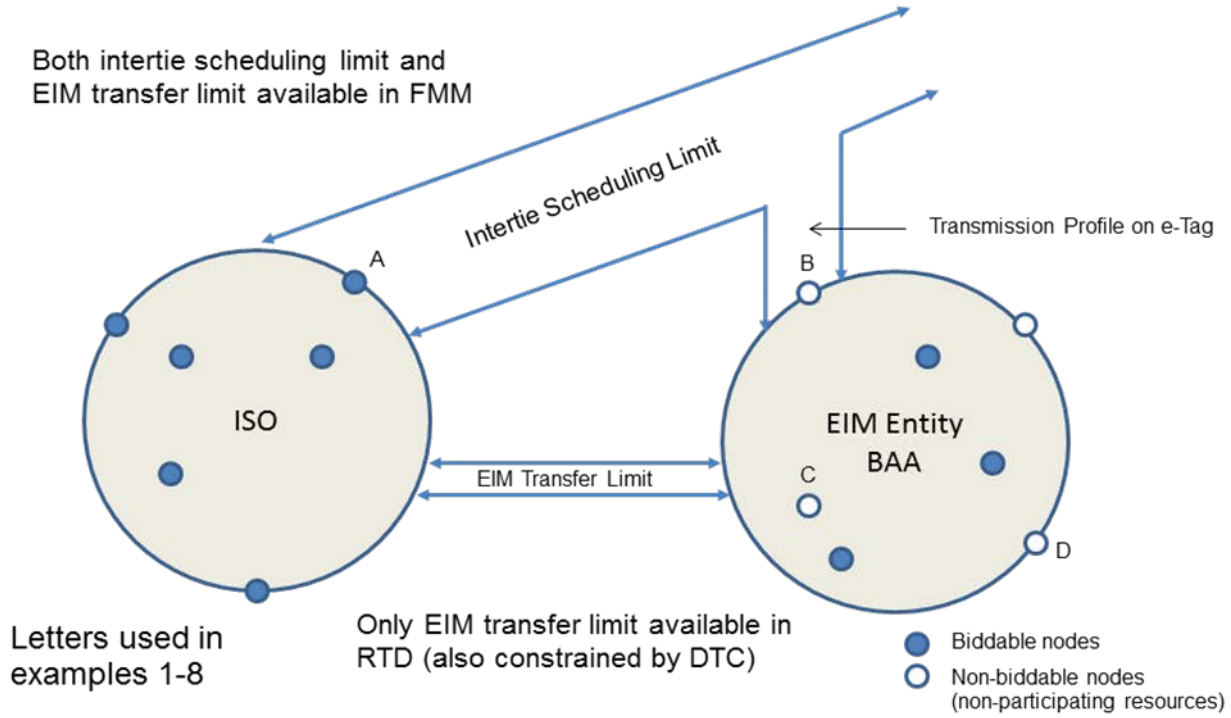

Figure 1 - Example of Modeled Nodes Within the EIM Area

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 that 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 is settled at FMM LMP. If the ISO is told after start of FMM optimization, the deviation from base schedule is 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 BAA 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 BAA 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 to ISO prior to FMM
- EIM entity BAA 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 BAA 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 to ISO prior to FMM
- EIM entity BAA 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 BAA 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 BAA

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 to ISO prior to FMM
- EIM entity BAA 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 BAA 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 to ISO prior to FMM
- EIM entity BAA 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 BAA 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 BAA

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 to ISO prior to FMM
- EIM entity BAA 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 BAA 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 to ISO prior to FMM
- EIM entity BAA 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 BAA 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 to ISO prior to FMM
- EIM entity BAA 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 Eetity import (D) paid FMM LMP at its intertie scheduling point
- EIM entity BAA 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 BAA. This would improve the quality of the FMM market solution versus resolving any unforeseen congestion impact in RTD. In addition, if transmission customers allow counterflows on EIM base schedules with the ISO within the EIM, making this transmission capacity available to support EIM transfers can increase benefits.

The ISO included fifteen-minute intertie bidding in Phase 2 to allow additional discussion with stakeholders. PacifiCorp and NV Energy both have chosen not to allow fifteen-minute intertie bidding on their EIM external interties initially and have expressed a willingness to consider allowing intertie bidding at a later date. The ISO believes that allowing economic bidding on EIM external interties would increase market liquidity in the FMM. The ISO is considering if the EIM entity should maintain discretion to allow or disallow FMM economic participating on EIM external interties given the interaction between BAAs. Some EIM entities have expressed operational concerns with being required to allow intertie bidding when the EIM entity initially begins operating in the EIM. Given these concerns, the ISO would not propose to require intertie bidding initially, but believes after one year of operational experience that intertie bidding should be enabled by the EIM entity.

8 Additional items identified during implementation

8.1 Compensation for third party transmission owner to support incremental EIM transfers

During Phase 1, the ISO modified how EIM transfer limits are implemented. The EIM transfer limit ensures that imbalance energy moved between EIM BAAs is within the transmission capability made available to the EIM. As more BAAs join the EIM, the transfer limits must be considered separately for each intertie scheduling point, not in aggregate for a given BAA. The design change allows for multiple transmission providers to offer available transmission capacity to maximize the EIM transfers between EIM BAAs or through non-EIM BAAs.

Since there will potentially be multiple intertie scheduling paths on which EIM transfers can be scheduled, the ISO included a transfer cost, anticipated to be at most a few cents per MWh, in the market optimization to enable the market to select the most direct path. In addition, the transfer cost can also be used to maximize the efficiency of the EIM transfer capability made available through intertie schedules. The ISO, as the market operator, will determine the appropriate level of the transfer cost. If an EIM entity has multiple intertie schedules that can account for transfers, the ISO will consult with the entity to determine the appropriate transfer costs to maximize the use of the transmission made available to the EIM. This transfer cost included in the market optimization will not be explicitly settled.

The ISO believes that the EIM transfer limit approach could be expanded to allow third party transmission owners to make available incremental transmission to support transfers. The incremental transmission would increase the transfer capability between BAAs in the EIM footprint. The incremental transmission made available most likely would be through non-EIM BAAs, but the ISO seeks stakeholder comments on allowing this process to be used within an EIM entity. However, this feature could not be used to avoid the current reciprocity of not

charging for transmission that supports EIM transfers. Unlike the minimal transfer cost to schedule the most direct path, this transfer cost would be settled. For example, assume a non-EIM BAA would allow transfers to occur through its system if there is unused transmission in the non-EIM BAA and the EIM would use this transmission at an agreed to rate, such as the non-firm transmission rate. The ISO would then set the transfer cost of the EIM transfer schedule, in this case, equal to the non-firm transmission rate. The market optimization would then use this EIM transfer schedule for tagging the transfer if the benefits of the dispatch exceeded the transfer cost. The transfer cost would then be collected from the market and paid to the non-EIM BAA.

This issue may be related to the transmission rate options discussed in section 3. For example, if an EIM transmission access charge was adopted to replace the current reciprocity principle, the compensation to third party transmission owners could perhaps be incorporated in the EIM transmission access charge.

8.2 Outage Reporting to Peak Reliability Coordinator (RC)

Currently, an EIM entity must use the ISO Outage Management System (OMS) to enter approved outages within its BAA. Each BAA is responsible for submitting outage information into the Peak Reliability Coordinator (RC) outage application. It is current practice for smaller balancing authorities, to input outage information directly into the Peak RC system which eliminates the need for a separate outage application designed by the balancing authority. The ISO proposes to allow the EIM entity to permit the ISO to submit outage information the entity has entered into OMS to Peak RC. This proposal, similar to the current Base Schedule Aggregation Portal (BSAP), would eliminate the need for the balancing authority to develop its own outage application. The proposal would not change the reliability responsibilities of the EIM entity.

9 Next Steps

The ISO plans to discuss this draft final proposal with stakeholders during a stakeholder conference call to be held on July 8th. The ISO requests comments from stakeholders on the proposed market design changes described in this issue paper and straw proposal. Stakeholders should submit written comments by July 22nd to EIM@caiso.com.