



Consolidated EIM Initiatives

from 2017 Roadmap

Draft Final Proposal

September 5, 2017

Consolidated EIM Initiatives Draft Final Proposal

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1. Purpose

The purpose of the Consolidated EIM Initiatives effort is to combine energy imbalance market (EIM) related items from the 2017 roadmap into one initiative. This consolidation will facilitate the stakeholder process and make efficient use of resources.

Originally, the initiative contained three items that were presented in the Issue Paper:

- Third party transmission contribution
- Management of bilateral schedule changes
- Equitable sharing of wheeling benefits

Additionally, new functionalities are being developed for the ISO 2017 Winter Release that will also affect the EIM. These functionalities require tariff changes and will be available to benefit all EIM BAAs as well as the ISO BAA. Hence, these items were introduced in the Consolidated EIM Initiatives Straw Proposal:

- Automated matching of import/export schedule changes with a single EIM non-participating resource
- Automated mirror system resources at ISO intertie scheduling points
- Base EIM transfer system resource imbalance settlement
- Leverage new non-generator resource (NGR) modeling functionality
- Allow submission of base generation distribution factors (GDFs) for aggregated EIM non-participating resources

Based on stakeholder feedback from the Issue Paper and Straw Proposal, the ISO decided to remove the 2017 roadmap items from scope of the initiative. This Draft Final Proposal describes the reasons for the scope changes and gives additional information regarding the new EIM functionalities.

2. Stakeholder Engagement and EIM Governing Body Role

Stakeholder input is essential for successful policy development. The Consolidated EIM Initiatives stakeholder process shapes market design, policy and Tariff changes through a series of proposals, meetings and written stakeholder comments.

Table 1 lists the planned schedule for the Consolidated EIM Initiatives stakeholder process.

Table 1: Schedule for Consolidated EIM Initiatives Stakeholder Process

Item	Date
Post Draft Final Proposal	September 5, 2017
Stakeholder Conference Call	September 12, 2017
Stakeholder Comments Due	September 22, 2017
EIM Governing Body Meeting	October 10, 2017
Board of Governors Meeting	November 1-2, 2017

The ISO is committed to providing ample opportunity for stakeholder input into its market design, policy development, and implementation activities. The ISO requests stakeholders to submit written comments to InitiativeComments@caiso.com.

2.1. EIM Governing Body Role

This policy initiative involves market rules changes that fall within the EIM governing body's primary authority and advisory authority.

The EIM Governing Body will have primary authority in approving the policy resulting from the following EIM functionalities:

- Automated matching of import/export schedule changes with a single EIM non-participating resource
- Automated mirror system resources at ISO intertie scheduling points
- Base EIM transfer system resource imbalance settlement
- Allow submission of base generation distribution factors (GDFs) for aggregated EIM non-participating resources

The EIM Governing Body will have advisory authority in approving the policy resulting from the following EIM functionality:

- Leverage new non-generator resource (NGR) modeling functionality

3. Resources

3.1. Energy Imbalance Market Resources

The EIM is a real-time market used to economically dispatch 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.

This initiative assumes a basic understanding on the EIM design, which went live on November 1, 2014. Review the EIM Draft Final Proposal and the EIM Year 1 Enhancements for additional information on the EIM design including: definitions, policy decisions, and descriptions of EIM design components. The EIM Draft Final Proposal and EIM Year 1 Enhancements are posted at:

Energy Imbalance Market Draft Final Proposal:

<https://www.westerneim.com/Documents/EnergyImbalanceMarket-DraftFinalProposal092313.pdf>

Energy Imbalance Market Year 1 Enhancements:

https://www.westerneim.com/Documents/DraftFinalProposal_EnergyImbalanceMarketYear1Enhancements.pdf

3.2. Consolidated EIM Initiatives Resources

The Consolidated EIM Initiatives Issue Paper and Straw Proposal outline the issues and proposals for this initiative. They are critical in understanding the scope for this Draft Final Proposal. The papers can be referenced at the following links:

Consolidated EIM Initiatives Issue Paper:

http://www.caiso.com/Documents/IssuePaper-ConsolidatedEnergyImbalanceMarketInitiatives_Updated.pdf

Consolidated EIM Initiatives Straw Proposal:

<http://www.caiso.com/Documents/StrawProposal-ConsolidatedEnergyImbalanceMarketInitiatives.pdf>

The EIM Enhancements Winter 2017 Business Requirements Specification (BRS) lists the business rules needed to implement the new EIM functionalities. This document includes details regarding the business process impacts and business requirements. The BRS can be referenced at the following link:

EIM Enhancements Winter 2017 BRS:

<http://www.caiso.com/Documents/BusinessRequirementsSpecification-EIMWinter2017Enhancements.pdf>

4. Scope Changes

4.1. Third Party Transmission Contribution – Removed from Scope in the straw proposal

The intent of this initiative was to allow third party transmission owners¹ to contribute transmission capacity located between two EIM BAAs for use in the EIM. It was originally believed this would benefit EIM and non-EIM entities. EIM entities would benefit due to increased energy transfer throughout the EIM area, while non-EIM entities that contributed transmission capacity would be eligible to receive congestion revenues. This functionality would result in a financial benefit when the contributed transmission capacity is used and valuable.

The Issue Paper proposed that third parties would receive congestion rents only for the transmission contribution; other payment types are outside the scope of what the ISO is considering. However, stakeholder comments indicated congestion rents may not be adequate compensation. Specifically, a transmission contribution would increase the amount of capacity between EIM BAAs and therefore reduce the likelihood that congestion would occur. Without congestion, there would be no financial benefit for the transmission contribution.

Additionally, stakeholders did not believe this functionality would be widely used. Concerns were expressed that the implementation cost would outweigh the financial benefit. Therefore, stakeholders stated that pursuing this initiative would be an inefficient allocation of ISO resources.

Based on stakeholder feedback, the ISO removed the Third Party Transmission Contribution from the scope of this initiative in the Straw Proposal. Stakeholder feedback agreed with the decision to remove this item from the scope of the initiative.

Implementation of this functionality at a later date may be a solution to help address concerns regarding compensation for net wheeling. For example, an EIM Entity supporting wheeling transactions could change their OATT to limit transmission available for use in the EIM to only support their own BAA's imports/exports. Additional transmission capacity could be purchased and donated back into the EIM by another entity. This would enable the intermediary BAA to receive payment for the transmission capacity supporting the wheel and the entity who donated the transmission capacity would be eligible to receive congestion revenues.

Also, the EIM transfer cost could be leveraged to address stakeholders requests to allow contribution of transmission, but at a minimum cost. Currently the EIM transfer cost is set at \$0.001. Its purpose is to ensure the most direct ETSR path is used for accounting for EIM transfers minimizing the number of e-Tags that must be updated. If the entity contributing the transmission had an approved transmission rate for the contribution service, the ISO could

¹ The term "transmission owner" is broadly defined as any entity holding firm transmission rights. This may be direct ownership or contract rights.

include this cost as the EIM transfer cost. These ETSRs would only be scheduled after all other ETSRs are exhausted.

The ISO will move the Third Party Transmission Contribution to the Stakeholder Initiatives Catalog so it can be considered at a later date based on prioritization. The Annual policy initiatives roadmap process can be found at the following link:

Annual policy initiatives roadmap process:

<http://www.caiso.com/informed/Pages/StakeholderProcesses/AnnualPolicyInitiativesRoadmapProcess.aspx>

4.2. Management of Bilateral Schedule Changes – Removed from Scope in the draft final proposal

Management of bilateral schedule changes was proposed to allow market participants better opportunity to hedge transactions after the EIM entities' base schedule submission deadline. The ISO proposed to leverage the current wheel through functionality to economically determine bilateral schedule changes that source in the EIM area or wheel across the EIM area. This would allow market participants with potential bilateral transactions to express a bid price at which the balanced source/sink pair would result in a schedule change.

Stakeholders commented that the ISO can address part of this issue by improving the ISO market timelines. This would enable EIM entities to move their base schedule deadline (currently T-57) closer to the NAESB e-Tagging timeline of T-20. However, the EIM will still initiate prior to the e-tagging deadline. As a result, any remaining imbalance settlement concerns will need to be managed by EIM entity business practices or changes to the OATT settlement of wheel schedule changes.

Stakeholder feedback proposed it is unnecessary to move forward with this initiative and therefore it has been removed from scope. The ISO outlined detailed examples in the Straw Proposal explaining how EIM entities can manage bilateral schedule changes through their OATTs and business practices.

4.3. Equitable Sharing of Wheeling Benefits – Removed from Scope in the draft final proposal

Under the current EIM design each EIM entity is responsible for its own transmission cost recovery through its OATT. EIM entities benefit from the reciprocal benefits provided by the transmission made available to the EIM. The purpose of this initiative is to investigate equitable sharing of benefits when an EIM transfer wheels through an EIM BAA.

The ISO identified a potential inequity resulting from the amount of wheeling transactions that occur throughout the EIM area. Said differently, some EIM entities experience more net wheeling than others relative to EIM transfers that sink or source within the EIM BAA.

The ISO suggested two solutions in the Straw Proposal to allow benefits to be more evenly dispersed throughout the EIM. The first option (1) is an ex-post payment based on the amount of net wheeling that occurs. The second option (2) is a rate that can be incorporated into the market and therefore allow market competition while providing compensation for net wheeling.

Stakeholders generally opposed implementation of either option. Stakeholders recognized that although net wheeling occurs throughout the EIM footprint, all EIM Entities are currently have more EIM transfers in and EIM transfers out than wheeling. Transfers in and transfers out are a direct economic benefit to the EIM BAA; therefore all EIM Entities are benefiting more than they are facilitating wheels. This item has therefore been removed from scope.

In order to address all stakeholder concerns, the ISO is committing to monitor net wheeling as the EIM footprint expands. Net wheeling data will be included in in the EIM quarterly benefits report going forward.

Quarterly Benefits Reports:

<https://www.westerneim.com/Pages/About/QuarterlyBenefits.aspx>

Additionally, Equitable Sharing of Wheeling Benefits will be included in the Stakeholder Initiatives Catalog so it can be considered at a later date if merited. The annual policy initiatives roadmap process can be found at the following link:

Annual policy initiatives roadmap process:

<http://www.caiso.com/informed/Pages/StakeholderProcesses/AnnualPolicyInitiativesRoadmapProcess.aspx>

4.4. EIM Enhancements Winter 2017

The ISO is currently developing new EIM functionalities that will be implemented in the Winter of 2017. These enhancements will be available to all EIM Entities² and are intended to automate manual processes and facilitate operation of the EIM. The Straw Proposal presented an overview of the functionalities. Additionally, the EIM Enhancements Winter 2017 BRS includes specific details including business rules.

This Draft Final Proposal will highlight benefits and provide an overview of each functionality. Participants are encouraged to review the BRS for specific details.

EIM Enhancements Winter 2017 BRS:

<http://www.caiso.com/Documents/BusinessRequirementsSpecification-EIMWinter2017Enhancements.pdf>

² The Non-Generator Resource modeling functionality is also available to Scheduling Coordinators.

5. Policy for EIM Enhancements Winter 2017

The ISO has identified several EIM design enhancements that will be available to all EIM entities when implemented in the Winter of 2017. The new Non-Generator Resource modeling functionality (section 5.4) is available to all Scheduling Coordinators. These enhancements are intended to facilitate and automate manual processes making it easier for entities to participate in the EIM. Tariff revisions are required to support these enhancements for all EIM entities.³

5.1. Automated Matching of Import/Export Schedule Changes with a Single EIM Non-Participating Resource

This functionality allows the ISO to automatically adjust a single EIM non-participating resource (NPR) schedule in an EIM BAA to match import or export schedule change after T-40. This will enable an automatic adjustment to replace a manual dispatch and still maintain the available bid range for use in the EIM dispatch. The intent of this enhancement is to provide EIM BAAs another tool to manage known imbalance and resolve it ahead of time so they have maximum control of what energy is made available for the real-time dispatch.

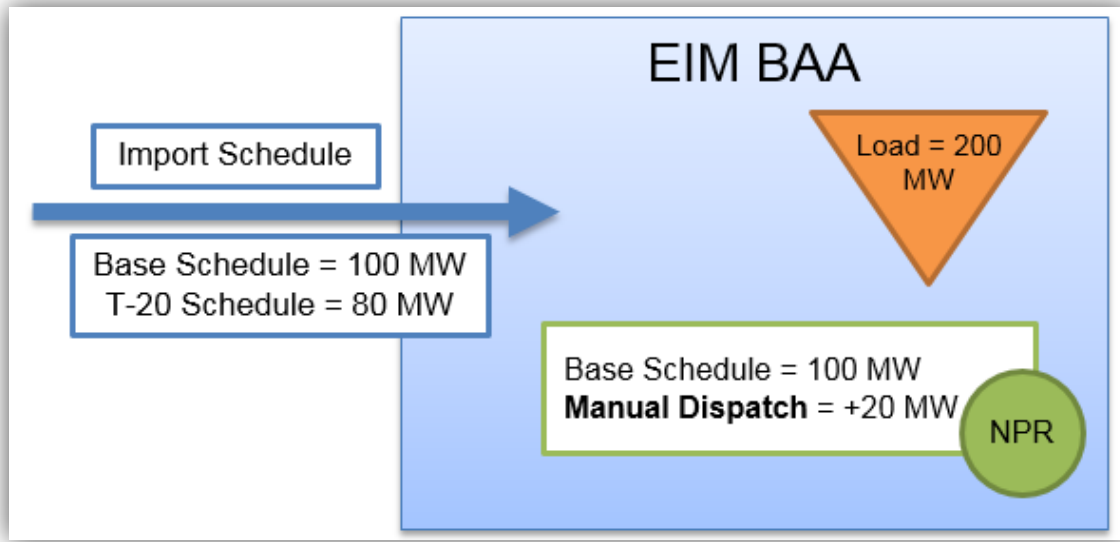
There are currently two solutions to solve imbalance if a schedule change occurs after T-40. The first solution (1) is for the BAA Operator to manually dispatch a generator internal to the EIM BAA to resolve the imbalance. This a manual process and therefore takes time and may be prone to error. However, the manual dispatch will maintain the available bid stack for use in the real time energy imbalance market. The second solution (2) is for the EIM entity to allow the market to resolve the imbalance by using the available bid stack. This results in less energy available for use in the real time energy imbalance market. It is the choice of each EIM entity to determine which approach to use.

The new functionality will provide an alternate solution and tool to resolve a schedule change. The EIM entity will now be able to utilize a third solution (3) of allowing a non-participating resource's (NPR's) schedule to automatically adjust when an intertie schedule change occurs.

The example shown below demonstrates the current practice of issuing a manual dispatch instruction (Figure 1) to the EIM non-participating resource. If imports to an EIM entity BAA decrease after T-40 by 20 MW, the EIM BAA operator will need to manually dispatch (as shown in the example) or allow the market software to solve the imbalance.

³ The Powerex implementation agreement included a principle that would exempt transactions wholly outside the US from the EIM administrative charge. This feature is not generally applicable to EIM entities so the ISO intends to support this functionality through FERC acceptance of a participation agreement. See CAISO Transmittal Letter and Answer in FERC Docket No. ER17-1796-000 (explaining that the ISO will separately submit for FERC acceptance participation agreements in support of the Powerex implementation).

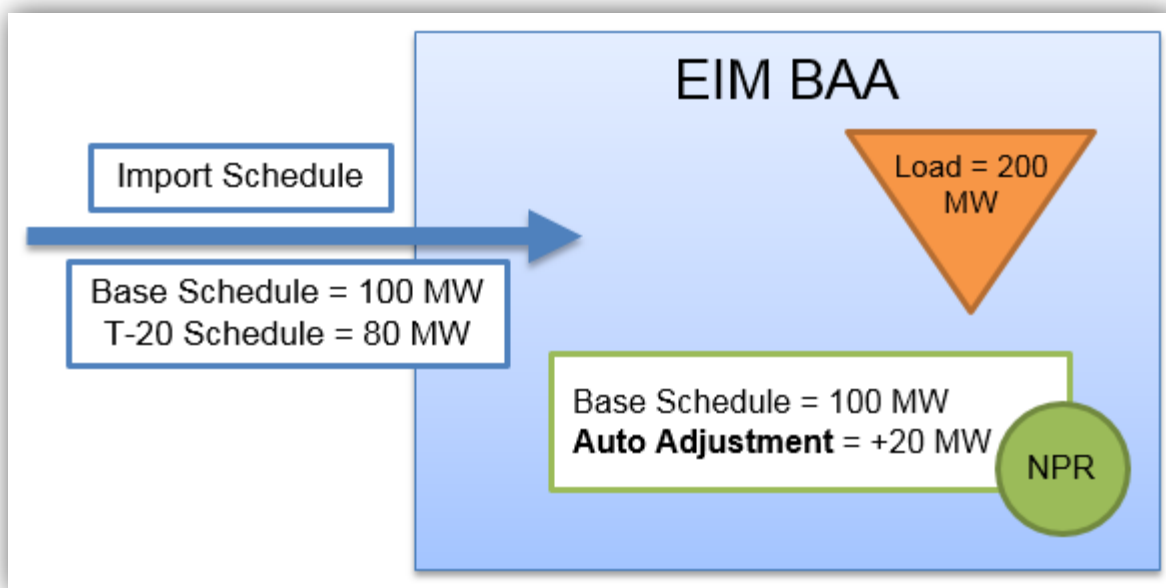
Figure 1: Manual Dispatch required to balance the import base schedule change after T-40.



As shown in Figure 1, 200 MW of load in the EIM BAA was balanced by 100 MW from the NPR plus 100 MW from an import schedule. However, by T-20 the import schedule changed to 80 MW. The EIM BAA operator balanced the 20 MW shortage by manually dispatching the NPR an incremental amount of 20 MW. This is a manual process that must be completed by the operator.

The automatic adjustment (Figure 2) duplicates the same result as the manual dispatch but requires no manual action, occurs instantaneously, and removes the potential of manual error.

Figure 2: Automatic adjustment will change NPR schedule to balance the import base schedule change that occurred after T-40.



As shown in Figure 2, the NPR schedule is still adjusted automatically by an incremental amount of 20 MW to balance the base schedule change that occurred after T -40. However, in this example the adjustment occurred automatically without the need for a manual dispatch. The settlement in both examples is the same: buy 20 MW at the import locational marginal price (LMP) and sell 20 MW at the NPR LMP.

This purpose of this enhancement is to facilitate the management of changes to base schedules that represent bilateral contracts outside the EIM. For this reason, it is limited to EIM non-participating resources such as system resources, including base energy transfer system resources (Base ETSRs).

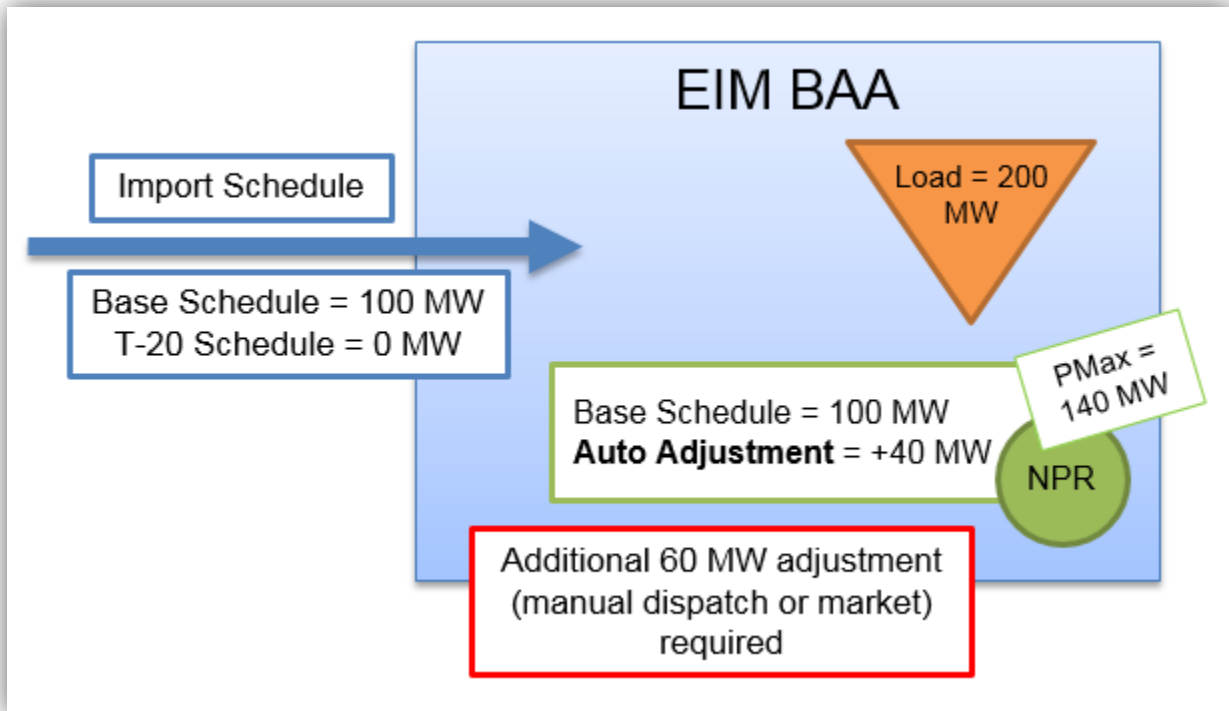
Additionally, the NPR will need to be exempt from the hourly block schedule error that is included in the resources sufficiency evaluation⁴. The reason for this exemption is because no bid range is used from participating resources to resolve the imbalance created by the schedule change. This will benefit EIM Entities because the NPR will automatically adjust for deviations in intertie schedules instead of needing the market to make adjustments. This exemption, however, does not eliminate participants from receiving the imbalance settlement as shown in Figure 1 and Figure 2.

The ISO proposes to allow EIM Entities to select a NPR that will be used for this functionality. This enables the entity to select a generator that has ramping capacity and characteristics that will be the most beneficial and economic. The market will automatically use the NPR schedule for auto-balancing to the extent that the generator is available. Beyond that point, the market will re-dispatch available participating resources. Additionally, the EIM BAA operator always has the option to send a manual dispatch.

An example of the auto adjustment up to the limitation of the unit can be seen in Figure 3. The NPR in Figure 3 has a PMax of 140 MW. Therefore, if the NPR base schedule is set to 100 MW it can only be adjusted up 40 MW so the PMax is not exceeded.

⁴ For more information about the schedule error that is included in the resources sufficiency evaluation, reference Section 7 of the EIM Year 1 Enhancements Draft Final Proposal: https://www.westerneim.com/Documents/DraftFinalProposal_EnergyImbalanceMarketYear1Enhancements.pdf

Figure 3: Auto-adjustment cannot exceed limitations of the associated NPR.



As shown in Figure 3, the NPR did not have the capability to accommodate the entire schedule change. Therefore, the schedule was auto adjusted to the unit's PMax and the remaining imbalance can be managed by a manual dispatch or the market.

If limitations of the NPR do not allow for the entire schedule change to be balanced, the market will still need to solve for the imbalance. This can be done by manual dispatch or by the market. If the market solves for the imbalance, the resources moved as a result of the imbalance are still required to be in the resource sufficiency test.

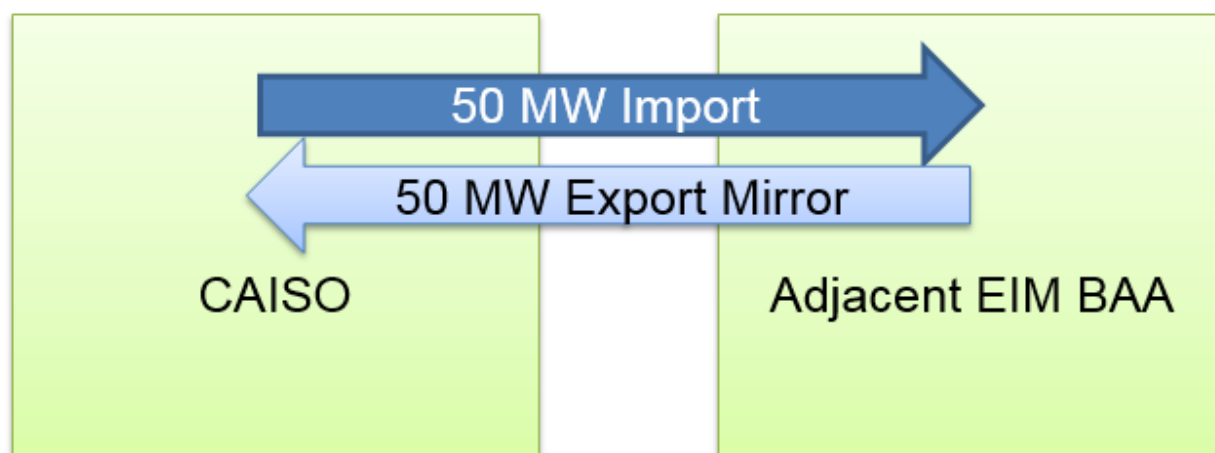
This functionality will be implemented in two phases. The Phase 1 (implemented Winter 2017) will allow for only one NPR to be paired to an intertie schedule changes. Phase 2 (implementation targeted for Fall 2018) will allow for multiple NPR and intertie schedule change pairs. This will enable EIM Entities to use their most efficient resources to auto-match intertie schedule changes when the change occurs after T-40. EIM entities can utilize this enhancement as a tool to preserve their bid range from participating resources to support EIM transfers rather than balancing a bilateral trade outside of the EIM.

5.2. Automated Mirror System Resources at ISO Intertie Scheduling Points

This new functionality was requested by EIM participants and will facilitate the automation of mirror system resources at ISO intertie scheduling points.

Mirror system resources are used to mirror import/export schedules between the ISO and an EIM entity at ISO intertie scheduling points. This allows the market to solve for both the California ISO and adjacent EIM BAAs simultaneously. For example, a 50 MW import to NEVP would be mirrored with a 50 MW export from CAISO.

Figure 4: 50 MW import to an EIM BAA and its corresponding 50 MW mirror export schedule at an ISO Intertie scheduling point.



Schedules clear through the ISO's market processes such as the day ahead market, the fifteen minute market, and the real-time dispatch. EIM entities are responsible for mirroring these schedules by submitting base schedules for their designated mirror system resources. Additionally, the EIM entity must adjust the mirror schedules for changes made to base schedules after T-40.

This enhancement will automate the mirroring of import/export schedule changes after T-40 that occur at ISO intertie scheduling points. The functionality is limited to mirroring ISO import/export schedules from registered system resources; ISO intertie transactions must still be mirrored manually via different mirror system resources.

The auto-mirroring functionality can be combined with the auto-matching functionality described in the previous section. An automated mirror system resource can be auto-matched to the non-participating resource used for that purpose. The automated mirror system resource must only

be mirroring ISO import/export self-schedules because bids must clear in the EIM and cannot be auto-matched.⁵

5.3. Base EIM Transfer System Resource Imbalance Settlement

Currently, the ISO models bilateral transactions between EIM entities using base energy transfer system resources (Base ETSRs). The EIM entity registers a minimum of two base ETSRs (one in the import direction and one in the export direction) to model bilateral activity with each counterparty EIM entity. Currently, the ISO does not settle Base ETSR schedule changes. This enhancement will provide EIM entities with settlement information for Base ETSRs schedule changes. The data will allow EIM entities to determine the point of delivery of the Base ETSR and therefore the LMP used for settlement between the two EIM entities will be known. The ISO will not require EIM Entities to use this data but it may help facilitate settlement of bilateral transactions in the EIM area.

5.4. Leveraging New Non-Generator Resource (NGR) Modeling Functionality

The ISO recently developed non-generator resource (NGR) modeling functionality to allow a resource to reduce output without having a forward energy schedule.⁶ This new functionality will be available to all Scheduling Coordinators and enables the modeling of individual or aggregated EIM participating and EIM non-participating resources. Currently, if an NGR aggregate is operating at 0 MW, the dispatch cannot decrease to a negative output even if the aggregate has storage capabilities. With this enhancement, the aggregated resource can have a base schedule equal to zero and still be able to receive a dispatch instruction to reduce output.

The modeling functionality will not enforce a state of charge constraint that is used by storage resources in the ISO's market today. Resources utilizing this function will have a continuous operating range from negative to positive injection, and none of the costs normally associated with resource management including start-up cost, start up time, minimum up time, minimum down time, or forbidden operating regions. In addition, these resources will be subject to local market power mitigation (LMPM) and can use any of the methods under the ISO's tariff to

⁵ If a self-schedule change is submitted, then the market will most likely accept the schedule change. An economic bid schedule change, on the other hand, is not guaranteed to be accepted. Therefore, only self-schedules can be used for auto-mirroring since they will clear in the market.

⁶ A full description of the NGR enhancements can be found in Section 6.2 of the Energy Storage Distributed Energy Resources (ESDER) Phase 2 Draft Final Proposal: http://www.caiso.com/Documents/DraftFinalProposal-EnergyStorage_DistributedEnergyResourcesPhase2.pdf

establish a default energy bid. Under the initial implementation, generic NGR will not be able to provide Resource Adequacy (RA). The existing dynamic competitive path assessment (DCPA) and LMPM methodologies will apply to the Generic NGR model considering it an algebraic injection. The energy bid of a resource modeled via the Generic NGR model will be subject to mitigation above the competitive LMP at its location.⁷

In addition to aggregated and individual resources, the NGR modeling functionality will be available for use on interties to support regulation down. For example, an intertie resource without a forward energy schedule will be able to provide regulation down to the ISO.

5.5. Allow submission of Base Generation Distribution Factors (GDFs) for aggregated EIM Non-Participating Resources

This enhancement will support base generation distribution factor (GDF) submission for aggregate EIM non-participating resources through the submission of base schedules. The market will distribute the base schedule and any imbalances of aggregate EIM non-participating resources using the submitted base GDFs, if available, or otherwise the registered default base GDFs for the resource in the Master File, normalized for outages. The base GDFs will be used to calculate the aggregate LMP for the aggregate EIM non-participating resource, as usual.

The implementation of this enhancement is critical to accurate modeling on an hourly basis and will enable the market to continue running efficiently and economically. Currently this feature is only supported for participating resources submitted via bids.

6. Next Steps

The ISO will discuss this Draft Final Proposal during the stakeholder conference call on September 12th. The ISO requests written comments from stakeholders; comments should be submitted by September 22nd to InitiativeComments@caiso.com.

⁷ Additional details can be found in the EIM Enhancements Winter 2017 BRS Section 5.1, requirements EIMWNT17_BRQ161 – EIMWNT17_BRA165 (pages 15 – 17) and EIMWNT17_BRQ321 - EIMWNT17_BRQ325 (pages 25 – 26).