



Consolidated EIM Initiatives from 2017 Roadmap

Issue Paper

June 27, 2017

Consolidated EIM Initiatives Issue Paper

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Revision History

Date	Revision
6/13/2016	Initial Release
6/27/2016	Updated example in Section 3.3 to show that net settlement resulting in a charge can occur when a curtailment is made.

1 Introduction

The Energy Imbalance Market (EIM) is a real-time market used 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 Consolidated EIM Initiatives is from the 2017 roadmap and addresses the following:

1.1 Third Party Transmission Contribution

Third party transmission owners have expressed interest in making available transmission capacity located between two EIM BAAs for use in the EIM markets. This initiative will benefit EIM Entities by allowing increased energy transfer throughout the EIM footprint. Current functionality enables collection of congestion revenues which are returned to EIM entities through the real-time congestion offset (RTCO). The congestion revenues associated with EIM transfer limits could similarly apply to third party transmission providers resulting in a financial benefit when the transmission capacity made available is used and valuable.

1.2 Management of Bilateral Schedule Changes

This initiative will investigate if the ISO's current wheeling through functionality can be used to manage bilateral schedule changes that source in the EIM footprint or wheel across the EIM footprint. This will 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.

1.3 Net Wheeling Charge

Reciprocity is fundamental to the EIM design and results in energy transfer being provided across EIM BAAs with no hurdle rate. Each EIM Entity is responsible for their own transmission cost recovery through their OATT. This initiative will investigate equitable sharing of benefits when an EIM transfer wheels through an EIM BAA.

2 Plan for Stakeholder Engagement

Stakeholder input is essential for successful policy development. The Consolidated EIM Initiatives stakeholder process will shape the market design and policies through a series of proposals, meetings and written stakeholder comments. Stakeholders should submit comments to InitiativeComments@caiso.com. Table 1 below lists the planned schedule for the Consolidated EIM Initiatives stakeholder process.

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

2.1 EIM Governing Body Role

This policy initiative involves market rules changes that fall entirely within the EIM governing body's primary authority. The EIM Governing Body will have primary authority in approving the policy resulting from this initiative.

2.2 Schedule

Item	Date
Post Issue Paper	June 13, 2017
Stakeholder Conference Call	June 20, 2017
Stakeholder Comments Due	June 30, 2017
Post Straw Proposal	July 27, 2017
Stakeholder Meeting	August 3, 2017
Stakeholder Comments Due	August 15, 2017
Post Draft Final Proposal	August 29, 2017
Stakeholder Conference Call	September 5, 2017
Stakeholder Comments Due	September 12, 2017
EIM Governing Body Meeting	October 10, 2017
Board of Governors Meeting	November 1-2, 2017

Table 1: Schedule for Consolidated EIM Initiatives Stakeholder Process

2.3 Background Information

This initiative assumes a basic understanding on the EIM design which went live on November 1, 2014. Please review the EIM Draft Final Proposal and the EIM Year 1 Enhancements 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 and EIM Year 1 Enhancements are posted at:

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

<http://www.caiso.com/informed/Pages/StakeholderProcesses/CompletedStakeholderProcesses/EnergyImbalanceMarketYear1Enhancements.aspx>

3 Third Party Transmission Contribution

3.1 Description

The overall financial benefit of the Energy Imbalance Market increases with additional transfer capacity across interties between balancing authorities in the EIM area. By increasing the transmission capacity to support EIM transfers, the benefits provided to EIM BAAs also increase.

Third party transmission owners have expressed interest in providing unused transmission from the bilateral market for EIM transfers. An incentive for the transmission contribution would be the opportunity to receive congestion revenues. This would also be a benefit to EIM BAAs as they would have the ability to economically transfer additional energy when the existing transfer capacity has been met.

3.2 Functionality

In the event that the EIM transfer becomes congested, the associated revenues are collected through the market and allocated to the appropriate EIM entity's real-time congestion offset (RTCO)¹. Although the third party cannot be paid directly for the transmission contribution, it could receive congestion revenues through the RTCO uplift charge.

The functionality to collect congestion revenues is already in place but it does not currently extend to third party non-EIM entities. The following items are necessary to enable third party transmission contributions:

¹ For additional information see the EIM Year 1 Phase 2 Draft Final Proposal available at: http://www.caiso.com/Documents/DraftFinalProposal_EnergyImbalanceMarketYear1EnhancementsPhase2.pdf

- Establish a pro-forma agreement allowing a scheduling coordinator to submit transmission contributions into the market on behalf of the third party.
- Enable the third party to receive congestion revenues by utilizing the existing energy transfer system resource (ETSR) functionality. Including the transmission service provider (TSP) in the list of balancing authority areas (BAAs) will allow third parties to receive congestion revenues.

3.3 Example of Congestion Revenue Charge

If a third-party transmission contribution results in a charge (see example below), settlement of the charge will need to be determined.

Assume that a third party has contributed transmission that enables 100MW of EIM transfer capability from EIM BAA #1 to EIM BAA #2. In the FMM, it is economic to transfer energy from EIM BAA #1 to EIM BAA #2, but the total transfer is limited by the available EIM transfer capability out of EIM BAA #1 and into EIM BAA #2. This results in congestion revenue from the price difference in EIM BAA #1 and EIM BAA #2. If the shadow price of the transfer constraint is \$5.00 / MWh, then the third party would receive congestion revenues of \$500.00 (\$5.00 x 100MW). At the 5-minute settlement interval, the third party is paid \$41.67 (\$500.00 / 12).

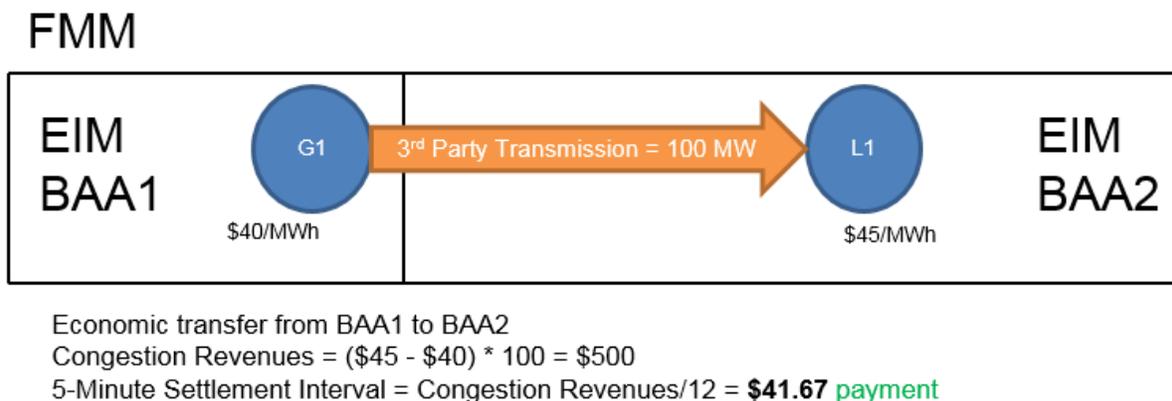
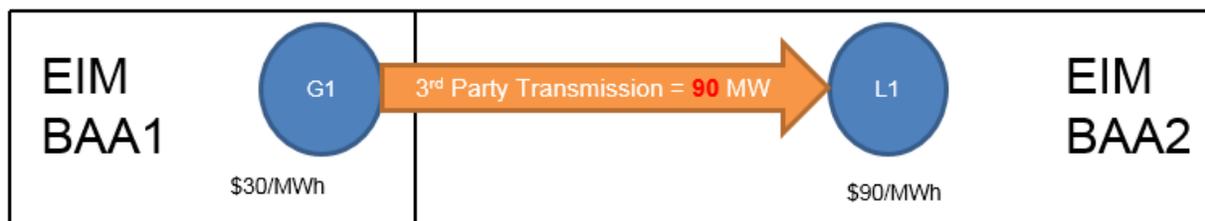


Figure 1: FMM Congestion Revenue Payment

However, if a curtailment is performed the transfer capability from EIM BAA1 to BAA2 is decreased in RTD. The net shortage results in a charge to the third party of \$600.00 (\$60.00 * 10 MW). At the 5-minute settlement interval, the third party would be charged \$50.00 (\$600.00 / 12).

RTD



Curtailment limited 3rd Party Transmission transfer to 90 MW
 Net shortage $(\$90 - \$30) \times 10 \text{ MW} = \600
 5-Minute Settlement Interval = Net Shortage/12 = **\$50 charge**

Figure 2: RTD Net Shortage Charge

Combining the FMM and RTD settlement would result in net charge of \$8.33 for the transmission the third party contributed to support EIM transfers.

FMM + RTD settlement = \$8.33 charge

Assuming the policy decision is that the charge should not accrue to the third-party who has contributed the transmission capacity, two policy elements will need to be addressed:

1. At what interval granularity (five minute, fifteen minute, hourly) should the net settlement not result in a charge?
2. If contribution results in net charge, who should be allocated the charge?

4 Management of Bilateral Schedule Changes

4.1 Description

Currently only EIM entities and a small number of third party participants bid into the EIM. When the balancing authority area through which these transactions are scheduled becomes an EIM entity, schedule changes made after hourly base schedules are submitted are exposed to real-time imbalance settlement. Imports to an EIM BAA and exports from an EIM BAA cannot be economically bid. Instead, any schedule change is a price taker for any within-the-hour adjustments. The difference between the LMP of the source and the LMP of the sink can result in a charge or payment, but customers have no advance knowledge of the dollar magnitude for such changes.

4.2 Functionality

The existing ISO wheeling bid functionality could be extended to the EIM. This would allow market participants to manage their exposure to imbalance settlement for bilateral schedule changes made after base schedules are submitted to the EIM entity prior to final submission by each EIM entity to the ISO. The wheel bids will need to be submitted at T-75, and could result in an advisory schedule prior to T-55.

The current ISO functionality supports wheel through transactions – i.e. an import paired with an export. This functionality could be extended to the EIM area. This can be seen in Figure 1, Import #1 comes in from a non-EIM balancing authority area, goes through the EIM footprint, and is paired with Export #1 leaving the EIM area. Additionally wheel out functionality provides the ability for market participants to pair a generation resource with an export from the EIM area. In Figure 1 this is shown as Gen #2 paired with Export #2. Note that Gen #2 is inside the EIM area and is a participating generator. There is no functionality to support an import bid that sinks into the EIM area because non-participating load does not bid into the real-time market. Figure 1 shows Import #3 coming into the EIM area and sinking at Load #3.

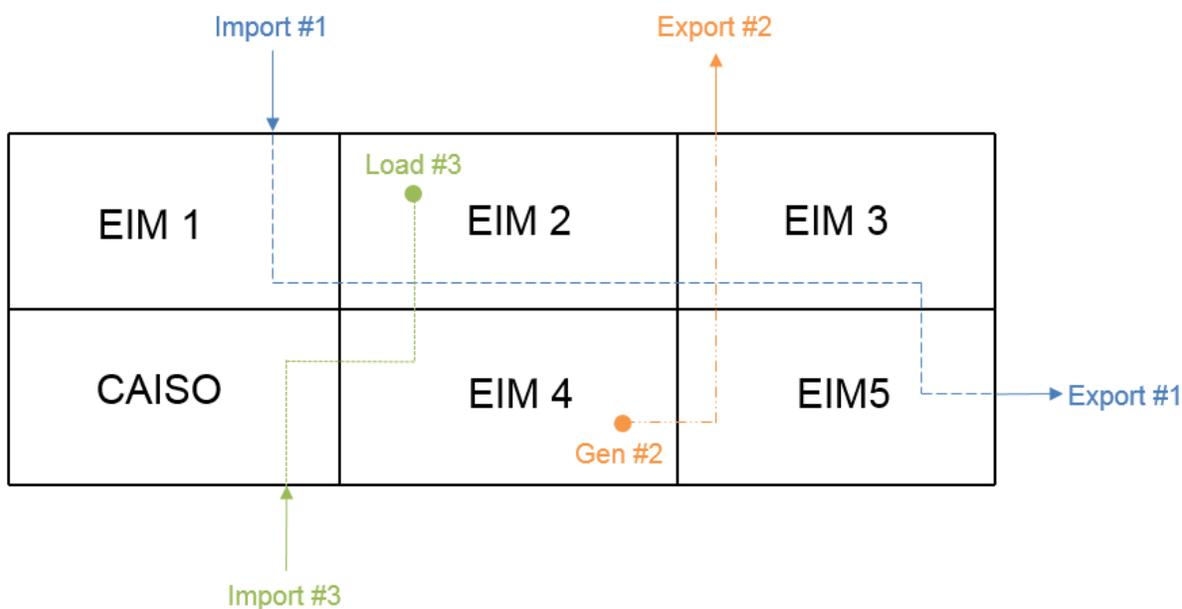


Figure 3: Imports and exports through EIM

A wheel through, Import #1 to Export #1, is the pairing of these two bids into a wheeling equality constraint. This essentially combines the source and sink bids at the corresponding system resources to a point-to-point bid, the sink bid minus the source bid. These bids will clear the market when this equality constraint is higher than the LMP difference (due to marginal loss and congestion) between the sink and source; thereby limiting the exposure of imbalance energy charges to the imputed bid.

To manage bilateral transactions that source in the EIM footprint, Gen #2 to Export #2, one thing to consider is generators must be an EIM participating resource. Since the market will need the ability to dispatch the resource, up or down, in order to match the export bid all generators must be participating resources. It will be possible to allow reductions from base schedules of the generators, or the ability to dispatch the generator down.

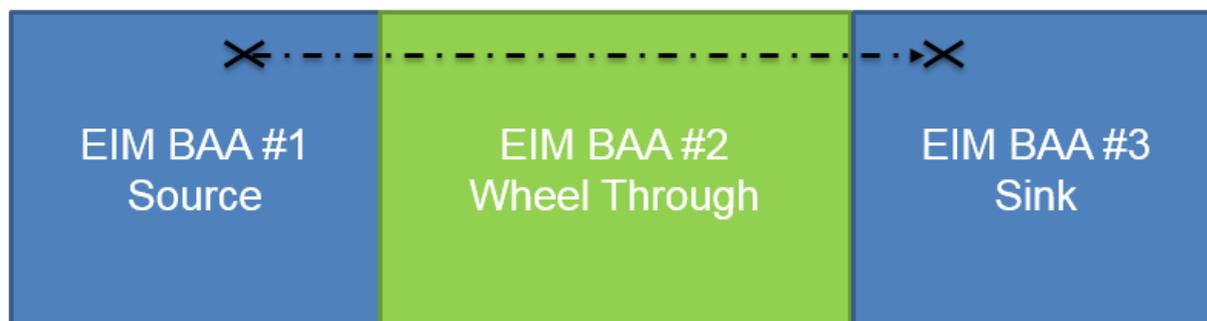
Bilateral transactions that sink in the EIM area, Import #3 to Load #3, will not be supported. With the current functionality of the real-time market, loads do not bid in real-time so it would not be possible to apply an equality constraint that matches an import bid with a load bid. However, since we can allow reduction from base schedules of generators this can have the same effect as incrementing an import to load transaction. A reduction to wheel out has the same effect as an increase to wheel in.

Another topic to consider is that transmission is charged for bilateral transactions. As with 15-minute and one-schedule change per hour intertie bids, the market will need to observe the transmission profile and not schedule above the lowest transmission segment on the eTag.² The ISO currently updates energy profiles on eTags and will need to also update these wheels even though the ISO may not be a BAA on the eTag. This will require that the ISO have access to all the eTags involved in all the EIM entities wheels.

5 Net Wheeling Charge

5.1 Description and Scope

Due to the geographical boundaries of EIM BAAs, EIM transfers can occur in which energy will wheel through an EIM BAA without sinking or sourcing. Specifically, energy will source in one EIM BAA, wheel through another EIM BAA, and sink in a third EIM BAA (see Figure 4). Should the source and sink EIM entities accrue the benefits of the transaction (current EIM structure) or should the wheel through EIM entity share the benefits in return for facilitating the transfer?



² For additional information see Section 5.2 of the FERC Order 764 Draft Final Proposal available at: <http://www.caiso.com/Documents/DraftFinalProposal-FERC-Order764MarketChanges.pdf>

Figure 4: Wheel Through EIM BAA

The scope of this initiative is limited to compensation for net wheeling as opposed to a redesign of the current EIM transmission rate and the principle of reciprocity.

5.2 Reciprocity and EIM Benefits

The Energy Imbalance Market currently functions on the principle of reciprocity as described in the EIM FERC filing³ and approved by FERC in Docket No. ER12-1386-000⁴. EIM participants pay transmission rates of the transmission provider based on the location of the transmission; internal load is assessed transmission charges and a wheeling access charge is applied to exports. To prevent rate pancaking, EIM transfers are exempt from wheeling charges. The ISO found this resulted in mutual and nondiscriminatory benefits for all EIM participants. More specifically, the ISO “concluded that the greater efficiency of an energy imbalance market easily outweighs any lost transmission revenues” (FERC Filing page 37) when a wheel-through occurs. Analysis completed for the EIM Year 1 Phase 2 Initiative⁵ confirmed the benefits of reciprocity because there had not been changes in bilateral scheduling patterns that could have led to a decrease in transmission revenue.

Table 2 shows the quarterly benefits by EIM BAA in millions of dollars. The net benefit of EIM as a whole increases with additional EIM transfer capability to allow the economic flow of energy across the EIM area.

Summary of Benefits by BAA

	APS	ISO	NV Energy	PAC	Puget	Total
Q4 2014		\$ 1.24		\$ 4.73		\$ 5.97
Q1 2015		\$ 1.44		\$ 3.82		\$ 5.26
Q2 2015		\$ 2.46		\$ 7.72		\$ 10.18
Q3 2015		\$ 3.48		\$ 8.52		\$ 12.00
Q4 2015		\$ 5.28	\$ 0.84	\$ 6.17		\$ 12.29
Q1 2016		\$ 6.35	\$ 1.70	\$ 10.85		\$ 18.90
Q2 2016		\$ 7.89	\$ 5.20	\$ 10.51		\$ 23.60
Q3 2016		\$ 5.44	\$ 5.60	\$ 15.12		\$ 26.16
Q4 2016	\$ 5.98	\$ 8.66	\$ 3.07	\$ 8.99	\$ 1.56	\$ 28.26

³ See FERC Filing for the Energy Imbalance Market, Section VI Transmission Charges: http://www.caiso.com/Documents/Feb28_2014_TariffAmendment_EnergyImbalanceMarket_ER14-1386-000.pdf

⁴ See FERC Approval for EIM, Section I Transmission Charges and Administrative Fee: http://www.caiso.com/Documents/Jun19_2014_OrderConditionallyAcceptingEIMTariffRevisions_ER14-1386.pdf

⁵ For additional information see the EIM Year 1 Phase 2 Draft Final Proposal available at: http://www.caiso.com/Documents/DraftFinalProposal_EnergyImbalanceMarketYear1Enhancements_Phase2.pdf

Q1 2017	\$ 5.23	\$ 9.50	\$ 3.50	\$ 11.47	\$ 1.40	\$ 31.10
Total	\$ 11.21	\$ 43.12	\$ 19.91	\$ 63.11	\$ 2.96	\$ 173.72

Table 2: Estimated EIM benefits by BAA (in millions)⁶

5.3 Difference between Transmission Rate Design and Equitable Sharing of Benefits

Transmission rate recovery is different than equitable sharing of benefits. This initiative will discuss the difference between the two and what potential market changes may be needed to implement a charge for net wheeling through EIM BAAs.

Transmission Revenue:

If market design changes are needed to address lost transmission revenue, they are likely the result of changes in bilateral scheduling. If bilateral scheduling has changed, there is potential justification for an EIM transmission rate change or change to the hourly resource sufficiency evaluation. Analysis completed by the ISO for EIM Enhancements Year 1 Phase 2 (Y1P2) did not observe changes to bilateral scheduling⁷. If market participants believe there are indeed changes in bilateral scheduling and transmission sales since the publication of the EIM Y1P2 initiative, they will need to provide data and analysis to quantify the lost transmission revenue. With that data, the ISO will be able to investigate whether a transmission charge is needed to address net wheeling. This will likely vary by EIM entity. If it is determined that a transmission charge is appropriate for net wheeling, changes to each EIM entity's OATT may be required detailing the revenue recovery.

Equitable Sharing of EIM Benefits:

If market design changes are needed because EIM BAAs believe there is incorrect sharing of EIM benefits when net wheeling occurs, changes to the Real Time Congestion Offset (RTCO) are needed. This will enable the source, wheel through, and sink EIM BAAs to mutually share the EIM benefits.

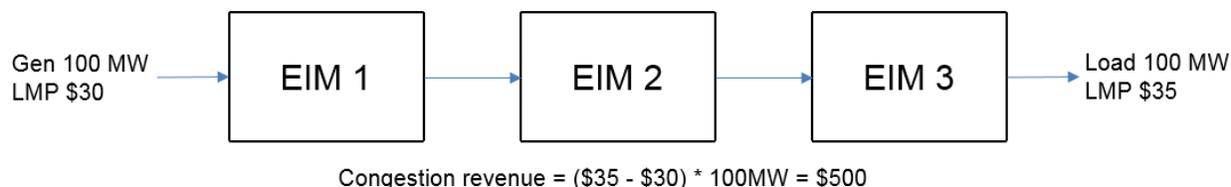
⁶ See EIM Quarterly Benefits Reports available at:
<http://www.caiso.com/informed/Pages/EIMOverview/Default.aspx>

⁷ See EIM Year 1 Phase 2 Draft Final Proposal for additional information:
http://www.caiso.com/Documents/DraftFinalProposal_EnergyImbalanceMarketYear1EnhancementsPhase2.pdf

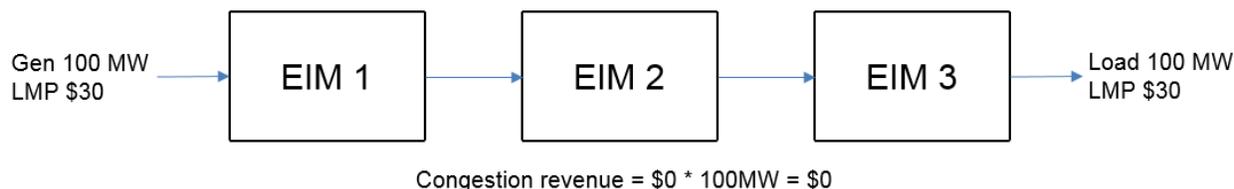
5.4 Wheel Through with and without Congestion

There are two outcomes of a wheel through transaction. If congestion occurs, the EIM BAA that facilitated the wheel through transfer will be compensated with congestion revenue through the RTCO (example 1). If congestion does not occur, the EIM BAA that facilitated the wheel through transfer will not be compensated (example 2).

1. Wheel through with congestion



2. Wheel through without congestion



Since compensation is already provided to the wheel through EIM BAA via congestion revenues when congestion occurs (example 1), it is assumed that this initiative's purpose is to evaluate mutual sharing of benefits to the wheel through EIM BAA for facilitating the transfer (example 2) even when congestion does not occur.

Existing functionality could be used to reallocate RTCO congestion revenues to the transmission provider. This would enable the wheel through EIM BA to receive congestion revenues for facilitating the transfer. Policy would need to be developed to determine how to reallocate congestion rents or incorporate an additional charge for wheel through transactions when congestion does not occur.

In this case, analysis would need to be completed to determine the magnitude of net wheeling across the BA and the cost associated with the wheeling that is not covered by the existing congestion rent settlement. This will likely vary per each EIM entity.

Assuming the intent of this initiative is to enable mutual sharing of benefits for wheel through transactions, the following Policy issues will need to be addressed:

- Is net wheeling compensation needed because the RTCO is not correctly distributing congestion revenues to the appropriate EIM entity?
- What rate would be used for net wheeling compensation?

6 Next Steps

The ISO plans to discuss this Issue Paper with stakeholders during a stakeholder conference call to be held on June 20th. The ISO requests comments from stakeholders on the proposed market design changes described in this issue paper. Stakeholders should submit written comments by June 30th to InitiativeComments@caiso.com.