



EIM Greenhouse Gas Enhancements

3rd Revised Draft Final Proposal

April 25, 2018

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1 Introduction and Background

Energy generated in California or imported into the state to serve California load is subject to California's greenhouse gas (GHG) regulations adopted by the Air Resources Board (ARB).¹ Under these regulations, the compliance obligations apply to first deliverers – generation owners or electricity importers. In the context of the western Energy Imbalance Market (EIM), participating resource scheduling coordinators are considered electricity importers if their resource(s) are dispatched to serve load in the California ISO (CAISO). These entities have a GHG compliance obligation under California's GHG regulations.

To address ARB's regulations, the CAISO developed a mechanism to reflect GHG compliance costs within locational marginal prices for resources serving CAISO load. Inside the CAISO balancing authority area, the price for energy includes the cost of GHG compliance. Outside the CAISO, the energy price does not include GHG compliance costs when external resources are serving load outside the CAISO. However, external resources do receive a payment for GHG compliance costs when they are dispatched to serve CAISO load. The CAISO market can identify the price difference because resources outside the CAISO balancing authority area bid a GHG compliance cost adder separately from their energy bids. When dispatching resources to serve load outside the CAISO, the market optimization considers only the energy bid. When dispatching resources to serve load inside the CAISO, the market optimization considers the energy bid plus the GHG compliance cost adder.

1.1 GHG Bids at the start of EIM

As part of the initial design of the western Energy Imbalance Market in 2014, EIM participating resource scheduling coordinators submitted a bid adder on a daily basis for each of their EIM participating resources. The bid adder allowed the CAISO to attribute EIM transfers to serve CAISO load to specific EIM participating resources based on least cost dispatch. CAISO load paid the EIM participating resource the marginal energy price and the marginal GHG price. EIM participating resources serving load outside of the CAISO received only a marginal energy payment. In this way, GHG costs did not affect the locational marginal price in the EIM Entity balancing authority area outside of California.

At the outset of the EIM, the CAISO did not mitigate the GHG bid adder or restrict the quantity of output from EIM participating resources that the market dispatch attributed as serving CAISO load.

¹ See generally California Air Resource Board website relating to Cap and Trade program: <https://www.arb.ca.gov/cc/capandtrade/capandtrade.htm>.

See also Title 17, California Code of Regulations sections 95801-96022.

The only restriction was that the combined energy bid and GHG adder had to be less than or equal to the \$1000 per MWh maximum energy bid price. Under this approach, EIM participating resource scheduling coordinators that did not want to comply, or who were legally barred from complying, with California's GHG regulations could use a high bid adder to signal the market that their resource(s) was not available for dispatch to serve CAISO load, and thus, avoid GHG compliance costs. The Federal Energy Regulatory Commission accepted these market design elements but directed the CAISO to submit a compliance filing in one year to implement a bid flag to preclude the market from dispatching an EIM participating resource to serve CAISO load.² Since the bid flag mechanism would obviate the need for the EIM participating resource scheduling coordinator to use a high GHG bid adder to signify that the market should not dispatch an EIM participating resource to serve CAISO load, the Commission also directed the CAISO include revisions implementing a cost-based GHG bid adder.

1.2 GHG Bids under EIM Year One Enhancements

As part of the CAISO's year one enhancements for EIM, the CAISO proposed revisions to address the Commission's directives. Specifically, the CAISO proposed to allow EIM participating resource scheduling coordinators to submit a bid quantity and an hourly GHG bid adder for each resource at or below the resource's daily maximum GHG cost cap as determined by CAISO, but not less than zero.³ Under this approach, an EIM participating resource scheduling coordinator submits a single megawatt quantity and single bid price on an hourly basis for its resource(s) to express its interest in serving CAISO load. The CAISO's tariff revisions recognize that the GHG bid adder covers the costs of compliance with ARB's regulations plus any financial risk between the actual cost and the daily cost of compliance. If the EIM participating resource scheduling coordinator does not submit a bid adder for its resource(s), or submits a bid adder with a zero MW quantity, the market will not dispatch the EIM participating resource to serve CAISO load. FERC accepted these revisions to the CAISO's GHG design for EIM.⁴ The CAISO implemented these bidding rule changes without making changes to the market optimization algorithm in production since the start of the EIM.

² *California Indep. Sys. Operator Corp.*, 147 FERC ¶ 61,231 (2014) at PP 238-240.

³ The CAISO calculates a daily maximum GHG cost using a process similar to the process the CAISO uses to calculate the GHG cost included in the default energy bids of CAISO resources. This includes a variable cost option and a negotiated rate option. However, rather than calculating a cost curve as is done for default energy bids within the CAISO, the CAISO calculates a single daily maximum cap for the EIM participating resource.

Under the variable cost option, on a daily basis, the CAISO proposes to calculate each unit's maximum GHG cost based on the unit's maximum heat rate as registered with the CAISO, the applicable GHG allowance price, and the resource's emission rate. These are the same three components that the CAISO uses to calculate the greenhouse gas cost included in the default energy bid curves of CAISO resources. The standard GHG emission rate is documented in the US EPA Subpart C default emission factors. Similar to the default energy bids of CAISO resources, the CAISO applies a 10 percent adder to the calculated maximum cost.

⁴ *California Indep. Sys. Operator Corp.*, 153 FERC ¶ 61,087 (2015) at PP 57-58.

1.3 Identifying the emissions impacts of secondary dispatch

Over the last year and a half, the CAISO has worked with ARB and stakeholders in ARB's rulemaking process to address a concern that the EIM GHG design is not fully capturing the impact to the atmosphere that occurs in connection with EIM transfers to serve CAISO load. Briefly, this concern relates to CAISO dispatches of EIM participating resources to serve CAISO load based on minimizing total costs of energy and GHG bid adders. The CAISO's least-cost dispatch can have the effect of attributing transfers to serve CAISO load to lower-emitting EIM participating resources because these resources face fewer or no costs to comply with ARB's regulations. In some instances, higher-emitting resources will need "to backfill" this dispatch to serve EIM load outside of the CAISO. The CAISO refers to this phenomenon as secondary dispatch.

Through its rulemaking process, ARB has adopted a method to account for the GHG effects from secondary dispatches associated with the dispatch of EIM resources to serve CAISO load.⁵ This accounting rule took effect January 1, 2018. For purposes of environmental integrity for the Cap-and-Trade Program, ARB's approach retires unsold allowances equal to the estimated difference in emissions between what the CAISO's optimization identifies from resources dispatched to serve CAISO load and the unspecified source emission rate applied to imports at CAISO scheduling points. ARB adopted this approach as an interim rule pending the CAISO's development of EIM design changes to address emissions from secondary dispatches.

2 Energy Imbalance Market Governing Body Classification

The Energy Imbalance Market (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 greenhouse gas design ensures that when load outside of the CAISO's balancing authority area is served by generation outside CAISO, the cost of greenhouse gas should not be reflected in the non-CAISO balancing authority area prices. The rules that underlie this greenhouse gas design are EIM-specific, and would not exist without EIM.

Therefore, this policy initiative involves market design changes that fall entirely within the EIM governing body's primary authority.

The EIM Governing Body will have primary authority in approving the following policy proposals:

- Revisions to CAISO's existing GHG bid adder
- Support multiple GHG programs in the West

⁵ 17 California Code of Regulations, Section 95852(b)(1)(D).

Stakeholders are encouraged to submit a response to the EIM categorization in their written comments, particularly if they have concerns or questions.

3 Proposal

3.1 Changes from 2nd Revised Draft Final Proposal

Eliminated the minimum bid price: In the previous paper, the CAISO highlighted that in order to implement the proposal, the CAISO and ARB⁶ would need to ensure alignment between the CAISO's market rules and ARB's regulations. Prior to the CAISO proceeding with a minimum bid price, ARB would need to initiate its own rulemaking process to modify its regulations. Based on stakeholder feedback, the CAISO has eliminated the minimum bid price from this proposal. The CAISO will continue to insure that the CAISO GHG design provides full cost recovery of ARB compliance costs for first deliverers of electricity to CAISO as identified by the EIM optimization.

Additional discussion to extend GHG tracking and attribution to the day-ahead market: The CAISO reiterates that day-ahead GHG design will be discussed further in the CAISO's stakeholder initiative examining extension of the day-ahead market to EIM entities. The CAISO plans to commence this initiative later this year. The CAISO believes that the proposed changes to the bid quantity will significantly address secondary dispatch in the EIM. The CAISO will leverage experience from this initiative as it addresses similar concerns when the EIM entities seek to join the day-ahead market.

3.2 The CAISO's revised proposal builds on existing GHG bid adder design and results in a more accurate attribution of resources supporting EIM transfers to serve CAISO demand.

Based on feedback received during the CAISO's stakeholder process, the CAISO proposes to adjust its solution to address emissions associated with secondary dispatch. The CAISO's proposal builds on its existing market design optimization algorithm. Specifically, the CAISO proposes to limit EIM participating resources' GHG bid quantity to help mitigate and track the atmospheric effects of secondary dispatch. Under this approach, the CAISO would limit the GHG bid quantity of EIM participating resources to the MW value between the EIM participating resource's base schedule and the resource's upper economic level. EIM participating resource scheduling coordinators would continue to submit cost-based GHG adders if they wish to offer their output of their EIM participating resources to serve CAISO load as they do today. By

⁶ ARB submitted comments on the 2nd revised draft final proposal which are available at <http://www.aiso.com/Documents/CARBComments-EIMGHGEnhancements-SecondRevisedDraftFinalProposal.pdf>

limiting the GHG bid quantity, the proposal will reduce the potential magnitude of secondary dispatch which will improve the accuracy of the market attribution. The CAISO optimization will limit the quantity attributed to a resource as serving CAISO demand when the resource is also serving demand external to CAISO through a base schedule. Since the GHG bid quantity is now limited, this will change the market dispatch to identify other EIM participating resources that have available capacity above their base schedule to support EIM transfers into CAISO to serve CAISO demand. The GHG emissions of these resources will now be appropriately reflected in the market attribution.

Table A reflects how the CAISO has addressed and proposes to address EIM participating resource's GHG bid quantities and GHG bid prices.

Table A: GHG Bid quantities and prices

	GHG Bid Quantity	GHG Bid Price
At outset of EIM	Pmax of resource	\leq \$1,000 less Energy bid
Year One Enhancement	0 MW to Pmax	\leq Resource daily GHG cost ⁷ plus 10%
Current Proposal	Upper economic limit less base schedule	\leq Resource daily GHG cost plus 10%

The proposal reduces secondary dispatches, but does not eliminate them. For example, assume that a resource has a base schedule of 80 MW and economic bids up to 100 MW. Under the current EIM Rules the resource could submit a GHG bid quantity of 100 MW. If the EIM optimization dispatched to 85 MW, 85 MW could be attributed as serving CAISO load. Since the resource only increased its output by 5 MW from its base schedule, the potential secondary dispatch is 80 MW. Under the current proposal, the EIM optimization would limit the resource's GHG bid quantity from 100 MW to 20 MW. If the EIM optimization dispatched the resource to 85 MW, 20 MW could be attributed as serving CAISO load. Since the resource increased 5 MW from its base

⁷ The resource daily GHG bid cost is calculated by multiplying the emission rate and the daily GHG compliance obligation index price.

schedule, no secondary dispatch is associated with that 5 MW. Instead, the potential secondary dispatch effect would only be 15 MW (i.e. the resource's GHG bid quantity less the amount of that quantity that is allocated to the resource's base schedule). Thus the current proposal reduces the magnitude of secondary dispatch from 80 MW to 15 MW. This has the similar effect of reducing secondary dispatch as the previously discussed two-pass solutions, but does not have price inconsistency or bidding incentive issues.

3.3 Support for multiple GHG programs in the West

Currently, California is the only western state with a GHG compliance program. The CAISO recognizes this fact may change in the near future. Accordingly, the CAISO has proposed a solution that is scalable to other areas. If another state proposes a GHG program that places a GHG compliance obligation on supply from outside its state (*i.e.* on imports or transfers for other states within a multi-state balancing authority area), the CAISO can apply the proposal discussed herein to the new GHG compliance area. Under this proposal, the market optimization can more accurately track the primary and secondary emissions associated with an EIM participating resource serving load within that area. Of course, the CAISO would need to coordinate any market design changes with that state's GHG program to ensure alignment. If another state does place a GHG compliance obligation on external supply, then external resources seeking to serve load in that area or in the CAISO will now have to submit a separate GHG bid adder to cover the costs of compliance obligations in both the new state's GHG program and the California's GHG program. The ability for an external resource not subject to GHG regulations to opt out of either the new GHG program or the California GHG program would remain unchanged. Any new GHG program will also result in an additional component of the LMP outside of the new GHG program region. If the new GHG program only places a compliance obligation on generation located within its state or has a carbon tax, these costs would be reflected in the resources' energy bids similar to what is done by resources in the CAISO today.

4 Next Steps

Table B outlines the proposed schedule to complete the stakeholder process changes for the EIM GHG Enhancements.

Table B: Stakeholder Process Schedule

Stakeholder Process Schedule	
Date	Milestones
April 25	Post 3 rd Revised Draft Final Proposal
May 2	Stakeholder Conference Call
May 16	Stakeholder Comments Due
June 20, 2018	EIM Governing Body Decision
July 25-26	Board of Governors Consent Agenda

The CAISO plans to discuss this straw proposal with stakeholders during a stakeholder call to be held on May 2, 2018. The CAISO requests comments from stakeholders on the 3rd revised draft final proposal. Stakeholders should submit written comments by May 16, 2018 to InitiativeComments@caiso.com.