



# ORA

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THE OFFICE OF RATEPAYER ADVOCATES' COMMENTS  
ON THE CALIFORNIA INDEPENDENT SYSTEM  
OPERATOR'S *REGIONAL INTEGRATION CALIFORNIA  
GREENHOUSE GAS COMPLIANCE AND EIM GREENHOUSE  
GAS ENHANCEMENT STRAW PROPOSAL*

December 15, 2016

The Office of Ratepayer Advocates (ORA) is the independent consumer advocate within the California Public Utilities Commission (CPUC), with a mandate to obtain the lowest possible rates for utility services consistent with safety, reliability and the state's environmental goals.

ORA submits these comments and questions on the California Independent System Operator's (CAISO) November 17, 2016 Straw Proposal on the *Regional Integration California Greenhouse Gas Compliance and EIM [Energy Imbalance Market] Greenhouse Gas Enhancement* (Straw Proposal). Accurately tracking greenhouse gas (GHG) emissions in the EIM and any expanded ISO is critically important to allow California to achieve its GHG reduction goals.

## **Introduction**

ORA agrees with the CAISO's proposed framework of a two-pass optimization to determine the incremental dispatch of resources outside California serving California load. However, ORA is concerned that the formulation of the GHG allocation base in the CAISO's proposed first pass of the optimization could lead to inaccurate attribution of GHG costs.

ORA understands that the main objective of assessing the incremental dispatch of external resources (outside California, or non-CAISO resources) is to determine the GHG compliance obligations of the resources that increase their generation to serve California load. The CAISO proposes to determine the incremental dispatch of external resources by using a two-pass optimization to compare the dispatch of these resources without California load to their dispatch after the addition of California load. The intent of the CAISO's proposed first pass is to isolate the effect of California load on the dispatch of non-CAISO resources serving load outside of California.

The CAISO's proposed first pass solution constrains two main variables that could significantly impact the dispatch of external resources: California load (by disallowing transfers from external resources to California), and the GHG price bids of non-CAISO resources. The dispatch of non-CAISO resources in the second pass not only reflects the inclusion of California load, but also the addition of the GHG price bids of non-CAISO resources. Therefore, the GHG compliance obligations allocated to non-CAISO resources, which have been incrementally dispatched in the second pass, cannot be solely attributed to serving California load. This is because the addition of the GHG price bids of the non-CAISO resources could have a significant effect on the dispatch of these resources.

ORA recommends modifications to the CAISO's first pass to include the same variables and constraints as the ones used in the second pass, with the exception of California load. Thus, the optimization in the first and second passes would allow the optimal dispatch of resources under similar conditions, except for one variable, which is California's load. By isolating only a single variable (California load), the results should better attribute the GHG compliance obligation to the EIM transfers serving California load.

ORA proposes no changes to the CAISO's second pass formulation; but the GHG allocation to the incrementally dispatched external resources would be determined by comparing the GHG allocation base from the modified first pass to the second pass.

## **Background**

Electricity importers, including the EIM Participating Resource Scheduling Coordinators, are subject to compliance obligations under the current California Cap-and-Trade regulations.<sup>1</sup>

All generation and imports in the CAISO embed the cost of GHG compliance in their energy bid. To express its willingness to be deemed deliverable to the CAISO, an EIM participating resource must submit: (1) a base schedule, (2) an energy bid,<sup>2</sup> (3) a GHG bid adder composed of a single GHG price bid,<sup>3</sup> and (4) a single capacity (MW) bid<sup>4</sup>. The market optimization minimizes the total cost to serve load across all balancing authority areas in the EIM including the CAISO. When evaluating the least cost dispatch to serve load in the CAISO, the optimization considers the energy bids, which includes the GHG costs of generation in the CAISO and the GHG cost of attributed resources for the EIM transfers to serve CAISO load. When serving load outside of the CAISO, only the energy bid, pertaining to both CAISO resources and EIM participating resources, is considered by the market optimization.

The CAISO market optimization generates the marginal GHG compliance cost component of the locational marginal price (LMP), which is also the rate the market uses to calculate payments to EIM participating resources for generation that is determined to serve CAISO imbalances.<sup>5</sup>

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<sup>1</sup> Electricity Importers include EIM Participating Resource Scheduling Coordinators serving the EIM market whose transactions result in electricity imports into California. CCR 17, Division 3 Chapter 1, Subchapter 10, Article 5, § 95802 (122). (Also [https://www.arb.ca.gov/cc/capandtrade/capandtrade/unofficial\\_ct\\_030116.pdf](https://www.arb.ca.gov/cc/capandtrade/capandtrade/unofficial_ct_030116.pdf))

<sup>2</sup> The energy bid is a staircase capacity-price curve above and below the base schedule. The combination of the energy bid and the GHG bid must not exceed the \$1000/MWh energy bid cap. Straw Proposal, p. 6.

<sup>3</sup> An EIM participating resource must submit a GHG bid price equal or less than its daily maximum GHG compliance cost (bid cap), but not less than zero. To establish the maximum GHG compliance cost, the ISO calculates a single daily GHG compliance for each EIM participating resource based upon the maximum heat-rate of the resource, the applicable GHG allowance price, and the resource's emission rate. ISO includes a 10% adder to the calculated cost. Straw Proposal, p. 7.

<sup>4</sup> Under the current GHG design for EIM, an EIM participating resource must submit a capacity (MW) quantity bid (independent of the energy bid curve) to express its willingness to be deemed deliverable to the ISO on an hourly basis. Thus, the CAISO will not consider the energy from EIM transfer in the CAISO market if an EIM participating resource submits a zero MW GHG bid. Straw Proposal, p. 7.

<sup>5</sup> The marginal cost difference between EIM generation serving load in the ISO balancing authority area and EIM generation serving load outside of the CAISO, which reflects the GHG compliance cost component of the LMP. Straw Proposal, pp.5-6.

In its proposed amendments to the current Cap-and-Trade regulations,<sup>6</sup> the California Air Resources Board (ARB)<sup>7</sup> raised concerns regarding “emissions leakage” that could occur due to the EIM cost optimization modeling.<sup>8</sup> In its Staff Report, the ARB stated that the EIM cost optimization model sometimes identifies zero-emissions power as dispatched to California before high-emitting resources are deemed dispatched to the state when there is a load imbalance. Thus, the model’s result indicates the zero-emission power as “deemed delivered” to California, whereas, in certain instances, the full transfers that support balancing the load to California are not identified and accounted for. The result could be that higher-emitting resources serving California load would not be identified and accounted for. The EIM accounting in such instances is not consistent with the California Cap-and-Trade program.

Currently, through the ARB’s rulemaking process, and the CAISO’s stakeholder processes, the CAISO and the ARB are addressing ARB’s concerns regarding the EIM optimization model design and GHG accounting. On October 13, 2016, the CAISO held a technical workshop to discuss three options to modify the EIM optimization model design to address ARB’s concerns:<sup>9</sup>

- Option 1: Calculate overall GHG impact based on comparison to counter-factual dispatch outside the market optimization.
- Option 2: Modify the CAISO optimization to attribute transfers to resources that are incrementally dispatched to serve California load and maintain resource-specific cost and attribution.
- Option 3: Modify the CAISO optimization and include residual emission rate for EIM transfers into the CAISO, while not considering resource attribution of residual emissions.

Based on stakeholder comments on the October 13, 2016 workshop, the CAISO proposed developing Option 2 indicating that it is the long-term solution for GHG tracking for both EIM and an expanded ISO. The CAISO stated that there will likely be a need for a bridge solution to fully account for the EIM GHG emissions, as the development of “Option 2” will require more time.<sup>10</sup> The CAISO provided a list of guiding principles to evaluate the options under consideration, and asked stakeholder for comments on those principles, and whether Option 2 meets those principles.<sup>11</sup>

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<sup>6</sup> *Staff Report: Initial Statement of Reasons on the Proposed Amendments to the California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms*, (ARB Staff Report), pp. 51-52. <https://www.arb.ca.gov/regact/2016/capandtrade16/isor.pdf>

<sup>7</sup> The ARB, under the Cap-and-Trade program, accounts for all the GHG emissions from electricity delivered to and consumed in California.

<sup>8</sup> The ARB stated that “emissions leakage occurs when it appears there has been a GHG emissions reduction through accounting for California program purposes, but the atmosphere did not actually experience that real GHG reduction.” ARB Staff Report, p. 51.

<sup>9</sup>—Straw Proposal, pp. 10-11.

<sup>10</sup> Straw Proposal, p. 10.

<sup>11</sup> Straw Proposal, pp.10-11.

## Discussion

### The CAISO's Proposed Option 2

To implement Option 2, the CAISO proposes a two-pass optimization, described as:

**First Pass:** Calculates the optimal dispatch of each generator outside of California without imbalance energy transfer (or net transfers) to California, while net transfers<sup>12</sup> from California to the EIM is allowed. The CAISO refers to the results of this pass as “GHG allocation base,”<sup>13</sup> and

**Second Pass:** Calculates the optimal dispatch of all generators and all load (i.e. optimize all resources, inside and outside of California, to meet California and the EIM load). The second pass also calculates the GHG allocation of each generator outside California based on the incremental dispatch of resources outside of California compared to the results from the first pass (GHG allocation base). The GHG allocation is limited by the GHG bid capacity and the incremental dispatch above the GHG allocation base.

The results are intended to allow the CAISO to attribute the GHG emission obligations to the incrementally dispatched resources, located outside of California, above the GHG allocation base that was determined in the first pass.

Figure 1 depicts ORA's interpretation of CAISO's first pass formulation; and Figure 2 depicts ORA's interpretation of CAISO's second pass formulation.

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<sup>12</sup> Straw Proposal, p. 13. This means that in the first pass, after California resources serve California load, excess supply from California is available to serve load outside of California.

<sup>13</sup> Straw Proposal, p. 12.

Figure 1: ORA's Depiction of CAISO's First Pass Optimization Formulation.

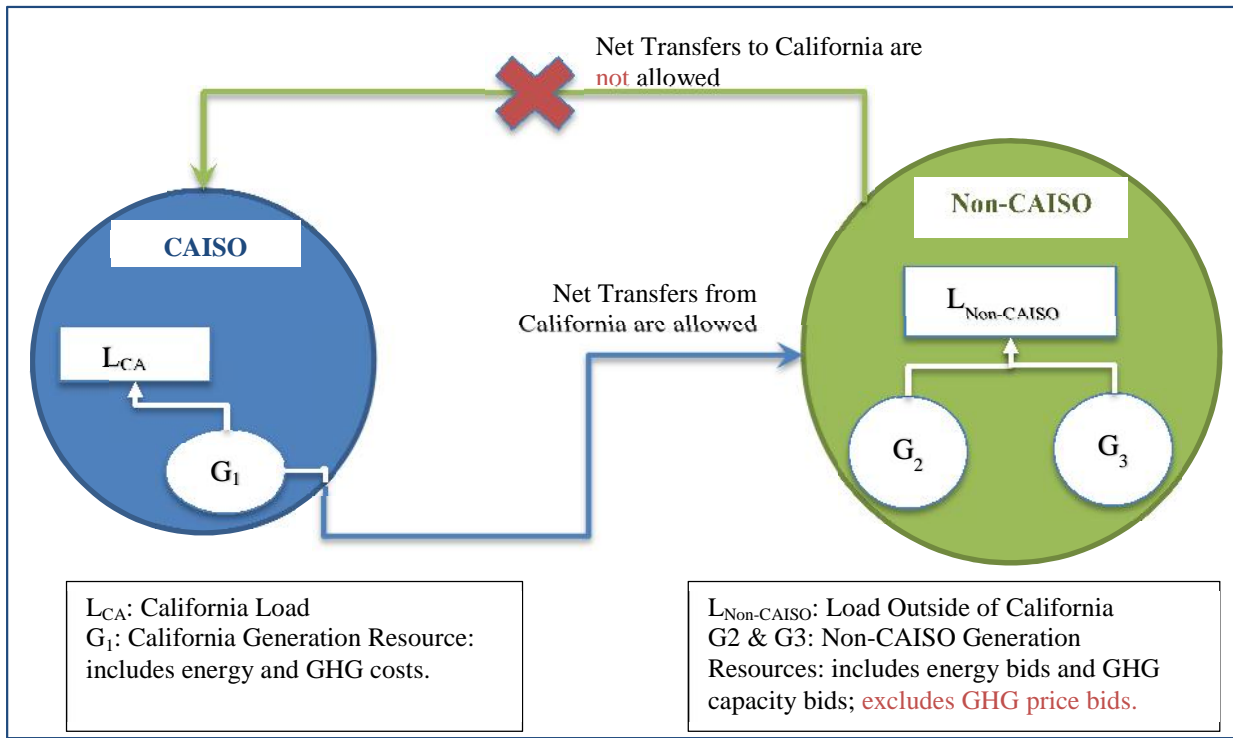
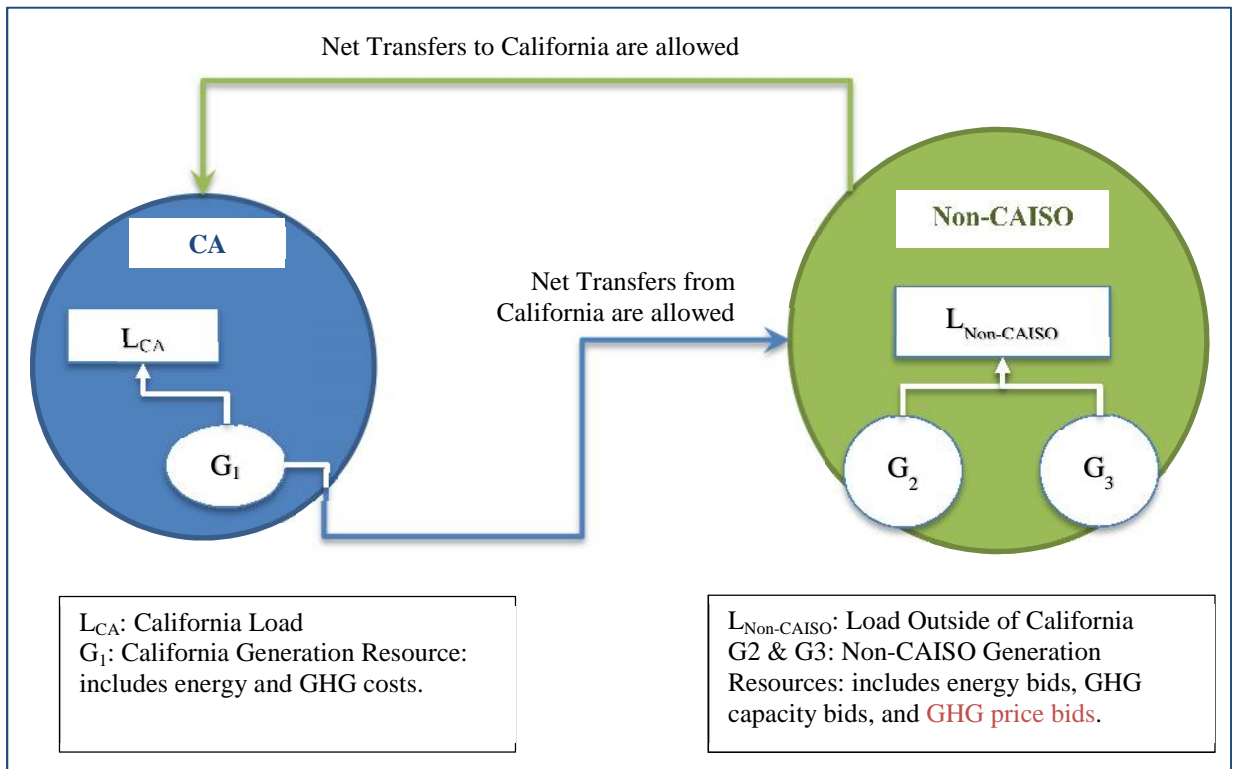


Figure 2: ORA's Depiction of CAISO's Second Pass Optimization Formulation.



## ORA Recommendations

ORA agrees with the CAISO's proposal to use a two-pass optimization to determine the GHG emissions that should be attributed to EIM transfers serving California load. However, as explained below, ORA has concerns regarding the formulation of the GHG allocation base in the first pass of Option 2.

### Apparent Inconsistencies in the CAISO's Proposed Option 2

The CAISO's straw proposal explains that the intent of modifying the current method of accounting for GHG emissions from EIM resources (i.e. non-CAISO resources) serving California's load is to attribute transfers to the resources that are incrementally dispatched, and to maintain resource specific cost and attribution.<sup>14</sup> The objectives of the CAISO's proposed two pass market optimization, as presented in the straw proposal are: (1) to determine the optimal dispatch outside of California, and then (2) to allow incremental dispatches of external resources into California.<sup>15</sup>

Although the intent of the CAISO's two-pass optimization is to isolate the effect of California load, the CAISO's proposed first pass constrains two main variables that could significantly affect the dispatch of external (i.e. non-CAISO) resources:

- California load (by disallowing transfers from non-CAISO resources to California), and
- GHG price bids of non-CAISO resources.

The CAISO's proposed first pass excludes both California load and the GHG price bids of non-CAISO resources, so the introduction of both these variables in the CAISO's second pass makes it impossible to separate the effects of these two variables on the results of the second pass. The incremental dispatch of external resources in the second pass could be the result of the inclusion of their GHG price bids, or the result of transfers from the EIM to California, or a combination of the two. Therefore, the GHG compliance obligations that are allocated to incrementally dispatched non-CAISO resources cannot be attributed solely to meeting California load.

One apparent inconsistency is that in the first pass, California load could impact the dispatch of non-CAISO resources serving load outside of California. Although this might not be the intended outcome of the first pass, allowing net transfers from California could impact the optimal dispatch of the non-CAISO resources serving load outside of California.<sup>16</sup>

Another apparent inconsistency in Option 2 is that the first pass includes the GHG costs of California's resources, but not the GHG costs of non-CAISO resources. CAISO's first pass allows net transfer from California.<sup>17</sup> This creates a competitive disadvantage to the California

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<sup>14</sup> Straw Proposal, p. 9.

<sup>15</sup> Straw Proposal, p. 9.

<sup>16</sup> Straw Proposal, p. 13. Net transfers from California depend on the California's load and California's resources.

<sup>17</sup> California resources have the GHG price embedded in their bids. Non-CASIO resources do not include GHG cost bids in their energy bids; the GHG cost bids are a separate component of their bids.

resources that could impact the optimization results in the first pass. If the CAISO's first pass included the GHG price bids of the non-CAISO resources, all the available resources (California as well as the non-CAISO) would be optimized on an equal basis to meet load outside of California.

The intent of Option 2 is to determine the optimal dispatch of non-CAISO resources with and without California load. When California load is included, the CAISO attributes the incremental dispatch of the non-CAISO resources to serving California load.<sup>18</sup> Thus, to isolate the effect of California's load on the dispatch of non-CAISO resources serving load outside of California, the first pass should not be constrained by any factors related to California's load. However, the CAISO's first pass optimization constrains the capacity of non-CAISO resources available to meet load outside of California by their GHG capacity bids. The GHG capacity bids indicate the amount of supply from non-CAISO resources that is deemed deliverable to California, which accordingly, limit the amount of supply available from these resources to serve non-California load.

Table 1 below summarizes ORA's assessment of some of the effects from the main constraints on the optimization result of CAISO's formulation of Option 2.<sup>19</sup>

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<sup>18</sup> Straw Proposal, p. 9.

<sup>19</sup> Although the CAISO's stakeholder workshops and off-line assistance have been very helpful in explaining the proposed Option 2 and how it would impact the market, not all of the constraints in Table 1 were explicitly listed in the straw proposal. ORA derived the additional constraints in Table 1 from the results of the CAISO's spreadsheet tool, so it is possible that ORA's interpretation is not entirely accurate.

**Table 1: Key Constraints in CAISO’s Optimization Problem of Option 2**

Option 2	Constraints	Effects of Constraints on the Results
First Pass	1) Net transfers from the non-CAISO footprint of the EIM to California are not permitted (Net Export Constraint)	<ul style="list-style-type: none"> <li>▪ California load can only be met using California’s Resources.</li> <li>▪ Load outside of California can only be met by non-CAISO resources (as well as net transfers from California, subject to the second Constraint described below).</li> <li>▪ The optimal solution in California (optimal dispatch of California’s resources) does not include the effects of load outside of California and non-CAISO resources.</li> </ul>
	2) Net transfers from California to the non-CAISO footprint of the EIM are permitted	<ul style="list-style-type: none"> <li>▪ Characteristics of California load and California’s resources can impact the dispatch of non-CAISO resources meeting load outside of California, because residual energy from California resources is available to serve part or all of the load outside of California. Therefore, California’s load can have an effect on the optimal dispatch of non-CAISO resources in the first pass.</li> </ul>
	3) California resources include energy bids and GHG costs.	<ul style="list-style-type: none"> <li>▪ In addition to the energy costs, GHG costs of California’s resources can impact the dispatch of non-CAISO resources serving load outside of California, in the first pass.</li> </ul>
	4) Non-CAISO resources include only energy bids (GHG price bids are not included in the first pass)	<ul style="list-style-type: none"> <li>▪ The optimal solution of the first pass does not include the effects of the GHG costs of the non-CAISO resources.</li> </ul>
	5) Non-CAISO resources include GHG capacity bids	<ul style="list-style-type: none"> <li>▪ GHG capacity bids limit the maximum available dispatch of non-CAISO resources serving load outside of California. See the GHG base values in example (5J) in CAISO illustrative model.<sup>20</sup></li> </ul>
	6) Congestion constraints	<ul style="list-style-type: none"> <li>▪ Congestion constraints can limit the maximum available dispatch of non-CAISO resources serving load outside of California. See the GHG base values in example 10J in CAISO illustrative model<sup>21</sup></li> </ul>
Second Pass	1) Net transfer from the non-CAISO footprint of the EIM to California is permitted.	<ul style="list-style-type: none"> <li>▪ All resources (California and non-CAISO) are optimized to yield the optimum dispatch at minimum cost serving load inside and outside of California.</li> </ul>
	2) Non-CAISO resources include energy bids as well as GHG price bids	<ul style="list-style-type: none"> <li>▪ GHG prices bids of non-CAISO resources can affect the optimal dispatch of resources.</li> </ul>
	3) GHG allocation base	<ul style="list-style-type: none"> <li>▪ GHG allocation base of non-CAISO resources limits the incremental dispatch of non-CAISO resources to meet load inside and outside of California.</li> </ul>
	4) Other constraints	<ul style="list-style-type: none"> <li>▪ With the exception of the three previous constraints, all other constraints considered in the first pass are included in the second pass.</li> </ul>

<sup>20</sup> CAISO spreadsheet of illustrative model discussed in the straw proposal, Tab labelled 5j.  
<http://www.caiso.com/Documents/IllustrativeModel-CurrentGreenhouseGasDesignComparedtoProposedTwoPassOption.xlsx>

<sup>21</sup> CAISO spreadsheet of illustrative model discussed in the straw proposal, Tab labelled 10j.  
<http://www.caiso.com/Documents/IllustrativeModel-CurrentGreenhouseGasDesignComparedtoProposedTwoPassOption.xlsx>



## ORA Recommended Modifications to the CAISO's First Pass Optimization

ORA recommends modifications to CAISO's first pass optimization to address the ARB's concern, as well as to address the first two proposed principles in the straw proposal:<sup>22</sup>

- Track emissions impacting the atmosphere as a result of generation outside California dispatched by the [CA]ISO market to serve California load
- Reflect those emissions in ARB's GHG regulations

To determine the non-CAISO resources that have been incrementally dispatched to serve California load, ORA recommends that the CAISO's proposed first pass optimization includes the same variables and constraints as the ones used in the second pass with the exception of California load. Thus, the first and second passes optimization would allow resources to dispatch under similar conditions, except for one variable, which is California's load.

ORA recommends the following modifications to the formulation of the CAISO's proposed **first pass**:

1. Include the GHG capacity bids and the GHG price bids of the non-CAISO resources willing to be deemed deliverable to California.

The inclusion of GHG capacity bids in the first pass sets the available supply from non-CAISO resources to serve California, as well as the remaining available supply to serve load outside of California.

The inclusion of GHG price bids in the first pass allows for the optimizations in the two passes under similar conditions, allowing California and non-CAISO resources to meet load outside of California on an equal basis.

2. Allow California and non-CAISO resources, (including their GHG price bids and energy bids), to meet load, inside and outside California.
3. Set California load to zero, and optimize the entire market. By setting California load to zero, energy supply from all the resources (California and non-CAISO) will only be available to meet load outside California.

ORA does not propose any changes to CAISO's formulation of the second pass, with the exception that the results from the ORA's recommended modification to the first pass would be used as the GHG allocation base in the second pass.<sup>23</sup>

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<sup>22</sup> Straw Proposal, p. 10.

<sup>23</sup> Note that the CAISO's formulation of the second pass includes California's load.

ORA recommends that the only difference between the first pass and the second pass to be the addition of California’s load in the second pass. All other constraints and variables in the two passes should be the same.

The optimal dispatch from the modified first pass would now reflect the dispatch of non-CAISO resources absent California load; hence, the results provide a more accurate GHG allocation base. When California load is added in the second pass, the incremental dispatch of the non-CAISO resources, (as compared to the GHG allocation base from the modified first pass), can then be attributed to serving California load. Therefore, the results of the second pass would more accurately allocate GHG obligation to the EIM transfers serving California load.

Table 2 illustrates the main variables and constraints in CAISO’s proposed optimization (as understood by ORA), compared to ORA’s recommended modifications to the first pass.

**Table 2: Illustration of the Main Variables and Constraints Considered in CAISO’s First and Second Pass Compared to ORA’s Recommended Modifications to the First Pass.**

	CAISO’s Proposed Option 2		ORA Recommended Modification to the First Pass	
	First Pass	Second Pass	First Pass	Second Pass
<b>Non-CAISO Supply</b>				
<b>California Supply</b>				
<b>Non-CAISO Demand (Load)</b>				
<b>California Demand (Load)</b>			×	
<b>Non-CAISO Energy Bids</b>				
<b>Non-CAISO GHG Capacity Bids</b>				
<b>Non-CAISO GHG Price Bids</b>	×			
<b>California Energy Bids</b>				
<b>California GHG Price Bids</b>				
<b>Net Transfers from EIM to California</b>	×		*	
<b>Net Transfers from California to EIM</b>				
* Note there are no net transfers to California as California load is set to zero.				

## **Conclusion**

ORA supports the collaborative efforts between CAISO, the ARB and other stakeholders to improve the GHG design in the EIM and regional integration initiatives. Inaccurate attribution of compliance obligations could result in the unintended consequence of erroneously shifting the compliance obligations to entities serving California load. If such obligations are inaccurately allocated to investor-owned electric utilities in California, the associated compliance costs would be incurred by California's ratepayers.

ORA therefore generally supports the CAISO's efforts to improve tracking of GHG emissions in order to align with ARB regulations and accurately assign GHG compliance obligations to out-of-state resources serving California load. Resolving the concerns that ORA identified in Option 2 should result in more accurate attribution of compliance obligations to external resources serving California load.

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