Comments of Powerex Corp. on
EIM Greenhouse Gas Enhancement
Draft Final Proposal

Submitted by	Company	Date Submitted
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Powerex appreciates the opportunity to submit comments on CAISO's May 24, 2017 EIM Greenhouse Gas ("GHG") Enhancement Draft Final Proposal ("Draft Final Proposal") and the Revised Final Proposal of June 23, 2017.

Powerex believes it is vitally important for the EIM to accurately identify the GHG emissions associated with EIM transfers serving load in California. It is now broadly recognized that the existing EIM optimization lacks this necessary accuracy, which is distorting dispatch decisions, sending inefficient price signals, and promoting "leakage" of GHG emissions. Powerex reiterates its strong support for modifying the EIM optimization algorithm to address these problems.

At the heart of the inaccuracy in the current EIM algorithm is that the attribution of GHG emissions for EIM transfers serving California load is overly broad: the software is able to assign these transfers to *any* willing EIM participating resource, even if the output of the resource was fully scheduled prior to EIM dispatch, and even if EIM transfers serving California load have no impact on the output of the resource. A much more accurate approach would be to limit the attribution of GHG emissions to only that portion of a resource's output that is available and economically dispatched to serve California load (*i.e.,* the portion of a resource's output that is not otherwise committed or economic to serve non-California load).

As expressed in its prior comments in this initiative, Powerex supports the use of a two-pass approach to identifying the output from non-California EIM participating resources associated with serving California load in the EIM and, therefore, subject to reporting and compliance requirements under the California Air Resources Board ("CARB") cap-and-trade program.[1] Such an approach would use the security-constrained economic dispatch software to estimate a hypothetical "first-pass" scenario in which participating resources are optimized but there are no EIM transfers serving load in California. This is a conceptually sound basis for establishing the counter-factual baseline output of resources that "would have run anyway," and which therefore should not be deemed as serving California load.

The Draft Final Proposal envisioned limiting the GHG emissions attributed to each resource to the difference between the hypothetical "first pass" to the actual solution in the binding market

[1] *See, e.g.,* Comments of Powerex Corp. on Regional Integration California Greenhouse Gas Compliance and EIM Greenhouse Gas Enhancement Straw Proposal (Dec. 15, 2016), *available a*t http://www.caiso.com/Documents/PowerexComments-RegionalIntegration-EIMGreenhouseGasCompliance-StrawProposal.pdf.

run. The Revised Draft Final Proposal describes an alternative two-pass implementation, in which the GHG attribution is limited to the difference between a participating resource's maximum bid range (instead of its final dispatched output) and the hypothetical "first pass" result. Powerex believes either of these approaches represents a significant improvement over the existing algorithm, and is therefore strongly supportive of moving forward with development, testing and implementation. Powerex also appreciates that the Revised Draft Final Proposal reduces some of the complexity of the Draft Final Proposal, making timely implementation more likely and reducing the risk of unintended consequences. As described more fully below, however, these same simplifications also leave a residual gap that, in certain circumstances, can periodically result in the potential for the EIM to under-state the GHG emissions associated with serving load in California. Powerex therefore urges CAISO to continue to work towards a more robust framework, as originally envisioned under the Draft Final Proposal, and commit to implementing as comprehensive of an approach as is technically feasible.

Finally, Powerex agrees that there are certain instances in which the GHG attribution should be informed by considerations other than how EIM transfers to California load may affect the short-term dispatch of a resource (as determined by the two-pass approach). However, Powerex believes it is imperative that such circumstances be clearly specified, and that solutions be narrowly tailored to address specific circumstance(s) that are of concern. The improvements possible under the two-pass solution will not be achieved if there are excessive loopholes for avoiding the two-pass framework altogether.

I. The Critical Need for Accurate GHG Attribution in the EIM

The Draft Final Proposal explains that CARB treats EIM transfers serving load in the CAISO Balancing Authority Area ("BAA") as electricity imports into California. More specifically, CARB permits EIM transfers serving load in the CAISO BAA to be reported as "specified source" deliveries (*i.e*., using the GHG emission rate of the specific generating resource identified as supporting that delivery). Thus, in order to ensure accurate GHG accounting, the EIM market solution must both dispatch resources to meet the energy needs of the combined EIM footprint—within California and outside of it—and identify which EIM participating resources are supporting EIM transfers serving load in the CAISO BAA. The scheduling coordinators for the resources serving load in the CAISO BAA, in turn, must report those deliveries to CARB and procure and retire the appropriate quantity of GHG emissions allowances.[2] The EIM optimization algorithm therefore seeks to minimize the sum of the bid-in cost of energy production and the bid-in cost of GHG compliance.

A. The Current EIM Optimization Does Not Accurately Account for GHG Emissions of EIM Transfers Serving Load in California

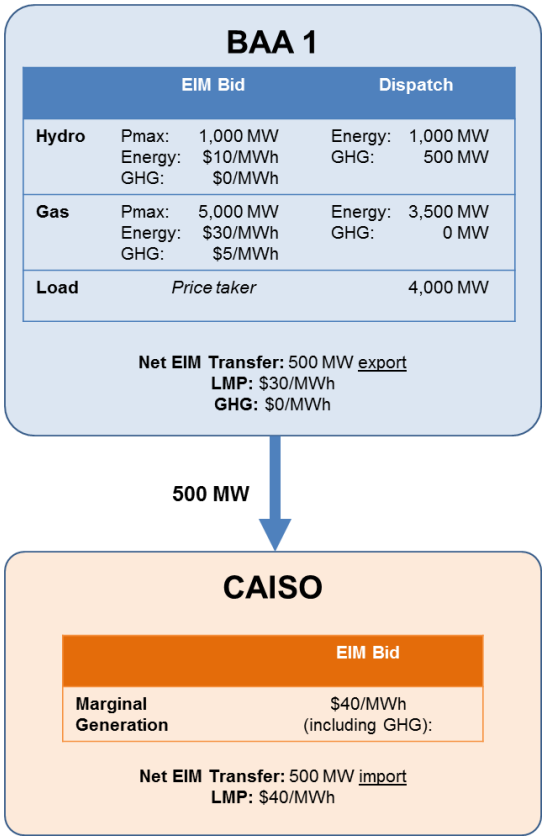
The current EIM optimization has been very successful in assigning GHG responsibility for EIM transfers serving California load in a manner that minimizes costs by assigning those transfers

[2] Draft Final Proposal at 3.

to the lowest-emitting participating resources willing to serve load in California.[3] CARB and stakeholders have expressed concerns, however, that the assigned GHG responsibility often does not reflect the actual out-of-state resources whose output increased as a result of EIM transfers serving California load. In other words, the existing EIM optimization often incorrectly assigns GHG responsibility to out-of-state resources that would have run even if there were no EIM transfers serving California load. In such cases, the existing EIM optimization does not reflect the incremental increase in GHG emissions associated with serving California load, with the result that too few GHG emission allowances are retired by EIM market participants. The failure of the existing EIM optimization to accurately take into account the increase in GHG emissions also distorts EIM dispatch outcomes and EIM prices and fails to provide accurate price signals for the participation of lower GHG-emitting resources in the EIM.

The hypothetical example below illustrates the functioning of the current EIM algorithm. In this example, the EIM optimizes dispatch and energy transfers between two BAAs: BAA1 and the CAISO BAA. The CAISO BAA consists of generation capacity with a bid-in cost of $40/MWh (including GHG costs). BAA1 consists of 1,000 MW of hydro generation with bid-in costs of $10/MWh for energy and $0/MWh for GHG compliance. BAA1 also consists of 5,000 MW of natural gas generation with bid-in costs of $30/MWh for energy and $5/MWh for GHG compliance. Forecast load in BAA1 is 4,000 MW for the upcoming interval, and up to 500 MW of EIM transfers are possible between BAA1 and the CAISO BAA. The least-cost dispatch solution is straightforward: the hydro generation in BAA1 is dispatched to its full 1,000 MW capacity, while the gas generation in BAA1 is dispatched to 3,500 MW. This generation is balanced in BAA1 by the 4,000 MW of demand plus 500 MW of EIM transfers serving load in California (where generation has a higher bid-in cost). The dispatch solution is shown graphically below:

[3] Participating resources located outside California submit bids consisting of an energy component as well as a GHG component. The GHG component of bids includes a maximum quantity (in MW) of output that may be deemed to serve load in California, as well as a GHG adder (in $/MWh).



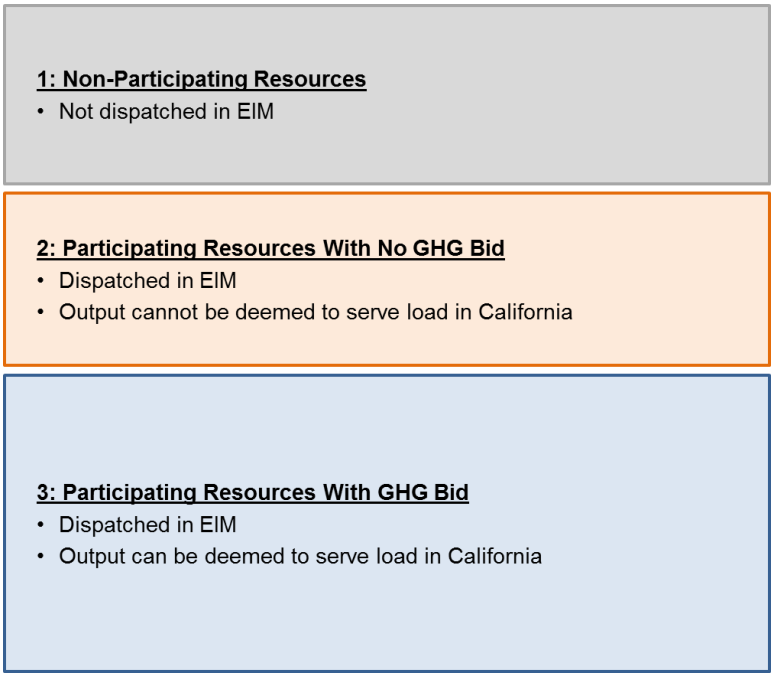
In addition to the physical dispatch of resources, the EIM algorithm must determine which BAA1 resources—hydro or natural gas, or a combination of both—were used to support the 500 MW of EIM transfers into California. Currently, the EIM algorithm minimizes the bid-in cost of the GHG attribution by associating the 500 MW of EIM transfers serving California load with 500 MW of the hydro output (with a GHG adder of $0/MWh in this example). The result is a market solution with: a LMP within the CAISO BAA of $40/MWh; LMP within BAA1 of $30/MWh; and a GHG shadow price of $0/MWh. The scheduling coordinators for the relevant hydro resources must report to CARB 500 MW of specified-source deliveries serving load in California, which will have an associated compliance allowance obligation of zero metric tons of CO_2 because these are non-emitting resources. In addition, the scheduling coordinators for the relevant hydro resources receive a payment from the CAISO for the 500 MW quantity of specified-source deliveries multiplied by the GHG shadow price (which, in this example, is zero).

This example illustrates the chief concern raised by CARB and by stakeholders: assigning the import into California to the hydro resource in BAA1 may minimize the cost of complying with CARB's regulations, but there is no meaningful connection between the hydro resource being dispatched and imports serving load in California. As the lowest-cost resource in BAA1, the hydro units would have run at full capacity even if there were no imports serving load in California at all. Thus, even if there were no EIM transfers, 1,000 MW of hydro would have been dispatched to serve load in BAA1. What *would* change between these two scenarios (with and without EIM transfers to California) is the output from the natural gas generators, which would produce 3,500 MW when there are EIM transfers to California but only 3,000 MW when these transfers to not occur. Thus, in this example, it is clearly the natural gas generation in

BAA1 that is supporting the EIM transfers serving load in California. Yet, under the existing framework, the EIM algorithm would incorrectly assign the GHG reporting obligation to the hydro resource (resulting in no carbon allowance obligations).

B. Powerex Supports the Proposed Two-Pass Approach as a Robust and Sound Framework for GHG Attribution in the EIM

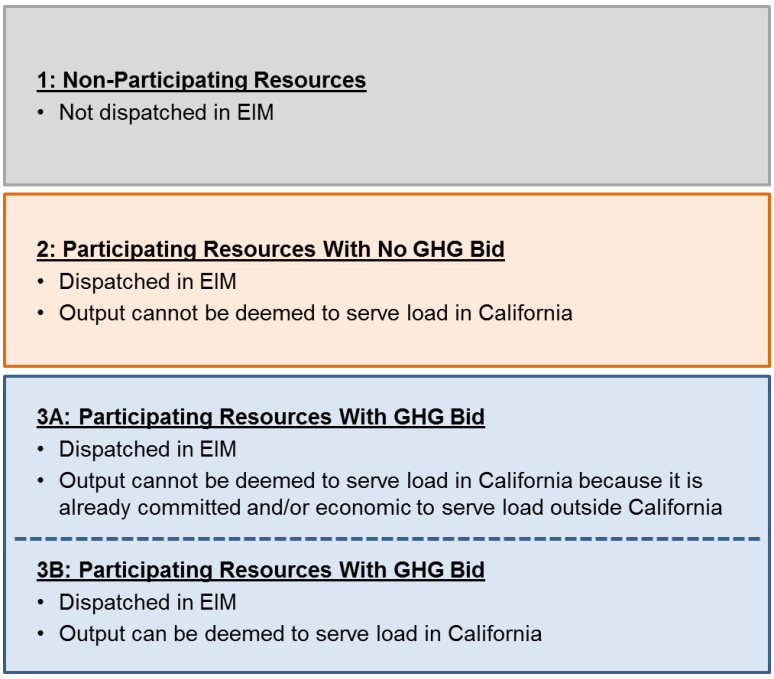
Resources located within BAAs participating in the EIM can be grouped into three broad categories, illustrated below:



Under the existing EIM algorithm, the entire output of each resource in the third category—"Participating Resources with GHG Bid," shown in blue—is eligible to be deemed to serve load in California. The resources that may not be deemed to serve load in California are resources that do not submit bids in the EIM at all (Group 1, in gray) and resources that submit a GHG quantity of 0 MW (Group 2, in orange). In other words, whether or not a resource is eligible to be deemed to serve load in California is based solely on the participation decisions made on behalf of those resources. And among the resources that are eligible to receive a GHG allocation, the EIM optimization assigns the GHG allocation on the basis of cost alone. There is nothing in the current EIM optimization framework that distinguishes between GHG emissions that would have occurred absent EIM transfers to serve load in California and the incremental increase in GHG emissions associated with serving load in California. In fact, the entire output quantity of the resources in Group 3 is available to be deemed to serve load in California ***even if the output has been scheduled to serve load outside of California in the day-ahead and/or real-time markets and/or the resource would have run anyway***. Since the EIM algorithm seeks a least-cost solution, this has the effect of systemically deeming external non-emitting resources as serving California load in the EIM, including during hours and intervals

that external GHG-emitting resources are the actual resources increasing their output to support EIM transfers serving California load.

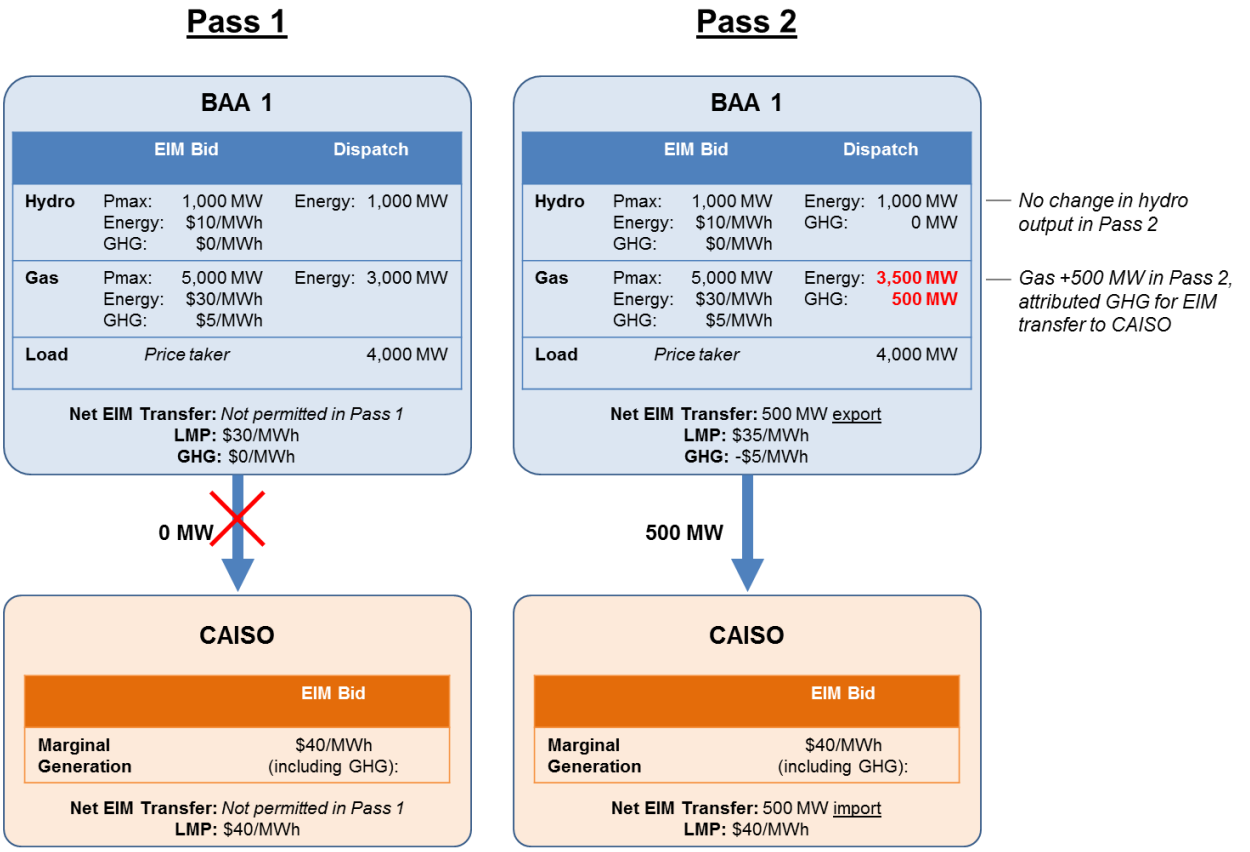
What is needed, then, is a more refined treatment of the third category of EIM participating resources. This category can be sub-divided into two components: the output (and GHG emissions) of these resources that serves load outside of California, and the incremental increase in the output of these resources to support EIM transfers to load in California.



Thus, what is needed is a way to differentiate between the output of EIM participating resources that would occur without EIM transfers to load in California from the output that occurs when such EIM transfers do occur.

Powerex believes that the "two-pass" solution described in the Draft Final Proposal represents a robust and conceptually sound framework for achieving this goal. Under this approach, the EIM software performs a new hypothetical "first pass" optimization in which there are no EIM transfers serving load in California. This hypothetical "first pass" optimization establishes a baseline level of resource output and GHG emissions from non-California resources to meet only non-California load, in a least-cost security constrained manner. Powerex believes this is a conceptually valid and robust baseline against which to compare the *actual* "second pass" dispatch of resources, in which EIM transfers may serve California load.

Under the proposed two-pass solution, the outcome from the above example would be starkly different. The "first pass" would simulate the EIM market outcome if there were no EIM transfers serving load in California. The solution in this "first pass" would consist of 1,000 MW of hydro and 3,000 MW of gas generation, and is shown on the left-hand panel, below. In the "second pass," which is also the actual market dispatch, the result is the same as above, (*i.e.,* 1,000 MW of hydro; 3,500 MW of gas; and 500 MW of EIM transfers serving California load). The right-hand panel, below, shows this "second pass" solution, with the change between the first and second pass highlighted in red:



The two-pass solution reveals that, when EIM transfers serve load in California, it is the *gas-fired generation* in BAA1 that increases its output and GHG emissions. Under this framework, the EIM algorithm would attribute the EIM transfers serving load in California to 500 MW of output from the gas generators in BAA1, not to the hydro resources. The final market solution in this case would be: LMP in the CAISO BAA of $40/MWh; LMP in BAA1 of $35/MWh; and a GHG shadow price of $-5/MWh. The gas-fired resources in BAA1 would be required to report to CARB 500 MW of specified-source deliveries to California, and procure and surrender the corresponding quantity of GHG emission allowances.

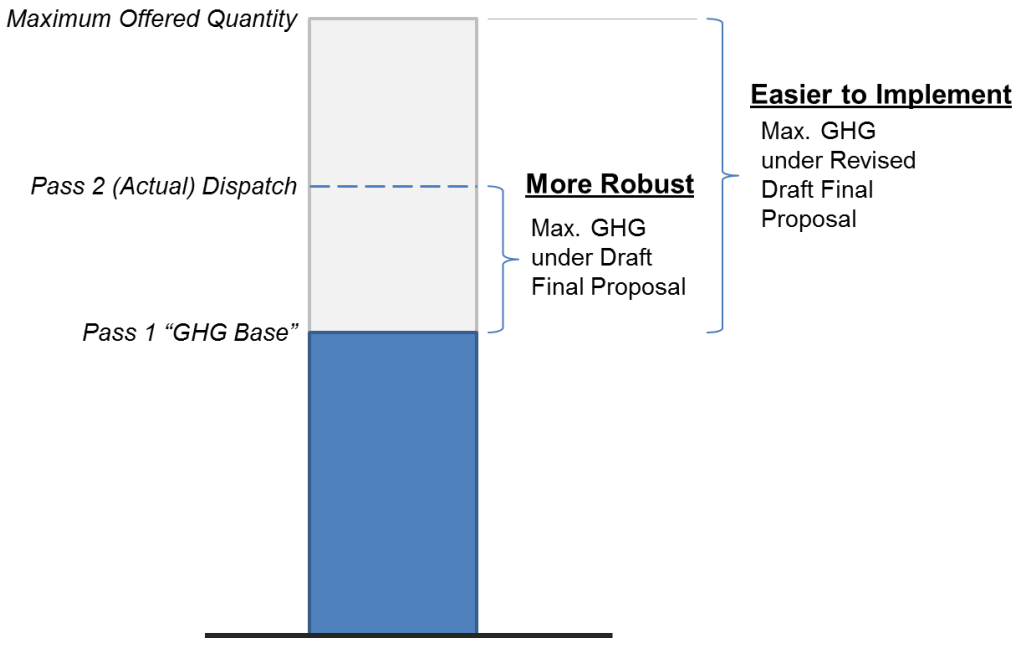
In effect, the two-pass solution limits the set of resources that are eligible to be deemed to serve California load to only the increase in output between the hypothetical first pass and the actual second pass. Like today, not all participating resources will be eligible to receive a GHG attribution. In contrast to the existing approach, however, the eligibility of a participating resource's output to receive a GHG attribution will *not be* solely at the discretion of the resource's scheduling coordinator (*i.e.,* the GHG quantity submitted in a bid), but will also be limited by the result of the hypothetical first-pass optimization.

It is important to note that the sole purpose of the "first pass" is to simply establish a counter-factual dispatch level for each resource (absent EIM transfers servings load in California) in order to calculate the quantity of output from each resource that may be deemed serve load in California. The "first pass" is *not* a binding market run.

C. Powerex Supports CAISO Implementing the Revised Draft Final Proposal While Continuing to Work Toward Implementing a Full Two-Pass Solution

Under the two-pass approach described in the Draft Final Proposal, the optimal selection of resources is more complex than under the current design. In certain cases, the approach also leads to some outcomes that may not be intuitive. The Revised Draft Final Proposal addresses these circumstances by describing an alternative two-pass approach that simplifies certain aspects of the proposal. Specifically, the Revised Draft Final Proposal would limit the GHG attribution of a participating resource to not exceed the difference between the resource's maximum bid range and the "first pass" result. This is an important difference from the prior proposal, since it limits the GHG attribution based on the *bid-in capacity* (relative to the "first pass" quantity) as opposed to the *capacity actually dispatched* in the binding market run (relative to the "first pass" quantity). Powerex understands the Revised Draft Final Proposal approach can be more readily implemented since it enables the maximum GHG quantity for each resource to be readily determined before the binding market run (instead of being a function of the binding market run) and hence can use the existing EIM optimization algorithm (with a revised value for the GHG MW for each resource, based on the "first pass").

The difference between the Revised Draft Final Proposal and the "full" two-pass solution from the Draft Final Proposal is illustrated below:



The Revised Draft Final Proposal can be viewed as limiting GHG attribution to the *upward capacity* of participating resources remaining after the "first pass" optimization. The full, more comprehensive, two-pass solution would go a step further, and limit GHG attribution to the portion of that capacity that is actually *economic to serve California load,* as determined by the actual dispatch of that resource above the "first pass" optimization level. The simplification under the Revised Draft Final Proposal thus leaves a residual "gap" in the GHG attribution

framework that can periodically result in California load being deemed to be served by lower-emitting resources' output that would have been dispatched anyway.

In Powerex's view, the Revised Draft Final Proposal is a less comprehensive and less robust approach to recognizing the GHG emissions associated with service California load than what was proposed in the Draft Final Proposal, but is perhaps a more workable approach that can hopefully be implemented in a timely manner. Powerex believes that the Revised Draft Final Proposal would be a substantial improvement over the current EIM algorithm. In Powerex's view, the greater certainty of timely implementation—and of the timely termination of the significant adverse consequences under the current framework—outweigh the shortcomings of initially implementing a simpler, but less robust, approach. Powerex believes that prompt implementation of a *better* approach is far more important than delayed implementation of the *best* approach.[4] Powerex therefore supports CAISO moving forward with implementation of the Revised Draft Final Proposal. However, in parallel with pursuing implementation of the Revised Draft Final Proposal, Powerex urges CAISO to continue to explore implementing a more comprehensive full two-pass approach, and to do so as soon as it is determined to be feasible. This dual strategy will retain CAISO's commitment to comprehensively addressing the challenges of GHG attribution in the EIM, while making significant improvements as soon as possible.

D. Powerex Requests that CAISO Report on Accuracy of GHG Attribution in the EIM to Assess Improvement of Proposed Solution and to Quantify Remaining Potential Improvements

Powerex believes that stakeholders and CAISO would benefit from a historical and ongoing analysis of GHG attribution in the EIM. Such analyses can be used to demonstrate the improvements in GHG attribution accuracy under the proposed solution once it is implemented. They can also be used to indicate the additional improvements that may be achieved through implementation of the full two-pass solution described in the Draft Final Proposal.

Historical GHG attribution in the EIM (since EIM inception) could be analyzed by comparing the GHG emissions actually attributed to a resource against the maximum attribution under the two-pass solution. Since there are no "first pass" results available for historical data, this analysis would use each resource's customer-submitted base schedule as a proxy for how a resource would operate absent EIM transfers serving load in California (by excluding all EIM dispatches).[5] Consider, for example, a 100 MW resource with a 60 MW submitted base schedule, 90 MW final dispatch in the EIM and 90 MW of GHG attribution:

[4] Indeed, in the event that unforeseen technical or other challenges jeopardize a January 2019 implementation date for the Revised Draft Final Proposal, Powerex recommends that CAISO implement the approach using customer-submitted resource base schedules as the "GHG base" quantity. That is, the GHG bid quantity would be equal to the lesser of (1) the customer-submitted GHG quantity; and (2) the difference between the maximum bid range and the resource base schedule. While CAISO has explained that base schedules are not necessarily optimized, this approach would still be considerably more accurate than the current algorithm, which permits *all* base schedule output to be deemed to serve California loads.

[5] In this historical analysis, the difference between base schedule output and EIM dispatched output will reflect not only EIM transfers serving California load, but also optimization of base schedules to serve load outside of California.

1. **Under the current algorithm**, the entire 90 MW of dispatched output would be eligible to be deemed to serve California load in the EIM.
2. **Under the Draft Final Proposal** (and assuming the results of the "first pass" was the same volume of output as the submitted base schedule of 60 MW), only 30 MW would be eligible to be deemed to serve California load in the EIM.
3. **Under the Revised Draft Final Proposal** (and again assuming the results of the "first pass" was the same volume of output as the submitted base schedule of 60 MW), only 40 MW would be eligible to be deemed to serve California load in the EIM.

Under the current GHG attribution framework, the entire 90 MW of output from the resource was "deemed" to serve California loads in the EIM, including the entire 60 MW base schedule output plus the 30 MW of additional EIM output. Under the Draft Final Proposal, only the incremental 30 MW of output from this resource—and *none* of its base schedule output—would be eligible to serve California loads in the EIM. The Revised Draft Final Proposal, meanwhile, would permit up to 40 MW of this resource's output to be deemed to serve California loads in the EIM. In other words, while the entire base schedule output of the resource in this example could be deemed to serve California loads in the EIM under the current algorithm, this would be very significantly reduced under the Revised Draft Final Proposal and eliminated altogether under the Draft Final Proposal.

By performing this analysis over time and by different types of resources, it will become evident the extent to which the current EIM algorithm has deemed California load to be served by the base schedules of low- or non-emitting resources in the EIM. The analysis will also provide an indicative estimate of how different the historical GHG attribution would have been under either of the proposed two-pass solution alternatives.

Once the Revised Draft Final Proposal framework is implemented, Powerex suggests that CAISO continue to perform the same analysis using the same metrics (*i.e.,* comparing GHG attribution to output in excess of base schedules) to provide a direct before-and-after comparison. However, Powerex believes CAISO should also perform the analysis comparing GHG attribution to output above the "first pass" GHG base schedule solution for each resource. The importance of this latter analysis will be to indicate whether—and the extent to which—there are still circumstances in which California load is deemed to be served by resources that would have run anyway to serve load outside of California. This will be a critical metric to assess the performance impacts of the simplifications under the Revised Draft Final Proposal, and will inform stakeholders and CAISO about the incremental benefits of implementing a more comprehensive two-pass approach.

II. Powerex Supports Only Limited Exemption from the "Two Pass" Approach if Necessary to Align GHG Attribution in the EIM with Existing Delivery Commitments or Investments

In the Draft Final Proposal, CAISO discusses the concept of "California Supply," with resources designated as such effectively allowed to bypass the two-pass framework to be deemed to

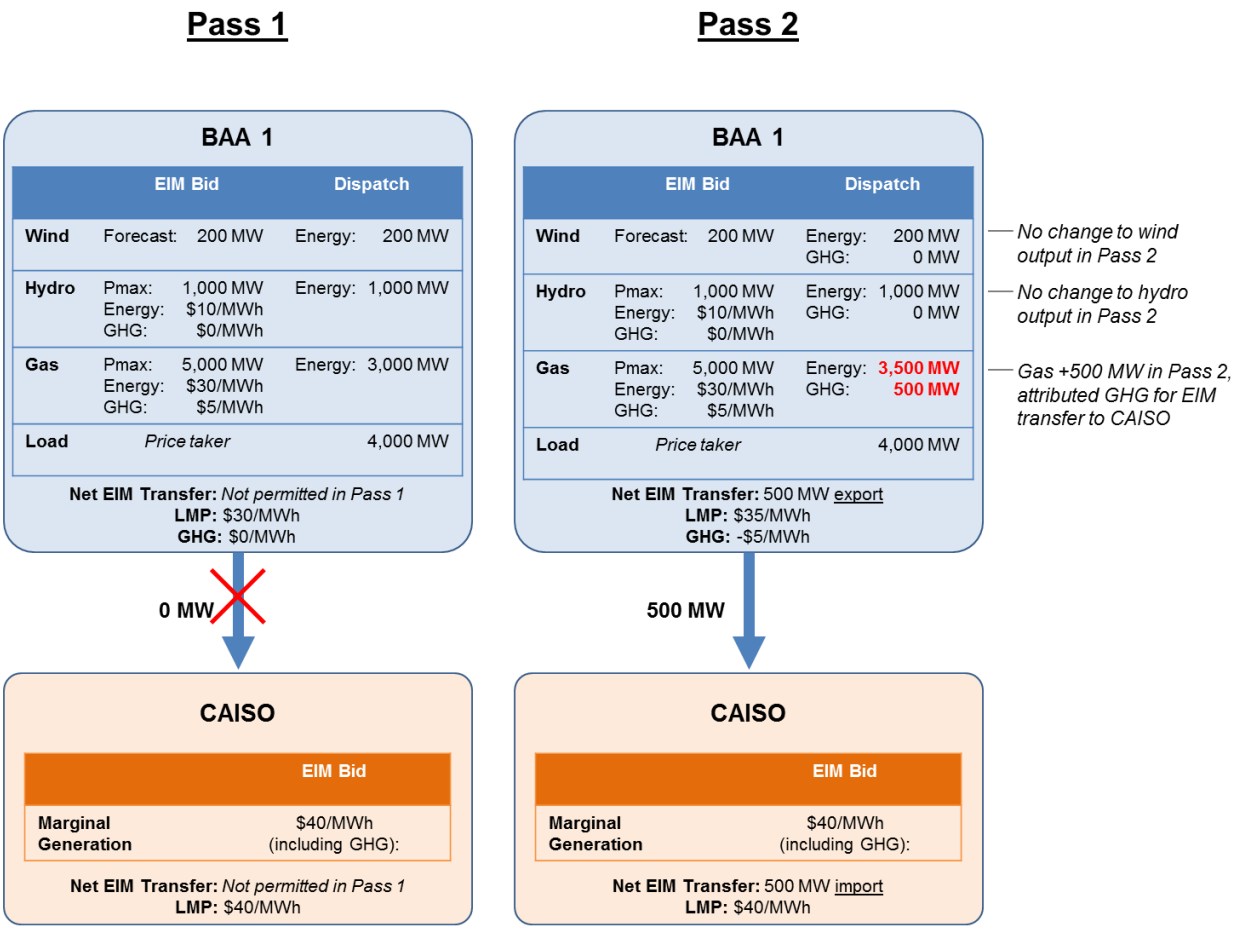
serve California load. Powerex urges CAISO to proceed with caution in creating any exemption from the two-pass framework. The purpose of developing the two-pass framework is to more accurately track GHG emission associated with EIM dispatch—a purpose that easily can be defeated by creating overly broad exemptions that effectively allow resources to "opt out" of the enhanced framework. For this reason, Powerex believes any functionality that has the effect of exempting a resource—or a portion of its output—from the two-pass framework for GHG attribution should be limited based upon clear and enforceable eligibility criteria. Powerex opposes any design that simply gives resource scheduling coordinators broad discretion to "check a flag" or "submit a quantity" and thereby avoid the two-pass approach.

A. Treatment of California-Funded Out-of-State Resources

The prior discussion shows how the proposed two-pass solution would help to identify the output from out-of-state resources associated with EIM transfers to serve load California and distinguish this output from that of out-of-state resources that would have occurred anyway (*i.e.,* output that serves load outside of California). In other words, the two-pass solution identifies the out-of-state resources supplying *additional* energy in order to support EIM transfers serving load in California in a given market interval. Since the two-pass approach effectively treats EIM transfers serving California load as incremental demand, the resources identified as supporting those transfers will generally have higher bid-in energy costs than the resources that serve load outside of California. Stated differently, out-of-state participating resources with lower variable production costs are likely to be dispatched regardless of whether or not there are EIM transfers serving California load, and hence EIM transfers serving California load are unlikely to be attributed to such out-of-state resources. Powerex believes this outcome is consistent with the purpose of the "specified source" reporting of energy imports into California, as it identifies the specific out-of-state resources *incrementally producing electricity* for the purpose of supporting deliveries to California load.

In certain cases, however, whether an out-of-state resource is producing electricity for delivery to California load is established well in advance of the resource being dispatched. For example, consider an out-of-state wind farm that was constructed to supply a California Renewable Portfolio Standard ("RPS") contract. Such a facility exists *only* because of that California-funded contract; it is, in a sense, a "California resource" despite being located outside of the state. Under the two-pass GHG attribution proposal, however, the low variable production cost of this wind facility makes it likely that the resource would be viewed as serving load outside of California as part of the "first pass" solution, thereby making the resource ineligible to be identified as the source of EIM transfers serving California load.

This can be seen by extending the prior example to include a wind farm with expected output of 200 MW. The result of the "first pass" is shown below, on the left-hand side. The wind and hydro resources with zero bid-in cost are obviously part of the least-cost solution, with the additional energy needed to meet forecast demand in BAA1 obtained from the gas resources. The "second pass" result, which is also the actual market result, is shown on the right-hand side. As before, permitting up to 500 MW of EIM transfer to serve California load results in a 500 MW increase in the output from gas-fired resources in BAA1. California load is therefore attributed to gas-fired generation in BAA1.



It is undeniably true that the wind resource in BAA1 "would have run anyway," even with no EIM transfer serving California load. However, it is likewise true that the resource would not even exist—and hence would be entirely unavailable—had it not been for the RPS contract to a California load-serving entity. In order to recognize that California loads are being served by the out-of-state renewable energy facility they have funded, it appears appropriate to provide a limited alternative "by-pass" to the two-pass framework for such facilities.[6] This appears to be one of the objectives of the Draft Final Proposal's "California supply" functionality.

While Powerex believes that such a bypass is appropriate, it is important to recognize that the accuracy of GHG attribution under the two-pass solution could be largely nullified if scheduling coordinators are given unchecked discretion to self-declare a resource as "California supply." For that reason, Powerex recommends that CAISO propose clear criteria, to be approved by CARB, for any out-of-state resource that seeks to be recognized as "California supply." As a starting point, Powerex suggests that the designation of California supply be limited to resources that are committed under a California RPS contract, a California Resource Adequacy

[6] Powerex notes that this objective could also be addressed through the existing "RPS adjustment" mechanism under CARB's cap-and-trade regulations. Under the RPS adjustment, the output of renewable resources under contract to a California load-serving entity but not physically delivered into California entitles the LSE to a credit that reduces its GHG liability. In other words, the benefits of contracting with low-GHG emitting resources outside of California are not "lost" if the output is not physically delivered to California (either through an e-Tag or through an EIM GHG allocation).

contract, or a contract to provide flexible capacity to California. Moreover, the designation as "California supply" should apply only to the portion of the resource's capacity that is under a qualifying contract. For instance, a 500 MW hydro resource with 100 MW committed under a Resource Adequacy contract should only be recognized as having 100 MW of "California supply," not 500 MW.

Under this approach, the portion of contracted "California supply" would increase the maximum GHG attribution that can be assigned to the associated resource. That is, the maximum GHG attribution would be the greater of:

1. the difference between the maximum bid range of the resource and the "first pass" results; and
2. the quantity of "California supply."[7]

This maximum value would be calculated after the "first pass" and used as the "GHG MW" value in the "second pass".

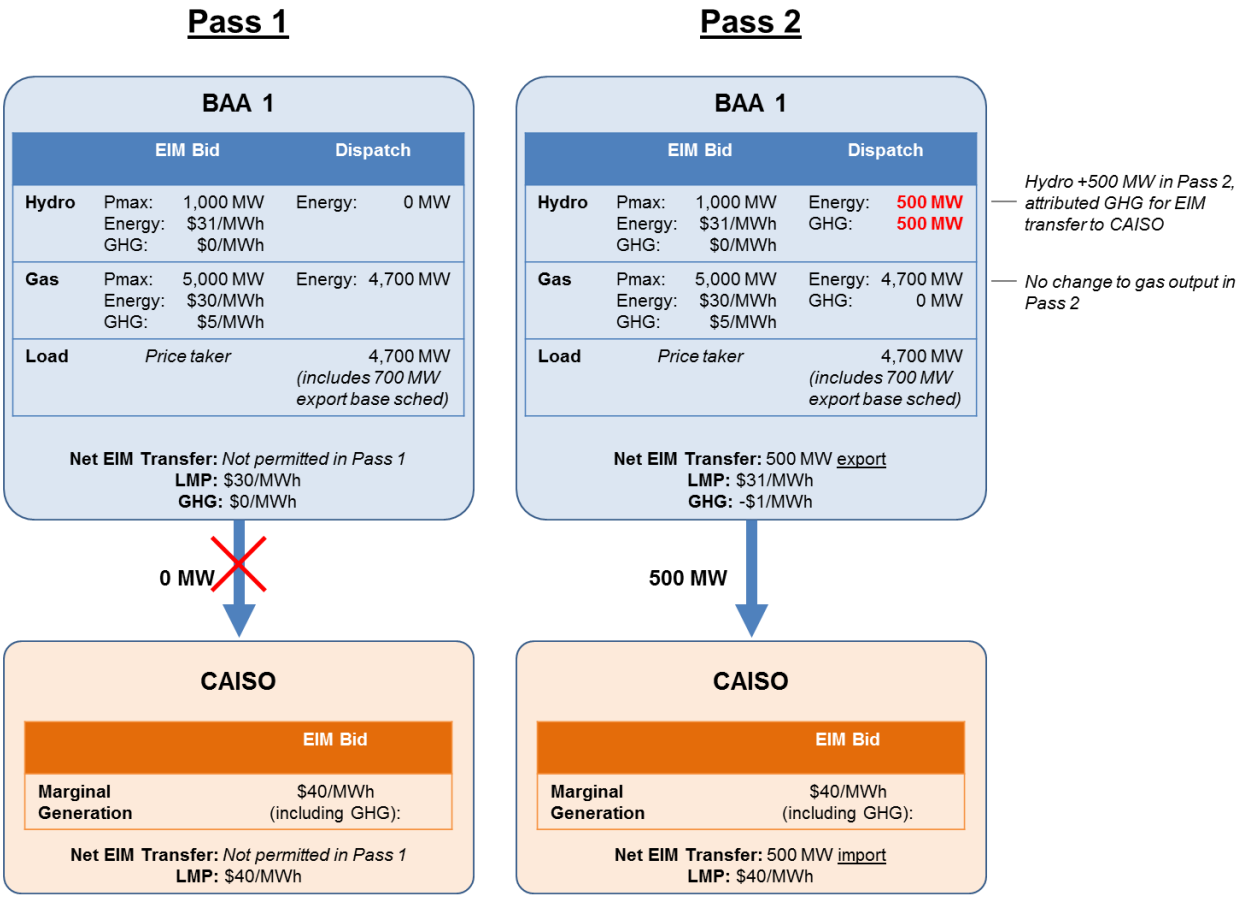
B. Avoiding Double-Counting of Resource Output for EIM and Non-EIM Deliveries to California Load

The Draft Final Proposal also discusses the need to ensure the GHG attribution in the EIM is not duplicative of GHG reporting and compliance obligations already associated with a resource's output as a result of deliveries arranged outside of the EIM framework.

Consider the prior example, except that the hydro resources submit a bid price of $31/MWh for energy, and $0/MWh for GHG. In addition, assume that these resources have already been designated as the specified source of a 700 MW delivery in the CAISO's day-ahead market. As CAISO staff have explained on numerous occasions, the EIM dispatch solution is not performed as an "incremental" dispatch of resources relative to their base schedules. Instead, the EIM performs a full dispatch of all resources, regardless of any pre-existing arrangements and associated base schedules.

In this example, the "first pass" solution, with no EIM transfer serving California load, does not include any output from the hydro resources, as the $31/MWh bid-in energy price is higher than the $30/MWh bid-in energy price from the natural gas resources. The "first pass" result is shown on the left-hand side of the figure below. In the "second pass," however, the hydro resources in BAA1 are the least expensive source for EIM transfer to serve load in California. This is because the total bid-in cost, including the GHG adder, is lower for the hydro resources ($31/MWh + $0) than for the gas-fired resources ($30/MWh + $5/MWh). The actual market solution is shown on the right-hand side of the figure below. The EIM transfer serving load in California is attributed to the 500 MW increase in output from the hydro resources in BAA1.

[7] The contractual "California supply" functionality would increase the sum of the maximum GHG attributions to out-of-state resources. The EIM also enforces a constraint that total GHG attribution must equal EIM transfers serving California load. Where EIM transfers serving California load are less than the aggregate GHG attribution limits of participating resources, the EIM algorithm will select the least-cost allocation. This means that "California supply" will be eligible to receive a GHG attribution, but it may not actually receive it if other eligible allocations result in lower total costs.



In the above example, the hydro resource is dispatched to 500 MW and also incurs a CARB reporting and compliance obligation for the 500 MW of EIM transfer serving California load. However, this same resource was already identified as the specified source for a 700 MW day-ahead sale into the CAISO BAA. Hence, the hydro resource is identified as the source for a total of 1,200 MW of deliveries serving California load, despite actually producing only 1,000 MW.

Powerex agrees with the reasoning in the Draft Final Proposal that such an outcome is undesirable for at least two reasons. First, it potentially creates an excessive burden on market participants with out-of-state resources, who will be required to report to CARB and bear compliance costs for energy imports into California that exceed the physical output of their resources. Second, if one resource has total GHG attributions that are too high, it logically follows that there will be other resources with GHG attributions that are too *low*, undermining the accuracy of GHG attributions for energy imports serving load in California. In order to avoid double-counting, Powerex agrees that the GHG attribution in the EIM should recognize the extent to which out-of-state resources are already committed (through non-EIM transactions) to supporting deliveries serving load in California.

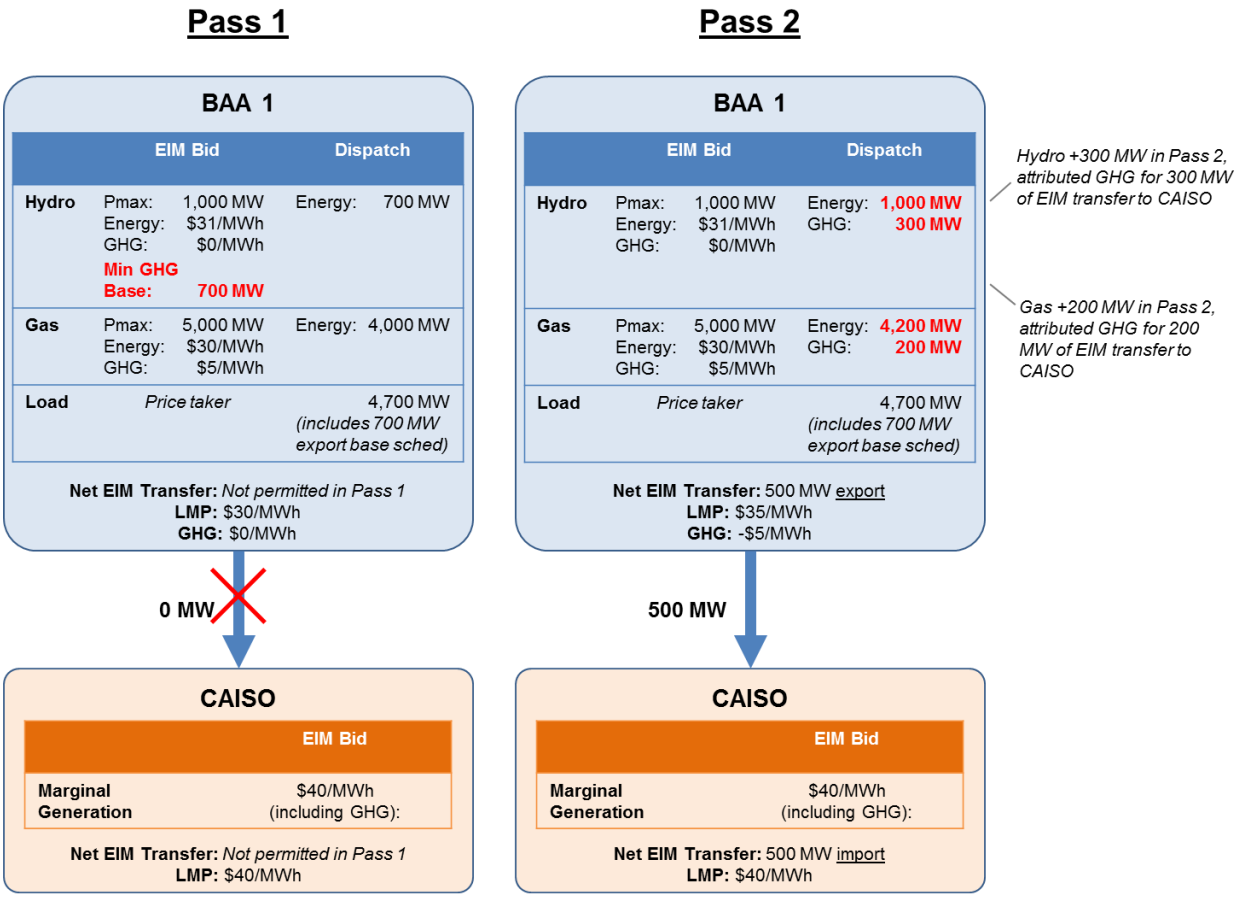
Powerex believes, however, that this is a separate and distinct issue from the treatment of California-funded resources discussed in the prior section. It therefore cannot be addressed via a single "California supply" designation or "flag," as appears to be proposed in the Draft Final

Proposal. Instead, Powerex recommends that CAISO enable scheduling coordinators to identify a minimum quantity of the "GHG allocation base" for each out-of-state participating resource, based on the quantity of specified-source energy deliveries associated with that resource outside the EIM. The output in the "first pass" simulation would be constrained to be no lower than this quantity, thereby reducing the maximum difference between the "first pass" and the "second pass" result and limiting the GHG attribution quantity in the EIM.[8]

The designation of a minimum "GHG allocation base" of 700 MW for the hydro resources in BAA1 is depicted below. In the "first pass," the output of the hydro resources is required to be no less than 700 MW, leading to the solution shown on the left-hand side of the figure below.[9] In the "second pass," the minimum constraint on the hydro resources is removed, and up to 500 MW of EIM transfers to serve California load are permitted from BAA1. This leads to the market dispatch shown in the right-hand side of the figure below.

[8] Unlike the implementation of the "California supply" designation discussed in the prior section, protecting against double counting needs to be reflected as additional constraints in the "first pass" optimization. This is because avoiding double-counting requires reducing the maximum amount of GHG attribution that a resource can be assigned in the EIM. To ensure that the full amount of EIM transfers serving California load can be attributed to out-of-state resources, however, necessarily requires *increasing* the maximum GHG attribution of other resources. This, in turn, requires a compensating reduction in the output of other resources in the "first pass."

[9] Note that the "first pass" result would be permitted to be *greater* than the minimum "GHG allocation base" quantity if the resource is economic to meet load outside of California. Avoiding double-counting requires only that the "first pass" result be *no less than* the specified minimum "GHG allocation base" quantity. In the binding market run or "second pass," this minimum constraint would not apply.



Only 300 MW of the EIM transfer serving load in California is now attributed to output from the hydro resources in BAA1, while 200 MW is attributed to natural gas resources. This solution properly recognizes that, of the 1,000 MW actually produced by the hydro resources in BAA1, 700 MW were already identified as supporting other specified-source energy deliveries serving California load outside the EIM. Hence only an additional 300 MW of hydro output were available to support EIM transfers serving California load; the remaining 200 MW of EIM transfers serving California load are therefore attributed to natural gas resources in BAA1.[10]

[10] Under this approach, sub-optimal specified-source base schedules can lead to sub-optimal market solutions in the first pass. Resolving these inefficiencies in the second pass can lead to aggregate increases in resource output between the first and second pass that exceed EIM transfers serving California load. This is not a problem, however, since the increase in output between the first and second pass establishes the *maximum* GHG attribution for a resource. The EIM optimization will also constrain the *total* GHG attribution across out-of-state resources to be equal to the EIM transfer serving load in California.