



Comments of Pacific Gas & Electric Company

Energy Imbalance Market Straw Proposal and Issue Paper

Submitted by	Company	Date Submitted
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Pacific Gas & Electric (PG&E) offers the following comments/questions in the stakeholder process for the California Independent System Operator’s (CAISO) Energy Imbalance Market (EIM) Initiative’s April 4, 2013 Design Straw Proposal and Issue Paper (“Proposal”).

PG&E’s primary objective is to ensure the EIM design is thoughtfully designed and carefully considered so the EIM can deliver on its promised benefits. The CAISO has stated that an EIM provides enhanced dispatch and diversification benefits and should yield superior intra-hour balancing at lower societal cost for all customers in the expanded EIM balancing area. In practice, however, poor choices in the design of market features and different rules among EIM entities could impede the achievement of the full benefits of an EIM, and, indeed, create additional costs and risks for California customers; so, full clarity on the design, implications to each territory, and costs will be important to understand through this process to ensure that the proposal is able to fully deliver on the benefits projected..

The CAISO’s Straw Proposal and Issue Paper identifies what the CAISO considers the primary issues and offers an outline of a high-level design. As expected at this stage, much of the detail has not been fleshed out and there are many unanswered questions. PG&E offers these comments as our initial thoughts to the Proposal

In our comments PG&E offers some guiding principles to help guide the EIM design. We also offer specific feedback on the design elements discussed in the Proposal. Finally, PG&E identifies four other issue areas that should be discussed as part of the stakeholder process: 1) allocation of administrative costs, 2) exit fees, 3) losses, and 4) market power mitigation.

Guiding Principles for EIM Design

PG&E recommends the following Guiding Principles to guide the EIM design:

- *Minimal Risk to Existing Customers* – California customers should not be asked to shoulder significant additional risk from the EIM.
- *Fair Cost Sharing* – The cost allocation needs to be fair to all parties and be based on cost causation.
- *Robustness* – The design should anticipate problems, including those due to the complexity of the EIM, and include fail-safes and other safeguards.
- *Scalable* – The EIM should anticipate new participants and be scalable.
- *Alignment* – EIM entities should anticipate a need to meet or accommodate some of the CAISO's policy priorities and rules such as rules governing the need for sufficient forward-procured flexibility capacity.

Initial Specific Feedback on the Design Elements Discussed in the Proposal

1. PG&E supports adjusting base schedules to eliminate transmission constraint violations within an EIM Entity before commencing the real-time market

PG&E supports adjusting base schedules to eliminate transmission constraint violations within an EIM entity before commencing the real time market (i.e., the EIM). If schedules are adjusted from the base schedules within the EIM to eliminate constraint violations, uplifts may be needed to cover some of the costs. Adjusting the base schedules to eliminate constraint violations before the EIM will eliminate uplifts from this source.

2. The proposed Minimum Shift Optimization (MSO) approach to adjust base schedules within an EIM Entity may reduce incentives for EIM participation and PG&E believes further exploration of alternatives is warranted

PG&E believes the proposed Minimum Shift Optimization (MSO) approach has several flaws and alternatives should be further explored.

Based on PG&E's understanding of the proposal, each EIM Participant in an EIM Entity will submit a balanced schedule using its resources (owned or under contract) to serve its load and estimated losses. These participants could also submit EIM offers to sell or buy back energy. The Market Operator would then evaluate whether the combined base schedules violated transmission constraints within an EIM Entity. Should a violation exist, the Market Operator would re-dispatch participating resources – those that submitted economic offers for use in EIM – to produce feasible, adjusted base schedules that are balanced in total for the EIM Entity. The adjusted base schedules may no longer be balanced for each EIM Participant within the EIM Entity.

This re-dispatch would use a MSO formulation, whose objective is to minimize the total MW of adjustments from the base schedules of participating resources within an EIM Entity. It would not consider the offer prices in the economic bids submitted by EIM Participants, only the dispatch range and the MW of movement. Resources will be charged or paid in the EIM for their deviations from the adjusted base schedules at real time market prices.

[Flaw #1] As designed, the proposal does not provide a mechanism to adequately compensate or charge a resource for the amount of adjustment from its base schedule made to produce the adjusted base schedule.

For example, a resource dispatched upwards from its base schedule to its adjusted base schedule has no way to recover the additional costs incurred. PG&E believes that such an approach based on MSO can provide the wrong incentives and may reduce participation in an EIM.

To further illustrate this problem, consider an independent power producer that owns a resource (G) that has a base schedule of zero MW (since it has not sold energy to another party prior to EIM). It participates in the EIM by submitting an energy bid into the market. Just before the real time market runs, the Market Operator determines that the base schedules violate a limit on a transmission facility in the EIM Entity. Results of the MSO indicate that dispatching 10 MW of energy from resource G and cutting 10 MW of energy from another resource owned by another EIM Participant can alleviate this violation with the fewest MW adjustments. The Market Operator increases the schedule for resource G by 10 MW to produce its adjusted base schedule. At the same time, it also reduces the schedule for the other resource by 10 MW. If, as proposed, EIM only pays for dispatches from its advisory base schedule, it will only pay resource G for any deviations in real time above its 10 MW adjusted base schedule. As PG&E understands it, the proposal does not explain how resource G will be compensated for the 10 MW of energy that it is required to supply in its adjusted base schedule. Without proper compensation, the EIM Participant that owns resource G may choose not to participate in the EIM.

One potential approach to address this issue would be to compensate or charge participating resources for adjusting their base schedule using the offer price in their energy bids. Such an approach, however, still has drawbacks.

Consider a resource incremented to produce the Advisory Base Schedule. Such a resource would only receive its offer price under a pay as bid approach for adjustments before EIM. This outcome could encourage participants to increase offer prices, particularly if a participant anticipates that the prices in the EIM will be higher than its

offer price. Such a resource could seek to increase its offer price hoping to capture the opportunity cost of an advisory base schedule adjustment rather than a “normal” adjustment per EIM dispatch later. Forecasting this opportunity cost could be difficult, and the inclusion of a potentially inaccurate estimate of the opportunity cost into the offer cost could undermine the price discovery that normally results from a real time market, thus distorting prices in EIM.

Moreover, because the MSO ignores offer prices in deciding which schedules to adjust, it could potentially increase the schedule for a very expensive resource. If this cost were to be recovered from other EIM Participants with resources that were adjusted downward, these participants may be exposed to costs that are higher than those they would pay if adjustments were made in the EIM. This could give participating resources with non-zero base schedules an incentive to withdraw submission of dispatch range below their base schedules to avoid the potentially high costs of having their schedules adjusted downward by the MSO.

Instead of relying on the MSO with or without a pay as bid mechanism for flows between EIM Participants caused by the adjusted base schedules, the CAISO should explore other more efficient solutions. One approach would be to curtail or cut schedules that contribute to violated transmission constraints (without incrementing the schedule for any resource) while maintaining a balanced adjusted base schedule for each EIM Participant. That is, curtail supply and demand in EIM Participants’ base schedules to bring flows under transmission limits. Any curtailed supply or load would be balanced in the real time market and be paid or charged the EIM price.

To prevent the adjustments from causing uncompensated energy flows from one EIM Participant’s adjusted schedule to that of another EIM Participant, the schedule cuts should also maintain balance in each EIM Participant’s adjusted schedule. Furthermore, any curtailment would need to be distributed fairly (e.g., no single participant should bear the brunt of the cut).

[Flaw #2] Applying a MSO-based approach to curtail base schedules while maintaining balanced adjusted schedules for each EIM Participant may result in curtailments that are unfair.

Consider a scenario with two EIM Participants (A and B) who submit balanced schedules. EIM Participant A submits a balanced base schedule with one supply, G_A , and one load, L_A . EIM Participant B submits a balanced schedule with one supply, G_B , and one load, L_B . Both base schedules contribute to power flow that violates the limit on a transmission path prior to the EIM. The base schedule from EIM Participant A contributes more flow on the violated transmission line per MW of schedule than does

the base schedule for EIM Participant B. The MSO analysis would indicate the most effective way (in terms of requiring the minimum MW adjustment) to address this violation would be to curtail the base schedule between resource G_A and load L_A .

The base schedule between resource G_B and load L_B would be unaffected even though it also contributed to flow on the violated path. As a result, load L_A would be exposed to the real time prices to buy back the curtailed amount while L_B would not be exposed to those prices if it gave an accurate forecast. In addition, EIM Participant A and EIM Participant B may both have purchased firm transmission from the EIM Entity to meet their individual balanced schedules. Market Participant A may object to having its use of the firm transmission curtailed given that Market Participant B's use is not affected even though they both contributed to the violation of the transmission constraint. EIM Participant A may decide to withdraw its dispatch range on G_A to avoid having its schedule cut by the MSO methodology. A pro-rata curtailment of all components of the base schedules that contributed to the constraint violation may be a more equitable approach. However, this is not possible under an MSO mechanism.

Ultimately, should the proposed MSO discourage participation in the EIM market, participants could exit the market, lower the amount of capacity available for dispatch, and would reduce the full benefits of an EIM. Alternative options warrant consideration.

3. BCR costs incurred in the CAISO Balancing Area (BA) to serve EIM entities must be allocated based on cost causation

PG&E requests clarification whether resources within the CAISO balancing area may be committed in the 15 minute market to address imbalance or transmission constraint enforcement needs in an EIM entity. Even with the schedule modifications made via MOC, it seems possible that CAISO units may be committed to address needs in an EIM entity. If CAISO resources are committed to serve those needs, any Bid Cost Recovery (BCR) charges should be allocated to the benefiting EIM entities.

4. The Market Operator should advise EIM Entities if commitment of additional resources in their areas would help address balancing and transmission issues in their areas

The CAISO should consider how committing additional resources in EIM Entities (through RTUC) would help the Market Operator to both maintain system balance and manage transmission constraints. Even though the Market Operator cannot commit resources in EIM Entities under the current design, it can provide advisory information to EIM Participants prior to adjusting their schedule, potentially allowing participants to voluntarily bring

additional resources on-line and revise their base schedules. These additional commitments could also provide added flexibility in the EIM, as well as reduce the need for the Market Operator to commit resources in the CAISO BA to address issues in other EIM Entities.

5. Activation of convergence bidding at the interties should be postponed until the new EIM market is stabilized

CAISO should delay reactivation of virtual bidding at the interties and also establish a separate stakeholder process to assess the benefits and cost allocation of all convergence bidding. PG&E recommends the CAISO delay reactivation by a minimum of 12 months following the implementation of Order 764 and EIM to allow participants to review the impact of EIM and 764 together across all seasons to ensure the markets are functioning efficiently.

Until the volatility and consistency of the new 15 real-time market is established and the effects of the new EIM market are known, it is inappropriate for the CAISO to exacerbate the potential for virtual bids to take advantage of market imperfections and distort market results by expanding the number of nodes available for virtual bids to include the interties. Premature implementation of virtual bidding at the interties has the potential to mask modeling problems within the markets that would be better discovered and corrected absent virtual bidding at the interties. Also, some functionalities enabled by virtual bids are unreasonable in so far as they create unavoidable uplifts borne by load and fail to lead to the goal of price convergence and more efficient commitment and dispatch.¹

If the effects were small, perhaps arguments for the existence of virtual bidding (e.g. claims they improve dispatches or market efficiency in excess of the unavoidable costs) could hold merit, but the effects, unfortunately for load, have been very large. In 2011, \$53 million in uplift charges were directly attributed to virtual bidding on the interties. In 2012, \$60 million in uplift was paid to convergence bidders even without virtual bids at the interties.²

¹ The CAISO's Department of Market Monitoring also has found that in practice convergence demand at internal scheduling points (which in theory could result in additional capacity being committed and available in the real-time market to help alleviate these issues) has in practice not materialized. The Department of Market Monitoring's Q4 2012 Report on Market Issues and Performance in fact found that "In practice, the impact of internal virtual demand on real-time price spikes appears to have been limited by the fact that any additional capacity available to convergence bidding may not be enough to resolve congestion or the short-term ramping limitations. This is further exacerbated by the hour-ahead market, which often does not reflect the same system conditions as in the real-time market and frequently reduces net imports, decreasing the benefits of additional capacity added in the day-ahead market. Price spikes associated with upward ramp insufficiencies are typically associated with brief shortages of ramping capacity and congestion." (Page 36)

² Department of Market Monitoring Reports, Quarter s 1, 2, 3 and 4 of 2012, <http://www.caiso.com/market/Pages/MarketMonitoring/MarketIssuesPerformanceReports/Default.aspx>

Moreover, the Department of Market Monitoring (DMM) anticipates an increase in Real-Time Congestion Offset (RTCO) costs resulting from the reintroduction of virtual bids at the interties and recommends the CAISO “reduce the biasing down of real-time limits of constraints for which intertie schedules have a strong impact on flows” prior to re-implementing virtual bids at the interties.³ Based on these reasons, decisions on reactivating virtual bidding on the interties should emerge through a separate stakeholder process and only following a stabilization period. Such a process should also consider cost allocation based on cost causation for uplifts derived from virtual bids in order to ensure the correct parties pay for virtual bidding profits. A separate stakeholder process will also allow for better consideration of the role of virtual bids in the proposed EIM. PG&E believes no market participant benefits if virtual bidding is reinstated too soon and later must be suspended again to address flaws which could have been caught if the market were allowed to function and be assessed as implemented.

6. Rules for Flexible Ramping Requirements in EIM Entities need clarification

Little detail is provided in the Proposal regarding procurement of flexible ramping. The CAISO should clarify the role of the CAISO in procuring flexible ramping capacity for the EIM entity and the ability of EIM participants to provide capacity to meet the CAISO’s flexible ramping constraint.

- i) The EIM entity should satisfy a flexible ramping constraint requirement similar to the constraint enforced in the CAISO. EIM rules should require sufficient non-Regulation ADS-accessible intra-hour balancing capacity as part of a feasible schedule. Per the planned Flexible Ramping Product (FRP) design, the CAISO’s market system will procure and dispatch flexible capacity routinely such that a sufficiency of “real ramp” capacity becomes a normal component of a “feasible” CAISO schedule. There should be a similar flexible ramping constraint for the EIM entity with rules that ensure that the EIM entity regulation capacity is not double counted as flexible ramping reserves.
- ii) The CAISO should develop safeguards to prevent the price impact of insufficient flexible ramping in an EIM entity from spilling over into CAISO energy prices or creating uplifts to California customers through convergence bidding. For example, if an EIM entity routinely provides insufficient real-time ramp capacity in its base schedule, the CAISO’s real-time optimization may seek to procure that capacity. The persistent need for more upward ramping capacity in real-time could lead to price

³ Comments on FERC Order 764 Market Changes Revised Straw Proposal by the Department of Market Monitoring, p4-5. http://www.caiso.com/Documents/DMM-Comments-FERC_Order764MarketChangesRevisedStrawProposal.pdf

increases in the CAISO. Beyond the possible direct energy price impact, insufficient EIM entity flexible ramping would likely create systematic RT and DA price differences which could be exploited by convergence bidders leading to CAISO uplifts. Therefore, the CAISO should consider requiring comparable ADS-accessible real-ramp capacity from all EIM entities as part of their feasible base schedules.

- iii) The CAISO should assess the performance of a non-regionalized procurement approach (i.e., incremental flexibility ramping needed in Real-time is procured by the CAISO for the entire EIM footprint). “Caged” flexibility or, conversely, inaccessible regions with high ramping needs could drive price-spikes. Assessment of this problem should be part of the EIM initiative. For any solution, cost-causation based cost-allocation at the Scheduling Coordinator (SC) level should be strongly considered so that price signals for flexibility solutions are meaningful.

7. It is unclear that the EIM’s GHG design complies with California GHG rules or is optimal in the market solution

It is unclear whether the Proposal will satisfy California’s GHG regulations in a fair and economically efficient manner. In line with the Alignment Principle, PG&E urges the CAISO to work with the California Air Resources Board (CARB) now to ensure clarity that the EIM proposal fully complies with California’s GHG cap regulations, including CARB’s resource shuffling rules, and that the proposed methodology for compliance will be achieved within an efficient, economic electricity market structure (as discussed further below). PG&E’s recommends additional work and examples be developed by CARB and CAISO to detail how:

- PacifiCorp might bid its GHG producing resources into the CAISO market;
- How then the EIM market would dispatch those and CA resources to meet PacifiCorp load and CAISO BA load;
- How GHG compliance is achieved (and who the complying entity will be); and
- How economic dispatch for all BAs in a least cost manner is achieved.

i) GHG costs associated with imports into California should be reflected in the real time LMP

Based on our understanding of the current Proposal, a participating resource outside of California will not include GHG allowance costs in its energy bids⁴. Instead, the Market Operator will insert a GHG cost adder, for any net intertie flows into California, in the objective function that is used to dispatch the system.

⁴ Since at the time of bid submission it is unknown whether the resources will be providing power to serve load in an EIM Entity or in California.

More detail and examples are needed to ensure participants understand the mechanics of the price formation. GHG costs associated with imports into California must be reflected in the real time LMP prices. Otherwise, prices in the CAISO may no longer be based on the marginal cost of serving energy at nodes in the CAISO area, leading to unnecessary uplift costs.

A simple example will illustrate PG&E's understanding of the implications of the intertie-cost-adder approach. Assume there are two generators serving loads in the CAISO and an EIM entity. Generator G_A is located in California and has a bid price of \$60/MWh (all the prices in the example are per MWh). Generator G_B is located in an EIM Entity outside of California and has a bid price of \$55. The anticipated cost of GHG allowances for importing energy from the EIM Entity into CAISO is \$10. Thus the total cost of energy imported from the EIM Entity into California to serve California loads is \$65 (\$55 for the energy from G_B and \$10 for the GHG costs assigned for flow on the intertie into California).

To serve loads in California, the solution will assume that, because the cheaper energy is available from generator G_A , it will be dispatched to its maximum offer limit, and that power must be imported into California from generator G_B , which has excess capacity⁵. In this case, the appropriate LMP for California would be \$65, which represents generator G_B 's bid price plus the cost of GHG allowances for the flow on the tie into California. This is the cost of serving the next MW of load in California. The LMP in the EIM Entity would be \$55. The intertie-cost-adder approach results in two different LMPs: \$65 for California and \$55 in the EIM entity (this is due to a fourth LMP component reflecting the GHG cost for power imported into the CAISO).

Including the GHG costs for the net EIM flows into California, as proposed by the CAISO, appears to produce accurate LMPs, does not distort pricing signals in the market, and reduces potential uplifts. In addition, it provides a market mechanism to collect the revenue needed to pay for GHG allowances required for the imports into California.

If we attempted to exclude the GHG costs from the LMP in California, the so called "LMP" in California would be \$55. This is not consistent with the meaning of marginal cost. Furthermore, the \$55 "LMP" for California is insufficient to cover generator G_A 's \$60 bid price. CAISO would have to make an additional payment of \$5 beyond "LMP" to generator G_A . This will result in uplift costs, which will be allocated to the CAISO loads.

ii) The GHG design has an apparent drawback of not allowing for head-to-head resource competition to provide power into California based on full-in costs

⁵ For simplicity, let's assume there is enough transmission capacity within CAISO and the EIM Entity and there is absolutely no congestion in the system. We will also assume a lossless system.

Although the proposed intertie-cost-adder approach seems to produce appropriate LMPs, it does have the apparent drawback of not allowing for head-to-head resource competition to provide power into California based on full-in costs. This is because GHG compliance costs are not included in the bids of the EIM participants, and GHG cost is only included in aggregated form in the objective function (it doesn't distinguish between high and low GHG emitters). The outcome may be incorrect market signals to resources located within the EIM entity by over-awarding high GHG emitters and under-awarding low GHG emitters. PG&E recommends that the CAISO and stakeholders consider solutions to this apparent design drawback.

8. At this early stage of the EIM, only minimal changes in governance should be considered

Given that only one Balancing Authority Area (PacifiCorp) has expressed its intent on joining the EIM and the low threshold for PacifiCorp to exit the EIM, the CAISO should only consider minimal changes to its governance structure. This issue can be revisited after the EIM becomes operational and other Balancing Authority Areas make a formal commitment to join.

Additional Issues to be Considered in the Stakeholder Process

PG&E identifies four other issue areas that should be discussed as part of the stakeholder process: 1) allocation of administrative costs, 2) exit fees, 3) losses, and 4) local market power mitigation.

1. Allocation of Administrative Costs

It is unclear whether the CAISO's proposed initial and annual administrative fees for new EIM entities are fair. Issues dealing with the accounting and allocation of these administrative fees should be included as part of the stakeholder process. PG&E has four recommendations regarding this issue:

- i. The CAISO should develop estimates of the total costs to develop and operate the EIM.
- ii. The CAISO should develop accounting mechanisms to track costs related to develop and operate the EIM. This includes the salary and overhead of CAISO personnel working on the EIM.
- iii. Services provided by the CAISO for the EIM should be priced as arms-length transactions. This will recognize the value of the investments made by California

customers over the past decade and help prevent subsidization of costs for EIM participants by CAISO participants.

- iv. The cost allocation methodology of EIM administrative costs should be decided as part of the stakeholder process.

2. EIM Exit Fees

While the proposed no-exit-fee approach may be attractive to potential EIM entrants, it may have unfavorable consequences for CAISO participants and should be the subject of further discussion in the stakeholder process.

First, the CAISO and market participants are making significant investments in the EIM over the next several years. Without costs estimates from the CAISO, PG&E assumes the CAISO's labor and out-of-pockets costs will significantly exceed the \$2.1 million initial charge to PacifiCorp. Without any exit fee, PacifiCorp can walk away from the EIM and leave California customers with no recovery of any of the costs expended by the CAISO and CAISO participants.

Second, the no-exit-fee construct effectively creates two classes of EIM participants. One class of participants has limited barriers to walk away from the market and another class of participants is locked into the market. This creates a situation in which the CAISO may be motivated to treat the two classes of participants differently in regards to design preferences and cost allocation issues.

3. Losses

The CAISO proposal references transmission losses in various sections. However, the discussion on losses is limited to mentioning of the term in the context of base schedules that must balance supply against load and losses. More details are needed to address how losses are calculated, compensated and paid for. The CAISO should include a separate section on transmission losses in the next revision.⁶

4. Local Market Power Mitigation

Questions such as what constitutes physical or economic withholding in this new market should be addressed. Modifications for Local Market Power Mitigation (LMPM) may need to be defined for an EIM. The Proposal provides a brief description of its Department of Market Monitoring (DMM) but does not provide any discussion on the potential for new market power mitigation needs introduced by an EIM.

⁶ For example, the topic of Loss Compensation involved lengthy stakeholder discussions from 2005 to 2007 when a real-time energy imbalance service market was being setup by the Southwest Power Pool (SPP).