DRAFT

Opinion on Intertie Convergence Bidding and the Imbalance Energy Offset

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1.0 Summary

The Market Surveillance Committee (MSC) has been asked to state its opinion on the CAISO's proposed responses to the problems created by the interaction of convergence bidding and the persistent market design problems that have led to large levels of uplift payments through the Real-Time Imbalance Energy Offset charge. At the center of the CAISO's current proposal[1] is a move to suspend convergence bidding on interties until a more robust solution is found to the pricing problems experienced on the interties between the CAISO and neighboring control areas.

The California ISO final proposal was developed following discussion at the April 29 Market Surveillance Committee meeting, stakeholder teleconferences on May 4, May 25 and June 17, an in person stakeholder meeting on July 19, 2011, and multiple rounds of written stakeholder comments.

We support the CAISO's proposal to eliminate convergence bids at interties. While the ability to submit such bids is not the root cause of the high levels of Real-Time Energy Imbalance Offset charges, and we do not expect the elimination of convergence bids at the interties to by itself reduce the level of these charges to an acceptable level, there is a reasonable basis for expecting that this change will reduce those charges to some extent. Whether the reduction will be small or substantial is not clear, but the direction of the effect is unambiguous.

Because the reduction in Real-Time Energy Imbalance Offset charges resulting from this change may turn out to be small, and the charges therefore remain excessive, while moving towards implementation of this change the CAISO should continue to evaluate other perhaps longer term and more far reaching changes in the pricing and scheduling of imports and exports to address the problem.

[1] http://www.caiso.com/Documents/DraftFinalProposal-Real-TimeImbalanceEnergyOffset.pdf, July 29, 2011

2.0 Background

Although great progress has been made in the integration and rationalization of electricity market operations across broad regions over the last decade, these advances have been largely been focused on transactions *within* the control areas of individual ISOs and RTOs. The improvement of the coordination of transactions *between* control areas has greatly lagged these internal advancements. This has been particularly true in the west, where the California ISO remains the only ISO in the Western Electricity Coordinating Council region.

One of the many sources of seams issues, as these inter-control area problems have come to be known, are the differing conventions for the timing of market closure and scheduling obligations. Most relevant to the issue at hand here is the fact that transactions between control areas throughout the western grid are currently scheduled on an hourly basis with intra-hour changes scheduled only in the event of contingencies or to address transmission overloads.[2] The CAISO, on the other hand, runs an internal dispatch and market that operates at 5 minute intervals in near "real-time.'' Although many internal resources can be dispatched on a five minute basis to sell energy into this real-time balancing market, external resources, although critical to the reliability of California's market, must for the most instead be cleared through an hour-ahead scheduling process (HASP) and then confirmed with adjacent balancing area authorities through a process known as "checkout."

Importantly, while the current market design allows for a fully integrated day-ahead market where both internal and external resources can buy and sell energy, the HASP is not a true market in the sense that the only market participant acting on behalf of California load serving entities in this process is the CAISO. Further, the prices and quantities that are determined in the HASP are used for settlements only for imports and exports. Going into the HASP, the CAISO has updated its forecasts of market conditions to reflect changes since the close of the IFM, and will seek to, essentially, buy or sell power over the interties in an attempt to minimize the cost of reliably meeting real-time load based on expected real-time conditions. In the HASP the CAISO essentially buys or sells power acting as an agent for all net consumers of power in the CAISO market. These "purchases" of imports can take the form of increased imports from neighboring regions or reduced exports from within the ISO to those regions.[3] The "internal CAISO demand" in the HASP is therefore driven completely by CAISO forecasts of real-time conditions.

[2] Consideration is being given to allowing 30 minute schedule changes for interchange transactions in the relatively near future.

[3] To take advantage of opportunities for improving operating efficiencies, the CAISO will also clear both offers to adjust export and import levels when those offers imply a gain from trade.

Conversely, internal CAISO demand in the real-time market is driven by actual conditions and supply is, mostly, limited to resources internal to the CAISO.[4] Under such conditions, the only entity able to participate in both HASP and real-time markets to buy and sell energy on behalf of internal CAISO loads is the CAISO itself. The relative level of prices in the two markets therefore depends on the CAISO's actions in these markets. The CAISO also is put in the position of a counter-party to trades in the two markets that, although intended to balance supply and demand, clear at different prices.

Inconsistencies between CAISO purchases and sales, and their respective prices give rise to unfunded costs that must be recovered through special charges. The potential for these costs arises because the CAISO settles HASP imports and exports at HASP prices, while settling internal load and generation at real-time prices. Any time the CAISO schedules net exports in the HASP and the HASP price is lower than the real-time price, the CAISO incurs costs that must be recovered from market participants through the Real-Time Imbalance Energy Offset (RTIEO) charge. Similarly, any time the CAISO schedules imports in the HASP and the HASP price is higher than the real-time price, the CAISO will also incur costs that must be recovered from market participants.[5] If the differences between the HASP prices and RTD prices at the interties were centered around zero and unpredictable, the CAISO would not incur material net Imbalance Energy Offset charges as a result of these HASP/RTD price differences, but this has not been the case.

As documented in several CAISO white papers[6] and in the State of the Market Report[7], positive Imbalance Energy Offset charges have persisted since the introduction of the new market design in the spring of 2009. On average, the CAISO has been a net-seller (i.e. exporter) in the HASP inter-change market, while the HASP price has been on average below the real-time price at which the CAISO implicitly "buys" the power in real-time to support these net exports. The problem has been exacerbated with the introduction of convergence bidding in January of this year.

[4] A relatively modest amount of energy that is imported under a protocol known as dynamic scheduling is also able to fully participate in the CAISO's real-time market.

[5] Conversely, the CAISO generates profits any time it schedules net imports and the HASP price is lower than the real-time price or schedules net exports at HASP prices that are higher than the real-time price.

[6] "Impact of Convergence Bidding on Interties, Draft Final Proposal," July 29, 2011, Figure 1 p. 7; "Impact of Convergence Bidding on Interties, Revised Straw Proposal," June 10, 2011, Figure 1 p. 7; "Redesign of the Real-time Imbalance Energy
Offset, Revised Straw Proposal and Options for an Intermediate Term Solution," May 18, 2011, Figure 1 p. 5; Issue Paper and "Price Inconsistency Caused by Intertie Constraints, Straw Proposal" April 27, 2011; "Impact of Convergence Bidding on Real-Time Imbalance Energy Offset, Issue Paper and Straw Proposal April 27, 2011, Figure 1 p 4.

[7] California ISO, Department of Market Monitoring, "2010 Market Issues & Performance Annual Report," pp. 68-70.

3. Convergence Bidding and the Imbalance Energy Offset Charge

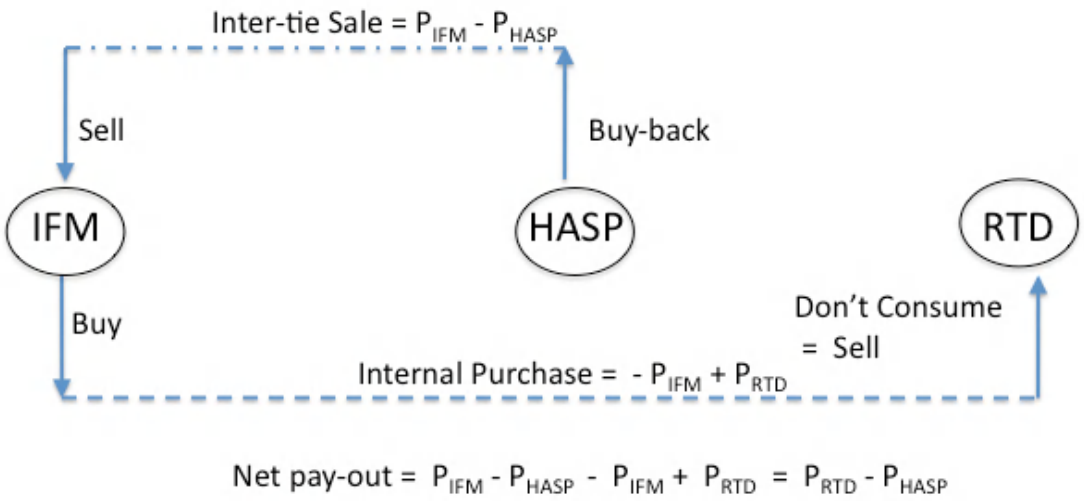
Convergence, or "virtual," bids are financial transactions that allow arbitrage between day-ahead and real-time, and are intended to allow firms to take financial positions that mimic physical ones. Internally, a convergence offer sale in the IFM is automatically balanced against a purchase in the real-time market, and a convergence bid purchase in the IFM is balanced with a sale in the real-time market. However, since physical intertie transactions are settled at the HASP price, intertie convergence bids are also settled at the HASP, rather than real-time, price. While this pricing policy provides for a consistent settlement of physical and virtual transactions on interties, it also greatly expanded the opportunities for trades that, while not risk free, can on average exploit persistent HASP-RTD price differences.

A further complication is that even internal convergence trades are in fact accounted for in the HASP. Mechanically, convergence bids impact the supply and demand balance only in the IFM. In both HASP and RTD, the market consists of adjustments to physical "supply," including intertie transactions, balanced against CAISO forecasts of actual physical demand. This means that, although internal convergence bids are settled at the RTD price, the supply to replace a "virtual" internal sale could be procured either from external supply in the HASP or from internal supply in RTD, depending on which appears lower cost in the HASP.[8]

An internal virtual purchase of 1 MW provides a position that pays the IFM price, p_{IFM}, to acquire the position in the IFM and is paid the real-time price p_{RTD} when the position is settled in real time. An intertie virtual sale provides a position that is paid the IFM price, p_{IFM}, for taking the position and pays the HASP price, p_{HASP} to settle the position. Figure 1 summarizes the flow of these two possible transactions.

[8] In comments, Powerex proposed rectifying this by waiting until RTD to clear internal convergence trades (see "Powerex Comments on Revised Straw Proposal and Intermediate Term Options, June 2, 2011.). This is equivalent to the CAISO assuming that internal virtual positions reflect actual real-time physical demand and supply when it runs HASP. The CAISO has rejected this solution as it anticipates that doing so would raise the cost of meeting load and potentially adversely impact reliability.

If CAISO did not adjust interchange or commit resources requiring long-start or ramp times in HASP, the CAISO would be limited to replacing this internal virtual supply that was scheduled to meet physical internal load in the day-ahead market with on-line and quick start generation in real-time, which could be very expensive and perhaps sometimes not even feasible. Since such outcomes would impose losses on the virtual supply bids, the potential for such outcomes would tend to reduce the level of virtual supply bids. Conversely, internal virtual demand bids would be treated as physical, driving the scheduling of additional imports in the HASP, driving up HASP prices and driving down RTD prices, making virtual demand positions less profitable. While such changes might converge HASP and RTD prices if virtual traders had perfect foresight, with traders lacking such perfect foresight such changes have the potential to introduce much more real-time price volatility, real-time reliability risks, and the potential for additional unintended consequences from interaction with other elements of the market design. The eastern ISO having such a HASP type evaluation process for scheduling imports, New York ISO, accounts for all virtual transactions as virtual in its HASP evaluation (RTC). It is important to note that convergence bidding can lead to convergence but there are no predictions about the *level* of price that would be converged upon. Such a solution could result in all markets converging at a higher price due to higher costs of system operation, such as might result from this proposed solution.



The result of combining these two virtual transactions into a "balanced" convergence bidding position is that there is no change to the net demand or supply in the day-ahead market where the virtual bids are present and offset each other, nor in HASP in which neither the virtual demand nor supply bids are present, nor in real-time in which neither the virtual demand nor supply bids are present, and therefore absent congestion, these bids have no impact on the underlying prices in any of the three markets.[9] However, at the same time, the balanced trade does not produce balanced revenues if the HASP and RTD prices are different. When the HASP price is lower than the RTD price, as it has been on average, the balanced trade produces positive revenues. These revenues are funded by the RTIEO charges.

The dual pricing constraint

An unrelated yet also vexing problem has been the reconciling the existence of convergence bids on interties with WECC standards for congestion management on interties. One of the benefits of convergence bidding is that it removes financial incentives to schedule interchange transactions day-ahead that will not flow in real-time, a practice sometimes called "implicit convergence bidding." When chronically applied during sensitive conditions, implicit convergence bidding can lead to reliability concerns as operators are expecting performance from resources whose owners do not in fact intend to perform.

In theory, convergence bids should be allowed to impact day-ahead market outcomes just like physical bids in order to promote price convergence and remove incentives for implicit convergence bidding. This concept is more controversial when convergence

[9] It might appear that these transactions are not balanced in real-time as the intertie transaction would be priced in HASP and the internal transaction priced in RTD. However recall that both the intertie and internal transactions are physically accounted for in the HASP. Thus both offsetting buy and sell positions are in effect "clearing" in the HASP market, although the internal transaction is priced at the RTD price.

bids, which are explicitly recognized as *not* reflecting physical resources, cause an interface to either become congested or uncongested in the day-ahead market. In practice, WECC rules require that interties be feasibly scheduled with respect to *physical* resources only. This means, for example, that a physically infeasible level of imports cannot be offset by virtual exports.

The CAISO has complied with this requirement by enforcing two constraints, one that determines physical interchange schedules utilizes only physical intertie bids and one that determines prices that takes account of both physical and convergence intertie bids. A problem with this solution is that the physical interchange schedules in the IFM can be inconsistent with the prices in the IFM. In particular, the submission of a virtual export transaction can cause a tie to be unconstrained for pricing purposes, yet constrained for the scheduling of physical imports. This design offers opportunities for a variety of inefficient scheduling practices. While we understand based on informal CAISO analyses that it does not appear that market participants have been taking advantage of these opportunities, this could change, and the observed price inconsistencies could reflect the use of more subtle ways of taking advantage of these limitations of the current design. Hence, it is desirable, although perhaps not urgent, to reform this element of the interchange scheduling and pricing design as well. In HASP the interchange schedules reflect only physical resources as virtual bids are not included in the market. The result is that convergence b ids impact physical dispatch differently in the two markets, further distorting the role of convergence bids in promoting the convergence of prices between the markets.

4. The CAISO Proposal

The possible responses to these problems consist of a) taking measures to eliminate the systematic differences in HASP and RTD prices, and b) mitigating or eliminating the ability to exploit these differences through convergence bids, c) modifying the settlement rules to reduce the significance of HASP- RTD price differences. The three responses are not mutually exclusive and some combination of these changes may be necessary to completely eliminate Imbalance Energy Offset charges.

The current CAISO proposal will focus on the second option. This option will also eliminate the need to manage dual constraints (virtual and physical) on interties and thereby eliminates the potential for inefficient interchange scheduling practices that exploit the inconsistencies in IFM interchange prices that the dual constraints can produce. By eliminating virtual bidding at the interties, the CAISO eliminates the ability to exploit the HASP-RTD price gap through virtual bids alone. There will still remain the ability to respond to and profit from these differences by adjusting physical transactions between day-ahead and HASP.

Other possible steps

One advantage of the CAISO proposal is that it can be implemented immediately. Other steps that would more directly address the market design and implementation flaws that

contribute to the RTIEO charges would involve changes to either the pricing algorithms, settlement calculations, the HASP or RTD optimization or some combination of these alternatives.

A theoretical "market based" solution would be to allow for a more fully participatory Hour-Ahead Market that would replace the current HASP process, which is dominated by CAISO forecasts and decisions. A fully participatory demand side to the Hour-ahead markets in which load serving entities bid to buy or sell supply incremental to their day-ahead schedules and suppliers (internal and external) could lock in changes to their day-ahead schedules could promote price-convergence and allow for a full price-formation process, both internal and external, in the hour-ahead time frame. Further, it would remove the CAISO from the role of counter-party to trades in HASP. Thus, for example sales in the hour-ahead would be balanced against purchases made at the same price. Unfortunately, an hour-ahead market will entail a major redesign whose implementation would be several years away.

Short of implementing a full hour-ahead market, other possible interim measures would be to focus on changing the settlement prices of hour-ahead intertie transactions. The root problem of the current system is that the CAISO doesn't fully know what resources it will need to meet load until real-time, while most imports have to be scheduled during an hour-ahead time frame. That means the CAISO must schedule imports, based upon hour-ahead import offer prices, and then match those adjustments to consumption based upon real-time prices. The two sides of these trades are paying different prices, and the CAISO, as the functional counter-party to both sides, faces the cost of any price differences which must then be recovered through the RTIEO uplift charge.

One solution would be to settle both interchange transactions, internal generation and load at the same real-time price – eliminating the risk of paying for the "spread." Settling interchange transactions at the real-time price, however, would create the potential for an importer (exporter) to sell (or buy) power at a price below (or above) what their bids specified they were willing to trade at. For example an importer may offer power at $50/MWh in HASP, have its offer accepted, and then face a much lower real-time price. If HASP transactions were paid the RTD price, then such an importer may be forced to sell at a "loss" for at least one interval. In some markets, such as PJM and the Midwest ISO, these parties must bear that risk, and take that risk into account in scheduling interchange. PJM and MISO market participants have the ability to change the level of interchange transactions during the hour, subject to ramp availability and some other limitations. This introduces additional uncertainty into forward commitment decisions that the CAISO would need to account for, so this would be a significant design change that would require careful evaluation.

In other markets, such as the NYISO, sellers are given a bid-price guarantee for imports that allows them to be paid the higher of the RTD price or their offer price. This is, in essence, a bid cost recovery provision. These bid-price guarantees reintroduce a divergence, albeit smaller, between hour-ahead payments and real-time prices that again make necessary an uplift fee. In addition, because scheduling limits on the interties are

not binding in RTD, such a real-time pricing system for interchange requires that binding scheduling limits in the HASP be reflected in settlement prices, so that importers are paid the higher of their offer price and the lower of the HASP and RTD price. Such changes in pricing rules could therefore provide an improvement, but would not be the "silver-bullet" that would completely eliminate the need for uplift payments such as the RTIEO and would require fairly material changes to the California ISO settlement system.

It is important to note that the ISO has been continuing to take measures to adjust its process for clearing transactions in HASP and dispatching the market in real-time to reduce costs and better converge HASP and RTD prices.[10] These efforts are independent of the convergence bidding changes outlined in the current CAISO proposal. These measures have to date not eliminated predictable differences between HASP and RTD prices. [11]

5. Discussion

We support the CAISO proposal to suspend convergence bidding on the inter-ties. While we agree that convergence bidding can provide hedging and market efficiency benefits in general, we believe that the combination of predictable price differences between the HASP and real-time, and the current design for pricing of inter-tie transactions create opportunities for profitable convergence bidding strategies that magnify real-time imbalance energy offset charges while failing to bring the HASP and RTD prices into convergence. We believe that it is not acceptable to continue to expose CAISO customers to the ongoing and potentially expanding costs that these trades impose on measured load.

It has been noted that the level of RTIEO charges attributable to a lack of convergence between HASP and RTD prices was a concern before convergence bidding was even implemented in February 2011. [12] Hence, one concern is that the implementation of convergence bidding on the interties merely changed the way in which these underlying problems have been expressed, and that with its elimination, predictable HASP/RTD differentials will continue to lead to outcomes that produce high levels of RTIEO charges.

While the incentive for market participants to schedule physical imports transactions in the day-ahead market and buy them back in HASP if the HASP price is lower than the

[10] See, for example, California ISO, Department of Market Monitoring, "Quarterly Report on Market Issues and Performance," May 24, 2011 pp. 18-19.
[11] See, for example, California ISO, Department of Market Monitoring, "Quarterly Report on Market Issues and Performance," May 24, 2011 pp. 7-9.
[12] Multiple CAISO analyses show high levels of the RTIEO since early 2010, see "Impact of Convergence Bidding on Interties, Draft Final Proposal," July 29, 2011, Figure 1 p. 7; "Impact of Convergence Bidding on Interties, Revised Straw Proposal," June 10, 2011, Figure 1 p. 7; "Redesign of the Real-time Imbalance Energy Offset, Revised Straw Proposal and Options for an Intermediate Term Solution," May 18, 2011, Figure 1 p. 5; "Impact of Convergence Bidding on Real-Time Imbalance Energy Offset, Issue Paper and Straw Proposal April 27, 2011, Figure 1 p 4. California ISO, Department of Market Monitoring, "2010 Market Issues & Performance Annual Report," pp. 68-70.

cost of that power will remain following elimination of virtual bidding at the ties, the incentives will be no greater than they are currently. Because the combination of virtual supply at the interties and virtual demand bids internal to the California ISO does not lead to price convergence between the day-ahead and HASP prices under the current rules, one form of trading does not necessarily "crowd-out" the other. We therefore believe that suspending convergence bidding on the interties has the potential to reduce RTIEO costs, and to reducing the potential for a dramatic future escalation of those costs.

That said, we are concerned that the suspension of convergence bidding will prove insufficient to eliminate the costs to load of the market flaws, as reflected in the RTIEO. The incentive of external suppliers to respond to persistent and predictable price differentials will remain and it is desirable for external suppliers to respond to high and low day-ahead and real-time prices. Further, this proceeding may very well have had a chilling effect on both implicit and explicit convergence bidding, as various solutions, some of which would make implicit convergence bidding more costly, have been considered. By taking a relatively firm stance that no further actions will be taken to address this issue short of the full market redesign, the CAISO may be removing some of the self-discipline that may have limited the level implicit convergence trades during the last few months.

If the RTIEO continues to grow or remains substantial in the absence of inter-tie convergence bids, then a potential next step could be to revise the prices at which HASP intertie transactions are settled, such as settling import and export transactions scheduled in the HASP at real-time prices rather than at HASP prices. This could involve implementing the hybrid system employed by the NYISO, or developing some variation on this approach.

Other Measures

The discussion above has concerned the impact on RTIEO of either physical or virtual imports scheduled in the day-ahead market but are not scheduled in HASP and hence settle at the HASP price. A related question is whether further measures are necessary to deter deviations between HASP and real-time interchange schedules that contribute to the magnitude of the RTIEO both directly and indirectly by increasing HASP real-time price divergence.

Such deviations can be caused, for example, by physical transactions that are scheduled in the HASP but do not flow in real-time because the market participant declines the dispatch instruction or the transaction fails check out with the other balancing authority area. As described in the CAISO Draft Final Proposal,[13] the costs of such a failure to perform is currently limited to little more than a refund of the HASP revenues that would have been earned had the transaction been delivered as scheduled. In fact, such non-performance imposes a cost on the system that is best measured by the RTD price. This is recognized for internal resources, whose cost of uninstructed deviations is at least the RTD cost of replacing the power they did not provide. We therefore believe that settling

[13] July 29, 2011 p. 10 section 4.2.2.

intertie transactions that are scheduled in HASP but do not perform in real-time because of reasons within the control of the market participant at the RTD price would both better reflect true costs and provide more symmetric treatment for internal and external resources. If, however, the transaction is curtailed because of a curtailment by the CAISO or another security coordinator, the HASP price would be the appropriate settlement price.

While some market participants recommended such a policy, the CAISO has not proposed charging the RTD price for such deviations in light of concerns expressed by other market participants relating to unintended consequences of such changes. [14] If these kinds of deviations are at all significant, the CAISO should identify the specific concerns relating to unintended consequences of such a change, evaluate and address them so that such a pricing policy can be implemented. Other ISO's, such as the New York ISO, have had such pricing rules in effect for a decade, and the implementation of efficient pricing should not be unduly delayed by the possibility of unspecified unintended consequences if the intended effect is to address a material market inefficiency.

Other proposed measures would expand the base of customers responsible for sharing the costs of the RTIEO to include imports that are reduced through market transactions in HASP. This is a different matter from an uninstructed deviation, such as a failure to perform on a HASP commitment. We therefore agree with the CAISO's position to not adopt this measure, at least as long as implicit trading remains under acceptable limits. Even if adopted, it may prove to be a weak deterrent to implicit convergence bidding as the direct costs caused by such behavior would still be distributed amongst a large base from which the implicit virtual trades would still constitute a relatively small share.

6. Conclusions

The inconsistencies between the hour-ahead market transactions with neighboring control areas and the real-time operation of the CAISO's internal market has been a persistent and troubling problem. These inconsistencies are an artifact of stubborn incompatibilities between the traditional trading regimes employed throughout the west that predate the existence of the CAISO, and the CAISO's pool-based market operations. The costs reflected in the real-time Imbalance Energy Offset are simply the latest manifestation of several long-standing incompatibilities. Improvements in the CAISO's operation of its current market design, and longer-term redesign of its HASP process, will improve the situation. However seams issues will likely persist in until there is some form of west-wide balancing market with unified settlement policies and timing.

Currently, the CAISO's HASP and real-time markets are not well integrated, and convergence bidding cannot resolve these integration problems. Convergence bidding on interties has contributed to an unacceptably high offset charge that is borne ultimately by California energy consumers. We therefore support the CAISO's proposal to suspend

[14] California ISO, "Impact of Convergence Bidding on Interties, Draft Final Proposal," July 29, 2011 p. 10 section 4.2.2

convergence bidding on interties. We suspect that further measures may in fact still be necessary if RTIEO charges continue at high levels.