# Opinion on Convergence Bidding

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## 1. Background

The Market Surveillance Committee (MSC) has been asked to comment on the California ISO's convergence or virtual bidding proposal.[1] Convergence or virtual bids are purely financial offers to sell or buy energy in the day-ahead market that if accepted must be liquidated in the real-time market for locations inside the ISO control area and in the hour-ahead scheduling process (HASP) for interties into the ISO control area. For example, the virtual sale of 1 MWh in the day-ahead market from a location inside the California ISO control area implies a corresponding price-taking offer to purchase 1 MWh of energy in the real-time market at that same location. A major market efficiency benefit of convergence bidding is the ability to schedule physical transactions in the least-cost market and use convergence bidding to buy or sell that energy at the most attractive price. The experience of the eastern ISOs also demonstrates that convergence bidding reduces the average difference between day-ahead and real-time prices.

However, convergence bidding also has the potential to allow market participants to profit from market inefficiencies or their ability to exercise unilateral market power in the energy market. For example, if a supplier is able to take actions to cause the real-time price to be higher than the day-ahead price, then this supplier can profit from this price difference by a convergence bid to buy energy in the day-ahead market and sell this energy in the real-time market. Thus, convergence bidding at locations where market participants face little competition can reduce overall market efficiency, because it enhances the ability of those market participants to exercise unilateral market power.

The California ISO has been engaged in the process of formulating a convergence bidding proposal for the Market Redesign and Technology Upgrade (MRTU) market since the summer of 2006. The MSC has participated in a number of meetings on this issue with ISO staff and stakeholders since that time. The MSC held a joint meeting with stakeholders to discuss the ISO's convergence bidding proposal on September 18, 2009 and held an MSC meeting to discuss the ISO's proposal with stakeholders on October 15, 2009. Individual members of the MSC also held meetings and participated in phone calls with a number of stakeholders to discuss aspects of the ISO's proposal. We would like to thank these stakeholders for taking the time to provide us with their input.

[1] The September 14, 2009 document, "Draft Final Proposal for the Design of Convergence Bidding," and the October 2, 2009 document "Addendum to the Draft Final Proposal for the Design of Convergence Bidding," describe the final convergence bidding proposal.

We support the major features of the ISO's convergence bidding proposal. In particular, we believe that overall market efficiency will be enhanced by allowing convergence bidding at the nodal level. We also believe that concerns about price manipulation and market power abuse are best dealt with through the stringent position limits and the local market power mitigation mechanism contained in the current ISO proposal, rather than by limiting convergence bidding to the Load Aggregation Point (LAP) level. We recognize the desire for the ISO to ensure that the interties are scheduled in a physically feasible manner and the increased potential adverse market efficiency consequences associated with allowing convergence bidding at the interties. For these reasons, we support the more stringent position limits on convergence bidding at the interties in the current ISO proposal. We also support the implementation of cost causation principles in the allocation of uplift charges to convergence bidding, although it important to emphasize that it is difficult to assign the majority of uplift charges using cost causation principles. We also support the ISO proposal's Congestion Revenue Rights (CRR) refund rule to protect against entities using convergence bids to enhance their ability to earn CRR revenues. However, we warn that it is important to design this refund mechanism to focus on the most egregious uses of convergence bids to enhance CRR payments, because it is often difficult to determine whether a market participant's actions actually caused the market outcome that triggered the CRR refund rule. Finally, although we worry that a fee for each bid segment submitted may discourage convergence bidding, we recognize that such a fee may be necessary if the ISO finds that solving for market prices and quantities becomes problematic due to an extreme number of bid segments.

**2. Level of Granularity in Convergence Bidding**

A number of stakeholder groups have argued in favor of starting with convergence bidding only at the load aggregation point (LAP) level. We believe that the major market efficiency benefits from convergence bidding in a locational marginal pricing (LMP) market can only be realized by allowing transactions at the nodal level. This is consistent with the experience of the PJM and New England markets, which currently allow virtual bidding at the nodal level. These ISOs have identified no adverse consequences from this functionality given the market power mitigation mechanisms they have in place and have identified substantial market efficiency benefits from nodal convergence bidding.

Restricting convergence bids to the LAP level could render the potential benefits of virtual bidding so small that few, if any, market participants would make use of this functionality. The ISO would end up spending significant sums of money to implement a market design change that is rarely used and fails to yield the benefits that it could. With virtual bidding at the nodal level a generation unit owner can receive the real-time price of energy for all energy produced from its unit despite the fact that the unit is fully scheduled in the day-ahead market. Virtual bidding at the LAP level does not provide the generation unit owner with this functionality. The generation unit owner's INC bid at the LAP level will be distributed to the nodes comprising the LAP using the day-ahead load distribution factors. In addition, virtual bidding at the nodal level will allow a Congestion Revenue Rights (CRR) holder to earn the real-time congestion charge between two locations in the network instead of the day-ahead congestion charge between the two locations. Virtual bidding at the LAP level does not allow this transaction if the two nodes are within a LAP, and it only allows a very imperfect form of this functionality if the two nodes are located in different LAPs.

It is important to emphasize that allowing virtual bidding at the nodal level could also provide market participants with greater opportunities to take privately profitable actions that could harm system reliability and market efficiency. For this reason, we support the position limits proposed by the ISO to protect against the potential for adverse market outcomes during the initial implementation of convergence bidding. Most convergence bidding behavior that causes harm to system reliability and market efficiency involves a single market participant taking a sizeable financial or virtual position in the day-ahead market. By limiting the total MWhs that any one market participant (or its affiliates) can submit in virtual supply or virtual demand bids at a location and across all locations within an hour and the day, the ISO can prevent suppliers from taking these sizeable and potentially harmful financial positions in the day-ahead market. These position limits still allow a large number of MWhs of virtual supply and virtual demand bids at any node in the ISO control area or intertie. The only requirement is that these MWhs be associated with many independent market participants, which increases the likelihood that the market efficiency benefits of virtual bidding at the nodal level are realized.

As market participants become familiar with convergence bidding, these position limits can be relaxed, although we support providing the Department of Market Monitoring with the discretion to alter the ISO's proposal for relaxing them if market participant behavior and system conditions warrant maintaining or reducing them to protect against harmful market outcomes. If the California load-serving entities (LSEs) maintain the current high level of coverage of their final demand with fixed-price forward contracts, the risk of these adverse market outcomes is small, even with very large position limits. We emphasize that the existence of convergence bidding does not imply any less need for LSEs to protect themselves against short-term price volatility or the exercise of unilateral market power in the short-term market by purchasing fixed-price forward contracts for a large fraction of energy requirements far enough in advance of delivery to allow new entrants to compete to provide these contracts. This energy procurement strategy by LSEs increases the likelihood that existence of convergence bidding increases system reliability and market efficiency.

**3. Local Market Power Mitigation with Convergence Bidding**

There is significant stakeholder controversy over how to implement a local market power mitigation mechanism in the day-ahead market with convergence bidding. One perspective is that if a local market power mitigation mechanism exists in the real-time market, there is no need for a local market power mitigation mechanism in the day-ahead market because LSEs wanting to protect themselves against the exercise of unilateral market power in the day-ahead market can submit virtual supply bids at prices that they expect to prevail in the real-time market. These virtual supply offers will displace the day-ahead offers of generation unit owners exercising unilateral market power. In real-time, the offers of the generation units necessary to meet demand will be mitigated and this physical supply will replace the virtual supply scheduled in the day-ahead market and market prices that reflect the functioning of the local market power mitigation mechanism will prevail in real time.

There are a number of assumptions implicit in this logic that argue against this sort of approach to local market power mitigation or almost any approach that incorporates virtual

demand and supply bids with physical supply and demand bids into a local market power mitigation mechanism.[2] First, an over-arching goal of MRTU is to obtain schedules from the day-ahead market that reflect the market's expectations of how generation units will operate in real time. A scheme that relies primarily on real-time local market power mitigation to discipline offers in the day-ahead market can result in day-ahead schedules for generation resources that deviate significantly from expected real-time production levels. Second, it is difficult, if not impossible, to mitigate virtual demand or supply price bids because these are purely financial offers and therefore do not have not underlying cost basis. For this reason, we are not aware of any market power mitigation mechanism that attempts to mitigate the price offers of convergence bids. Therefore, any approach that attempts to incorporate convergence bids into a market power mitigation mechanism runs the risk of unintended consequences from the interaction of unmitigated virtual supply and virtual demand bids with mitigated physical demand and supply bids and this can result in day-ahead physical schedules that deviate significantly from expected real-time system operation.

For these reasons, we support the use of a day-ahead local market power mitigation mechanism based only on physical generation resources and the ISO's day-ahead load forecast. Specifically, the day-ahead local market power mitigation mechanism should subject enough physical generation units to mitigation to be able to supply the ISO's day-ahead load forecast without subjecting any locations in the ISO control area to the exercise of local market power. We believe that this local market power mitigation mechanism is consistent with the current real-time market power mitigation mechanism which mitigates a sufficient amount of physical supply to satisfy real-time demand in the actual ISO network configuration. The ISO's proposed local market power mitigation mechanism under convergence bidding is consistent with this logic.

We recognize that there may be instances when the ISO's day-ahead forecast may be less than the level of physical demand that clears the day-ahead market, so that offers from some physical generation resources that are not subject to local market power mitigation may be needed to meet this demand. However, an alternative reason for physical demand from the day-ahead market to be larger than the ISO's load forecast is that virtual supply offers were accepted to serve this demand and it was unnecessary to accept offers from unmitigated physical resources. There also may be instances when the level of physical demand that clears the market may be less than the ISO's day-ahead load forecast. By the above logic, this market outcome can result in unmitigated offers from physical resources being accepted because virtual demand bids may displace higher-priced physical demand bids and the total amount of physical resources dispatched may be greater than the ISO's load forecast. We believe that subjecting enough physical generation resources to mitigation to meet the ISO's load forecast provides the appropriate level of protection against the exercise of unilateral market power for loads while still providing sufficient opportunities for generation unit owners to recover their total costs of production.

## 4. Convergence Bidding at the Interties

[2] The Option B proposal for local market power mitigation with convergence bids introduced during the October 9, 2009 convergence bidding stakeholder meeting may be an exception to this rule. We believe this proposal is worthy of further study for possible implementation at a future date.

Convergence bidding at the interties presents a number of market design challenges because it is impossible to identify a physical supply or demand resource that actually supplies or demands the energy bought or sold at the intertie in the day-ahead market so that the distinction between a virtual bid or offer and physical bid or offer in the day-ahead market is largely a matter of semantics.[3] Consequently, all day-ahead schedules at the interties can be thought of as virtual transactions until these schedules are tagged and a resource in the neighboring control is designated as providing this intertie schedule. For this reason, we question the need for the current ISO proposal to enforce two sets of constraints on intertie schedules in the day-ahead market—one for what are deemed to be physical exports and imports and another for the sum of the physical and virtual import and export schedules.

This market rule seems to complicate the day-ahead scheduling process with no corresponding reliability benefit. A day-ahead physical intertie schedule can be subject to a day-ahead congestion charge because of virtual bids and offers at the intertie, despite the fact that there is sufficient intertie capacity for all physical schedules to flow. We are concerned that the asymmetric treatment of physical and virtual intertie transactions under the current ISO proposal could have unintended consequences, because there is no difference between a physical and virtual transaction until the intertie schedule is actually tagged, yet the ISO subjects physical intertie transactions to additional constraint in the scheduling run in the day-ahead market.

In particular, the proposed two-step process (scheduling run with two constraints followed by a pricing run with only the total constraint) will result in prices and schedules that are inconsistent in the following sense. Schedules and prices are consistent (technically speaking, the prices support the schedules) if each market participant's schedule maximizes their profits, given the prices. Inconsistencies arise if bids are not taken that are below the price, or bids are taken that exceed the price; either can, in theory, occur. In general, when this occurs in markets, it provides incentives for market participants to provide bids that are not cost reflective or to otherwise misrepresent their costs or characteristics. For example, if a physical bid for 100 MW of imports is not taken in the day-ahead market due to the physical constraint in the scheduling run, but a costlier virtual bid is taken, the physical bidder has an incentive to designate its bid as virtual, not physical. If its virtual bid of 100 MW is taken, then in HASP, it could simultaneously export 100 MW virtually (matching the day-ahead virtual import schedule) and submit a fixed physical import schedule of 100 MW. This mischaracterization in the day-ahead market is costless, and increases the probability that a bid will be taken.

A potential alternative to the ISO's proposal is to treat all import and export schedules in the day-ahead market as virtual transactions. Any intertie schedule that is tagged immediately following the close the day-ahead will be treated as a physical schedule and all other schedules will be treated as virtual. This mechanism avoids the potential scheduling and pricing inconsistency described above as well as recognizes that all day-ahead intertie transactions are virtual. It would also allow the maximum amount of intertie capacity to be allocated in the day-

[3] We understand that the Western Electricity Coordinating Council (WECC) rules require the ISO to ensure intertie schedules are physically feasible and therefore implicitly fail to acknowledge the purely financial nature of all day-ahead intertie transactions. Nevertheless, we recommend that the ISO virtual bidding rules recognize that there is no distinction between physical and virtual bids at the interties in the day-ahead market.

ahead market. Any untagged schedules would be treated as virtual and a price-taking INC bid would be entered for the day-ahead export schedule and price-taking DEC bid would be entered for the day-ahead import schedule in the HASP. Any tagged schedule would be treated as a self-schedule in the HASP.

An additional concern with the ISO's proposal for convergence bidding at the interties is the fact that day-ahead virtual bids at the interties will be cleared against the HASP price, whereas the day-ahead virtual bids at locations inside the ISO control area will be cleared against the real-time price. Several interties in the ISO control area also allow external resources to dynamically schedule energy in real time which means that this energy is paid the real-time price. Consequently, there may be instances when a large external supplier can use its ability to submit dynamic schedules at an intertie to profit from convergence bidding at that intertie. For example, this supplier might submit a high offer price in HASP to profit from a virtual export schedule in the day-ahead market at that location (buying at the lower day-ahead price and selling at the higher HASP price). In real-time, this supplier could then lower its offer price and dynamically schedule over this intertie to sell additional energy needed in real-time. Although the presence of an external supplier with the ability to submit dynamic schedules at an intertie can reduce the average price difference between the day-ahead, HASP and real-time prices at that intertie, there is also increased concern that this supplier may use convergence bidding to enhance its ability to exercise unilateral market power.

Although we do not believe any of these concerns with the ISO's convergence bidding proposal at the interties are a reason to delay the implementation of convergence bidding, they do provide justification for the ISO's significantly smaller position limits on convergence bids at the interties.

**5. Uplift Costs, Transactions Costs and Grid Management Charges**

We support the use of the principle of cost causation to allocate of uplift charges to convergence bids in the ISO proposal. However, we also caution that determining cost causation is much easier in theory than in reality. We also believe that another important cost allocation principle for convergence bidding is equal treatment of physical and virtual supply and demand. As a general rule, virtual sales and purchases of energy in the day ahead market should be treated in the same way as physical sales and purchases in the day-ahead market and be subject to the transactions costs—grid management charges, operating reserves charges, and Residual Unit Commitment (RUC) charges—as physical generation and loads. There may be a need for exceptions to this general rule, but a high standard, in terms of expected market efficiency benefits, should be required to justify any deviations from this general principle. On one hand, we would like to see low barriers to virtual bidding in order to encourage the development of a deep market. On the other hand, deviations from this principle of equitable treatment could create arbitrage opportunities between the physical and financial markets for energy that may detract from overall market efficiency and system reliability.

The ISO proposal's transaction charge on bid segments appears to be consistent with this logic. Setting the bid segment charge too high may discourage participation in the day-ahead market by financial players during the initial implementation of convergence bidding when we

hope many players will learn how to participate in this market. However, setting the charge too low may result in so many bid segments that the ISO is unable to solve for market prices and schedules in a timely manner. We urge the ISO to continue to monitor the size of this charge to ensure that it balances these two competing goals.

**6. CCR Refund Mechanism**

We also support a Congestion Revenue Right (CRR) refund mechanism but recognize the mechanism should focus on stopping most egregious problems, rather than attempt to solve all of the problems, associated with using convergence bidding to enhance CRR revenues. A too detailed and proscriptive a procedure could significantly reduce overall market efficiency.

The objective of this mechanism is to identify if convergence bidding behavior by an entity (and its affiliates) is significantly enhancing the revenues received from its CRRs by moving locational prices in day-ahead market in a way that is inconsistent with the behavior of real-time locational prices. There is no perfect way to determine if this behavior is in fact occurring. Imperfect, but computationally tractable tests are needed to identify patterns of convergence bidding that are indicative of this behavior. The design of these imperfect tests represents a balance between the need to avoid false positives and false negatives. Unfortunately, the tests used by PJM based on simulated effects of flows through congested constraints that contribute to the value of CRRs are rough, and can simultaneously have high rates of both false negatives and false positive.

For these reasons, we support a simplified CRR refund rule that guards against the most obvious cases of convergence bidding being used in this manner, rather than a more complex approach that attempts to catch all instances of this behavior. Because there is then the risk that the mechanical test will miss significant instances of distorting strategic behavior, the Department of Market Monitoring must be given the tools to carefully monitor for such instances and be prepared to act if they arise. For example, the use of a distributed load slack bus in the proposed test means that the test would miss the use of demand virtual bids in load pockets to deliberately increase the value of CRRs sunk in such areas and sourced in radially-connected generation pockets. The Department of Market Monitoring will need to watch for such types of behavior that the necessarily imperfect screening mechanism will miss.

**7. Regulatory Issues**

There are three regulatory issues associated with the implementation of convergence bidding that will enhance the likelihood that it increases rather than decreases market efficiency and system reliability. Perhaps the most important regulatory determinant of the success of convergence bidding is how the California Public Utilities Commission (CPUC) treats the profits and losses earned from convergence bidding by the three California investor-owned utilities. The second regulatory issue is the release of information on convergence bids to market participants. The final issue concerns the discretion that the Department of Market Monitoring has to alter position limits and whether and where individual market participants can submit convergence bids.

The CPUC has not issued any guidelines on how the costs and revenues from virtual transactions by the three investor-owned utilities—Pacific Gas and Electric, Southern California Edison, and San Diego Gas and Electric—would be treated in the CPUC rate-making process. We believe that it is essential that the CPUC have clear rules for how profits and losses to these entities from convergence bidding under MTRU will be treated before it begins. One simple mechanism that the CPUC could implement would be to place company-specific limitations on the total MW volume of virtual bids within an hour of the day, day-of-the-week, and month-of-the year that could be submitted by each of the IOUs. Within these guidelines, the shareholders of these companies would bear the appropriate risk and receive the appropriate rewards from the IOU's virtual bidding activities.

We support the day-ahead release of all virtual bids and offers and sales with or without explicitly identifying the market participant. As we have emphasized in the past, with high levels of fixed-price forward contracting for energy and ancillary services, the bids by submitted by market participants convey little, if any, information about their underlying costs of production or any other company-specific confidential information. The release of bid information in a timely manner with the identity of the market participant would serve a very beneficial sunshine regulation function in enhancing overall market efficiency. Any market participant that wanted to bid in a manner that degrades system reliability and market efficiency would face the risk of having to explain this behavior to the press and general public. If it is not possible to release virtual bid information in a timely manner, then immediate release at the close of the day-ahead market of the net virtual position (total virtual supply bids accepts minus the total virtual demand bids accepted) at each location in the ISO control area and intertie point would help market participants become more informed participants in this financial market.

We support providing the ISO with the ability to set position limits, limit the locations where participants can submit convergence bids, and even prohibit a market participant from submitting convergence bids. We recommend that the ISO consult with the Department of Market Monitoring and the Market Surveillance Committee before making these decisions. All financial market have provisions that allow the market operators to suspend trading or even prevent certain market participants from participating the market when this behavior is determined to be harmful to market efficiency. We expect the ISO to set an appropriately high standard for taking these actions, but it must have this discretion to ensure that market participants do not suffer significant economic harm from convergence bidding.