

# Memorandum

**To:** ISO Board of Governors  
**From:** Eric Hildebrandt, Interim Director, Market Monitoring  
**Date:** October 21, 2009  
**Re:** **Market Monitoring Report**

---

*This memorandum does not require Board action.*

## EXECUTIVE SUMMARY

This report provides comments and recommendations by the Department of Market Monitoring (DMM) on the ISO's proposal for convergence bidding being presented by Management to the ISO Board of Governors at the October 29, 2009 meeting. The report focuses on specific provisions of the ISO's proposal that mitigate concerns about how convergence bidding may be utilized to "game" or undermine other ISO market rules to the detriment of overall market performance or other participants. DMM is supportive of the ISO's overall proposal for convergence bidding, but is providing recommendations for potential further refinements or actions that may be taken to further mitigate concerns about convergence bidding. A summary of key recommendations is provided at the end of this report.

## OVERVIEW

Convergence bidding is a key component of the Federal Energy Regulatory Commissions' (FERC) Standard Market Design for markets based on locational marginal pricing (LMP), and offers potential for improved market efficiency under the type of two-settlement system incorporated in the ISO's new nodal market. However, DMM has cautioned that if convergence bidding is implemented on a nodal basis – rather than at a higher level such as load aggregation points (LAPs) and generation hubs (Gen Hubs) – market rules must be carefully designed and incorporate a variety of provisions to avoid the potential for market manipulation or the exploitation of market design or modeling flaws to the detriment of market efficiency and other participants. Throughout the stakeholder process on this issue, DMM identified and developed specific mitigation rules and monitoring requirements necessary to address the potential adverse impacts of convergence bidding in the event the ISO decides to initially implement convergence bidding on a nodal level. With these measures in place, DMM believes the concerns about how

convergence bidding may be utilized to “game” or undermine other ISO market rules can be effectively mitigated.

DMM supports the ISO’s overall proposal for convergence bidding, which includes implementation of nodal convergence bidding, for several reasons:

- **Mitigation Provisions.** The ISO’s proposal includes all of the specific measures identified by DMM as being important to implement in conjunction with nodal convergence bidding. These include (1) position limits, (2) an automated settlement rule to limit how owners of congestion revenue rights (CRRs) might utilize convergence bidding to increase CRR payments, and (3) a process for quickly limiting or suspending the ability of individual participants to engage in virtual bidding at specific locations. More specific recommendations and caveats relating to further steps that can be taken to protect against the potential negative impact of convergence bidding on a nodal basis are provided later in subsequent sections of this report. Most notably, DMM is recommending that the ISO continue to examine further refinements that may provide additional assurance that local market power mitigation (LMPM) procedures remain highly effective under convergence bidding.
- **Market Performance/Price Divergence.** Based on the first six months of experience under the ISO’s new nodal market design, DMM is encouraged by the performance of this new market design, and the progress of the ISO’s efforts to identify problems and implement market or operational enhancements to further improve market performance. While further improvements are needed and challenges remain, DMM is optimistic that – with the necessary support from Management – significant improvements can be made prior to the implementation of convergence bidding more than one year from now. For example, DMM believes that it is important for the ISO to continue to identify and address the root cause of systematic price divergences that have been observed between the integrated forward market (IFM), hour-ahead scheduling process (HASP) and the 5-minute real-time markets prior to implementation of nodal convergence bidding. While nodal convergence bidding is designed to help to resolve some of the price divergence between these markets, it may also be more difficult for the ISO to identify and address the root cause of such price divergences once convergence bidding is implemented.
- **Implementation Issues.** The more extended timeline for development and testing of the nodal convergence bidding (with implementation scheduled in February 2011) should provide greater assurance that additional details and potential unanticipated problems associated with nodal virtual bidding can be identified and mitigated prior to implementation. This timeline should allow the ISO to thoroughly test details of convergence bidding implementation, such as (1) technical issues that might require limitation of the volume of virtual bids that might be submitted at a nodal or overall system level, (2) potential problems with the market model reaching convergence with an AC power flow, and (3) the potential implications of greater reliance on the residual unit commitment (RUC) process to commit sufficient physical supply on a day-ahead basis to meet forecasted load. The ISO has indicated that it will re-open the stakeholder process and make market or software design changes as necessary to respond to any significant problems that are identified during this software design and testing process. Throughout the

stakeholder process, the ISO has also emphasized that the software design being developed would be capable of implementing convergence bidding on either a LAP or nodal level. Thus, should any major technical issues prevent implementation of convergence bidding at a nodal level, DMM expects that the ISO would be fully prepared to implement convergence bidding at a LAP level (or a more limited nodal level) within the planned timeline of February 2011.

The following sections of this paper provide comments and recommendations on the ISO's straw proposal as it relates to key concerns about how convergence bidding may be utilized to "game" or undermine other ISO market rules along with DMM recommendations for mitigation measures against these practices. A summary of key recommendations is provided at the end of this report.

## **KEY ISSUES**

### ***Position Limits***

The initial 10 percent position limit incorporated in the ISO's proposal would provide a controlled transition to nodal virtual bidding, and would substantially mitigate the potential for several of the specific ways in which virtual bidding might be used to "game" ISO market rules, as discussed in the following sections of this report.<sup>1</sup> In addition, DMM believes that the 10 percent position limits that will be in effect initially under the ISO's proposal provide an effective "safety net" that would significantly limit the potential for any unforeseen ways in which virtual bidding may detrimentally impact market performance or reliability.<sup>2</sup>

Although some market participants have argued that the ISO has not provided adequate justification for the 10 percent position limit, DMM recommended that position limits be set at 10 percent based on a consideration of several factors:

- First, since this limit would be applied to each participant, under a scenario in which four to six participants are placing virtual bids at a node, this would allow the volume of virtual bids to be equal to 40 to 60 percent of the physical volume at the node. This level appears roughly equivalent to the volume of virtual bidding in other ISOs, and would be sufficient to allow robust competition to exist at a nodal level.

---

<sup>1</sup> Position limits only apply to the volume of bids each individual participant may submit at any single node. For example, under a 10 percent position limit, a node with 100 megawatts of generation capacity would have a limit of 10 megawatts for each market participant for each hour. For load nodes, position limits could be based on metered loads during the previous year (e.g., the maximum or an average of specific hours).

<sup>2</sup> For instance, while position limits on individual participants are not specifically designed to prevent problems in reaching AC convergence within the market model, the initial 10 percent limit can certainly help to indirectly avoid such problems by avoiding cases where an excessive cumulative volume of virtual supply or demand clears at individual nodes. In the case of AC convergence, it should be noted that the ISO's proposal includes other measures to more directly avoid cases when AC convergence is not achieved, such as the ability to place a constraint on the total net injection or withdrawal at each individual node in the market model in order to ensure AC convergence.

- At the same time, if the degree of competition among participants at a nodal level was more limited, the 10 percent position limit would be low enough to limit the ability of any individual participant to move the market.
- In practice, DMM believes that the 10 percent limit would also be sufficient to allow most generators to purchase enough virtual demand to hedge all or most of the financial risk associated with a forced outage of a unit scheduled for energy in the IFM.<sup>3</sup>
- Finally, DMM notes that no position limits will be placed on convergence bidding at a LAP or Gen Hub level, given that it is very unlikely that it would be possible or profitable for an individual participant to significantly impact LMPs at this level. This provides an additional mechanism for participants to arbitrage price differentials and hedge (albeit imperfectly) financial risks associated with unit outages or bilateral contracts.

The ISO’s proposal incorporates an initial position limit of 10 percent at all nodes within the ISO, but includes provisions to raise this limit to 100 percent after the first year of convergence bidding and to be eliminated after two years. DMM has cautioned that while this schedule may be achievable, the actual decision to raise position limits should be based on actual market conditions and performance over time. DMM stands ready to provide analysis and recommendations to the ISO – along with stakeholders and the Market Surveillance Committee– on this issue based on actual market experience once convergence bidding is in effect.

### ***Local Market Power Mitigation***

Without a sufficient supply of very competitively priced virtual supply bids at a nodal level, convergence bidding has the potential to undermine the effectiveness of current ISO procedures for local market power mitigation (LMPM). While generators and traders have argued that market forces will ensure a sufficient supply of very competitively priced virtual supply bids at a nodal level, load-serving entities (LSEs) and the California Public Utilities Commission (CPUC) have urged caution about adopting a virtual bidding market design that relies heavily upon this assumption.

DMM is also cautious about adopting a market design that relies on an extremely competitive supply of relatively low-priced virtual supply bids at a nodal level to ensure that the ISO’s LMPM procedures remain highly effective within transmission constrained areas. While aggressive bidding of virtual supply by LSEs and traders in transmission constrained areas could

---

<sup>3</sup> In practice, the amount of a generator’s total energy scheduled in the IFM that could be hedged under the 10 percent position limit would typically be well above 10 percent for two reasons. First, virtually all generation is located near demand or other generation nodes that are “electrically similar” to the generation node and, as a result, have LMPs that are extremely highly correlated. Since the generator could submit virtual bids equal to 10 percent of the peak demand or nameplate generating capacity at each of these nearby nodes, the generator could effectively hedge a very large portion of any of its generation scheduled in the IFM. In addition, most generators – particularly within the major transmission constrained areas of the ISO grid – own portfolios consisting of multiple units (e.g., 3 to 6 separate units). Probabilistically, the generator would need to only hedge against an outage at any one of these units, so that the generator need only purchase virtual demand equal to the scheduled output of one of the units. If the generator purchases additional virtual demand beyond the scheduled output of an individual unit, the generator is going beyond the level needed to “hedge” the risk of an outage, and is essentially choosing to sell more of its output at the real-time price rather than the IFM price.

mitigate the ways in which LMPM might be undermined by virtual bidding, the degree to which LSEs may be authorized to engage in virtual bidding by the CPUC is still unresolved. Consequently, as part of this stakeholder process, DMM has identified specific examples of how convergence bidding at a nodal level could be used to undermine the ISO's current LMPM procedures,<sup>4</sup> and has assessed a range of options that could be used to mitigate these concerns.<sup>5</sup>

After considering a range of LMPM options, we believe there are at least two effective options for addressing concerns about how inclusion of virtual bids in the LMPM process may undermine LMPM procedures:

- The continued use of the current LMPM procedures (which are based on forecasted load and physical supply bids only) provides a reasonable level of protection against the ways in which convergence bidding could undermine LMPM, and this approach involves fewer problems or risks than if both virtual demand and supply bids were included under current LMPM procedures. Under this approach, enough physical supply to meet forecasted load is subject to mitigation, so that a relatively limited amount of competitively priced virtual supply may be needed to prevent uncompetitively high unmitigated physical or virtual supply bids from setting LMPs in the IFM within constrained areas. Since this approach would also tend to reduce the extent to which physical supply is "crowded out" by virtual supply in the IFM, this approach would help avoid excessive reliance on commitment of resources through the RUC process (and the potential inefficiencies resulting from increased reliance on RUC).
- DMM has identified another option that it believes would also effectively eliminate concern that virtual supply and virtual demand bids may undermine LMPM, and would have the additional benefit of increasing overall market efficiency. Under this approach, virtual supply and demand bids would be included in LMPM procedures, but physical supply bids would be considered based on default energy bids (DEBs) in order to prevent physical supply with a lower cost (but higher market bid price) from being "displaced" by virtual supply bids in the bid mitigation procedures. We believe this option merits further consideration as a further modification of LMPM procedures, particularly as an option for complying with the FERC's directive for the ISO to base LMPM on bid-in demand within three years of the implementation of the ISO's nodal market design.

The ISO's straw proposal calls for the first of these two options to be implemented. As noted above, DMM believes this approach provides a reasonable level of protection against the ways in which convergence bidding could undermine LMPM. However, we urge further consideration of the second approach described above as a further improvement in LMPM that could still be further reviewed and implemented prior to convergence bidding.

---

<sup>4</sup> Convergence Bidding: DMM Recommendations, Attachment A: Examples of Convergence Bidding and Local Market Power Mitigation, November 2007 ( <http://www.caiso.com/1c8f/1c8ff4236e8e0.pdf>)

<sup>5</sup> *Local Market Power Mitigation Options Under Convergence Bidding*, Department of Market Monitoring, October 2, 2009 (<http://www.caiso.com/243b/243bebe3228c0.pdf>) and *Illustrative Examples of Alternative Local Market Power Mitigation*, Department of Market Monitoring, October 6, 2009 (<http://www.caiso.com/243f/243fce76bf30.pdf>).

### ***Settlement Rule for Congestion Revenue Rights***

The ISO's proposal also incorporates a variety of measures to mitigate concerns that virtual bids may be utilized by participants to impact congestion in the day-ahead market, and thereby increase their CRR payments from the ISO (or decrease payments owed to the ISO for "counterflow" CRRs). Both PJM and the New England ISO have "claw back" settlement rules designed to reduce CRR payments to a participant in cases when the participant's virtual bids may have artificially increased day-ahead congestion. As part of this stakeholder process, DMM examined the settlement rule employed by PJM, but also developed an alternative approach that is designed to more accurately target virtual bidding that may be designed to increase profits from a participant's CRR holdings by decreasing (rather than increasing) price convergence in the day-ahead and real-time markets. This alternative approach has garnered support from numerous generators, traders and LSEs as a more targeted and appropriate approach compared to the approach employed by PJM and the New England ISO. DMM believes that this settlement rule will mitigate much of the concern about the use of virtual bids to "game" CRRs. To the extent that participants may seek to circumvent this settlement rule, DMM believes such behavior can be effectively monitored and addressed by either tightening key thresholds used in the settlement rule, or, on a case-by-case, basis by other sanctions targeted at the specific behavior in question, as discussed below.

### ***Limitation or Suspension of Convergence Bidding***

Virtually all of the ways in which convergence bidding may be used to "game" market rules or distort competitive market outcomes would involve convergence bids that would exacerbate – rather than reduce – differences in day-ahead and real-time prices.<sup>6</sup> DMM believes it is preferable to prevent such behavior before-the-fact (e.g., through rules such as position limits, effective market power mitigation rules, and the type of CRR settlement rule described above). However, in order to provide a more general "safety net" against detrimental behavior not prevented by these rules, DMM has proposed that in the event virtual bidding, either in general or by any particular participant or group of participants, was found to be contributing to an unwarranted divergence in prices in the IFM and real-time market, or otherwise distorting competitive market outcomes, the ISO would have the authority to suspend virtual bidding in general or suspend or limit individual market participants' ability to submit virtual bids. In the event the ISO suspends or limits virtual bidding, either in general or for an individual market participant or group thereof, the ISO would file supporting documentation with the FERC within 10 business days of the suspension. The suspension or limitation would remain in effect for 90 calendar days unless the FERC directs otherwise. With this approach, the ISO would be able to act promptly to limit or suspend any virtual bidding activity that was creating significant detrimental impacts to the market. During this 90 day period, DMM would have the opportunity to modify market rules as necessary, and/or refer the behavior to FERC's Office of Enforcement as a potential violation of ISO and FERC market rules prohibiting market manipulation.

---

<sup>6</sup> Moreover, such convergence bidding would typically be unprofitable based on the virtual bids actually accepted, but would be profitable due to the profits earned by the participant's price when the price impact of the virtual bids is leveraged through other market transactions (such as physical sales in the day-ahead or real-time markets, CRRs, and sales under seller's choice or other bilateral contracts). Thus, one of the key indicators used by other market monitors to identify potential use of convergence bidding to manipulate market prices or otherwise "game" market rules is a pattern of sustained or unusual losses from virtual bidding by a participant.

## ***Residual Unit Commitment***

An additional concern that has been raised regarding this approach is that it may place significant or excessive reliance on the RUC process due to the displacement of physical supply with greater volumes of virtual supply in the IFM.<sup>7</sup> DMM believes that given current ISO market rules and performance, additional local market power mitigation to the RUC process is not warranted. Currently, potential local market power in the RUC process is mitigated by a combination of several different elements of the ISO's overall market design:

- As part of the resource adequacy (RA) process the ISO specifies RA requirements that must be met for each local capacity area (LCA). Requirements for each LCA are designed to ensure that there is sufficient RA (or RMR) capacity to meet the requirements within each LCA under a range of contingencies. In addition to having a must-offer obligation in the IFM, this RA capacity is required to submit a \$0 bid into RUC and does not receive a RUC capacity payment if scheduled for RUC.
- In addition, start-up and minimum load bids for all units are subject to mitigation. Under current market rules, participants' start-up and minimum load bids cannot exceed 200 percent of the unit's start-up and minimum load fuel costs.<sup>8</sup>

DMM believes that the level of mitigation afforded by these elements of the current market design is sufficient, especially given that the pre-IFM LMPM provisions included in the ISO's proposal (i.e., which mitigate enough physical supply to meet the load forecast) should prevent large volumes of virtual supply from "displacing" physical supply within transmission constrained areas in the IFM.

Earlier in 2009, the ISO had initiated a stakeholder process to consider allowing participants to submit start-up and minimum load bids on a daily basis (up to 400 percent of costs), subject to mitigation to cost-based levels when units were committed to meet non-competitive constraints. Should this type of modification be made to the current caps on start-up and minimum load bids, DMM believes that market power mitigation measures would need to be developed and added to the RUC process to mitigate start-up and minimum load bids for any units committed in RUC for non-competitive constraints.

---

<sup>7</sup> A concern about excessive reliance on RUC is that this may reduce market efficiency and raise overall cost (including uplifts and prices), since the RUC optimization commits units only on start-up and minimum load bids, and does not consider the units' energy bids. Thus, the units committed in RUC may represent a less efficient, higher cost mix of resources available to meet energy demand in the real-time market. Even if prices "converge" in the IFM and real-time market, prices may be at a higher overall level as a result of this less efficient unit commitment and dispatch in the real-time market.

<sup>8</sup> Participants select from one of two options for start-up and minimum load bids each month: a *cost-based* option, under which their start-up and minimum load costs are re-calculated each day based on daily gas prices, and a monthly *bid-based* option. Under this bid-based option, the participant can submit a bid of up to 200 percent of start-up and minimum load fuel costs (calculated using gas futures prices for the next month). This bid is then fixed for one month.

## ***Informational Issues***

In the stakeholder process, LSEs have identified several types of information that – if released on a relatively frequent basis – could alleviate some of their concerns about being able to quickly and effectively modify their convergence bidding to ensure better price convergence and “defend” against ways in which convergence bidding by other participants may raise overall costs. These include more frequent release of (1) aggregate virtual bid curves by node, (2) nodal load distribution factors, and (3) information on enforcement/unenforcement or biasing of constraints in the IFM and real-time markets. DMM believes that pursuing ways to make such information publicly available may provide a reasonable and effective way of increasing the potential efficiency benefits of convergence bidding and alleviating concerns about convergence bidding at a nodal level.

## **RECOMMENDATIONS**

Below is a summary of key recommendations provided in this report. The discussion supporting these recommendations has been provided in prior sections of this memo:

- Position limits should be raised from the initial 10 percent based on observed market performance, rather than a pre-determined schedule.
- The ISO should continue to examine further refinements to the convergence bidding implementation that may provide additional assurance that pre-IFM local market power mitigation (LMPM) procedures remain highly effective under convergence bidding. An alternative approach identified by DMM for modifying LMPM should fully address concerns about how convergence bidding might undermine LMPM, and would also be consistent with FERC’s directive to base LMPM on bid-in demand (rather than the demand forecast) within three years of the start of the ISO’s new nodal market.
- If the ISO relaxes current caps on start-up and minimum load bids, a market power mitigation process should be added to ensure mitigation of start-up and minimum load bids of units committed through the RUC process.
- The ISO should continue to place a high priority on identifying and addressing the root cause of systematic price divergences between the day-ahead and real-time markets over the more than 12 months that remain prior to implementation of convergence bidding.
- The ISO should be prepared to re-open the stakeholder process and make market or software design changes as necessary to respond to any significant problems that are identified or unresolved during the software design and testing process.
- Market participants have identified specific additional market data as an effective way of increasing the potential efficiency benefits of convergence bidding and alleviating concerns about convergence bidding at a nodal level. The ISO should seek to make such additional market data available to market participants in a timely fashion, to the extent possible through the stakeholder process that is currently being initiated on the issue of information release.