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# **Straw Proposal for the Design of Convergence Bidding**

**July 2, 2009**

# Straw Proposal for the Design of Convergence Bidding

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# Update on the Design for Convergence Bidding

*Prepared for Discussion at Stakeholder Meeting on July 9, 2009*

## 1 Executive Summary

Convergence or “virtual” bids<sup>1</sup> are financial bids submitted only in the Day Ahead market. There is no requirement for such bids to be backed by physical assets, nor is there any linkage recognized by the market between the virtual bids and any physical supply or demand bids submitted by the same entity. If cleared in the Integrated Forward Market (IFM), these virtual supply and virtual demand bids would settle first at Day Ahead prices and then be automatically liquidated with the opposite sell/buy position at Real Time prices.

Convergence bidding provides market participants with several financial functions. First, there is the opportunity to earn revenues (and to risk losses) resulting from any differences in the Day Ahead and Real time prices. Market participants, using their insights into system and market conditions, are able to use potentially superior information to identify virtual bidding opportunities that result in more efficient market outcomes. The potential for reward encourages virtual bidding activity that would tend to minimize any systematic differences between Day Ahead and Real time prices, thus minimizing incentives for under or over-scheduling physical demand in the Day Ahead. Second, suppliers can use virtual demand bids to hedge the possibility of generator outage between Day Ahead and Real Time, which may be particularly useful in peak conditions.

Convergence bidding also has proven to contribute liquidity and provide other benefits in other ISO markets. For example, one further benefit is that the additional liquidity helps discipline the market power of physical suppliers.

It is important to emphasize that virtual bidding will not adversely affect the tools the ISO will be using under MRTU to ensure reliability. Virtual bids are not part of the Residual Unit Commitment (RUC) process that commits additional capacity, if necessary, to meet the next day’s demand forecast, nor are virtual bids part of any dispatch or Real Time market processes (except for financial settlement at the Real Time LMPs).

The California ISO (the ISO) has engaged in an on-going stakeholder process to develop the key features for convergence bidding that began in summer of 2006 with the most recent stakeholder meeting occurring in October 2008. The most recent white paper that discussed all of the open issues entitled *Update on the Design of Convergence Bidding*<sup>2</sup> was published in November 2007. This revised Straw Proposal and ensuing public discussions seek to continue progress for designing and implementing this important market enhancement.

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<sup>1</sup> The terms “convergence” and “virtual” are interchangeable; one emphasizes the non-physical nature of these types of bids and the other their expected market impact.

<sup>2</sup> The paper *Update on the Design of Convergence Bidding* is posted at <http://www.caiso.com/1c8f/1c8ff39f65a70.pdf>

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During previous stakeholder discussions there is a divide over a number of issues most notably the spatial granularity of virtual bids as well as the allocation of bid cost recovery uplift charges to virtual bidders.

Since the launch of the new ISO markets in April 2009, the ISO is hopeful that discussions on this granularity issue based on actual market outcomes will lead to increased consensus among stakeholders.

The ISO's current position is that the majority of the benefits provided by convergence bidding can only be gained by implementation at the nodal level and is now proposing nodal virtual bidding including the ability to bid at interties and trading hubs with an initial position limit at each node of 10% of a) for generator nodes the capacity of the generator b) for load nodes either the maximum MW amount that flows over a node over a period of time, or by the MWh volume of the peak withdrawal for the node, c) for interties the rated capacity, d) for PNodes or APNodes that both inject and withdraw power the larger of the maximum demand and the maximum capacity MW value could provide the basis to apply the position limits.

The ISO has previously reviewed all settlement charge types and identified the types of charges that should apply to virtual bids. The ISO published two papers in 2008 in regards to cost allocation to convergence bids:

1. *Straw Proposal for Convergence Bidding Cost Allocation*<sup>3</sup> published in February 2008 and discussed with stakeholders at meetings in February 2008 and October 2008.
2. *Issue paper on Two-Tier Real-Time Uplift*<sup>4</sup> which was also published in October 2008 and discussed at the October stakeholder meeting.

Consistent with the concept that virtual bids should pay uplift costs similarly with those costs paid by physical bids with a view to cost causation, the ISO offers a revised proposal to charge (1) virtual demand for a portion of the IFM Tier 1 costs (for the increased unit commitment within the IFM), (2) virtual supply for a portion of RUC Tier 1 costs (for the increased unit commitment within RUC), and (3) virtual supply a portion of Real-Time uplift costs for bid cost recovery paid to short-start units that are started up in the Real-Time Market as a result of a RUC schedule from the Day-Ahead market. Items (1) and (2) were included in the previous ISO proposal, whereas item (3) is new in the current proposal.

A number of issues were discussed and largely resolved through prior stakeholder meetings and remain unchanged in this straw proposal. Those issues include:

- Credit policy for convergence bids
- Basic characteristics of convergence bids
- Changes to Pre-IFM process for Market Power Mitigation
- Proposal to address scheduling incentives to Seller's Choice Contracts

The ISO plans to seek approval from its Board of Governors on the design of Convergence Bidding in December 2009. However, since stakeholder discussions have been ongoing since

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<sup>3</sup> *The Straw Proposal for Convergence Bidding Cost Allocation* is located at;  
<http://www.caiso.com/1f60/1f60e10811e40.pdf>

<sup>4</sup> *The Issue Paper on Two-Tier Real-Time Uplift* is posted at;  
<http://www.caiso.com/205b/205bf1653cf60.pdf>

2006, if the stakeholder process can be brought to conclusion earlier, the ISO will plan to go to the ISO Board for approval in October 2009.

The ISO requests written comments, suggestions or questions on the convergence bidding features explained within this paper and the stakeholder discussion which will be held on July 9, 2009. The ISO will post a template on these policy issues, and stakeholders should feel to utilize this template or submit written comments in any other format.

**Written comments should be emailed to [convergencebidding@caiso.com](mailto:convergencebidding@caiso.com) by July 24, 2009.**

## **2 Plan for Stakeholder Engagement**

The following dates represent a tentative schedule for resolving convergence bidding design and policy issues:

- July 9 – Stakeholder meeting to discuss design and issues addressed in this straw proposal
- July 24 – Written stakeholder comments should be submitted to [convergencebidding@caiso.com](mailto:convergencebidding@caiso.com)
- Late-August Stakeholder Meeting to further discuss issues and comments
- Additional stakeholder meetings and/or calls to be determined
- December 2009 – Decision by CAISO Board of Governors
- Early January 2010 – FERC Filing on convergence bidding

### 3 Design Features of Convergence Bids

#### 3.1 Granularity

Stakeholders continue to be divided on the issue of spatial granularity of virtual bids. Suppliers in particular strongly advocate for nodal virtual bidding, so that virtual bids could be submitted and settled at the LMPs of 3000+ nodes consistent with physical supply. This would be useful for the physical hedging of possible generator outages and provide the opportunity for prices to converge at the nodal level. Other entities advocate as strongly that virtual bids should be submitted and settled only at the three LAPs, consistent with the way most physical demand will be settled under MRTU. These stakeholders are primarily concerned with any ability of nodal virtual bidding to raise market prices or result in infeasible schedules.

The ISO proposes that virtual bidding be introduced at the nodal level with an initial 10% MWh limit at each node. How the limits will be set for each node is described in Section 3.2 below. The ISO sees a number of benefits that convergence bidding at the nodal level will provide to the markets.

- Current market data show divergence of prices at the LAP level as well as the nodal level in some hours at certain locations. Nodal level convergence bidding will allow better price convergence than LAP level;
- Ability for physical generators to hedge their production;
- Ability to hedge intermittent wind – Virtual supply bids could be used to account for anticipated intermittent generation in the DAM;
- Explicit identification of financial transactions at the inter-ties so ISO operators can clearly identify physical versus financial transactions. Convergence bids could also be used to account for anticipated unscheduled flows and result in increased schedule feasibility; and
- Virtual bids could be used for more accurate demand bidding at the nodal level resulting in more efficient unit commitment.

PJM, New England ISO (NEISO) and Midwest ISO (MISO) all allow virtual bidding at the nodal level and have communicated the benefits provided to their markets in regards to liquidity, mitigating market power, and price convergence. New York ISO (NYISO) is in process of moving towards a nodal market from a zonal market for virtual bids at the recommendation of their market monitor. The NYISO, who has had virtual bidding in place since 2001, allows virtual bidding at only eleven zones. In early 2010 they will implement zonal virtual bidding at 40 nodes within their New York City Zone and roll out virtual bidding to all generation nodes after 30 days if there are no issues with system performance.

ISO is also interested in the potential benefits that nodal convergence bidding can provide in a market with growing penetration of variable (intermittent) generation renewables. Currently, wind resources do not have a requirement to submit schedules in the IFM; under the Participating Intermittent Renewables Program (PIRP), which encompasses more than half of the wind resources, they are required to exchange telemetry data with the ISO for purposes of

establishing an hour-ahead schedule and they are subject to special rules for settlement of real-time imbalances (against the hourly schedule). Hence, the IFM will clear without the wind resources (unless other measures are taken to represent expected wind schedules). Because if they did schedule in the IFM, wind resources would do so as price-takers, this will create an upward bias in the IFM prices compared to real-time prices. It will also result in higher than necessary uplift costs, as the ISO would then have to decommit IFM resources to compensate for wind output.

In consultations with eastern US ISOs and RTOs, nodal convergence bidding is expected to play a significant role in correcting this potential bias in market prices and uplift costs. The ISO is investigating further the potential for nodal convergence bidding given the forecast uncertainty associated with wind output, and will present additional information on wind integration and market design at future stakeholder meetings.

Along with nodal convergence bidding is the increased risk of market manipulation. The ISO desires to offer full functionality for convergence bidding rather than limited functionality which would be the case with LAP level implementation. Position limits at each node would allow the ISO to pursue full functionality cautiously and provide maximum benefits while mitigating risk. Section 3.2 below describes the ISO proposal for position limits.

### 3.2 Position Limits

The ISO seeks the capability to impose limits on the MWh quantities of virtual demand and virtual supply bids that could be submitted by an individual Scheduling Coordinator (and its affiliates) at individual nodes. The key reason for maintaining the ability to establish position limits is to mitigate the potential exercise of market power at a specific node especially under an immature market. The general concept is to be able to limit virtual bidding by each Scheduling Coordinator (SC) to a percentage of a certain MW amount for a PNode or APNode. The ISO proposes initial position limits be set at 10%<sup>5</sup> for each SC at each node for virtual bids.

- a) For nodes associated with generators, the position limits for each SC could be tied directly to the capacity of that generator. For example, if PNode X is the injection point for a generator with a PMax of 100 MWs, the position limit at PNode X would be a specific percentage of 100 MWs. If the position limits were 10%, then virtual bids would be limited to 10 MWhs per SC at that node.
- b) For nodes associated with demand, a firm MW amount could be determined by the maximum MW amount that flows over that node over a period of time, or by the MWh volume of the peak withdrawal at each node, of which a 10% would establish the position limits for each SC at each node.
- c) For PNodes or APNodes that both inject and withdraw power, the larger of the maximum demand and the maximum capacity MW value could provide the basis for the application of position limits for each SC. The maximum of these two values would serve at the basis for a 10% position limit for both virtual supply and virtual demand bids for each SC.

- d) For intertie points the MW value would be based on 10% of the rated capacity of the intertie.

Position limits were originally suggested by the Market Surveillance Committee (MSC) as a means for the ISO to pursue nodal convergence bidding and suggested they be lifted as market confidence increased. The Department of Market Monitoring (DMM) also recommended position limits in their November 2007 recommendation for Convergence Bidding<sup>6</sup> with an initial setting of 10% if the ISO is to pursue nodal convergence bidding.

The ISO proposes the following schedule for increasing position limits over a 12 month period;

- Initial implementation through six months after implementation – 10% limit
- Month seven through twelve – 50% limit
- 12 months after implementation of virtual bidding – no position limits

The increase of position limits would occur automatically on the specified dates unless the ISO makes a filing with the Commission specifying reasons for the existing position limit to remain in place.

### 3.3 Convergence Bidding at the Interties

Currently, participants can arbitrage IFM and HASP prices by scheduling an import or export in the IFM, and simply not delivering in the HASP. Allowing convergence bidding at the inter-ties makes explicit those transactions that would occur implicitly otherwise. The ISO is also considering whether or not there should be a requirement for a NERC E-tag to be submitted for all physical DA import awards to demonstrate that the market participant had a reasonable intent to deliver energy once virtual bidding at the interties is available.

Other ISOs allow convergence bidding at their tie points, and have not found this practice to be problematic in terms of reliability. It is true that California relies heavily on imported energy, which raises concerns about infeasible inter-tie schedules due to convergence bidding at the ties. In particular, there is considerable concern that infeasible schedules would result due to fictional counter-flows created by virtual bids. While it is true that convergence bids can create congestion, and even crowd out physical bids, it is highly unlikely that such an occurrence would persist. In particular, consider the case in which there is transmission congestion, net inbound energy on the interties, and the net convergence bidding position is virtual demand, (i.e., Imports > Exports + Virtual Demand). In this case, the exporter would pay a low price in the IFM. In the HASP, congestion is relieved as virtual exports are liquidated. The HASP price for exports is higher as a result, and so the virtual exporter is paid back at the higher price.

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<sup>6</sup> *Convergence Bidding – Department of Market Monitoring Recommendations* is posted at:  
<http://www.caiso.com/1c8f/1c8ff5f46c90.pdf>

This is a “winning” transaction in which virtual bids exacerbate the transmission constraint. It is simple to construct a similar example in the case of net outbound energy. It is important to note, however, that neither of these cases can persist because other market participants will catch on to these winning transactions and, as they arbitrage away this opportunity, they will restore balance to the market. In short, convergence bidders will drive the IFM and HASP prices to converge. This is the hallmark of convergence bidding in general, and will likely be especially true at the interties because of the historically high volume of bidding at the ties.

Because imports and exports clear in HASP, the ISO proposes that convergence bids on the ties settle as the difference between the IFM price and the HASP price. In the same way as convergence bidding at nodes will drive the IFM and RTM prices together, CB at the ties will drive the IFM and HASP prices together.

Other than Resource-Specific System Resources with RA contracts, the ISO proposes that interties resources not be considered in the Residual Unit Commitment (RUC) run. Except in the case of a resource-specific system resource, committing an intertie resource in RUC would not be meaningful because there is no actual unit associated with the intertie to commit. Furthermore, a RUC commitment would not reserve transmission capacity.

### **3.4 Convergence Bids at Trading Hubs**

Trading Hub prices are part of a settlement service for bi-lateral transactions that occur outside the ISO Markets. A Trading Hub price does not result directly from the Market optimization. Specifically, Trading Hub prices are simply weighted prices calculated *ex post* from Locational Marginal Prices (LMPs) for the settlement of Inter-SC Trades (ISTs) at the Trading Hub geography. The weights used for the calculation of Trading Hub prices are based on annual averages of Nodal generation. These are the same weights as those used in the release and in the settlement of Congestion Revenue Rights (CRR).

Some Market Participants have expressed interest in being able to use Convergence Bidding to hedge their bi-lateral transactions that settle at Trading Hubs. Although Trading Hubs are not currently part of the MRTU optimization, they could be incorporated into the optimization by defining custom LAPs (CLAPs) that would include the same collection of pricing nodes as the Trading Hubs. A Convergence Bid submitted at the Trading Hub would then be distributed to those pricing nodes based on a fixed set of weights, and the bids would be constrained so that they all clear (or not) together. This would enable Market Participants to achieve an approximate hedge for those transactions. The hedge would likely not be exact because the ISTs would still occur outside the ISO market. Bidding at the Trading Hubs would be limited to convergence bids.

The ISO is working with its software vendor to determine the extent of the work necessary to implement these custom LAPs for Trading Hubs. If it is determined that implementation of the Trading Hub CLAPs is so onerous as to threaten the implementation timeline for Convergence Bidding, the ISO may propose that the Trading Hub functionality be included in a subsequent release.

### **3.5 CRR Settlement Rule**

Nodal convergence bids can be used to increase day-ahead congestion at certain nodes increasing the value of a CRR. This is a well documented market manipulation concern that has been addressed at other ISOs that engage in nodal virtual bidding through the application of a CRR settlement rule. The ISO proposes to include an automated settlement rule (similar to an existing PJM practice) as part of the market design of convergence bidding that adjusts the revenue from CRRs in the event of virtual bidding behavior that may impact the value of that instrument in the DA market.

Such a rule would adjust CRR revenue to the average hourly auction price paid for the CRR in hours for which:

- a) the holder of the CRR had one or more virtual trades accepted at the source or sink of the CRR, or at a node "nearby" to the source or sink; and
- b) The difference between the LMPs at the source and sink nodes in the Day Ahead market is greater than the difference between the LMPs in Real Time.

Note: "nearby" nodes are defined as those with a shift factor of .75 or greater relative to either the source or sink node of the CRR.

### **3.6 Uninstructed Deviation Penalty (UDP)**

The potential for uninstructed deviations to undermine the effectiveness of LMPM provisions exists with or without convergence bidding. With nodal convergence bidding there is the potential for this problem to be exacerbated by providing additional means for generators to leverage their ability to affect real-time prices. The potential for this problem to occur will be mitigated through the use of initial position limits and give the ISO time to monitor this potential issue.

If uninstructed deviations are determined to be a problem adversely affecting the market and system reliability it may be necessary to seek authority to activate the UDP functionality.

### **3.7 Ability to Suspend Virtual Trading**

The ISO should have tariff authority and functional ability to suspend virtual trading, both for individual market participants and for all of them, if market conditions warrant.

### **3.8 Scheduling Incentives under Seller's Choice Contracts**

Prior to the launch of the new ISO markets, the State of California entered into a number of contracts during the electricity crisis, some of which permit the seller to select the location for the delivery of energy. Most of these contracts will be expiring by 2011. The "Seller's Choice" settlement allows contractual deliver at generation nodes up to the level of physical supply at the node that is feasible.

Current market rules established for Physical Inter-SC Trades (IST) were formulated to prevent sellers under Seller's Choice contracts from choosing nodes for delivery that would alter their effective congestion charge, allowing them to pay less for IST settlement and potentially shift congestion costs to buyers. Essentially, since Seller's Choice contracts could be interpreted as allowing the seller to choose the point of delivery, they would have an incentive to choose delivery nodes with low Locational Marginal Prices (LMP). Numerical examples are detailed in the ISO's 2005 filing<sup>7</sup> to FERC on ISTs. The solution to this problem implemented by ISO is to impose both physical validations on ISTs and a rule that settles any quantity that is not covered by the IFM schedule or the advisory HASP schedule of the Generator that is supporting the Physical IST at a hub rather than a node.<sup>8</sup>

There is some potential for nodal convergence bidding to undermine the physical validations. In particular, nodal convergence bidding could change the expected outcome of the additional validations and settlement rules for ISTs because with a convergence bid, the seller can pass the Pre-Market and Post-Market Validations and settlement rule with a schedule that is infeasible with respect to the real-time dispatch. For example, a virtual demand bid at the same node or nearby node of the Physical Inter-SC Trade can result in the Generator that is supporting that IST clearing a higher quantity in the IFM than is feasible, resulting in that Inter-SC Trade clearing all of its quantity at the nodal price rather than being converted or partially converted to the trading hub price which would be the outcome without the virtual demand bid. Moreover, this Day-Ahead schedule will also alter the LMPs used to settle ISTs. Essentially, any virtual bidding strategy that lowers the IST settlement price more than any offsetting LMP charges in the IFM plus any virtual/physical re-settlements in the Real-Time market will work to the advantage of the seller or the buyer.

Fortunately, there are procedures or rules that could be adopted to limit this impact of nodal convergence bidding. The ISO addressed in detail in the November 2007 paper the potential interaction of nodal convergence bidding and the procedures established under the new market structure to settle ISTs to address issues with seller's choice contracts under nodal convergence bidding. The proposal for options and a preferred approach to address this issue have not changed from the November 2007 paper. Specifically, under nodal convergence bidding, the ISO would propose to initially to monitor the IFM and real-time schedules supporting ISTs and Seller's Choice contracts to determine if market manipulation is occurring. If it does manifest, the ISO's preferred approach is to apply behavioral restrictions on parties to seller's choice contracts, such as restricting the right to submit nodal convergence bids, either entirely or limited to nodes that affect ISTs.

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<sup>7</sup> *Comprehensive Design Proposal for Inter-Scheduling Coordinator Trades Under the CAISO Corporation's Market Redesign and Technology Upgrade*, March 15, 2005, located at: <http://www.aiso.com/docs/2005/03/17/200503171020425484.pdf>

<sup>8</sup> Further explained in FERC's *Order on Conceptual Proposal Establishing Settlement Services for Inter-Scheduling Coordinator Trades*, issued June 10, 2005, located at: <http://www.aiso.com/docs/2005/06/13/2005061308575721305.pdf>

### 3.9 Additional Characteristics of Virtual Bids

The following items specify the ISO's preferred design characteristics for virtual bids:

- a) Virtual bids should be explicit, which means that virtual bids should be distinguishable from physical bids. Similarly to the rules in other ISO markets, the submission and processing of virtual bids will include an indication (a flag) that identifies them as virtual rather than physical. This explicit characteristic for virtual bids is important for effective market monitoring (so that virtual bids are not actually mitigated) and is necessary to ensure that virtual bids are not included in the RUC.
- b) Virtual bids in the Day Ahead market must have a price and quantity (\$/MWh).
- c) Submission of virtual bids will only occur in the Day Ahead Market. By submitting a virtual bid, the Scheduling Coordinator bids to take a forward financial position that will, if cleared in the IFM, be liquidated as a price taker at the Real Time price.
  - i. Virtual supply that clears in the Day Ahead will require the seller to buy back that same quantity of supply at the same location at the Real Time price.
  - ii. Virtual demand that clears in the Day Ahead will require the buyer to sell back that same quantity of demand at the same location at the Real Time price.
- d) Virtual bidding provisions apply only to Energy Bids. No design provisions are contemplated for explicit virtual bidding for Ancillary Services or other products in the ISO markets.
- e) There should be capability to submit virtual bids at any pricing node or set of pricing nodes that is used for settlement purposes.
- f) The ISO also seeks capability for virtual bids to be submitted at other pre-defined aggregated pricing nodes, such as LAPs or sub-LAPs or new Trading Hubs that may be defined, as well as possibly limit virtual bidding to LAPs or sub-LAPs.
- g) For each location (each LAP, pricing node, Trading Hub, or intertie point), a Scheduling Coordinator would be allowed to submit no more than one virtual demand bid and no more than one virtual supply bid.
  - i. Virtual supply bids (\$/MWh) would be submitted using a monotonically increasing bid curve and would be allowed up to a maximum of 10 segments, the same as a bid for physical supply.
  - ii. Virtual demand bids (\$/MWh) would be submitted using a monotonically decreasing bid curve and would be allowed up to a maximum of 10 segments, just like a price sensitive physical demand.

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- h) Virtual bids are identical to the existing energy curve that is submitted for physical bids; however, virtual bids are energy only, with a single energy curve that starts at zero MWhs. Virtual bids do not encompass three-part bids; thus, virtual bids do not include start-up or minimum energy costs.
- i) The ISO would use the same LAP distribution factors that are applied to physical bids in the relevant market for LAP-level virtual bids in the relevant market. (Real Time LDFs are likely to be different from Day Ahead LDFs.)
- j) For virtual bids that are submitted at the LAP-level, the distribution factors used to distribute virtual bids should be the same as the load distribution factors (LDFs) used to distribute physical demand schedules and bids. Thus virtual demand appears just like physical demand on the network for the purposes of IFM pricing, and virtual supply is effectively negative virtual demand.
- k) Virtual Bids are not subject to local market power mitigation.
- l) Virtual bids are subject to the same bid caps as physical bids.

## 4 Proposed Modifications to the Day Ahead Market Process

### 4.1 Summary

The ISO proposes the following structural changes to the Day Ahead Market process:

- Bid-in Demand – The “pre-IFM” process should maintain the MPM/RRD run, but use submitted bids (“Bid-in Demand”) rather than forecasted Demand in the MPM/RRD run (which analyzes and mitigates market power of generator bids and dispatches Reliability Must Run units.)

This change aligns bid mitigation with the market-clearing process in the IFM and responds to one of LECG’s recommendations in their February 23, 2005, review of the MRTU design. Moreover, FERC’s September 21, 2006 Order directed the ISO to make this change within three years after MRTU start-up. The ISO believes that it makes sense to include this feature with the introduction of virtual bidding as it adds to the market efficiency benefits of aligning bid mitigation with the market-clearing process in IFM and eliminates the need to restrict the pool of resources in IFM.

- Pool of Resources – Unrestrict the generating units that are considered in the IFM, so that all available resources that submitted bids in the Day Ahead Market are considered and not just the resources that cleared the MPM-RRD run.
- RMR units – Manual commitment (after IFM, but before RUC) for the few remaining RMR units not committed in the MPM/RRD run or the IFM run that are necessary for local reliability (i.e., voltage support) based on forecasted demand.

### 4.2 Pre-IFM process for Market Power Mitigation

In the initial launch of the new ISO markets, the Day Ahead process includes a “pre-IFM” optimization run that determines which bids are subject to mitigation for market power (MPM), as well as Reliability Requirements Determination (RRD) that determines which Reliability Must-Run (RMR) generating units are needed for the following day. For Release 1, this combined “MPM-RRD” run evaluates supply against forecasted demand, and performs the mitigation pass on those generating units that are used in the solution.

Upon the introduction of nodal convergence bidding, the process for market power mitigation in the Day Ahead market should consider virtual bids because they may impact the market power of physical bids; however, virtual bids should not be mitigated like physical bids might be. This is because local virtual bids are open to all market participants and this therefore liquid market will be disciplined by competition. This is analogous to import bids not being mitigated, although they do impact prices, because of the assumption of import supply competitiveness.

The ISO proposes to modify the currently established pre-IFM process in the following ways:

- a) The MPM-RRD run should evaluate supply with bid-in demand, not forecasted demand. Thus the market power mitigation function would utilize the same clean bids – including virtual bids – that are used in the IFM pricing run.
- b) Although virtual bids would be part of the bid-in demand that is included within this new MPM run, virtual supply bids would not be subject to mitigation like physical supply bids.
- c) Virtual bids also would be subject to the same bid caps upon which physical bids are limited.
- d) The established MPM-RRD run should be maintained; any additional commitment of RMR units that is determined to be necessary will be done through a manual process.
  - Since the MPM-RRD run will use bid-in demand, it is possible for virtual supply bids to commit less than the minimal RMR generation that is needed to for voltage support in local areas. The ISO anticipates that, assuming convergence bidding will not likely be introduced until 2011, the reduced number of available RMR units could be committed manually on a daily basis.
  - The ISO anticipates any manual commitment of needed RMR units would occur after the IFM run, but before RUC is run thus giving the RMR units the “market first” opportunity in the day-ahead IFM.
- e) Since only physical bids are included in the Real Time optimization process, the Market Power Mitigation function in the Real Time market process would not be changed.

### **4.3 Eliminating the restriction on the pool of resources in the IFM**

The “pre-IFM” process determines the pool of resources that is considered in the IFM. The IFM pricing run uses the bid curves that clear the “pre-IFM” process, and not all available resources that have submitted Bids in the Day Ahead Market.

The ISO proposes that, upon the introduction of virtual bidding, regardless of the decision on granularity, the pool of resources that is considered in the IFM should be unrestricted. In other words, the IFM run would consider all available resources that submitted Bids in the DAM, not just the restricted pool of resources that have cleared the pre-IFM run in that particular Day Ahead process. This would include resources that submitted Bids that did not clear the pre-IFM and, therefore, bids that have not been mitigated.

Restricting the pool of resources that may be included in the IFM run is not needed now because the bid-in demand (which would include virtual bids) would now be used both in the pre-IFM and the IFM reducing the disparity between the two, reducing the probability of unmitigated bids clearing the IFM. At the same time, unrestricted the pool of resources allows for occasional conditions where due to the interplay of mitigated and virtual bids, it may be more efficient to commit some generators that have not been committed in the pre-IFM run.

### **4.4 Manual Commitment of Needed RMR Units**

The use of Bid-in Demand coupled with virtual bids could result in fewer RMR units being committed in the MPM-RRD process than would otherwise be committed using forecasted

demand in the absence of virtual bidding. The ISO has the right to issue manual RMR Dispatch Notices to RMR units that are needed for local reliability in the event that the MPM-RRD process does not dispatch needed RMR units. The contemplated change could result in additional circumstances of such manual RMR Dispatch. The ISO operators would issue manual RMR Dispatches before running the RUC process so that any incremental RUC commitment would factor in the manual RMR Dispatch.

In case of an over-generation situation, resources could be de-committed after RUC has run as a result of subsequent market processes, such as the Short-Term Unit Commitment (STUC) or the Real-Time Unit Commitment (RTUC) or, possibly, through Exceptional Dispatch procedures for long start units after RUC. The RUC process itself should not de-commit units because otherwise it may re-optimize the IFM results with no consideration of Energy bids.

#### **4.5 De-commitment of Units**

In case of an over-generation situation, resources could be de-committed after RUC has run as a result of subsequent market processes, such as the Short-Term Unit Commitment (STUC) or the Real-Time Unit Commitment (RTUC) or, possibly, manually through Exceptional Dispatch procedures for long start units after RUC. The RUC process itself does not de-commit units because otherwise it may re-optimize the IFM results with no consideration of Energy bids.

#### **4.6 Residual Unit Commitment**

Several months prior to the start-up of the new ISO markets, some stakeholders raised concerns about the design, performance and results of the residual unit commitment (RUC) procedure based on market simulation observations. To address these concerns the ISO conducted a thorough assessment of RUC performance during a five-day structured market simulation period. On February 13, 2009 the ISO issued a report which described the results of its assessment and concluded as follows:

Based on the investigation described in this document, the ISO is confident that the results and performance of RUC are consistent with the FERC-approved RUC design and, most importantly, do not indicate any flaws in either the design or the implementation of RUC that suggest there could be unintended consequences that would jeopardize the successful performance of the new MRTU market structure. The ISO is committed, both before and after the March 31 launch, to continuous and careful monitoring of the performance of RUC and all other elements of the new market structure, so that any anomalous or extreme market results will quickly be identified and analyzed and any problems promptly addressed. In addition, the ISO has identified the RUC design as a topic for discussion in the post-launch stakeholder process to finalize the design of convergence bidding, to ensure full compatibility between convergence bidding and the RUC design.<sup>9</sup>

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<sup>9</sup> “Analysis of Residual Unit Commitment Results from MRTU Structured Testing,” February 13, 2009, page 4, available on the ISO web site at: <http://www.caiso.com/2354/2354a5d818400.pdf>. The ISO Department of Market Monitoring (DMM) also analyzed the structured testing results and its conclusions regarding RUC were consistent with the findings in the report mentioned above. The DMM report, “Review of California ISO MRTU Structured Market Simulation Results Trade Days – December 9-12, 2008” dated January 16, 2009, can be obtained from the ISO web site at: <http://www.caiso.com/2338/2338847e69480.pdf>

Pursuant to the commitment in the February 13 report to include RUC as a topic of discussion in the convergence bidding design process, the ISO will examine in this process the question of compatibility between the convergence bidding design and the RUC design, to determine whether any changes to the RUC design or any other RUC-related provisions are warranted. To date the ISO is aware of two potential concerns that have been identified. The first relates to the RUC availability payment, whereby non-Resource Adequacy capacity is paid a locational price determined in the RUC optimization per MW-hour of its RUC awards. The concern raised was whether the potential to earn a RUC availability payment would provide perverse incentives for a supply resource with non-RA capacity to submit virtual supply bids in such a manner as to defer scheduling of its non-RA capacity to the RUC and thereby profit from its RUC payments more than it would by having the same capacity scheduled in the IFM. Presumably such an outcome would profit the resource in question at the cost of reduced market inefficiency and greater costs to the rest of the market.

The second concern relates to the potential for a supply resource located within a generation pocket to submit virtual demand at the same location as a means to schedule a total amount of generation within the pocket that would, in the absence of the virtual demand, overload the constraint leading out of the pocket. The concern is that this would essentially amount to an IFM schedule that is infeasible with respect to the physical load and supply schedules, which would in turn increase RUC procurement costs and require re-dispatch of generation in the real-time market to relieve the infeasibility.

The ISO invites stakeholders to comment on these and any other concerns they may identify regarding the compatibility of the convergence bidding and RUC designs. As a starting point, however, the ISO does not believe that either of the above concerns would materialize because they would not be profitable for the resource in question in each case. In the first case, any potential profit is mitigated by the fact that the MW quantities and the costs of any non-RA RUC awards in the markets to date have been infinitesimal, so as long as RA capacity is adequate to meet system needs, RUC will not offer any meaningful profit opportunity. Moreover, the virtual bidder seeking to displace physical RA capacity in the IFM would likely have to bid a low price and pay back a higher price when the virtual bid is liquidated in the real-time market. In the second case, the price arbitrage is even more compelling. The virtual load that enables the supply to over-schedule a constraint in the IFM may buy energy at a reasonable day-ahead LMP, but will lose money by being paid a lower (or even negative) real-time price to liquidate the virtual load when the constraint becomes binding in real time and the supply must be curtailed.

To ensure a thorough assessment of any concerns stakeholders may have regarding how the convergence bidding design will work with the RUC design, the ISO requests that stakeholders who have identified specific problems to describe them in detail, include numerical examples, and be sure to illustrate both the direct impacts on the virtual bidder via its virtual transactions and the indirect impacts on any load or supply the same entity may have in the market, as well as the impacts on the rest of the market. Please include such discussions in submitting written comments per the instructions stated earlier in this paper.

## **4.7 Information Release**

The ISO proposes to post the clearing quantities of virtual bids on the same schedule and to the same level of specificity as the release of information on physical bids. In particular for physical

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bids, hourly Day Ahead LMPs identifying energy, congestion and losses at each Pnode and APnode are posted to OASIS at 1:00 pm PST. Megawatt-hour quantities of clean bids for physical load and generation cleared at each location are released 180 days following the trade date. Certain fields are omitted to mask the obvious identity of the Scheduling Coordinator. The ISO proposes that the same policy with regard to information release be applied to virtual transactions. Specifically, the ISO proposes that the MWh volume of convergence bids at each node be released 180 days following the trade date. This is consistent with practices in other ISO markets.

Some Market Participants have argued that because convergence bidding can have significant impacts on market outcomes, additional and more granular information about virtual transactions should be released on a more frequent basis. This point is well-taken in that convergence bids are purely financial, and are therefore not constrained by the physical characteristics of generation, transmission and load as physical transactions naturally are. Thus, virtual transactions could be used to game the market, and additional information released more frequently could help Market Participants counter-balance this. On the other hand, it can fairly be pointed out that physical load and generation can also game the market. Following that line of reasoning, more frequent and detailed release of information on physical trades and bids would also be warranted. In grappling with these competing stances, it is crucial to recognize that convergence bidding can also serve to make markets yield more efficient outcomes, as indeed it has been observed they do in other ISO markets.

Ultimately, the ISO's proposal reflects the positions that (1) monitoring of the markets for gaming, either through physical or virtual means, is the purview of the Department of Market Monitoring and (2) it would be discriminatory toward Market Participants making virtual trades to report on the outcomes of those trades in a manner different from the reporting of physical trades.

## 4.8 Proposed Credit Policy for Convergence Bidding

The ISO's Business Practice Manual (BPM) for Credit Management states the "ISO intends to maintain the confidence of Market Participants in the ISO Markets and to sustain ISO's mission of ensuring an adequate supply of power at a reasonable cost, by equitably, consistently and strictly enforcing these credit procedures. The ISO recognizes that Market Participants want credit-related practices that are appropriate and transparent." The ISO aims to achieve these objectives in designing credit policies for convergence bidding, and specifically aims to:

- Ensure participants in the convergence bidding market are creditworthy, or post sufficient collateral to support their bids to avoid exposure of other market participants to undue credit risk;
- Design credit requirements for convergence bidding that are no more onerous than necessary to meet the above objective. An excessively conservative credit policy would discourage convergence bidding and the price convergence benefits this provides; and
- Prevent virtual bids from clearing the IFM if they would cause a Scheduling Coordinator to assume a financial liability that exceeds its approved credit level.

The ISO's proposed credit requirements for convergence bidding fit in the same framework as for other transaction types used by market participants.

In brief, a market participant must maintain an Aggregate Credit Limit ("ACL"), consisting of an Unsecured Credit Limit, if any, and Posted Collateral, if any in excess of their Estimated Aggregate Liability "EAL", which is the total outstanding and unpaid obligations to ISO at all times. The ISO monitors these amounts and requests additional collateral from the market participant as necessary. Liabilities or amounts due to a market participant are included in their Estimated Aggregate Liability (EAL), and convergence bids will become a component of the EAL<sup>10</sup>.

The ISO surveyed peer ISO/RTOs and published an initial proposed credit policy for convergence bidding, and based on stakeholder feedback, ISO has revised and enhanced that proposal. Like the ISO's CRR valuation approach which uses a 95<sup>th</sup> percentile value regarding potential variation between auction prices and CRR payment obligations, the convergence bidding proposal will use a 95<sup>th</sup> percentile value in setting reference prices as the differentials between Day Ahead and Real Time prices. These Reference Prices would be based on actual LMPs produced during the first year of operation under the MRTU design.

By using the most current information available about a market participant's convergence bidding exposure, the ISO aims to appropriately balance the above concerns. The ISO aims to use dynamic information about the convergence bids as ISO-NE does, rather than a static per MWh bid limit as used by some ISO/RTOs. The ISO thus intends to provide for a credit process for convergence bids that:

- Is dynamic in that, rather than using fixed MW limits, the ISO will value convergence bids against the market participant's available credit in dollars;

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<sup>10</sup> The other components of the Estimated Aggregate Liability are listed in the Credit BPM, <http://www.caiso.com/1c57/1c57bf8541890.doc>

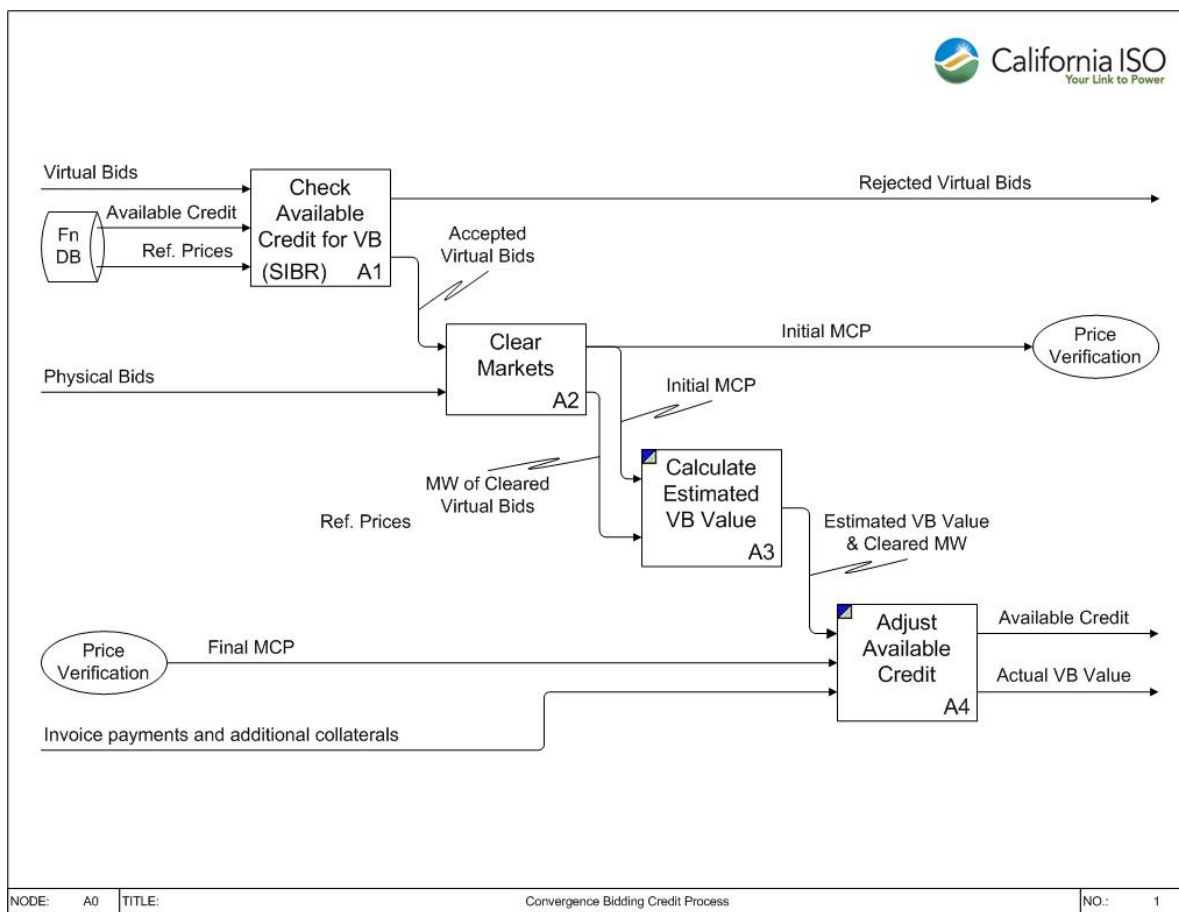
- Seeks to assess the actual risk at every point, including using granular reference prices that are adjusted seasonally and which are specific to each LAP, and revalues the convergence bids when actual price data is available; and
- Mirrors and in some ways improves upon CB credit practices in other ISOs.

This section describes the proposal for the design of the credit policy for Convergence Bidding. The ISO welcomes stakeholder comments on this proposal.

### 4.9 Overview of the Convergence Bidding Credit Process

The Convergence Bidding credit checking and valuation process consists of several steps involving multiple departments within ISO. The process is illustrated, at a high level, in Figure 1. Each step is discussed in detail later in sections 5.2 through 5.4.

**Figure 1: Convergence Bidding Credit Process**



All Virtual Bids submitted by each market participant will be compared to the Available Credit Limit (Aggregate Credit Limit less Estimated Aggregate Liability excluding the proposed convergence bids) of this market participant (Step A1 in Figure 1). The Virtual Bids passing the credit check will be fed into the market clearing process. The Virtual Bids failing the credit check will be rejected based on timestamp as described in more detail in section 5.2 below.

The initial Market Clearing Prices (MCPs) from the market clearing process will be used to calculate the estimated value of the cleared Virtual Bids that will be added to the Estimated Aggregate Liability (EAL) of the market participant (Step A3 in Figure 1). The initial MCPs are subject to verification and correction before becoming final.

When the final MCP becomes available, the ISO will recalculate the values of cleared Virtual Bids and adjust the Available Credit of all market participants accordingly (Step A4 in Figure 1).

#### 4.10 Credit Checking for Virtual Bids

When a market participant submits Virtual Bids in the Day-Ahead energy market, the Market Clearing system will compare the value of the Virtual Bids to the market participant's Available Credit. The value of the Virtual Bids is the sum of the product of a Reference Price and the absolute value of the MWs of each Virtual Bid. The criterion of credit checking, which adopts the approach suggested by stakeholders during the discussion on credit policy at the September 12, 2007 Stakeholder Meeting<sup>11</sup>, is defined as the following:

$$\left(\sum_i \text{Reference Price} * \text{abs}(VBMW_i)\right) \leq \text{Available Credit}$$

Where,

**Reference Price** is the 95<sup>th</sup> percentile value of price difference between the Day-Ahead and Real-Time energy markets.<sup>12</sup> The ISO will calculate a Reference Price for each of the three ISO Load Aggregation Points (LAPs). The Reference Price is calculated for every three-month period (Jan-Mar, Apr-Jun, Jul-Sep, and Oct-Dec) of each year using the hourly actual LAP-average LMPs of the same period of the previous year.

The absolute value of the MWs of all Virtual Bids (including both virtual supply and virtual demand bids) will be counted for credit checking. In situations where a market participant is bidding both virtual supply and virtual demand at a single node in any given hour, the ISO proposes to include only the supply or the demand bid, whichever has the largest MW value, but not both, in the credit checking.

**Available Credit** is updated daily.

If Virtual Bids fail the credit check as noted above, Virtual Bids will be rejected based on the timestamp on a last in, first out basis. If a market participant submits a batch collection of bids at the same time to SIBR (Scheduling Infrastructure Business Rules) through the web services or graphical user interface, all Virtual Bids received in that batch will be rejected if the credit limit is exceeded. The ISO will provide information about a market participant's available credit (ACL - EAL) through the portal or another mechanism.

If Virtual Bids are submitted in multiple batches, Virtual Bids in the earlier submitted batches could be accepted by nature of being within the credit limit while virtual bids in subsequent

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<sup>11</sup> The presentation for this discussion is posted at: <http://www.caiso.com/1c51/1c51b4fe5acd0.pdf>

<sup>12</sup> ISO-NE, NYISO, PJM use 97<sup>th</sup> percentile values, while MISO uses 50<sup>th</sup> percentile value.

batches could fail the credit check and be rejected. All Virtual Bids submitted in and after the failed batch will be rejected. The market participant may submit revised Virtual Bids after failing the credit check, subject to ISO's bidding timelines.

#### 4.11 Calculation of Estimated Value of Virtual Bids

After the clearing of the Real-Time markets, the initial MCPs are still subject to verification and correction if necessary. The ISO will calculate the estimated values of all cleared Virtual Bids each day using the initial MCPs. The estimated Value of the cleared Virtual Bids of a market participant is calculated as:

$$\text{Estimated VB Value} = \sum_i \Delta \text{MCP}_i * \text{Cleared VBMW}_i$$

Where,

$$\Delta \text{MCP}_i = \text{MCP}_{DA,i} - \text{MCM}_{RT,i}$$

that is the difference between the MCPs of the Day-Ahead and Real-Time markets. The MCP could be the LMP of a specific node or the average of LMPs in a LAP that matches with the geographic specification of the Virtual Bid.

The *Cleared VBMW* has a negative sign for virtual demand bids and positive sign for virtual supply bids.

The estimated value of cleared Virtual Bids of a market participant will be added to the EAL, adjusting<sup>13</sup> the Available Credit of the market participant. The adjusted Available Credit is then ready for the next day's credit checking of virtual bids (Step A3 in Figure 1).

#### 4.12 Adjustment of Value of Virtual Bids

After the close of Real-Time markets, the ISO will verify the initial MCPs and make corrections if necessary. When the final MCPs become available, the values of the Virtual Bids cleared then will be re-calculated using the actual LMPs (Step A4 in Figure 1). The EAL of each market participant will be adjusted accordingly.

#### 4.13 General Credit Policy Issues

##### A. Maximum amount of credit that may be used

Currently, entities participating in the ISO markets must maintain an Aggregate Credit Limit (Unsecured Credit Limit plus posted collateral) in excess of the EAL at all times. The ISO will request more collateral when the EAL exceeds 90% of the Aggregate Credit Limit, but the Tariff allows 100% usage before rejection of bids. Other ISOs have different thresholds.<sup>14</sup>

The ISO is not proposing to change the current Tariff provision regarding the amount of credit that can be used for Virtual Bidding. However, we note that in the CRR auction process, all of a market participant's Available Credit may be reserved for participation in the auction. As a

<sup>13</sup> The daily estimated value could either increase or decrease the EAL and ACL. If the participant's transactions are profitable, its available credit would be increased by the amount of the profit.

<sup>14</sup> MISO allows for 100%, PJM 85%, and NYISO allows 50% for Virtual Bids.

result, a market participant may need to instruct the ISO to set aside a lesser portion for participation in the CRR auction, or post additional collateral to ensure sufficient capacity for Virtual Bids.

**B. Treatment of defaults from Virtual Bidding**

A payment default from Virtual Bidding will be treated as other market defaults by a Scheduling Coordinator. When it occurs, the net creditors in the month of the default will be short-paid. As the counterparties for the convergence bids are buyers and sellers in the real-time energy market, payments related to convergence bids will settle at the same time as for payments related to the real-time energy market. Accordingly, providing for a different allocation of losses in the event of a default is not considered feasible or warranted.

## 5 Proposed Cost Allocation for Virtual Transactions

In developing a full conceptual proposal for assessing costs on virtual transactions, the ISO has followed the principle that virtual bids should be charged costs for which they have caused, similarly to physical bids. This means that virtual (and physical) demand bids should be subject to uplift costs related to the increased unit commitment within the Integrated Forward Market (IFM) of the Day Ahead process, and that virtual supply bids and underscheduled load should be subject to uplift charges related to the increased unit commitment within the Residual Unit Commitment (RUC) of the Day Ahead process.

In the January 28, 2008 Straw Proposal for Convergence Bidding Cost Allocation the ISO proposed the following:

For the allocation of IFM Tier 1 BCR Uplift to virtual demand -

- If virtual demand plus physical demand is greater than the ISO Forecast then SCs with a virtual demand obligation will pay a portion of the IFM Tier 1 Uplift Costs. In this case virtual demand resulted in IFM clearing above the ISO Forecast resulting in additional commitment costs in the IFM

For the allocation of RUC Tier 1 BCR Uplift to virtual supply -

- If the quantity of total virtual supply cleared in the IFM is greater than the total virtual demand that cleared the IFM then the difference between these quantities will equal the amount in MW that the ISO must procure in the RUC process as a result of virtual supply clearing the IFM instead of physical supply. In this case Virtual Supply will be allotted a portion of RUC Tier 1 Uplift costs based on net virtual supply clearing the IFM

Allocation of both IFM and RUC BCR uplift to each SC is based on their gross virtual positions in the Day-Ahead market.

### 5.1 Stakeholder Comments on Cost Allocation

Stakeholders raised some issues with the cost allocation proposal in written comments submitted in February 2008 and in November 2008 which are summarized below:

- *Proposal for IFM Tier 1 and RUC Tier 1 charges to virtual bids are reasonable other than not allowing market participant based netting*
- *There seems to be an implicit assumption in these tests that the same physical results would have been obtained without the virtual bids as with them. Cost should*

*be allocated to virtual bids regardless of whether they meet the threshold tests specified in the proposal*

- *Both physical and virtual participants have the right to expect that cost allocations will be based on empirical data showing cost incurrence. Only after such an analysis is complete would the ISO be in a position to allocate costs in a fair and reasonable manner*
- *ISO's proposed cost allocation method should have a parallel cost allocation methodology for Real Time uplift charges resulting from virtual bids*
- *Proposal is largely a positive step towards rational allocation of IFM and RUC uplifts to virtual transactions though proposal to base cost allocation on gross, instead of net virtual positions is unsupported.*
- *Physical and virtual demand should be treated in a like manner whenever there is a straightforward cost causation event which is the case when allocating costs for IFM and RUC BCR uplift to virtual bids. .*

## **5.2 Revised Cost Allocation Proposal**

The ISO has taken into account stakeholder comments and has made an effort to create a proposal based on cost causation that is fair and reasonable. Short of a separate market run and a subsequent settlement to determine market outcomes both with virtual bids and without virtual bids the ISO can not determine exactly what additional BCR uplift costs virtual bids may create. Even this approach is arguable in that just pulling virtual bids out of the market run and re-running the market may not reflect bidding behavior and market outcomes that would have occurred in the complete absence of virtual bids.

The ISO proposes the following changes to the cost allocation proposal presented to stakeholders on February 8, 2008:

- The allocation of RUC Tier 1 BCR Uplift charges to virtual supply will be allocated to each SC based on their pro-rata share of the total obligation based on their net virtual supply position rather than gross virtual supply position
- The allocation of IFM Tier 1 BCR Uplift to each SC will continue to allocated based on gross virtual demand since it is possible that virtual demand will result in the ISO clearing above its forecast even though each SC that cleared virtual demand has a net virtual supply position in their portfolio (See Example 2 below) .
- Any BCR uplift costs resulting from the start-up of short start units in real-time resulting from a RUC schedule will be moved from the Real-Time BCR Uplift charge to the RUC Tier 1 BCR Uplift charge and be allocated to under scheduled load and net virtual supply. Bid cost recovery costs related to bid costs for these units would remain part of the Real-Time BCR Uplift allocation.

### 5.2.1 Virtual Demand Obligation to Pay IFM Tier 1 Uplift

The ISO proposes the following revised methodology to determine the virtual demand obligation to pay IFM Tier 1 Uplift.

- if virtual demand plus physical demand is less than or equal to the ISO Forecast of ISO Demand (CFCD) than there will be no IFM Tier 1 Uplift charges allocated to virtual demand. In this case virtual demand does not result in increased commitment costs in the IFM but rather results in IFM clearing closer to the ISO Forecast resulting in less need to procure additional MW in RUC.
- If virtual demand plus physical demand is greater than the ISO Forecast then SCs with a virtual demand obligation will pay a portion of the IFM Tier 1 Uplift Costs. In this case virtual demand resulted in IFM clearing above the ISO Forecast resulting in additional commitment costs in the IFM.
- The total virtual demand obligation will equal the quantity that the virtual demand put the IFM solution above the ISO Forecast.
- If there is a virtual demand obligation it will be distributed to all SCs with cleared virtual demand based on their pro-rata share of the total obligation.
- Each SCs obligation will be multiplied by the IFM Uplift Base Rate as described below

The IFM Uplift Rate =  $\text{Min}(\text{Hourly Net IFM Bid Cost Uplift divided by the IFM Load Uplift Obligation} + \text{Virtual Demand obligation}), (\text{Hourly Net IFM Bid Cost Uplift divided by the sum of all hourly Generation in the Day-Ahead Schedule and IFM Upward AS Awards})$

Examples 1-4 in Section 4 below further illustrate this concept.

#### **Physical Load Obligation to pay IFM Tier 1 Uplift**

The obligation for physical load to pay IFM Tier 1 Uplift will be determined by the quantity of IFM Scheduled Demand (Load plus Exports) in excess of their IFM Self-Scheduled Generation

and IFM Imports, adjusted by any applicable Inter-SC Trades of IFM Load Uplift. The obligation for each SC is then multiplied by the IFM Uplift Rate.

- Physical load and virtual demand will pay the same IFM Uplift Rate.
- There is no change to allocations of IFM Tier 1 BCR to physical load resulting from this proposal

### **5.2.2 Virtual Supply Obligation to Pay RUC Tier 1 Uplift**

The ISO proposes to determine the obligation for virtual supply to pay RUC Tier 1 Uplift by determining how much physical supply was displaced by virtual supply in the IFM resulting in the need for the ISO to purchase additional MW in RUC. This quantity is equal to the net of the total cleared virtual demand and the total cleared virtual supply when the result is a positive net virtual supply.

In addition, the ISO is proposing to allocate a portion of BCR uplift currently recovered through the Real-Time Uplift BCR charge code 6678 to virtual supply and under scheduled load through the RUC BCR Uplift charge.

Since virtual supply displaces physical generation in RUC and short-start units with RUC schedules are not started up until Real-Time, virtual supply as well as under scheduled load could contribute to the need to start-up these units in Real-Time therefore contributing to the BCR uplift. Since these short-start units are started up in real-time as a result of a decision made in the RUC process the ISO believe it makes more sense for the uplift for these units to be recovered through the RUC BCR charge than the Real-Time BCR charge.

- If the virtual supply cleared in the IFM is equal to or less than virtual demand that cleared in the IFM then there will be no charges for RUC Tier 1 Uplift allocated to virtual supply. In this case the ISO did not procure additional MW in RUC as a result of virtual supply.
- If the quantity of total virtual supply cleared in the IFM is greater than the total virtual demand that cleared the IFM then the difference between these quantities will equal the amount in MW that the ISO must procure in the RUC process as a result of virtual supply clearing the IFM instead of physical supply.
- If there is a virtual supply obligation it will be distributed to all SCs with a net virtual supply position based on their pro-rata share of the total obligation.

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- Each SC's obligation will be multiplied by the RUC Base Rate as described below:

The RUC Uplift Base Rate = MIN (ISO Hourly Total RUC Allocation Amount/ the Total Net Negative ISO Demand in that Trading Hour plus the virtual supply obligation),(ISO Hourly Total RUC Allocation Amount divided by the total RUC Capacity in that Trading Hour)

### **Physical Load Obligation to pay RUC Tier 1 Uplift**

- Physical load's obligation to pay RUC Tier 1 Uplift will be determined by each SCs Net Negative Demand deviation. The obligation for each SC will then be multiplied by the RUC Base Rate.
- Both virtual supply and physical load will pay the same RUC Uplift Base Rate.
- Additional uplift costs related to start-up of short start units started in the real-time market as a result of a RUC schedule would now be included in the dollars to be recovered through RUC BCR Uplift and allocated to under scheduled load.

The examples below demonstrate how the revised cost allocation proposal will work in four different market scenarios.

### **5.2.3 Examples of IFM Tier 1 and RUC Tier 1 Uplift Allocation to Virtual Transactions**

#### Example # 1

Four SCs participated in the Day-Ahead market and submitted virtual transactions

- IFM Bid Costs to be recovered = \$12,000
- RUC Bid Costs to be recovered = \$3,000
- Under scheduled load based on meter reads = 7,000 MW
- Physical Demand Obligation (Load Scheduled Day-Ahead - SS Gen – SS Imports adjusted by inter-sc trades of uplift obligation) = 15,000 MW

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- ISO Forecast = 35,000

IFM Results

- Physical Demand = 28,000
- Virtual Demand = 5,000
- Physical Supply = 27,000
- Virtual Supply = 6,000

In this example the IFM Tier 1 obligation to virtual demand would equal zero since total Demand in the IFM cleared below the ISO Forecast.

The RUC Tier 1 obligation to virtual supply will equal 1000 MW based on (28,000 physical demand – 27,000 physical supply or 6,000MW virtual supply – 5,000 virtual demand = 1000MW). Since virtual transactions are not included in RUC the ISO would procure an additional 7,000MW in RUC to meet the ISO Forecast based on the cleared Physical Demand of 28,000. In addition the ISO would procure an additional 1000MW in RUC due to the physical supply clearing at 27,000 MW. This 1000MW represents the quantity that was displaced by virtual supply and will have to be procured by the ISO in the RUC process.

The table below shows how costs for IFM and RUC Tier 1 Uplift would be allocated to four SCs under the current proposal as well as the prior cost allocation proposal presented in February 2008.

**Revised Proposal**

	<b>Cleared DA Virtual Demand</b>	<b>Cleared DA Virtual Supply</b>	<b>Net Virtual Supply Position</b>	<b>IFM Tier 1 Uplift Allocation</b>	<b>RUC Tier 1 Uplift Allocation</b>	<b>RUC Tier 1 Uplift Allocation 11/7 Proposal</b>
SC1	2000	1800	- 200	\$0	\$0	\$0
SC2	1000	900	- 100	\$0	\$0	\$0
SC3	800	1300	500	\$0	\$ 144.23	\$144.23
SC4	1200	2000	800	\$0	\$ 230.76	\$230.77
<b>Total (MW)</b>	<b>5000</b>	<b>6000</b>	<b>1000</b>	<b>\$0</b>	<b>\$ 375.00</b>	<b>\$375.00</b>

$$\text{RUC Tier 1 Uplift Rate} = \$3,000 / (1000\text{MW} + 7,000\text{MW}) = \$0.375$$

In the table above SC3's obligation was determined by taking the SCs net cleared virtual supply (500 MW)/ total net virtual supply (1300MW) \* total virtual supply obligation (1000MW) = 384.61MW obligation. The 384.61MW obligation is then multiplied by the RUC 1 Uplift Rate (.375) = \$144.23

**February 2008 Proposal**

	<b>Cleared DA Virtual Demand</b>	<b>Cleared DA Virtual Supply</b>	<b>IFM Tier 1 Uplift Allocation</b>	<b>RUC Tier 1 Uplift Allocation</b>	<b>RUC Tier 1 Uplift Allocation 11/7 Proposal</b>
SC1	2000	1800	\$0	\$112.50	\$0
SC2	1000	900	\$0	\$56.25	\$0
SC3	800	1300	\$0	\$81.25	\$144.23
SC4	1200	2000	\$0	\$125.00	\$230.77
<b>Total (MW)</b>	<b>5000</b>	<b>6000</b>	<b>\$0</b>	<b>\$375.00</b>	<b>\$375.00</b>

$$\text{RUC Tier 1 Uplift Rate} = \$3,000 / (1000\text{MW} + 7,000\text{MW}) = \$0.375$$

In the table above SC3's obligation was determined by taking the SCs total cleared virtual supply (1300 MW)/ total virtual supply (6000MW) \* total virtual supply obligation (1000MW) = 216.66 MW obligation. The 216.66MW obligation is then multiplied by the RUC 1 Uplift Rate (.375) = \$81.25

**Comparison to February 2008 Cost Allocation Proposal**

Between the two proposals the MW obligation to virtual supply is the same and is equal to 1000 MW. The calculated rate of .375 is also the same. The only difference is that now the \$375 of costs is shared between the two SCs that had a net virtual supply position in their portfolio rather than between the four SCs based on gross virtual supply.

Example # 2

- Four SCs participated in the Day-Ahead market and submitted virtual transactions
- IFM Bid Costs to be recovered = \$12,000

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- RUC Bid Costs to be recovered = \$2,000
- Physical Demand Obligation for IFM Tier 1 = 15,000 MW
- Under scheduled load based on meter reads = 2,000MW
- ISO Forecast = 35,000

**IFM Results**

- Physical Demand = 33,000
- Virtual Demand = 4,000
- Physical Supply = 30,000
- Virtual Supply = 7,000

In this example there will be both a virtual demand Obligation of 2,000 MW based on the MW quantity of virtual demand that exceeds the ISO forecast and a virtual supply obligation of 3,000 MW based on 7000MW virtual supply – 4,000MW virtual demand which equals the quantity the ISO must procure in RUC based on the virtual supply that cleared the market. This case shows that virtual demand may result in the ISO exceeded the forecast even though there are no SCs with a net virtual demand position in the market. Since each MW of virtual demand may contribute to demand in the IFM clearing above the ISO forecast it must be allocated to each SC based on the quantity of gross virtual demand that cleared the IFM.

The table below shows how costs for IFM and RUC Tier 1 Uplift would be allocated to four SCs.

	<b>Cleared DA Virtual Demand</b>	<b>Cleared DA Virtual Supply</b>	<b>Net Virtual Supply</b>	<b>IFM Tier 1 Uplift Allocation</b>	<b>RUC Tier 1 Uplift Allocation</b>
SC1	1500	2000	500	\$529.41	\$200.00
SC2	900	1200	300	\$317.65	\$120.00
SC3	700	1500	800	\$247.06	\$320.00
SC4	900	2300	1400	\$317.65	\$560.00
<b>Total (MW)</b>	<b>4000</b>	<b>7000</b>	<b>3000</b>	<b>\$1,411.76</b>	<b>\$1,200.00</b>

## California ISO

IFM Uplift Base Rate =  $\$12,000 / (15,000 + 2,000) = \$.71$

RUC Uplift Base Rate =  $\$2,000 / (2,000 + 3,000) = \$.40$

In the table above SC1's IFM Tier 1 Obligation was determined by taking the SCs total cleared virtual demand (1500 MW) / total virtual demand (4000MW) \* total virtual demand obligation (2000MW) = 750MW obligation.  $750\text{MW} * \text{IFM Tier 1 Uplift Rate } (.71) = \$529.41$ .

SC1's RUC Tier 1 Obligation was determined by taking the SCs total net virtual supply (500MW) / total net virtual supply (3000MW) \* total virtual supply obligation (3,000MW) = 500 MW obligation.  $500 * \text{RUC Tier 1 Rate } (.40) = \$200.00$

### **Comparison to February 2008 Cost Allocation Proposal**

In this case since all SCs in the market had a net virtual supply position the outcome under both the revised proposal and the February 2008 proposal are exactly the same.

### **Example # 3**

- Four SCs participated in market and submitted virtual transactions
- Physical Demand Obligation for IFM Tier 1 = 20,000 MW
- Under scheduled Load = 1,000
- IFM Bid Costs to be recovered = \$20,000
- RUC Bid Costs to be recovered = \$0
- ISO Forecast = 35,000

#### IFM Results

Physical Demand = 34,000

Virtual Demand = 4,000

Physical Supply = 36,000

Virtual Supply = 2,000

#### RUC

0 MW

The virtual demand obligation for IFM Tier 1 = 3,000 MW  
 The virtual supply obligation for RUC Tier 1 = 0MW since there was a net virtual demand result in the market

The table below shows how costs for IFM and RUC Tier 1 Uplift would be allocated to four SCs.

	Cleared DA Virtual Demand	Cleared DA Virtual Supply	Net Virtual Supply	IFM Tier 1 Uplift Allocation	IFM Tier 1 Uplift Allocation 11/7 Proposal	RUC Tier 1 Uplift Allocation
SC1	1500	500	-1000	\$978.26	\$826	\$0
SC2	900	200	-700	\$586.96	\$529	\$0
SC3	700	900	200	\$456.52	\$0	\$0
SC4	900	400	-500	\$586.96	\$413	\$0
Total (MW)	<b>4000</b>	<b>2000</b>	<b>-2000</b>	<b>\$2,608.70</b>	<b>\$1818</b>	<b>\$0</b>

IFM Tier 1 Uplift rate =  $\$20,000 / (3000\text{MW} + 20,000\text{MW}) = \$.87$

RUC Tier 1 Uplift rate = \$0

SC1's obligation for IFM Tier 1 Uplift shown in the chart above was calculated as  
 $(1500\text{MW} / 4000\text{MW}) * 3,000\text{MW} = 1125\text{MW}$  obligation.  $1125\text{MW} * .87 = \$978.26$

**Comparison to February 2008 Cost Allocation Proposal**

There would be no difference in outcome between the revised proposal and February 2008 proposal.

**Example # 4**

Four SCs participated in market and submitted virtual transactions

Physical Demand Obligation for IFM Tier 1 = 15,000 MW

Under scheduled Load = 5,000

## **California ISO**

IFM Bid Costs to be recovered = \$15,000

RUC Bid Costs to be recovered = \$3,000

ISO Forecast = 35,000

### IFM Results

Physical Demand = 30,000

Virtual Demand = 5,000

Physical Supply = 32,000

Virtual Supply = 3,000

In this example there will be no allocation of IFM or RUC Tier 1 Uplift charges to virtual transactions. Since physical Demand plus virtual demand cleared is equal to the ISO forecast there will be no cost allocation for IFM Tier 1 Uplift to virtual demand and since virtual supply cleared lower than virtual demand there are no additional RUC Tier 1 Uplift costs that may be attributed to the cleared virtual supply.

### **Comparison to 11/7 Cost Allocation Proposal**

There will be no differences between cost allocation in this example between the current proposal and the February 2008 proposal.

## **5.3 Other Charge Codes**

### **5.3.1 Real Time BCR Uplift (Charge Code 6678)**

The ISO proposes to allocate the portion of BCR cost related to short-start units committed in Real-Time as a result of a RUC schedule through Charge Code 6806 RUC Tier 1 Uplift. Those costs currently are recovered through Real-Time BCR Uplift. Other costs related to real-time bid cost recovery will continue to be allocated to measured demand until the ISO redesigns the Real-Time Uplift charge to allocate costs in two-tiers.

FERC ordered the ISO in the April 2007 Rehearing Order 15 to develop a two-tier charge for real-time uplift within three years of MRTU start-up. The ISO will address this order through a stakeholder process separate from that for convergence bidding.

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<sup>15</sup> 119 FERC 61,076 April 20 , 2007  
<http://www.caiso.com/1bcb/1bcb7bd7f40.pdf>

### 5.3.2 Other Uplift Charges

The ISO proposes no changes from the November 7, 2008 proposal regarding the following Uplift charges:

- IFM Bid Cost Recovery Tier 2 Charges
- Day-Ahead Residual Unit Commitment (RUC) Tier 2 Charges
- Real-Time Uninstructed Imbalance Energy
- Ancillary Services Cost Allocation
- FERC Fee Over/Under Recovery
- Allocation of IFM Marginal Losses Surplus (MLS) Credit
- Real-Time Imbalance Uplift Charges
- Real-Time Congestion Off-Set

## 6 Next Steps

A stakeholder meeting will be held on July 9, 2009 to discuss the issues presented in this straw proposal. The ISO is also requesting written comments from stakeholders by July 24, 2009 to [convergencebidding@caiso.com](mailto:convergencebidding@caiso.com)