Draft Final Proposal for the Design of Convergence Bidding

September 14, 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 September 18, 2009

1 Executive Summary

Convergence or "virtual" bids[1] 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 and continued with a series of meetings in 2007 and 2008. There was no stakeholder activity on convergence bidding from November 2008 through June 2009 while the ISO prepared to launch MRTU. The stakeholder process resumed in July 2009 with a Straw Proposal posted on July 2 and a stakeholder meeting held on July 9. A series of three stakeholder conference calls were held in August through September to continue to discuss key elements of the design of convergence bidding with stakeholders. This Draft Final Proposal incorporates new design features discussed on the recent stakeholder conference calls and incorporates stakeholder comments. A combined Market Surveillance Committee (MSC) Stakeholder meeting will be held on September 18 to discuss the key elements discussed in this proposal.

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[1] 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.

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. The most recent set of written stakeholder comments received still reflects this divide.

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 proposes 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.

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. The ISO is proposing a revised methodology to allocate these costs to virtual bidders from what was described in the July 9 Straw 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

A number of design features have been added to the Draft Final Proposal based on discussions with stakeholders in August and September. Those design features are:

- SC certification for convergence bidders
- GMC allocation for convergence bidders
- Proposal for convergence bidding at the interties
- Proposal for bid volume limits
- Updates to CRR settlement rule
- Revision to cost allocation proposal
- More details regarding the suspension of virtual bids

The ISO plans to seek approval from its Board of Governors on the design of Convergence Bidding in October 2009. Implementation is currently planned for February 2011 and the ISO is evaluating whether implementation can be moved up to October 2010. The ISO formed a technical working group to discuss technical issues related to the implementation of convergence bidding. Conference calls for the technical working group are planned for the following dates:

- September 3, 17
- October 1, 15, 29
- November 12
- December 3 (tentative)

Documents related to working group activities are posted at the following link:

http://www.caiso.com/241e/241e6f6335bc0.html

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 September 18, 2009.

Written comments should be emailed to mmiller@caiso.com by October 2, 2009.

2 Plan for Stakeholder Engagement

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

- July 9 – Stakeholder meeting to discuss design and issues addressed in straw proposal
- July 24 – Written stakeholder comments should be submitted to
- August 13 – Stakeholder conference call to discuss cost allocation, GMC and SC Certification
- August 27 – Stakeholder conference call to discuss GMC, Bid volume limits, and RUC
- September 9 – Stakeholder conference call to discuss convergence bidding on the interties
- September 14 – Draft Final Proposal posted
- September 18 – MSC/Stakeholder Meeting to discuss Draft Final Proposal
- October 2 – Stakeholder written comments due to mmiller@caiso.com

- October 29- 30, 2009 – Decision by CAISO Board of Governors

Design Features of Convergence Bids

2.1 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.

2.2 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% for each SC at each node for virtual bids. All position evaluation will be done based on the highest MW point submitted in the energy bid curve. This valuation will be done upon initial submission in SIBR as part of the validation process.

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[2] with an initial setting of 10% if the ISO is to pursue nodal convergence bidding. DMM submitted comments to the July 2 Straw Proposal that support the ISO position to implement convergence bidding at the nodal level with initial 10% position limits.

The ISO proposes the following schedule for increasing position limits (based on February 2011 implementation) over a 12 month period;

- Initial implementation through eight months after implementation – 10% limit
- Month nine 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. The position limit timeline for the 10% limit is extended from six to eight months as compared to what was described in the Straw Proposal to avoid increasing position limits during the summer months.

Market participants' comments to the July 2 Straw Proposal did not support the inclusion of position limits. Some parties commented that the 10% position limits would result in the need to do dirty hedges and force market participants to submit multiple bids at multiple nodes to hedge the outage of a generator to work around the 10% limitation. Other market participants commented that position limits were unfounded and were not in practice at any other ISO in the country. Others commented that the position limits were too high to mitigate risk and that the ISO should implement LAP level virtual bidding.

The ISO supports implementing nodal virtual bidding cautiously and believes that a 10% limit is a reasonable starting point.

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

2.3 Bid Volume Limits

The ISO believes that bid volume limits are necessary as the ISO Day-Ahead market software can not handle an unlimited volume of bids. Testing on ISO software has been performed with no adverse system impact with bid volumes ranging from 5,000 to 10,000 10-segment bids. These volume limits are intended to limit the number of convergence bids submitted into the IFM and not the MW volume of bids. When considering the number of convergence bids, one virtual bid can have different bid curves (up to 10 segments each) in different trading hours within the same trade day as long as the Pnode/Apnode and the direction (supply or demand) stay the same. The exact system limit on number of bids will be determined in the implementation stage when the ISO is able to perform additional tests.

The ISO proposes to apply a configurable limit on the number of convergence bids per trade day system wide. The system wide limit will be allocated evenly across all SCs that desire to submit convergence bids. When some SCs hit their bid limits, if the system limit has not yet been reached, the ISO will allocate remaining bid capacity pro-rata to the SCs that need them. If after the re-allocation if there are SCs that are over their bid limit the bids above the limit will be rejected on a last in first out basis. The evaluation of bid volume limits and re-allocation will be done at the market close time in SIBR with only the convergence bids that pass validation including credit limit check.

As explained in Section 5, credit will be checked upon the submission of virtual bids based on a reference price and the absolute MW value of virtual demand and virtual supply bids. The number of bids allocated to an SC is not relevant to credit until they are submitted with a MW value. If an SC reaches their credit limit and still has bids available, those bids will be considered invalidated and thus reallocated to other market participants as described in the prior paragraph.

SCs may prioritize their bids in their payload by including the high priority bids at the top of the payload or by submitting their highest priority bids manually through the SIBR API/UI first.

2.4 Achieving an AC Solution in the Day-Ahead Market

The ISO will continue to be committed to achieving an AC solution with the inclusion of virtual bids.

In order to increase the likelihood of ensuring AC convergence under virtual bidding, The ISO will include the software capability of enforcing MW limit constraints on a location basis to limit the amount of unrealistic virtual bids on a particular location or set of locations. These limits will only be used when AC solution is not attainable. This MW limit will be done within the IFM before the day-ahead market clears. When a MW limit enforcement is needed, it will be applied to the total flow affected by both physical and convergence bids.

3 Convergence Bidding at the Interties

The ISO proposes that convergence bidding be enabled at the intertie points between the ISO's control area and external or embedded control areas. The rationale for this proposal is two-

fold. Convergence bidding at the interties will enable Market Participants to arbitrage differences between the Day Ahead and HASP prices thus facilitating price convergence. In addition, by providing a mechanism for market participants to engage in virtual bidding at the interties the proposal will eliminate the incentive for parties to engage in implicit virtual bidding, which can negatively impact reliable operation.

The proposed design of this functionality is based on two underlying principles. The first principle is that net physical schedules at the interties must be within established scheduling limits. NERC and WECC standards are clear on the point that physical schedules cannot violate the scheduling limits on the interties coming out of the Day Ahead market. Moreover, given the extent to which California is highly dependent on imported power to meet load-serving requirements, enforcing the inter-tie scheduling limits with respect to physical schedules gives ISO operators a high level of confidence that these physical schedules will be deliverable. The second principle employed in this proposal is that, just as is the case for internal schedules, virtual and physical schedules on the interties must be co-determined based on their economic bid prices and must have a shared congestion price in order for the virtual transactions to be meaningful. Virtual bids need to be able to create congestion as well as to provide counter-flows to mitigate congestion.

In summary and as explained in more detail below, the ISO proposes to adhere to both principles by adding one additional constraint for each inter-tie scheduling point in the scheduling run of the IFM that will not be enforced in the pricing run. Specifically, the ISO proposes to enforce in the scheduling run a constraint that requires the net physical schedules across each scheduling point, ignoring the accepted virtual schedules, to be within the established scheduling limit for that scheduling point. A comparable constraint that applies to the combined net physical and virtual schedule across the scheduling point would be enforced in both the scheduling run and the pricing run.

The ISO has researched how the eastern ISOs have addressed these concerns with regard to virtual bidding on their interties. The solutions run the whole gamut. Most importantly, these other ISOs do not enforce inter-tie scheduling limits comparable to those used by the CAISO under the WECC requirements, hence the examples of the other ISOs are not directly applicable to the California context.

- NYISO does not allow CB at their tie-points at present, though it has not ruled this out as a potential future enhancement.
- PJM allows CB at their interties, and does not enforce scheduling limits on physical schedules analogous to those in the west. PJM does require reservation of transmission, however, and this effectively limits physical transactions to be within applicable limitations.
- ISO-NE also allows convergence bidding at their interties, and enforces a constraint that the cleared transactions – physical and virtual combined – cannot exceed the applicable line limit.
- MISO enables virtual bids at their interchanges, and has a transmission reservation requirement prior to the close of their Day Ahead market. This requirement ensures that physical bids do not exceed their scheduling or line limits.

To understand the ISO's current proposal as summarized above, it is useful to recall the general process by which the IFM clears, and also how this will be different under convergence bidding at internal pricing nodes. In the ISO's new market structure, the IFM employs two passes, a scheduling run and a pricing run, to determine market-clearing schedules and prices. The Scheduling Run employs penalty prices to make sure that priorities among schedules are maintained. The prices from the scheduling run are therefore are not meaningful market prices. The schedules determined in the Scheduling Run are meaningful, however, and are passed to the Pricing Run in which valid market clearing prices are determined using participants' submitted bids. Under convergence bidding and in the case of internal pricing nodes, virtual and physical bids will be commingled in the IFM clearing process. They will be treated equally in the Scheduling and Pricing runs, will clear against each other and will receive the same price at any given pricing node. Virtual schedules can create congestion, mitigate congestion, and can displace physical generation and/or load. However, participants who submit virtual bids have financial incentives that act to converge IFM and Real Time prices. In other words, virtual bidding that is aimed at trying to create greater divergence between IFM and RTM prices would typically be a losing proposition for the bidder.

Despite the discipline provided by the market incentives just described, there is an important reason to include an additional mechanism with respect to convergence bidding at the interties. The concern is that virtual counter-flows could allow a set of physical intertie schedules to clear the IFM that would violate established scheduling limits for one or more inter-ties, which would in turn violate NERC and WECC reliability standards. Moreover, given California's dependence on imported power, failure to observe the scheduling limits with respect to physical imports and exports in the IFM could result in the IFM accepting a set of import schedules that may not be fully deliverable in real time. To avoid such problems the ISO proposes that the design of convergence bidding at the interties include the enforcement of a constraint within the IFM optimization that will ensure that physical intertie schedules are within the required limits.

The CAISO is not proposing to limit physical imports and exports via a transmission reservation requirement mechanism similar to the PJM and MISO requirements. Although this approach is working for other ISOs, we propose instead to enforce the applicable scheduling limit on physical IFM schedules as a constraint within the market software. This approach has the advantage of keeping the scheduling of physical resources in the market rather than first subjecting them to a "first come, first serve" transmission reservation. Having the constraint enforced in the market enables physical imports and exports to net against each other. This enables more physical scheduling of imports and exports in the Day Ahead market because bid-in imports and exports can net against each other. Not only does this serve to make sure that NERC and WECC reliability standards are upheld, but it also gives the CAISO operational staff confidence that the intertie energy on which California heavily relies can be reliably delivered.

The enforcement of the scheduling limits on physical IFM interchange schedules clearly addresses the concerns underlying the first design principle, and is the element of the ISO's proposal that distinguishes the treatment of interchange bids from bids elsewhere on the ISO grid. In order to adhere to the second principle that virtual and physical bids clear together in

the IFM, we propose to enforce an additional constraint such that the net of virtual and physical imports and exports also be less than or equal to the applicable scheduling limit. This second constraint is no different to the way physical and virtual bids are treated in the IFM with respect to all other constraints within the ISO system. For purposes of establishing IFM prices, the shadow price of the second constraint will determine the congestion components of intertie prices. Again, this is no different to how IFM prices are determined throughout the ISO grid, based on constraints applied to the combined physical and virtual bids submitted to the market. Because of the addition of the physical-only constraint, however, we have two constraints being applied to the establishment of IFM inter-tie schedules, and we need to consider how they will interact.

Constraint [1] – The Physical Constraint: Physical imports net of physical exports must be less than or equal to the scheduling limit at the relevant scheduling point in the applicable direction.

Constraint [2] – The Physical + Virtual Constraint: Physical and virtual imports net of physical and virtual exports must be less than or equal to the scheduling limit at the relevant scheduling point in the applicable direction.

To see how the enforcement of these constraints plays out between the Scheduling and Pricing runs of the IFM, four cases are analyzed below.

Case A – Neither [1] or [2] is binding:

Recall that constraint [1] is the physical constraint which keeps intertie schedules from exceeding scheduling limits. Constraint [2] is the constraint that physical + virtual schedules also be within the applicable scheduling limit. Physical and virtual schedules are co-determined in the scheduling run, and are subject to both these constraints.

The physical values, which net out to clear under the scheduling limit, are passed to the pricing run. In the pricing run, these physical values are enforced as constraints. Only the physical + virtual constraint impacts prices, and this is consistent with the design principle with which we started. Namely, that the congestion component of interties prices be based on the enforcement of virtuals and physicals mixed together. The physicals are co-determined with virtuals in the scheduling run, but then fixed in the pricing run in order to ensure that schedules do not exceed the intertie scheduling limits.

Since neither of the constraints is binding, the congestion component of intertie prices in this case is zero.

Case B – Both [1] and [2] are binding:

In the case that both constraints are binding, we know that virtual imports exactly equal virtual exports. The constraints are redundant in that the enforcement of them both will not yield a different solution than the enforcement of either one of them alone. That shadow value on the

physical + virtual constraint will be the congestion component of prices that are yielded by the pricing run.

Case C – [1] is not binding, but [2] is binding:

This is a mixed case in that there is no congestion created by the physical bids, but the virtuals do create congestion. Because [2] is binding, it is clear that the virtual schedules that come out of the scheduling run create virtual congestion on the intertie where there was none created by the physical schedules. The pricing run will enforce the physical + virtual constraint, and the price at that intertie will have a congestion component reflective of the shadow value of constraint [2].

In this instance, the price to which all cleared bids at this intertie are subject, both physical and virtual, indicate congestion. While this is consistent with the design principle that virtuals and physicals determine prices by clearing together, this can lead to a disadvantageous situation for physical intertie schedules. In particular, there could a situation in which a physical resource is not dispatched due to the virtual congestion. There may also be a situation in which a physical schedule could clear at a higher price than they would without the inclusion of the virtuals in the market. However, that lost "opportunity cost" can also work in the opposite direction so that physicals enjoy a "windfall" due to the influence of virtuals.

As we generally see with convergence bidding, the market will self-correct in such instances. Congestion in the IFM that will not be there in the HASP will cause the Day Ahead price to be higher than the HASP price. The virtuals that created the virtual congestion in the prevailing direction will be liquidated at the lower HASP price, and will therefore lose money. Additionally, it is reasonable to expect that other Market Participants, including those playing in the physical intertie market, will jump on that price divergence in order to make money by arbitraging that difference and to hedge their other market positions.

Case D– [1] is binding, but [2] is not binding:

In this second mixed case, the physical constraint is binding, but the physical + virtual constraint is not. By enforcing constraint [1] in the scheduling run, we ensure an intertie schedule that is within applicable scheduling limits. Also in the scheduling run, we see that the virtuals, which are co-determined with the physicals, mitigate the congestion so that the physical + virtual constraint is not binding. The physical import and export values are passed to the pricing run, and the pricing outcome reflects the fact that there is no congestion due to the cleared virtuals.

The potentially disadvantageous result of this case is that physical schedules that are relieving physical congestion do not receive any congestion payment because the virtual schedules have rendered the intertie un-congested. However, just as in the last case, the potentially disadvantageous could have been advantageous in other circumstances. Also as in Case C, prices will discipline the market to prevent such an outcome from persisting. Once the virtual schedules from the IFM are gone, congestion will be evident in the HASP that was masked by those virtuals in the IFM. This will cause the HASP price to be higher than the Day Ahead price.

The virtuals that relieved the physical congestion in the prevailing direction will be liquidated at the higher HASP price, and will therefore lose money. As noted previously, it is reasonable to expect that other Market Participants, including those playing in the physical intertie market, will jump on that price divergence in order to make money by arbitraging that difference and to hedge their other market positions.

In both Case C and Case D, there can be inconsistencies between prices and physical dispatches. These inconsistencies can be to the advance or to the detriment of the market participant with the physical schedule. These inconsistencies are entirely a by-product of enforcing the physical constraint, Constraint [1], in the scheduling run, and passing the resulting physical intertie schedules on to the Pricing Run as fixed values. The ISO is mindful of these potential inconsistencies, but does not propose to develop a "make whole" payment for lost opportunity costs, nor do we propose a "claw back" for "windfall" profits. This is consistent with existent ISO policy, and also reflects appreciation for the fact that market prices will discipline circumstances that generate these outcomes.

Reliability Concerns and Residual Unit Commitment (RUC):

In the IFM, physical and virtual imports will clear against physical and virtual exports. Once those schedules are determined, the physicals alone are passed to the Residual Unit Commitment (RUC) run which evaluates the extent to which those physical schedules can meet forecasted load levels. The RUC run can commit System Resources with RA contracts as well as internal generation in order to meet the needs of forecasted load. This relieves the reliability concern that virtuals could displace physical bids in the Day Ahead market, and that the needed physical flows would not be available in the HASP or Real Time time-frames. The RUC run, which occurs directly after the IFM, will commit additional resources as necessary to meet load requirements.

It is important to point out once again that, just as is the case with virtual bidding within the CAISO control area, the prices on the interties that would result in the case that virtuals drastically displace physical bids would be highly disadvantageous to the market participants who placed those virtual bids. Virtual bids that provide additional or better information about physical conditions to the market, and that thereby serve to converge prices are the winning transactions.

Potential Tagging Requirement:

The ISO will undertake a stakeholder process to consider formal tagging requirements or some other mechanism to deter not tagging physical intertie schedules will be developed.[3] Although it is expected that any party currently engaging in implicit virtual bidding on the interties would simply use virtual bids to achieve the objectives of those transactions once convergence bidding is implemented, incentives to implicitly virtually bid on the interties may still exist. Specifically,

[3] Note that the CAISO addresses e-tagging in the Operating Procedures Manual posted at the following link: http://www.caiso.com/docs/2002/04/26/200204261503156164.pdf.

there is the possibility that participants could submit bids labeled as physical, receive a physical schedule, and then wait to make a decision about tagging that scheduled energy in order to preserve the option of liquidating the transaction in Real Time. This would have the impact of causing divergence between Day Ahead and HASP/Real Time prices which we would not expect to occur frequently, nor would we expect this to persist. Although prices will discipline this behavior, having physical bids upon which we cannot fully rely will negatively impact operational reliability. As mentioned previously in the Convergence Bidding stakeholder process, the ISO will be undertaking a separate initiative on tagging requirements, and the policy with respect to convergence bidding on the interties will certainly be a part of that discussion.

3.1 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.

3.2 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. The CAISO Department of Market Monitor's (DMM) proposal for CRR Settlement Rule is included in *Attachment B* to this document.

3.3 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.

3.4 Ability to Suspend Virtual Trading

In its November 2007 recommendations on convergence bidding, the Department of Market Monitoring (DMM) suggested that the CAISO should have authority to quickly respond to any problems that may occur under nodal virtual bidding by limiting or suspending virtual bidding by participants individually or collectively.**4**. As described in DMM's November 2007 whitepaper, in the event the CAISO suspends or limits virtual bidding, the CAISO would file supporting documentation with the FERC within ten business days of the suspension. The suspension or limitation would remain in effect for 90 calendar days unless the FERC directs otherwise. Within this 90 day period, FERC could consider documentation provided by the CAISO, as well as any information submitted by market participants subject to the limitations or suspension.

The ISO's August 2, 2009 straw proposal also recommended that the ISO should have the tariff authority and functional ability to suspend virtual trading for market participants individually and collectively if market conditions warrant. **5** In its comments on the ISO straw proposal, DMM re-iterated its support for the type of tariff authority outlined in DMM's November 2007 whitepaper, and noted that it looked forward to additional comments or suggestions from stakeholders on how the details of such authority might be structured.**6**

The ISO received limited comments on this issue in response to its straw proposal.

- J.P. Morgan did not oppose the ISO's straw proposal, but requests that the ISO clearly specify the circumstances under which it would either suspend or limit an individual participant's ability to submit convergence bids. (p.4)
- WPTF expressed concern about "undefined internal authority to suspend trading", and encouraged the ISO to confirm that it would not employ suspension functionality without FERC authorization. (p.3)
- CERS suggested it supports that ISO having authority to apply virtual bidding limitation on specific participants if market manipulation is detected, but questioned where this authority

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[4] Convergence Bidding: Department of Market Monitoring Recommendations, November 2007, Department of Market Monitoring, http://www.caiso.com/1c8f/1c8ff5f46c90.pdf

[5] *Straw Proposal for the Design of Convergence Bidding*, July 2, 2009, p.11.

[6] Comments on Straw Proposal for the Design of Convergence Bidding, Department of Market Monitoring, July 24, 2009, pp.4-5.

would come from, how quickly it could be implemented, and what the ISO would do if not granted this authority (p.1).

In addition, participants expressed concerns about two other issues that the ISO notes are examples of the specific type of behavior that the authority to limit or suspend convergence bidding by individual participants at specific nodes is designed to protect against:

- CERS expressed concern that proposed position limits may not entirely mitigated potential use of virtual bidding to circumvent the intent of physical validation provisions for Sellers Choice contracts (p.1).
- SCE suggested that the ISO may consider special convergence bidding settlement provisions to deter a generator's ability to increase its profits from virtual bidding through excessive uninstructed deviations in the real time energy market. (p.4)

To be profitable, both of these types of market behavior would ultimately exacerbate differences in IFM and real time energy prices. Thus, the ISO believes that these scenarios can be addressed by having the authority to limits or suspend the ability of individual participants to place convergence bids at specific nodes in the general manner outlined in DMM's initial November 2007 whitepaper. Specifically:

- In the event that virtual bidding by any particular participant or group of participants was found to be contributing to an sustained unwarranted divergence in prices in the IFM and real time market, the CAISO would have the authority to suspend or limit virtual bidding by individual market participants at specific nodes.
- The determination of whether a sustained divergence in prices in the IFM and real time market had occurred would be based on a calculation of the deviation between average hourly prices in these markets during a rolling four week period, or other such period determined to be appropriate given the participant's bidding behavior under review.[7]
- The ISO's determination of whether the participant's bidding behavior caused or significantly contributed to this price divergence would be based on simulations of the ISO's IFM results without the virtual bids under review, when practicable, or other appropriate analytical methods as necessary.[8]
- As part of the ISO's determination to limit or suspend a participant's ability to engage in Virtual Bids at specific nodes, the ISO would requests explanation of the relevant virtual bidding practices.
- The ISO would then be required to file supporting documentation with the FERC within ten Business Days of the limitation or suspension.
- The suspension or limitation would remain in effect for 90 calendar days from the time the ISO submitted its initial filing at FERC, unless (a) FERC directs otherwise, or (b) the ISO determined that the limitation was not longer needed.
- After this 90 day period, the suspension would remain in effect only if approved by FERC.

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[7] For instance, if the bidding behavior under review only occurred during certain hours or days, the analysis may be limited only to the sub-set of hours or days.

[8] This analysis may be performed by re-running the actual IFM software without by virtual bids under review, or an alternative simulation model or analytical method for approximating results of the IFM.

- To the extent that the behavior involved a potential violation of the Commission's market rules prohibiting market manipulation, the behavior would also be subject to referral to FERC's Office of Enforcement (OE). However, the ISO notes that such referrals can be subject to a very lengthy process of review and investigation prior to any resolution. In addition, since any actions by FERC OE subsequent to a referral are generally confidential, the ISO cannot rely on this process an immediate, short term mechanism for mitigating potential detrimental virtual bidding practices.

This approach provides the ISO with authority to quickly respond to any convergence bidding practices that are having the effect of undermining the physical validation provisions for Sellers Choice contracts, or allowing generators to profit from uninstructed deviations, or, more generally, manipulating market prices or deterring price convergence. At the same, time, ISO's authority to quickly protect against such scenarios is ultimately limited by FERC, which may act on a expedited basis to remove or modify any limitations placed by the ISO. This approach is also similar to provisions in the MISO tariff which authorize the MISO's Independent Market Monitor (IMM) to suspend or limit virtual bidding by individual participants (See MISO Tariff Section 65.5 – 65.6).

3.5 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[9] 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.[10]

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[9] *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.caiso.com/docs/2005/03/17/2005031710204254 84.pdf

[10] 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.caiso.com/docs/2005/06/13/2005061308575721305.pdf

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 proposes 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.

3.6 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 individual pricing node where a network generator, load or inter-tie resources exist in the network model and at aggregated pricing nodes including default LAP trading hub or aggregated generation node.

f) 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.

g) 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.

h) 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.)

i) 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.

j) Virtual Bids are not subject to local market power mitigation.

k) 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.

- 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.

- RMR units – Manual commitment (Prior to the MPM/RRD run) 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.

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 previously included this change as a requirement for the design of convergence bidding but this enhancement was approved by the ISO Board of Governors at the September Board meeting and will be implemented prior to convergence bidding.

4.4 Manual Commitment of Needed RMR Units

When convergence bidding is implemented, the MPM-RRD procedures as they operate today will not be effective to schedule needed RMR units. This is because accurate RMR scheduling relies on an assessment of physical supply resources versus expected physical load, whereas the MPM-RRD under convergence bidding will utilize bid-in demand rather than the demand forecast, and will include virtual bids as well as physical bids. As a result the ISO proposes to perform RMR commitment and scheduling manually once convergence bidding is implemented.

In most cases ISO operators will determine the need to commit RMR units in the day-ahead market prior to running the MPM-RRD process. The committed RMR units will then appear in the MPM-RRD as self-committed at minimum load. In some instances the ISO operators may determine the need to commit additional RMR units after the day-ahead MPM-RRD process is finished, either prior to the running of the IFM, or after the IFM and prior to RUC. In these cases the RMR unit will appear in the IFM or RUC, respectively, as self-committed at minimum load.

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.[11]

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 has opened for discussion 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 were warranted. At the start of this process the ISO was 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

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[11] "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

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 invited stakeholders to comment on these and any other concerns they may identify regarding the compatibility of the convergence bidding and RUC designs. The ISO had previously noted that it did 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.

Although no specific problematic scenarios have been in this process to date, the ISO is still open to considering any specific problems stakeholders may identify and requests that stakeholders who have identified specific problems describe them in detail in their written comments, including numerical examples that 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.

In an effort to identify potential problems that might arise from the interaction of convergence bidding with RUC, the ISO performed some additional tests on RUC to simulate the effect of (1) large quantities of virtual supply displacing physical supply in the IFM, and (2) the effect of nodal virtual demand changing the distribution of load clearing the IFM and thus altering the IFM supply schedule going into RUC. Since the ISO is unable to submit virtual bids into the IFM with the current system some workarounds were used to simulate the desired effects. The results of these tests were discussed with stakeholders on the August 27 conference call and are included as Attachment C to this paper. The initial testing showed no anomalous or extreme RUC results in terms of quantities and costs of RUC capacity or RUC prices. Additional testing will be performed on RUC once the ISO has a system in place to submit virtual bids under market simulation conditions. This will occur during the implementation phase of convergence bidding.

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 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.

The ISO must take a broader look at its information release policy based on the new market design. A stakeholder process will launch no later than October to address information release requirements which could include requirements for both virtual and physical bids.

5 Convergence Bidding Certification Requirements in CAISO Markets

All CAISO market participants must fulfill certain registration requirements in order to participate in CAISO markets. In addition to the submission of standard business contact information, the application process does include specific requirements for training, testing (in some instances), posting credit, disclosure of affiliate relationships, and establishing a Fed-wire connection for settlement purposes.

In this section of the report, CAISO staff will describe the proposed Convergence Bidder (CB) Certification registration requirement process. Because Convergence Bidders will interface with the CAISO in much the same way as a Scheduling Coordinator (SC), the proposed application

and certification requirements for Convergence Bidders are modeled more on the SC certification process with appropriate modifications.

5.1 Proposed Convergence Bidder (CB) Certification Process

5.1.1 Application Timeline, Fees, and IDs

The proposed application timeline for Convergence Bidders is 90 days, which is the same as that for Candidate CRR Holder Registration Process. The 90-day timeline is more appropriate because Convergence Bidders will not be scheduling physical supply or demand in CAISO markets. For example, SC registration requirements not applicable to Convergence Bidders include the requirements to Complete Real-Time and Contact Drills; Submit an SC Emergency Plan; Register Intertie Resource IDs; Establish CAISO Automated Dispatch System (ADS) Access; Establish SLIC System Access; and Establish Access to Settlement Quality Meter Data System.

Thus, at least 90 days prior to the proposed start of service, the CB Applicant must submit a completed application form to the CAISO with a non-refundable application fee of $5,000, the same as that for SCs (See SC BPM, Section 5.2). A Draft External Checklist for Convergence Bidder registration is attached below.

With its application fee, a Convergence Bidder applicant will be granted access for one user account in CAISO systems. This user account will consist of two identification numbers (IDs): The first is a Short Name ID. For example, ACES Power Marketing is a registered scheduling coordinator with the CAISO and has the Short Name ID ACES. The Short Name ID is exactly the same as the Scheduling Coordinator Identification number (SCID).12 Thus, when fully registered, a convergence bidder will have a Short Name ID that may also (out of convention and convenience) be referred to as an SCID. The second ID in a user account is a Business Associate Identification number (BAID) which will be used during the invoicing and settlement process. The BAID for ACES Power Marketing is confidential, as is the case with other SC BAIDs. There will be no fee to request additional user accounts (Short Name/SCID and BAID), but the CB may be assessed a $500 per month GMC charge for each user account (i.e., Short Name/SCID/BAID), the same as that for SCs (See SC BPM, Section 5.5.1).

5.1.2 Training, Testing, and Fed-Wire Requirements

The proposed Convergence Bidder certification process includes a new training class, to be developed, on Detailed Settlements for Convergence Bidders. This is necessary because the existing CRR Holder training is not applicable to Convergence Bidders, and the SC training (Detailed Settlements and the SC Certification Workshop) contains lengthy material related to the scheduling of physical supply or demand, which are not applicable to CBs. Further, Convergence Bidders will primarily be concerned with Day-Ahead and Real-Time energy settlement and Integrated Forward Market (IFM) and Residual Unit Commitment (RUC) Bid Cost Recovery (BCR) uplift. Thus, a new class on Detailed Settlements for Convergence Bidders seems appropriate.

With regard to testing, Convergence Bidders should be required to complete a Market Proficiency Test similar to that required for SCs. As part of the training process, SCs are

[12] List of Scheduling Coordinators, http://www.caiso.com/docs/2005/10/28/200510281214421255.pdf

required to complete a Market Proficiency Test to demonstrate proficiency in submitting various types of Bids and Self-Schedules to the CAISO. The Market Proficiency Test is part of the SC Certification Workshop and simply requires participants to independently demonstrate skills acquired during the workshop. This involves submitting simulated bids and schedules in a Scheduling Infrastructure Business Rules (SIBR) application.

A Fed-wire requirements or test will ensure that a CB Applicant can submit payments to/and receive payment from CAISO. This requirement will be the same as that for SCs (See SC BPM, Section 5.3.6).

Overall, Convergence Bidders, like SCs, will be required to maintain continued proficiency and compliance with the rules and regulations concerning participation in the CAISO Markets (SC BPM, Section 6.1.2).

5.1.3 Establish Financial Security with CAISO

For Convergence Bidders, the establishment of security with the CAISO will be the same as that for SCs. Information on establishing security with the CAISO is described in the BPM for Credit Management which is located at the following link on the CAISO website:

https://bpm.caiso.com/bpm/bpm/version/000000000000001

Since credit will be validated for convergence bidders upon submission of a bid, credit must be posted with the prior to submitting a bid into the ISO Day-Ahead Market.

5.1.4 Affiliate Disclosure

Although most of the proposed CB certification requirements have been closely modeled on those for SCs, the proposed affiliate disclosure requirements for Convergence Bidders will be the same as those for CRR Holders. There are no affiliate disclosure requirements for scheduling coordinators. In contrast, market participants in other ISOs around the country are required to disclose their affiliate relationships, regardless of their particular role in the market.

CRR Holders "must notify the CAISO of all affiliates, that are themselves Candidate CRR Holders, CRR Holders or Market Participants, any Affiliate that participates in an organized electricity market in North America, and any guarantor of any such Affiliate," per CAISO Tariff § 36.7.3 and §39.9 (see also BPM for Candidate CRR Holder Registration, Section 2.3.5).

5.1.5 Maintaining CB Certification Status Obligations & Operations

Maintaining Convergence Bidder status obligations and operations should parallel the SC requirements set forth in the Maintaining SC Status Obligations & Operations section of the BPM for Scheduling Coordinator Certification & Termination (Section 6). This section of the SC BPM describes (1) the ongoing obligations for an SC, (2) the termination procedure for SC status, and (3) the details on the operations of an SC. The ongoing obligations and termination procedure for Convergence Bidders should be the same as that for SCs.

However, because Convergence Bidders will not be scheduling physical supply or demand in CAISO markets, details on the operations of CBs will necessarily differ from that of SCs. For example, the receipt of Dispatch Instructions is not applicable to CBs and it is not necessary for

CBs to maintain twenty-four hours a day, seven days per week communications, beyond that of a primary and secondary phone contact.

5.2 Certification Requirements in Other ISOs

In other ISOs around the country, Convergence Bidding is known as Virtual Bidding (VB), Virtual Transactions, or Virtuals. Virtual Bidding is viewed as a Market Participant transaction, not as another market participant type. During the market participant or customer registration process, a declaration can be made (e.g., check the box) if the market participant intends to engage in virtual bidding.

With regard to training and testing, there is no mandatory training or testing requirements for market participants in other ISOs, including virtual bidders. Some ISOs recommend certain training classes but classes are not mandatory.

Market Participants in other ISOs are required to periodically post adequate credit and collateral prior to engaging in virtual transactions. Affiliate Disclosure is required for all market participants in other ISOs, including virtual bidders.

6 Proposed Credit Policy for Convergence Bidding

The ISO's Credit BPM states "CAISO intends to maintain the confidence of Market Participants in the CAISO Markets and to sustain CAISO's mission of ensuring an adequate supply of power at a reasonable cost, by equitably, consistently and strictly enforcing these credit procedures. CAISO 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 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 the convergence bidding and the price convergence benefits this provides.

The ISO's proposed credit requirements for convergence bidding fit in the same framework as for other transaction types and market participants. In brief, a market participant must maintain an Aggregate Credit Limit (consisting of an Unsecured Credit Limit, if any, and Posted Collateral, if any) in excess of their Estimated Aggregate Liability (EAL, outstanding and unpaid obligations to the 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 EAL, and virtual bids will become a component of the EAL.13

The ISO surveyed peer ISO/RTOs and published an initial proposed credit policy for convergence bidding, and based on stakeholder feedback, the ISO has revised and enhanced

[13] The other components of the Estimated Aggregate Liability are listed in the Credit BPM, http://www.caiso.com/1c57/1c57bf8541890.doc

that proposal. Like ISO's CRR valuation approach which uses a 95th percentile value regarding potential variation between auction prices and CRR payment obligations, the convergence bidding proposal will use a 95th percentile value in setting reference prices as the differentials between day-ahead and real-time market prices.

By using the most current information available about a market participant's convergence bidding exposure, the ISO will appropriately balance the above concerns. The ISO proposes to use dynamic information about the value of virtual bids, rather than a static per MWh bid limit. CAISO thus aims to provide for a credit process for convergence bidding that:

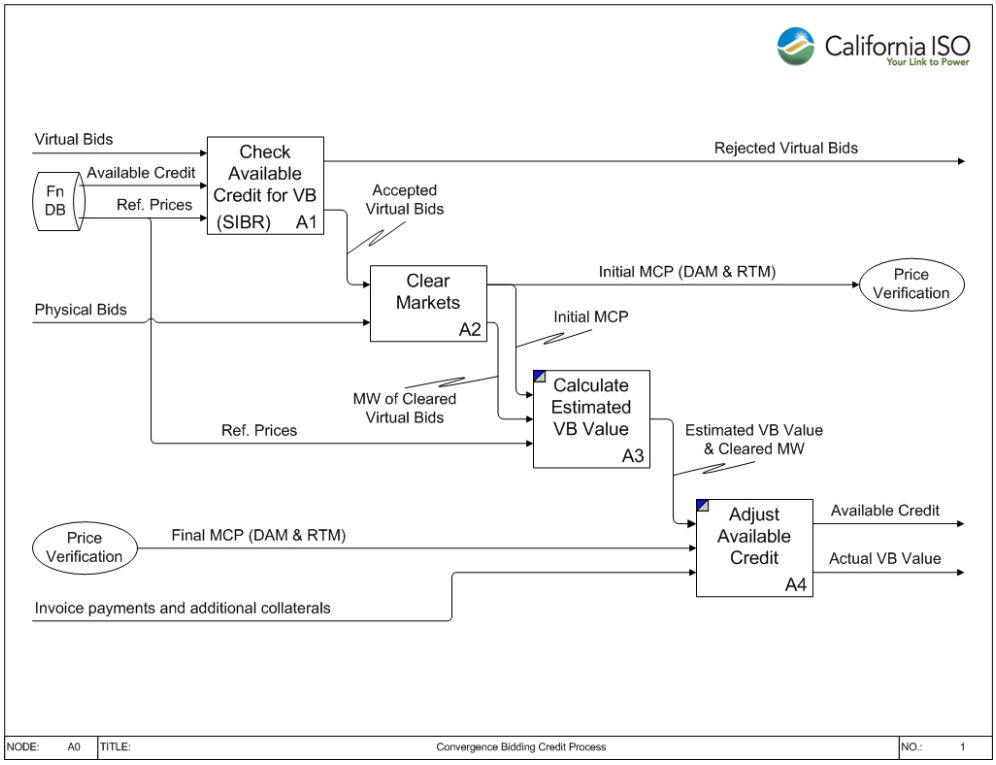
- Is a dynamic process. Rather than use fixed MW limits, the ISO will compare the value of virtual bids against the market participant's Available Credit Limit in dollars;
- seeks to assess the actual risk at every point, including using granular reference prices that are adjusted seasonally and which are specific to each Pricing Node, and revalues the virtual bids when actual price data is available;
- Mirrors and in some ways improves upon convergence bidding credit practices in other ISOs.

This section describes the proposal for the design of the credit policy for convergence bidding.

6.1 Overview of the Convergence Bidding Credit Process

The convergence bidding credit checking and valuation process consists of several steps involving multiple departments within the ISO. The process is illustrated, at a high level, in Figure 1. Each step is discussed in detail later in section 1.2 through 1.4.

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) of this market participant (Step A1 in Figure 1). The virtual bids passed the credit checking will be fed into the market clearing process. At the same time, the value of the virtual bids, based on historical reference prices, will be added the EAL of the participant. The virtual bids failing the credit check will be rejected based on timestamp as described in more detail in section 1.2 below.

After the close of day-ahead market, but before the close of real-time market, the virtual bid component of EAL will be adjusted based on the cleared MW of the virtual bids.

After the close of real-time market, the ISO will calculate the estimated value of the cleared virtual bids using initial Market Clearing Prices (MCPs). The EAL of the market participant will be adjusted accordingly (Step A3 in Figure 1). The initial MCPs are subject to validation and correction before becoming final.

If the MCPs are corrected in the validation process, the ISO will adjust the virtual bid component of EAL of all market participants for the last time. (Step A4 in Figure 1).

6.2 Credit Checking for Virtual Bids

When a market participant submits virtual bids in the day-ahead market, the value of the virtual bids will be compared to the market participant's Available Credit Limit. The value of the virtual bids is the sum of the product of a reference price and the MWs of each Virtual Bid. The criterion of credit checking is defined as the following:

$$(\sum_i Reference\ Price_i * abs(VBMW_i)) \leq Available\ Credit\ Limit$$

where,

Reference Price is the 95th percentile value of price difference between the day-ahead and real-time energy markets.14 The CAISO will calculate a reference price for each of the CAISO Pricing Nodes. 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 LMPs of the same period of the previous year.

The absolute value of the MWs of all virtual bids (virtual supply and virtual demand) will be counted for credit checking.

Available Credit Limit is updated daily or more frequently.

The virtual bids passed the credit checking will be fed into the market clearing process. The value of the virtual bids will be added the EAL of the participant as credit reservation for the virtual bids.

If virtual bids fail the credit check as noted above, the bids will be rejected based on timestamp on a last in, first out basis. If a market participant submits a batch collection of virtual bids at the same time to SIBR (Scheduling Infrastructure Business Rules) through the web services or graphical user interface all bids received in that batch will be rejected if the Available Credit Limit is exceeded. Since this collection of bids will contain the same timestamp, the SIBR software will validate this group of bids simultaneously and will not be able to apply the last in first out methodology. The ISO would have no basis for selecting which bids should be accepted or rejected. However, if virtual bids are submitted in multiple batches, the virtual bids in the batches submitted before the batch that fails the credit check may be accepted. 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 the ISO's bidding timelines.

6.3 Calculation of Estimated Value of Virtual Bids

After the day-ahead market is closed, but before the real-time market is closed, the ISO will adjust the credit reservation for the virtual bids in the EAL based on the cleared MW of the virtual bids. That is,

$$Estimated\ VB\ Value = \sum_i Reference\ Price_i * abs(Cleared\ VBMW_i)$$

After the clearing of the real-time markets, the ISO will calculate the estimated values of all cleared virtual bids using the initial MCPs. The estimated value of the cleared virtual bids of a market participant is calculated as:

$$Estimated\ VB\ Value = \sum_i \Delta MCP_i * Cleared\ VBMW_i$$

where,

$$\Delta MCP_i = MCP_{DA,i} - MCM_{RT,i}$$

[14] ISO-NE, NYISO, PJM use 97th percentile values, while MISO uses 50th percentile value.

that is the difference between the MCPs of the day-ahead and real-time markets. The MCP is the LMP of the Pricing Node 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 EAL of the market participant will be adjusted based on the estimated value of cleared virtual bids. The adjusted Available Credit Limit is then ready for next day's credit checking of virtual bids (Step A3 in Figure 1).

6.4 Adjustment of Value of Virtual Bids

After the close of Real-Time markets, the CAISO will verify the initial MCPs and make corrections if necessary. If the MCPs are corrected, the values of the cleared virtual bids will then be re-calculated using the final MCPs (Step A4 in Figure 1). The EAL of each market participant will be adjusted accordingly.

6.5 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 in excess of the EAL at all times. The ISO will request more collateral when the EAL exceeds 90% of the Aggregate Credit Limit. The ISO Tariff allows 100% usage before rejection of bids. The ISO proposes to apply the same rule to convergence bidding, that is 100% Available Credit Limit can be used for submitting 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 may 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.

7 Proposed Cost Allocation for Convergence Bids

7.1 Grid Management Charge to Convergence Bidders

The costs recovered through the Grid Management Charge are allocated to eight service charges. The service charges are described in detail in Appendix F, Schedule 1, Parts A and F of the ISO tariff. Since convergence bidding is solely a financial transaction not all service charges apply to convergence bidding under the cost causation principle. The following service charges will be applied to convergence bidding: Forward Scheduling Charge, Market Usage (Day Ahead) Charge, and Settlements, Metering and Client Relations Charge.

The Settlements, Metering and Client Relations (SMCR) Charge will be fixed at $1000.00 per month, per Scheduling Coordinator ID Code (SCID) with an invoice value other than $0.00 in the current Trading month. New market participants entering solely for convergence bidding will be charge the SMCR if the market participant decides to become a scheduling coordinator. For existing market participants who will use their existing SCID for convergence bidding there will be no additional cost.

During the stakeholder process, it was determined that the current billing determinants for the Forward Scheduling Charge and Market Usage (Day Ahead) Charge were poorly aligned with the goals of convergence bidding. The Forward Scheduling Charge is based upon a billing determinant of $ per schedule. The Market Usage (Day Ahead) Charge is based upon a billing determinant of $ per cleared net MWh. As a result, the recommendation was made to create a new service charge exclusively for convergence bidding. The revenue generated from the Convergence Bidding Charge will be applied to the existing Forward Scheduling Charge and Market Usage (Day Ahead) Charge.

The new Convergence Bidding Charge will have a billing determinant of $ per cleared gross MWh. The rate is estimated to be between $0.065 and $0.085 per cleared gross MWh. The rate is consistent with the rate other ISOs charge for convergence bidding. The exact rate will be established in the 2011 GMC Extension stakeholder process beginning January 2010.

If Convergence Bidding is implemented in late 2010, the billing rate will be established during a separate stakeholder process to be held starting in February 2010. The rate is estimated to be between $0.065 and $0.085 per cleared gross MWh

The table below shows how the proposed CAISO costs to virtual bids compare with other ISOs.

	Min Max	Admin Fees	Transaction Fees	BCR Uplift Fees	Bid Limitations
PJM	.01	Yes $.045 per cleared bid	$.06 per bid segment	Yes to virtual demand and virtual supply	1. Ability to impose SC Daily Limit 3000 bid/offer segments 2. Credit limits 3. Apply location based MW limits as necessary to achieve AC solution
NYISO	1 MW for first bid segment .01 for subsequent segments	Yes	$.10 per submitted virtual bid regardless of segments $.05 for cleared bids	Yes to virtual supply only	1. Total Volume 2X Generation Capacity (plus/minus) at Location

			(credited 50%) Sliding scale based on SCUC performance (min .03 – max $1.00)		2. Soft Bid Volume Cap 3. Credit Limits
MISO	0.1MW	Yes .85 per cleared bid	No transaction fees	Yes to virtual demand and virtual supply	1. Daily Virtual MW Limit can be imposed 2. 2. Credit Limits
ISO-NE	1 MW	Yes $.06 per cleared bid	$.005 per bid segment	Yes to virtual demand and virtual supply	1. Bid limits unknown 2. Credit Limits
CAISO	1 MW	Yes .065 to .085 per cleared bid	No Transaction fees	Yes to virtual demand and virtual supply	1. Credit Limits 2. Bid volume limits 3. Ability to apply location based MW limits when necessary to achieve AC solution

7.2 Transaction Fees for Submitted Bids

The ISO proposes that no transaction fees be imposed on submitted virtual bids. The GMC stakeholder process for 2011 will consider a redesign of existing GMC charges. During that process it may be determined that an administrative fee to cover costs for submitted bids makes sense in the context of the new market design. At this time ISO administrative fees cover only costs for cleared bids and do not separate out costs for submitted bids. The ISO has a number of other provisions in place that will deter excessive bid volumes from virtual bids and does not believe a transaction fee is necessary merely for the purpose of limiting bid volumes.

Those provisions are:

- Bid volume limits
- Limit of one virtual demand bid and one virtual supply bid per location
- 1 MW minimum
- Credit check against submitted virtual bids

7.3 Allocation of IFM and RUC Tier 1 Costs

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 July 2 Straw Proposal 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. The costs allocated to virtual bidders would be based on the quantity the virtual demand resulted in the ISO clearing above its forecast. Costs will be allocated to SCs based on gross virtual demand that cleared 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 than 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 SCs with Virtual Supply will be allotted a portion of RUC Tier 1 Uplift costs based on their net virtual supply that cleared the IFM

Some stakeholder commented that the ISO should include the net effect of virtual supply when determining whether virtuals put the ISO over its forecast, i.e. physical demand plus virtual demand minus virtual supply > than the ISO forecast and that allocations to individual SCs for IFM and RUC Uplift should be based on their net portfolios.

Other stakeholders commented that they were opposed to the threshold tests to determine whether costs for IFM and RUC Tier 1 Uplift should apply to virtual bidders and that the ISO proposal did not reflect cost causation. Some stakeholders also commented that allowing netting of virtual bids system wide did not reflect cost causation.

The ISO discussed revision to the cost allocation proposal contained in the July 2 Straw Proposal with stakeholders on the August 13 stakeholder conference call where the ISO proposed the following revisions:

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

- If virtual demand plus physical demand minus virtual supply is greater than the ISO forecast of demand then SCs with a virtual demand obligation will pay a portion of the IFM Tier 1 Uplift Costs. The virtual demand obligation is equal to the sum of each SCs net virtual demand. Costs would be allocated to SCs with a positive net virtual demand position.

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

If virtual demand plus physical demand minus virtual supply is less than the ISO forecast of demand then SCs with a virtual supply obligation will pay RUC Tier 1 Uplift. The virtual supply obligation is equal to the sum of each SCs net virtual supply. Cost would be allocated to SCs with a positive net virtual supply position.

Several stakeholders submitted comments to the proposal discussed on the August 13 call. Some stakeholders commented that a nodal virtual demand bid in one location is not offset by a virtual supply bid in another location and that the cost allocation for virtual bids should be more granular, possibly at the DLAP level. Some stakeholders also commented that the threshold tests to determine whether or not virtual bids should pay IFM and RUC Tier 1 Uplift costs are arbitrary and should be eliminated. Other stakeholder commented that while the ISO has recognized the fact that virtual demand can offset virtual supply, the algorithms for both the IFM allocation (to net virtual demand) and the RUC cost allocation (to net virtual supply) has a methodological weakness in that they reflect cost being caused by virtual bids when there may not be any net impact from the sum total of all virtual transactions market-wide. The CAISO proposal does not count the benefit of reduced DA commitment cost driven by virtual supply, or the benefit of reduced RUC commitment cost driven by virtual demand. As a result, virtual transactions as a whole pay more than the share they are causing.

7.4 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 August 13, 2009

7.4.1 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. SCs with a net virtual demand position in their portfolio will be charged for IFM Tier 1 uplift if virtual demand system wide is positive. The obligation will be based on how much additional unit commitment was driven by net virtual demand that resulted in IFM clearing above what was needed to satisfy measured demand (load plus exports). If physical demand plus virtual demand minus virtual supply is equal to or less than measured demand (load + exports) SCs will not be charged for IFM Tier 1 Uplift. If physical demand plus virtual demand minus virtual supply is greater than measured demand the obligation for SCs with net virtual demand will increase proportionately based on the quantity net virtual demand put the IFM above measured demand. The maximum obligation would equal the system wide net of virtual demand minus virtual supply when net virtual demand system wide is positive. The minimum obligation is equal to 0.

For a given hour let:

IFM $Demand_i$ = Individual SC cleared Day-Ahead Load + Exports

SS $Supply_i$ = Individual SC cleared Day-Ahead Self-Scheduled Generation + Self Scheduled imports

VD_{sw} = System wide cleared virtual demand

VS_{sw} = System wide cleared virtual supply

PD_{sw} = System Wide Physical Demand

CAISO Forecast of Demand = LF

Actual Demand = AD

<u>The obligation for virtual demand to pay IFM Tier 1 Uplift will be based on the following equation:</u>

$$\text{Virtual Demand Obligation} = MAX(0, VD_{sw} - VS_{sw}) + Min(0, PD_{sw} - AD)$$

The Tier 1 rate for IFM Uplift would be calculated as follows:

$$\text{IFM BCR Tier 1 Rate} = \frac{\$ \text{ IFM Uplift}}{\sum_i \left(\text{Max}\left(0, \text{IFM Demand}_i - \text{SS Supply}_i\right)\right) + \text{MAX}(0, VD_{sw} - VS_{sw}) + \text{Min}(0, PD_{sw} - AD)}$$

Each SCs obligation to pay IFM Tier 1 Uplift will be calculated as:

$$\text{IFM Tier 1 Charge}_i = \text{IFM Tier 1 Rate} * \left[\frac{\text{Max}(0, VD_i - VS_i)}{\sum_i \text{max}(0, VD_i - VS_i)} * (VDsw - VSsw) + (\text{Max}(0, \text{IFM Demand}_i - \text{SS Supply}_i)) \right]$$

An example of how the IFM Tier 1 obligation is calculated for virtual demand is included as Example 1 in *Appendix A* of this document.

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 are no changes to allocations of IFM Tier 1 BCR to physical load resulting from this proposal

7.4.2 Virtual Supply Obligation to Pay RUC Tier 1 Uplift

The ISO proposes the following revised allocation of costs for RUC Tier 1 Uplift for underscheduled load and virtual supply.

To the extent that the CAISO forecast of demand is less than or equal to measured demand costs will be allocated to net virtual supply and underscheduled load.

To the extent that the CAISO forecast is greater than measured demand costs will be allocated to measured demand by ratio share.

Some stakeholders commented that virtual supply should not pay for RUC procured beyond what was needed for actual load since they are they are not the cause of these additional costs nor are they the benefactor of these costs. The ISO agrees with stakeholder on this point but also agrees that underscheduled load is neither the cause nor the benefactor of RUC procured beyond what is needed to cover measured demand when the ISO forecast is higher than measured demand. The ISO proposes that these costs be allocated to RUC Tier 2 and be paid for by measured demand since they are the benefactors of these additional costs due to reliability.

The obligation for virtual supply will be determined by 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.

For a given hour let:

UL_i= Individual SC net negative demand deviation

VD_{sw} = System wide cleared virtual demand

VS_{sw} = System wide cleared virtual supply

CAISO Forecast of Demand = LF

Actual Demand = AD

The obligation for virtual supply to pay RUC Tier 1 Uplift is calculated as:

$$\text{Virtual Supply Obligation} = MAX(0, VS_{sw} - VD_{sw})$$

The rate for Tier 1 RUC Uplift will be calculated as follows:

$$\text{RUC Tier 1 Uplift Rate} = \frac{\$ \text{ RUC Uplift Tier 1}}{\sum_i (Max(0, IFM\ Demand_i - SS\ Supply_i) + MAX(0, VS_{sw} - VD_{sw})}$$

The dollars to be allocated through RUC tier 1 will be calculated as follows:

$$\text{\$ of RUC Tier 2 Uplift} = \text{\$ Total RUC Uplift} * \frac{\text{Max (0, LF – AD)}}{\text{Total RUC Capacity}}$$

$$\text{\$ of RUC Tier 1 Uplift} = \text{\$RUC Uplift} * \frac{\text{Max (0, LF – AD)}}{\text{Total RUC Capacity}}$$

Each SCs obligation to pay RUC Tier 1 Uplift will be calculated as:

$$\text{RUC Tier 1 Charge}_i = \text{RUC Tier 1 Rate} * \left[\frac{\text{Max (0,VSi – VDi)}}{\sum_I \text{max (0, VSi – VDi)}} * (\text{VSsw – VDsw}) + UL_i \right]$$

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 Tier 1 Rate.

- Both virtual supply and physical load will pay the same RUC Uplift Tier 1 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.

An example of how the RUC Tier 1 obligation is calculated for virtual supply is included in Example 2 in Appendix A of this document.

7.5 Other Charge Codes

7.5.1 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.

7.5.2 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

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

8 Next Steps

A combined Market Surveillance Committee (MSC) stakeholder meeting will be held on September 18, 2009 to discuss the issues presented in this proposal. The ISO is also requesting written comments from stakeholders by Friday, October 2, 2009 to mmiller@caiso.com. Conference calls for the Convergence Bidding implementation working group are planned up to December 2009. The ISO plans to seek board approval on convergence bidding in October 2009 and to implement convergence bidding in February 2011.