



California ISO
Your Link to Power

Update on the Design for Convergence Bidding

*A “Market Release 1A” enhancement
to be implemented within one year of MRTU start-up*

November 7, 2007

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Update on the Design for Convergence Bidding

Prepared for Discussion at Stakeholder Meeting on November 14, 2007

1 Executive Summary

Convergence or "virtual" bids¹ are financial bids submitted only in the Day Ahead market. There is no requirement for such bids to be backed by physical assets. 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. The potential for reward encourages virtual bidding activity that would tend to minimize the difference 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 CAISO 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.)

To meet FERC's requirement to implement convergence bidding within one year after MRTU start-up, the CAISO has engaged in an on-going stakeholder process to develop the key features for these financial bids. This paper and ensuing public discussions seek to continue progress for designing and implementing this important market enhancement.

At this point in time, stakeholders involved in this process are divided over one fundamental issue -- the 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 noted above. 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 typically concerned with any ability of nodal virtual bidding to raise market prices.

The CAISO is hopeful that continued discussions on this granularity issue based on actual MRTU market outcomes may lead to increased consensus among stakeholders. After start-up of

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.

MRTU, discussion can be directly related to the daily experience with financially binding hourly bids in the Day Ahead market and a comparison of actual prices between the Day Ahead and Real Time markets.

To allow this extended discussion and be able to defer a definitive policy decision on the initial granularity for virtual bids, the CAISO is seeking to build system and software capability for virtual bidding at both the nodal level and the aggregated level (such as the three Default LAPs).² The CAISO is beginning to work with its software development vendors to build such flexibility, so that virtual bidding could be initiated at whatever level of granularity is decided upon later. This configurable platform also could allow convergence bidding to begin at one level of granularity, and then evolve toward a different level over time.

While this functionality for nodal and aggregated virtual bidding cannot be guaranteed at this early stage of development, the CAISO does not yet see any insurmountable obstacles in this product implementation process. The CAISO will continue to work toward developing this all-encompassing capability and provide regular updates as well as forums for stakeholders to consider the pros and cons of different levels of granularity.

Section 2 of this paper offers a plan and draft timeline for making the determination whether to start convergence bidding at the LAP or nodal level. The CAISO is seeking stakeholder input on the proposed schedule for resolving this granularity issue and other considerations that should be weighed.

Section 3 summarizes the preferred design characteristics for virtual bids. Most of this material has been reviewed with stakeholders previously; however, the CAISO welcomes additional discussion as well as input on features that have not been fully discussed.

Sections 4, 5 and 6 of this paper propose important market design features, which are necessary for convergence bidding at any level of granularity. These features include:

- **Modifications to the Day Ahead market process:**
 - a) The local market power mitigation (MPM) pre-IFM runs would be performed using Bid-in Demand (which would include virtual bids) rather than forecasted demand which will be utilized in the currently established pre-IFM process for day-one MRTU. This change would align bid mitigation with the market-clearing process in IFM, which clears Bid-in Demand against Bid-in Supply.
 - b) The pool of resources that would be considered in the IFM run would include all available resources, not just the restricted pool of resources that have cleared the local market power mitigation pre-IFM run.
- **Credit requirements:** The determination of credit requirements for convergence bidding is based largely on the existing practices at other ISOs. This latest proposal refines the process (that was initially discussed within stakeholders on August 10, 2007) for daily credit checks to ensure that the financial obligations incurred by virtual bids do not exceed dollar-based collateral limits based on the available credit of the Scheduling Coordinator.

² This design could limit virtual bidding to an aggregated level (LAP-level) or it could allow nodal virtual bidding, which would permit both nodal and aggregated level virtual bids simultaneously.

- **Cost allocation:** The CAISO has previously reviewed all settlement charge types and identified the types of charges that should apply to virtual bids. 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 CAISO offers a refined proposal to charge virtual demand for a portion of the IFM Tier 1 costs (for the increased unit commitment within the IFM) and charge virtual supply for a portion of RUC Tier 1 costs (for the increased unit commitment within RUC.)

Section 7 of this paper discusses ways to address potential complications that may result if convergence bidding is allowed at the nodal level. Additional issues related to nodal virtual bidding may be addressed in the future; the focus of this section relates to:

- **Maintaining the settlement features for Seller's Choice contracts:** To preserve the Inter-SC Trade validation process established to address the incompatibility of pre-existing seller's choice contracts and an LMP market design, the CAISO proposes to monitor the interaction of convergence bidding and the physical validation of the Inter-SC Trades. If the CAISO finds that convergence bids by suppliers with Seller's Choice contracts are creating a divergence between Day Ahead and Real Time schedules, then behavioral restrictions or additional physical validations will be applied to curtail such behavior.

The CAISO requests written comments, suggestions or questions on the convergence bidding features explained within this paper and the stakeholder discussion which will be held on November 14th. The CAISO will post a template on these policy issues, and stakeholders should feel to utilize this template or submit written comments in any other format.

Written comments should be emailed to convergencebidding@caiso.com by November 30, 2007.

2 Building the Functionality for Convergence Bidding

Regarding the granularity for convergence bidding, the CAISO intends to design and develop software systems with capability for nodal virtual bidding as well as LAP-level or some other aggregation of pricing nodes. In addition, the CAISO seeks to have scalable functionality that could limit virtual bids only to the Default LAP-level bids. And the CAISO seeks to have capability to switch these features on or off easily – so that, for example, virtual bidding might be initially limited to Default LAP-level only, but then evolve into nodal-level virtual bidding at a later date.

The CAISO seeks to have this flexibility so that the granularity at which convergence bidding is introduced can be determined with greater confidence and stakeholder support after MRTU's launch, while still allowing several months to prepare for virtual bidding and other Release 1A features.

The CAISO is currently drafting documentation specifying the software requirements for such a configurable system. The CAISO anticipates developing an implementation schedule in coordination with appropriate vendors during the first quarter of 2008. Such a schedule will likely include several months of software testing and simulations of convergence bidding in preparation for the roll-out of Market Release 1A within one year of the MRTU Go Live date.

2.1 Resolving the Nodal versus Zonal Issue

The CAISO will defer the policy decision on nodal or LAP-level virtual bidding until the end of August, 2008, which should allow additional time for stakeholder consideration on this granularity issue as well as for observing five months of the redesigned LMP markets in operation.

The CAISO intends to conduct further stakeholder meetings in 2008 to review and discuss issues relevant to the granularity of convergence bidding. One major focus of these discussions will be the specific recommendations by the CAISO's Department of Market Monitoring, whose latest paper (November 2007) on convergence bidding is posted at:
<http://www.aiso.com/1807/1807996f7020.html>

The CAISO also will be relying on guidance from the Market Surveillance Committee (MSC), which has been heavily involved in the development and resolution of convergence bidding issues.

CAISO management anticipates presenting a recommendation on the granularity for convergence bidding, as well as any associated features such as those listed in the following sub-sections, at the CAISO Board of Governors that is currently scheduled for September 9-10, 2008.

Assuming Board approval, the CAISO will strive to submit a comprehensive tariff filing to FERC soon thereafter that would permit the implementation of convergence bidding.

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

- **November 14, 2007:** Stakeholder meeting to review convergence bidding design and issues raised in this paper.

- **November 30, 2007:** Written stakeholder comments on this paper should be submitted to convergencebidding@caiso.com
- **December 12-13, 2007:** Informational briefing and presentation on convergence bidding to the CAISO Board of Governors
- **February 15, 2008:** Stakeholder meeting to review development of convergence bidding functionality and discuss granularity issues.
 - **Mid-April, 2008:** Stakeholder conference call to review development of convergence bidding functionality and discuss granularity issues.
 - **Late May, 2008:** Stakeholder conference call to review development of convergence bidding functionality and discuss granularity issues.
 - **Mid-July, 2008:** Stakeholder conference call to review development of convergence bidding functionality and discuss granularity issues.
- **Mid-August, 2008:** Stakeholder meeting to review development of convergence bidding functionality and discuss granularity issues.
- **Late-August, 2008:** CAISO recommendation for the granularity of virtual bids upon implementation.
- **September 9-10, 2008:** Decision by CAISO Board of Governors
- **Late September:** Tariff filing to FERC on convergence bidding

Additional discussions in conjunction with meetings of the MSC likely will be incorporated into this stakeholder process on convergence bidding.

The CAISO invites written comments from stakeholders on this tentative schedule for resolving how to implement convergence bidding, as well as key factors upon which this decision should be weighed. Comments should be submitted to convergencebidding@caiso.com by November 30, 2007.

2.2 Additional Design Features

The CAISO is pursuing capability for other key features which might be incorporated in conjunction with nodal virtual bidding, and therefore the utilization of these features is linked to the fundamental decision on the granularity for virtual bidding. For now the CAISO intends to develop or gain assurance that functionality for the following features will be in place upon the initiation of convergence bidding; the policy question whether to implement these features is expected to be part of the policy decision how the initial implementation of convergence bidding should occur.

2.2.1 Position Limits

The CAISO seeks the capability to impose limits on the amount of virtual demand and virtual supply bids that could be submitted by individual Scheduling Coordinators at individual nodes, and to have the ability to raise, diminish or eliminate these limits depending on market

conditions. A key reason for maintaining the ability to establish position limits is to mitigate the potential exercise of market power at a specific node.

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.

- 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 MWs 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 MW volume of the peak withdrawal at each node, of which a percentage 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 position limit for both virtual supply and virtual demand bids for each SC.

Having position limits for each SC at each node means that the virtual bids of each SC would be restricted, and that limits on virtual demand bids would be separated from virtual supply bids. Thus, (using the example above,) virtual demand bids at Node X would be limited to 10 MWs for each SC, and virtual supply bids at Node X would be limited to 10 MWs for each SC. The existence of position limits would apply only to virtual Bids and not to physical Bids.

2.2.2 CRR Settlement Rule

The CAISO seeks the capability for an automated settlement rule (similar to an existing PJM practice) that adjusts the revenue from CRRs in the event of virtual bidding behavior that may impact the value of that instrument in the DA market.

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

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

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

2.2.3 Uninstructed Deviation Penalty (UDP)

One purpose of UDP is to guard against implicit virtual bidding. To the extent other elements of the convergence bidding design discourages implicit virtual bidding, the need for UDP is reduced.

The ability to apply UDPs already exists under the current MRTU design. It is not anticipated that there are any necessary enhancements or modifications to the current UDP design in preparation for the implementation of convergence bidding.

If nodal convergence bidding were implemented without position limits, or if those position limits were relaxed, it may be necessary to activate the UDP functionality.

2.2.4 Ability to Suspend Virtual Trading

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

3 Proposed Characteristics of Virtual Bids

The following items specify the CAISO'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 CAISO's markets.
- e) There should be capability to submit virtual bids at any pricing node or set of pricing nodes that is used for settlement purposes (except interties). Virtual bids should not be permitted at intertie points. Several market participants have raised the potential for increased risk of gaming opportunities with virtual bidding at the interties. Moreover, the ability to hedge generator outages (one of the primary purposes of virtual bidding) can be accomplished in a number of ways using the ability to change intertie schedules in the HASP.
- f) The CAISO is considering ways to permit virtual bids at the Existing Zone Trading Hubs. This may present implementation challenges as Trading Hubs overlap the LAPs (for example, the SP26 EZ Gen Hub includes the SDG&E LAP) and have different distribution factors from LAPs. The CAISO is investigating this issue and exploring options for resolution.
- g) The CAISO also seeks capability for virtual bids to be submitted at other pre-defined aggregated pricing nodes, such as LAPs or sub-LAPs or new Trading Hubs that may be defined, as well as possibly limit virtual bidding to LAPs or sub-LAPs.

- h) For each location (each LAP or for pricing node), 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.
- i) 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.
- j) The CAISO 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.)
- k) 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.
- l) Virtual Bids are not subject to local market power mitigation.
- m) Virtual bids are subject to the same bid caps as physical bids.

The CAISO invites written comments, suggestions or questions from stakeholders on these characteristics of virtual bids. Comments should be submitted to convergencebidding@caiso.com by November 30, 2007.

4 Proposed Modifications to the Day Ahead Market Process

4.1 Summary

Regardless of the granularity at which virtual bidding is implemented initially, the CAISO 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 CAISO to make this change as part of Release 2. The CAISO believes that it makes sense to include this feature with the introduction of virtual bidding as it adds to the market efficiency benefits of aligning bid mitigation with the market-clearing process in IFM and eliminates the need to restrict the pool of resources in IFM.

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

4.2 Pre-IFM process for Market Power Mitigation

In the initial launch of MRTU, 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 (perfect competition). This is reminiscent of import bids not being mitigated (although they do impact prices) because of the assumption of import supply competitiveness.

Regardless whether virtual bidding is nodal or limited to the LAP, the CAISO 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 bids (including virtual bids) that are used in the IFM pricing run (mitigated as the case may be).
- 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 CAISO anticipates that, assuming convergence bidding will not likely be introduced until 2009, the reduced number of available RMR units could be committed manually on a daily basis.
 - The CAISO anticipates any manual commitment of needed RMR units would occur after the IFM run, but before RUC is run (giving the RMR units the "market first" opportunity in the day-ahead IFM).
- e) Since only physical bids are included in the Real Time optimization process, the Market Power Mitigation function in the Real Time market process would not be changed.

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

The "pre-IFM" process implemented in MRTU Release 1 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 CAISO proposes that, upon the introduction of virtual bidding, regardless of the decision on granularity, the pool of resources that is considered in the IFM should be unrestricted. In other words, the IFM run would consider all available resources that submitted Bids in the DAM, not just the restricted pool of resources that have cleared the pre-IFM run in that particular Day Ahead process. This would include resources that submitted Bids that did not clear the pre-IFM and, therefore, Bids that have not been mitigated.

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

4.4 Manual Commitment of Needed RMR Units

The use of Bid-in Demand coupled with virtual bids could result in fewer RMR units being committed in the MPM-RRD process than would otherwise be committed using forecasted demand in the absence of virtual bidding. The CAISO has the right to issue manual RMR Dispatch Notices to RMR units that are needed for local reliability in the event that the MPM-RRD process does not dispatch needed RMR units. The contemplated change could result in additional circumstances of such manual RMR Dispatch. The CAISO operators would issue manual RMR Dispatches before running the RUC process so that any incremental RUC commitment would factor in the manual RMR Dispatch.

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

4.5 Information Release

The CAISO proposes to post by each location the clearing quantities of virtual bids as part of the IFM results. On a daily basis, as part of the Day Ahead market process that posts results at 1:00 pm., the aggregated quantities of the cleared virtual bids (not physical bids) will be published by location (but not revealing the Scheduling Coordinator who submitted these virtual bids).

A key purpose would be to increase market liquidity without inviting tacit collusion. Another would be to ensure that virtual bidders or other market participants have information that could counter any virtual bidding by the sellers of Seller's Choice contracts.

The CAISO invites written comments, suggestions or questions from stakeholders on these proposed key changes to the Day Ahead market which are needed to facilitate convergence bidding. Comments should be submitted to convergencebidding@caiso.com by November 30, 2007.

5 Proposed Credit Policy for Convergence Bidding

The CAISO's Business Practice Manual (BPM) for Credit Management states the "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. The CAISO recognizes that Market Participants want credit-related practices that are appropriate and transparent." The CAISO aims to achieve these objectives in designing credit policies for convergence bidding, and specifically aims to:

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

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

In brief, a market participant must maintain an Aggregate Credit Limit ("ACL"), consisting of an Unsecured Credit Limit, if any, and Posted Collateral, if any in excess of their Estimated Aggregate Liability "EAL", which is the total outstanding and unpaid obligations to CAISO at all times. The CAISO monitors these amounts and requests additional collateral from the market participant as necessary. Liabilities or amounts due to a market participant are included in their Estimated Aggregate Liability (EAL), and convergence bids will become a component of the EAL³.

The CAISO surveyed peer ISO/RTOs and published an initial proposed credit policy for convergence bidding, and based on stakeholder feedback, CAISO has revised and enhanced that proposal. Like the CAISO'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 prices. These Reference Prices would be based on actual LMPs produced during the first year of operation under the MRTU design.

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

- is dynamic. Rather than using fixed MW limits, the CAISO will value convergence bids against the market participant's available credit in dollars;

³ The other components of the Estimated Aggregate Liability are listed in the Credit BPM, <http://www.aiso.com/1c57/1c57bf8541890.doc>

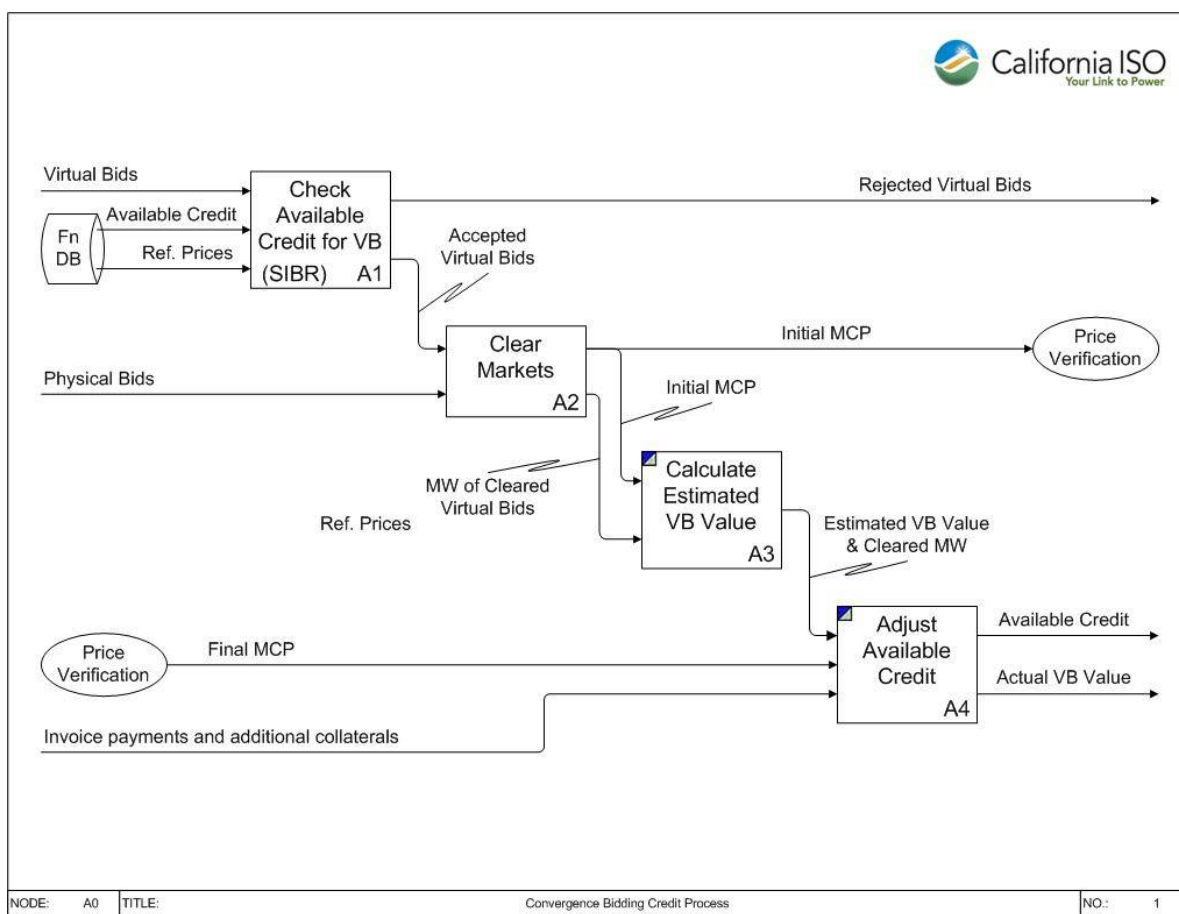
- seeks to assess the actual risk at every point, including using granular reference prices that are adjusted seasonally and which are specific to each LAP, and revalues the convergence bids when actual price data is available;
- mirrors and in some ways improves upon CB credit practices in other ISOs.

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

5.1 Overview of the Convergence Bidding Credit Process

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

Figure 1: Convergence Bidding Credit Process



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

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

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

5.2 Credit Checking for Virtual Bids

When a market participant submits Virtual Bids in the Day-Ahead energy market, the Market Clearing system will compare the value of the Virtual Bids to the market participant's Available Credit. The value of the Virtual Bids is the sum of the product of a Reference Price and the absolute value of the MWs of each Virtual Bid. The criterion of credit checking, which adopts the approach suggested by stakeholders during the discussion on credit policy at the September 12, 2007 Stakeholder Meeting⁴, is defined as the following:

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

where,

Reference Price is the 95th percentile value of price difference between the Day-Ahead and Real-Time energy markets.⁵ The CAISO will calculate a Reference Price for each of the three CAISO Load Aggregation Points (LAPs). The Reference Price is calculated for every three-month period (Jan-Mar, Apr-Jun, Jul-Sep, and Oct-Dec) of each year using the hourly actual LAP-average LMPs of the same period of the previous year.

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

Available Credit is updated daily.

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

⁴ The presentation for this discussion is posted at: <http://www.aiso.com/1c51/1c51b4fe5acd0.pdf>

⁵ ISO-NE, NYISO, PJM use 97th percentile values, while MISO uses 50th percentile value.

If Virtual Bids are submitted in multiple batches, Virtual Bids in the earlier submitted batches could be accepted by nature of being within the credit limit while virtual bids in subsequent batches could fail the credit check and be rejected. All Virtual Bids submitted in and after the failed batch will be rejected. The market participant may submit revised Virtual Bids after failing the credit check, subject to CAISO's bidding timelines.

5.3 Calculation of Estimated Value of Virtual Bids

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

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

where,

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

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

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

The estimated value of cleared Virtual Bids of a market participant will be added to the EAL, adjusting⁶ the Available Credit of the market participant. The adjusted Available Credit is then ready for the next day's credit checking of virtual bids (Step A3 in Figure 1).

5.4 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. When the final MCPs become available, the values of the Virtual Bids cleared then will be re-calculated using the actual LMPs (Step A4 in Figure 1). The EAL of each market participant will be adjusted accordingly.

5.5 General Credit Policy Issues

A. Maximum amount of credit that may be used

Currently, entities participating in the CAISO markets must maintain an Aggregate Credit Limit (Unsecured Credit Limit plus posted collateral) in excess of the EAL at all times. The CAISO will request more collateral when the EAL exceeds 90% of the Aggregate Credit Limit, but the Tariff allows 100% usage before rejection of bids. Other ISOs have different thresholds.⁷

⁶ The daily estimated value could either increase or decrease the EAL and ACL. If the participant's transactions are profitable, its available credit would be increased by the amount of the profit.

⁷ MISO allows for 100%, PJM 85%, and NYISO allows 50% for Virtual Bids.

The CAISO is not proposing to change the current Tariff provision regarding the amount of credit that can be used for Virtual Bidding. However, we note that in the CRR auction process, all of a market participant's Available Credit may be reserved for participation in the auction. As a result, a market participant may need to instruct the CAISO to set aside a lesser portion for participation in the CRR auction, or post additional collateral to ensure sufficient capacity for Virtual Bids.

B. Treatment of defaults from Virtual Bidding

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

The CAISO invites written comments, suggestions or questions from stakeholders on these proposed credit policies for convergence bidding. Comments should be submitted to convergencebidding@caiso.com by November 30, 2007.

6 Proposed Cost Allocation for Virtual Transactions

In the May 31, 2007 White Paper the CAISO presented an initial conceptual proposal on what CAISO settlements charges should be allocated to virtual transactions. In the August 10, 2007 Issue Paper titled "*Options for Conceptual Design of Convergence Bidding*," the CAISO presented a more detailed proposal for cost allocation for virtual transactions and proposed that a portion of IFM Tier 1 Uplift costs (CC 6636) be allocated to virtual demand and a portion of RUC tier 1 Uplift Costs (CC 6636) be allocated to virtual supply and that virtual transactions be exempt from IFM and RUC tier 2 charges (CC 6637, 6807), RTM Bid Cost Recovery (CC 6678), and all Ancillary Services costs both Tier 1 and Tier 2.

The CAISO's proposal for cost allocation described in this Proposal has been revised from the initial proposal presented in the August 10th paper to allocate costs for IFM Tier 1 and RUC Tier 1 bid cost recovery costs to virtual transactions on a system-wide basis rather than at the LAP level. This approach is consistent with the existing cost allocation methodology for physical load where dollars to be recovered are allocated to physical load system wide. This proposal for cost allocation will apply regardless of whether virtual transactions are bid at the LAP level or the nodal level. The CAISO has also added the Neutrality Adjustment CC 8999 as an additional charge or payment that could include virtual transactions.

The following paragraphs will provide an explanation with examples of the revised cost allocation proposal for IFM and RUC Tier 1 Uplift costs as well as provide a review of charge types addressed in previous issue papers in order to provide a complete proposal.

6.1 Stakeholder Comments on Cost Allocation

Stakeholders expressed concern in comments to both the August 10, 2007 and May 31, 2007 White Papers that costs should be allocated to virtual transactions based on cost causation and that the CAISO must be conscious not to over allocate costs in order to keep the market as deep and liquid as possible. Since virtual transactions provide cost benefits to the market, when considering cost allocations those cost benefits should be weighed against any costs that may result from virtual transactions.

Other stakeholders commented that virtual transactions should be treated the same as physical transactions to every extent possible and most related costs should be allocated to virtual transactions including Day-Ahead and Real-Time BCR costs, GMC, and FERC Fees.

Comments are summarized below:

- *Virtual Transactions should not be treated the same as physical demand when allocating costs and costs and cost offsets should be considered symmetrically*
- *Any virtual transaction may have the potential to displace physical generation and load. As a consequence, virtual players should not be exempted from the Real-Time Market Uplift Charges. An exemption from uplift costs for virtual supply and demand bidders would likely raise cost to California ratepayers.*
- *Tier 1 IFM or RUC commitment costs should be allocated to virtual demand only if and only to the extent that virtual demand increases demand beyond the level of actual load.*
- *Convergence bids should not be exempted from Real-Time Tier 1 Bid Cost Recover charges since Virtual supply cleared in the IFM becomes demand in real-time and has an*

impact on the commitment of physical generating units. Convergence bids should also not be exempt from some GMC related charges and FERC fee charges.

- *if virtual transactions are to bear certain IFM costs, they should similarly receive credit for cost reduction they bring to the RUC process by leading to less costly commitment decisions in the IFM.*
- *Virtual Bids should be exempt from Ancillary Services related charges and Tier 2 neutrality costs but not from Tier 1 IFM and RUC Bid Cost Recovery charges.*

The CAISO has taken into consideration stakeholder comments and has made an effort to find a balance between allocating a fair share of costs to virtual transactions while not over allocating costs in order to encourage participation in the virtual market. The CAISO has also reviewed the cost allocation practices at MISO, NYISO, PJM and ISO-NE to determine best practices and the CAISO's proposal is in line with cost allocation methodologies in practice at these other ISOs.

6.2 IFM and RUC Charges for Virtual Transactions

Under MRTU all supply resources are eligible for Bid Cost Recovery (BCR) which allows Generating and Dynamic System Resources to recover their Start-Up Costs, Minimum Load Costs, and Energy and Ancillary services bid costs to the extent those costs are not covered by LMP and AS revenues from the market.

Generating Units and Resource Specific System Resources that are committed by the CAISO in the IFM, RUC, or RTM are eligible to recover Start-Up Costs and Minimum Load Costs as well as Bid Costs for Energy and Ancillary Services. Supply Resources that are self-committed are eligible to recover only Bid Costs for Energy and Ancillary Services. The funds needed to compensate eligible resources for their Bid Cost Recovery are collected through the IFM and RUC Tier 1 and Tier 2 Uplift charges, and RTM Uplift charge, all of which are charged to demand (with exports being exempt from RUC uplift charges.)

Virtual transactions will be cleared in the Day-Ahead IFM and will have an impact on the commitment of physical generating units in the IFM and RUC processes. As a result there will be some cost impact to the market.

The Day-Ahead IFM clears based on bid in demand and as a result virtual demand results in more unit commitment in the IFM and less unit commitment in RUC. In the absence of virtual demand generating units committed in the IFM process may have otherwise been committed in RUC to account for the difference in load cleared in the IFM and the CAISO Forecast of CAISO Demand (CFCD). Virtual supply has the opposite effect and results in fewer physical generating units committed in IFM and more physical generation committed in RUC.

Since virtual transactions are not considered in the RUC process the quantity of virtual supply beyond physical generation that clears the Day-Ahead IFM to cover the load can not be counted in RUC and that quantity must be procured from physical generating units in the RUC process to cover the CFCD.

In an attempt to balance additional costs incurred in IFM commitment as a result of virtual transactions with costs that may be offset in RUC by virtual transactions the CAISO is proposing that market participants that engage in virtual transactions be allocated a portion of the IFM Tier 1 to virtual demand and RUC Tier 1 to virtual supply based on the net of all virtual transactions system wide. This will result in either a charge for IFM Tier 1 to SCs with a net

virtual demand obligation for an hour or a charge for RUC Tier 1 for SCs with a net virtual supply obligation for an hour but not both in the same hour.

To determine the portion of the dollar amount out of the total IFM and RUC bid costs that must be recovered that should be allocated to virtual transactions, the CAISO will net the total virtual demand in MW system wide against the total virtual supply in MW system wide. If the total system-wide net is virtual demand then SCs with a virtual demand obligation will be charged for IFM Tier 1 Uplift and the obligation to virtual transactions for RUC Tier 1 Uplift will be zero. On the other hand if the total system net results in a net virtual supply then SCs with a virtual supply obligation will be charged for RUC Tier 1 Uplift and the obligation to virtual transactions for IFM Tier 1 Uplift will be zero.

6.2.1 IFM Tier 1 Uplift (CT 6636) Cost Allocation to Virtual Demand

Charge Code 6636 includes costs of make whole payments for start-up, minimum load and bid costs for resources committed in the IFM based on bid in Demand.

The current IFM Tier 1 charge is allocated to SCs based on Day-Ahead Scheduled Demand less Self-Scheduled Generation and imports plus or minus any Inter-SC Trades of IFM Load Obligation.

In order to allocate IFM Tier 1 Uplift cost to virtual demand the CAISO will determine what portion of the total IFM BCR dollars will be allocated to virtual demand. As described above if the system wide net of all virtual supply bids and all virtual demand bids results in a net virtual supply the obligation for IFM Tier 1 Uplift to virtual demand will be zero. If the system wide net results in a net virtual demand the CAISO will allocate pro-rata the quantity of MW of net virtual demand system wide * the IFM Tier 1 Uplift rate to SCs with a virtual demand obligation. The net positive system-wide virtual demand will be included along with the physical demand in the computation of the Tier 1 Uplift Rate (\$/MWh).

Example 1- IFM Tier 1 Uplift Cost Allocation to Virtual Demand

For the purposes of this example we will make the following assumptions:

- Four Market Participants with cleared virtual transactions in the Day-Ahead Market
- Total IFM Bid Costs that need to be recovered = \$50,000
- Physical Load IFM Tier 1 Obligation (based on Scheduled Day-Ahead load minus Self-Scheduled Generation and imports) = 36,000 MW
- Virtual Demand IFM Tier 1 Obligation (based on system net of virtual demand and virtual supply) = 2,000 MW
- Sum of all CAISO Generation schedules in DAM + Upward A/S Awards = 20,000 MW

Virtual Transactions by SC System Wide with Net Virtual Demand

SC	Virtual Demand (MW)	Virtual Supply (MW)	Net VD (MW)	Net VS (MW)
SC1	2,000	1,000	1,000	0
SC2	500	1,600	0	1,100
SC3	2,200	400	1,800	0
SC4	1,800	1,500	300	0
Total	6,500	4,500	3,100	1,100

Step 1 – Determine total system net for virtual transactions

Total net virtual demand system wide = 6,500 MW – 4,500 MW = 2,000 MW

Total net virtual supply system wide = 4,500 MW – 6,500 MW = 0 MW

In this scenario only IFM Tier 1 Uplift will be allocated to SCs with a net virtual demand.

Step 2 – Determine each SC’s obligation by determining net virtual transactions system wide for each SC

Please see the chart above under column Net VD to see each SCs net virtual demand obligation. The total of all SCs virtual demand obligation is 3100 MW as shown in the chart above.

Step 3 - Determine IFM Tier 1 Uplift Rate

To determine IFM Tier 1 rate the CAISO will divide the dollars to be recovered \$50,000 by the Larger of the sum of the net virtual demand obligation (3100MW) plus the Physical Load obligation (36,000 MW) or the total DAM generation plus upward A/S. IFM Tier 1 Uplift Rate = \$50,000/ max (3,100 MW + 36,000 MW), 20,000 = 1.28 \$/MW

Step 4 – Determine dollar amount out of \$50,000 to be recovered that should be allocated to SCs with a virtual demand obligation

Dollars will be allocated to virtual demand based on the total system wide net determined in Step 1 above which is 2000 MW.

The dollars to be allocated to SCs with net virtual demand = Total system net virtual demand (2000 MW) * the IFM Tier 1 Rate (1.28 \$/MW) = \$2,557.54

This means that out of the \$50,000 total IFM bid costs that must be recovered \$2,557.54 will be allocated to virtual demand.

Step 5 - Allocate IFM costs for virtual demand determined in Step 4 (\$2,557.54) to each SC that has a net virtual demand obligation.

The CAISO will allocate IFM costs for virtual demand determined in Step 4 (\$2,557.54) to each SC that has a net virtual demand obligation system wide based on the ratio of each SC’s net virtual demand obligation system wide to the total net virtual demand obligation for all SCs system wide.

Cost Allocation of IFM Tier 1 Uplift by SC

SC	Net Virtual Demand	Net Virtual Supply	IFM BCR Costs
SC1	1,000	0	\$825
SC2	0	1,100	\$0
SC3	1,800	0	\$1,485
SC 4	300	0	\$248
Total	3,100	1,100	\$2,558

In the table above it shows that SC1 was allocated \$825 of IFM Tier 1 BCR Costs based on $\$2,557.54 * (1,000/6,500) = \825

6.2.2 RUC Tier 1 Uplift (CC 6806) Cost Allocation to Virtual Supply

Charge Code 6806 includes costs for make whole payments for resources committed to meet the difference between bid in demand and the CAISO Forecast of Demand.

The existing RUC Tier 1 Uplift charge is allocated to SCs based on their Net Negative CAISO Demand Deviation (load that deviated from the Day-Ahead schedule) in a Trading Hour.

The allocation of RUC Tier 1 Uplift will occur using the same five step process as described above for the IFM Tier 1 Uplift allocation.

In order to allocate RUC Tier 1 Uplift to virtual supply the CAISO will determine what portion of the total RUC uplift dollars should be allocated to virtual supply. If the system wide net of virtual demand and virtual supply results in a zero net virtual supply there will be no RUC Tier 1 Uplift allocated to virtual supply. The CAISO will then allocate the dollar amount of RUC Uplift

costs pro-rata between the net virtual supply and the non-Convergence Bid IFM BCR allocation billing determinant which would be the under scheduled load over all SCs.

Example of RUC Tier 1 Uplift Cost Allocation to Virtual Supply

For the purposes of this example we will make the following assumptions:

- Four Market Participants with cleared virtual transactions in the Day-Ahead Market
- Total RUC Uplift Costs that need to be recovered = \$6,000
- Physical Load RUC Tier 1 Obligation (Under scheduled load) = 3, 500 MW
- Virtual Supply RUC Tier 1 Obligation (Based on system net of Virtual Supply and Virtual Demand) = 2,500 MW
- CAISO Total RUC Capacity = 5,000 MW
- Example covers a single trading hour

Example 2 - Virtual Transactions by SC System Wide with Net Virtual Supply

SC	Virtual Demand (MW)	Virtual Supply (MW)	Net VD (MW)	Net VS (MW)
SC1	1,000	2,000	0	1,000
SC2	500	1,500	0	1,000
SC3	200	700	0	500
SC4	1,800	1,800	0	0
Total	3,500	6,000	0	2,500

Step 1 – Determine total system net for virtual transactions

Total net virtual supply system wide = 6,000 MW – 3,500 MW = 2,500 MW

Total net virtual supply system wide = 3,500 MW – 6,000 MW = 0 MW

In this scenario only RUC Tier 1 Uplift will be allocated to SCs with a net virtual supply.

Step 2 – Determine each SC’s obligation by determining net virtual transactions system wide for each SC

Please see the chart above under column Net VS to see each SC’s net virtual supply obligation. The total of all SC’s virtual supply obligation is 2500 MW as shown in the chart above.

Step 3 - Determine RUC Tier 1 Uplift Rate

The CAISO will determine the RUC Tier 1 Rate by dividing the dollars to be recovered (\$6,000) by the Maximum of either the sum of the total virtual supply obligation (2,500 MW) and the Physical Load obligation (3,500 MW) or the CAISO total RUC Capacity (5,000 MW)

$$\text{RUC Tier 1 Uplift Rate} = \$6,000 / (2,500 \text{ MW} + 3,500 \text{ MW}) = \$1.00$$

Step 4 – Determine dollar amount out of \$6,000 to be recovered that should be allocated to SCs with a virtual supply obligation

Dollars will be allocated to virtual demand based on the total system wide net determined in Step 1 above which is 2,500 MW.

The dollars to be allocated to SCs with net virtual supply = Total system net virtual supply (2,500 MW) * the RUC Tier 1 Rate (\$1.00) = \$2,500

This means that out of the \$6,000 total RUC Uplift costs that must be recovered \$2,500 will be allocated to virtual supply.

Step 5 - Allocate IFM costs for virtual demand determined in Step 4 (\$2,500) to each SC that has a net virtual demand obligation.

The CAISO will allocate RUC Uplift costs for virtual supply determined in Step 4 (\$2,500) to each SC that has a net virtual supply obligation system wide based on the ratio of each SC's net virtual supply obligation system wide to the total net virtual supply obligation for all SCs system wide.

Cost Allocation by SC

SC	Net Virtual Demand	Net Virtual Supply	IFM BCR Costs	RUC BCR Costs
SC1	0	1,000	0	1,000
SC2	0	1,000	0	1,000
SC3	0	500	0	500
SC4	0	0	0	0
Total	0	2,500	0	\$2,500

In the chart above it shows that SC1 was allocated \$1,000 in RUC Tier 1 costs based on $\$2,500 * (1,000 / 2,500) = \$1,000$

6.3 Neutrality Adjustment and Rounding Adjustment

Charge Code 8999 & Charge Code 4999

In accordance with the CAISO Tariff, the CAISO is authorized to levy additional charges or make additional payments to market participants to accommodate for special adjustments with regards to:

- Amounts required to reach an accounting trial balance of zero in the course of the Settlement process in the event that the charges calculated due from CAISO Debtors are not equal to the payments calculated due to the CAISO Creditors for the same Trading Day or Trading Month.
- Awards payable by or to the CAISO pursuant to good faith negotiations or CAISO ADR Procedures that the CAISO is not able to allocate to or to collect from a Market Participant or Market Participants in accordance with CAISO Tariff.

Currently these charges or payments will be allocated amongst Scheduling Coordinators who traded on that Trading Day pro rata to their Measured Demand in MWh of Energy or over an interval determined by the CAISO and pro rata based on Measured Demand during that interval.

The CAISO proposes that these charges or payments as a result of Neutrality and Rounding Adjustment continue to be allocated to Measured Demand only.

6.4 Grid Management Charge (GMC)

The GMC is an administrative charge that is used to fund the operation and services of the CAISO.

The composition of the GMC under the MRTU markets is the focus of a separate stakeholder process. The methods in which to assess the CAISO's administrative costs to virtual bidding transactions will be addressed in 2008 within the GMC stakeholder process.

Virtual transactions will be subject to administrative fees. The CAISO may determine that a separate administrative fee is appropriate for virtual transactions or may apply already existing GMC charges that will apply after MRTU to virtual transactions.

The following GMC charges will be considered for application to virtual transactions:

CC 4537 - GMC Market Usage Forward Energy

Market Usage Forward Energy contains the activities associated with determining the market prices, maintaining and controlling the OASIS, monitoring market performance, ensuring generator compliance with market protocols, and calculating the results of the Integrated Forward Market

CC 4511 – GMC Forward Scheduling

Forward Scheduling Services contains the activities associated with accepting, processing, and validating Day-Ahead schedule transactions and schedules for the Hour-Ahead Scheduling

Process (HASP), and Real-Time adjustments to Day-Ahead interchange schedules. The schedule transactions included in this context are the components in the schedule that are processed, validated, accepted and awarded by Day Ahead IFM or HASP. The components include Ancillary Service bids, Energy Bids and Schedules

CC 4575 - GMC Settlements, Metering, and Client Relations

The Settlements, Metering, and Client Relations charge is a flat per-month charge on any Business Associate that accrues any settlement charges/credits during a trade month, excluding exemptions. Included in this charge are costs associated with Settlements, Metering, and Client Relations functions within the CAISO.

CC4536 – Market Usage Uninstructed Energy

The Market Usage Uninstructed Energy charge for each Scheduling Coordinator is calculated using the absolute value of each Scheduling Coordinator's Net uninstructed deviations by Settlement Interval. The Billing Determinant for Market Usage Uninstructed Energy will be the absolute value of net portfolio deviations by Settlement Interval.

6.5 Other Charge Codes

6.5.1 IFM Bid Cost Recovery Tier 2 Charges

Charge Code 6637 includes costs for any remaining IFM uplift not covered in Tier 1.

The CAISO proposes to continue to allocate CC 6637 to Measured Physical Demand only.

6.5.2 Day-Ahead Residual Unit Commitment (RUC) Tier 2 Charges

Charge Code 6807 relates to costs for remaining RUC Uplift not covered in Tier 1.

The CAISO proposes that CC 6807 continue to be allocated to Physical CAISO Metered Demand only.

6.5.3 Real-Time BCR Uplift Charges

Charge Code 6678 includes costs for make whole payments for resources committed in the Real-Time Market.

The CAISO proposes that no costs be allocated to virtual transactions under the existing single tier charge and continue to allocate these costs to Measured Demand only.

The CAISO has been directed by FERC in the April 20, 2007 Order, to develop a proposal for two-tiered allocation of real-time bid cost recovery that could be included in MRTU Release 2. At that time the CAISO will explore the possibility of allocating a portion of the Tier 1 costs to virtual transactions.

6.5.4 Real-Time Uninstructed Imbalance Energy

Charge Code 6475 the Real Time Uninstructed Imbalance Energy (UIE) Settlement Amount is the payment or charge due to or from a resource for its UIE. UIE Settlement Amount consists of two components:

- Tier 1 UIE (UIE1) Settlement Amount, accounts for deviations from resources' IIE
- Tier 2 UIE (UIE2) Settlement Amount, accounts for deviations from resources' Day Ahead schedules.

In February of 2007 a policy decision was made through a stakeholder process to modify the Real-Time LAP methodology with neutrality allocation related to the difference between LDFs in the Day-Ahead and Real-Time Markets to be applied to real-time metered LAP loads. At that time the decision was made that these neutrality revenues would not be allocated to convergence bids or exports.

For more information please see the White Paper on "*Modification of MRTU Real-Time LAP Price Computation*" dated 2/14/07 that is posted on the CAISO website at the following link:

<http://www.caiso.com/1b87/1b87a43319f20.pdf>

6.5.5 Ancillary Services Cost Allocation

Charge Types 6090, 6196, 6596, 6696

Costs for Ancillary Services procured are charged to load based on the metered load share of the A/S obligation. The CAISO will calculate the SC's Ancillary Services obligation for each service across IFM, HASP, and Real-Time markets based on metered demand and allocate the cost for each service using the user rate.

The CAISO proposes that virtual transactions be exempt from both tier 1 and tier 2 Ancillary Services costs. As discussed in the May 31 Conceptual Proposal, A/S is purchased based on the CAISO forecast and therefore, virtual transactions will have not impact on the quantity of A/S procured.

Tier 2 A/S costs result from the revenue non-neutrality that results from the procurement of A/S using the CAISO Demand Forecast and the calculation of load obligation using actual metered demand. Although it is possible that virtual supply bids could create some cost impact in the procurement of Ancillary Services, such impact is likely to be very minor. Thus the CAISO suggests that exempting virtual supply from Tier 2 A/S costs is warranted for simplicity and justifiable because there would be no major impact upon other market participants.

6.5.6 FERC Fee Over/Under Recovery

Charge Code 525

The FERC Annual Assessment is CAISO's charge to recover estimated and actual annual FERC fees from Market Participants. This charge is collected by the CAISO on behalf of the FERC.

Each Scheduling Coordinator (considering exceptions) is obligated to pay for the FERC Annual Charges for its use of the CAISO Controlled Grid to transmit electricity, including any use of the

CAISO Controlled Grid through Existing Contracts scheduled by the Scheduling Coordinator. Currently this charge is allocated to SCs based on Measured Demand.

Since virtual transactions do not result in the use of the CAISO Controlled Grid to transmit electricity the CAISO proposes CC 525 continue to be allocated to Measured Demand and there be no allocation to virtual transactions.

6.5.7 Allocation of IFM Marginal Losses Surplus (MLS) Credit

Charge Code 6947 includes the surplus resulting from difference between marginal and average losses.

The CAISO proposes that CC 6947 is not applicable to virtual transactions and to continue to apply the MLS credit to Measured Demand. Since virtual transactions occur in buy/sell pairs and are closed out with an automatic countervailing trade in real-time, they are paid or charged the LMP which includes the energy, congestion and losses component in the Day-Ahead Market and are in turn charged or paid the LMP in Real-Time Market. Since these transactions in effect net to zero, and with price convergence the expected applicable marginal loss component of the LMP at the relevant location (the LAP or the node) is expected to be on the average the same in the day-ahead and real-time, virtual transactions are minimally affected by the over collection of marginal losses.

6.5.8 Real-Time Imbalance Uplift Charges

Charge Code 6477 includes the assessment of Charges or Payments for the net sum of Settlement Amounts for IIE, UIE, and UFE, less Real-Time Congestion Offset does not equal zero.

The CAISO proposes that CC 6477 is not applicable to virtual transactions and should continue to apply this credit or charge to Measured Demand.

6.5.9 Real-Time Congestion Off-Set

Charge Code 6774 rebates HASP and RT Congestion costs to SCs.

CC 6744 involves congestion charges collected in HASP from AS Imports (and in Real-Time from dynamically scheduled intertie generating resources) as well as congestion charges collected in the Real-Time Market and is used to reimburse the ETC/TOR holders for their Real-Time Congestion charges, with any excess allocated to Metered Demand excluding ETC and TOR holders. The CAISO proposes that CC 6744 is not applicable to virtual transactions and should continue to be allocated to Metered Demand.

The CAISO invites written comments, suggestions or questions from stakeholders on these cost allocation proposals for virtual transactions. Comments should be submitted to convergencebidding@caiso.com by November 30, 2007.

7 Issues Related to Nodal Virtual Bidding

Stakeholders have previously identified potential complications that may result if convergence bidding is allowed at the nodal level. The CAISO anticipates further discussion on these issues as part of an extended stakeholder process to resolve the convergence bidding implementation.

This paper focuses on one of these issues: nodal virtual bidding and the features designed under MRTU for Seller's Choice contracts.

7.1 Scheduling Incentives under Seller's Choice Contracts

7.1.1 Summary

This section addresses the potential interaction of nodal convergence bidding and the procedures established under MRTU to settle Physical Inter-SC trades (IST) to address issues with seller's choice contracts.⁸

All nodal Physical ISTs will be subject to physical validations before and after the Integrated Forward Market (IFM) and financial settlement rules that effectively limit the ability of sellers to deliver more energy at a node than is physically capable of being delivered at that node. If the CAISO implements *unrestricted* nodal convergence bidding,⁹ sellers delivering pursuant to Seller's Choice contracts could undermine the physical validation requirements through the use of virtual bids.

In the event that unrestricted nodal convergence bidding is established, the CAISO would prefer initially to monitor the IFM and real-time schedules supporting ISTs and Seller's Choice contracts to determine if such activity is manifesting. If it does manifest, there is a range of options to offset any effects on ISTs. The CAISO'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. Sellers could still submit LAP-level convergence bids. Other options could also diminish the impact of nodal convergence bidding on ISTs. The most effective of these is including additional pre-IFM runs to re-establish physical validation. However, this option is less desirable from the CAISO's perspective due to implementation costs.

7.1.2 Background

Prior to MRTU, 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.

As noted above, although the decision whether or when to introduce convergence bidding at the nodal level will not be made until a later date, the CAISO is pursuing development of

⁸ The issues described here would not arise under LAP-level convergence bidding.

⁹ Restricted nodal convergence bidding, such as applying position limits to virtual supply offers by an SC, would greatly diminish the scope of this problem, but not completely eliminate it.

system capabilities for such implementation. Hence, the CAISO seeks to address and discuss with stakeholders potential market issues that might arise with nodal virtual bidding.

One such issue is the interaction of the rules that relate to Seller's Choice contracts delivered at nodes through use of the CAISO's ISO settlement service under MRTU and nodal convergence bidding. There is some potential for nodal convergence bidding to undermine the physical validations. However, there are procedures or rules that could be adopted to limit this impact of nodal convergence bidding.

The following sub-sections evaluate the options and recommends that CAISO establish a monitoring program to evaluate the effect of nodal convergence bidding (if implemented) on ISTs, with clear criteria for behavioral restrictions on parties that engage in such activity to alter physically feasible IFM schedules.

7.1.3 Features of the Inter-SC Trade (IST) Settlement Mechanism

The MRTU rules established for Physical ISTs 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 LMPs. Numerical examples are detailed in the CAISO's 2005 filing¹⁰ to FERC on ISTs.

The solution to this problem implemented by CAISO 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.¹¹

The Pre-Market Validation first ensures that a generator does not bid more MW than its available capability, or P-max, and also ensures that the generator's self-schedule or energy bid curve in MW is equal to or greater than the quantity of physical Inter-SC Trades supported by that generator. SCs receive warning messages advising them that the supporting generator's bid does not cover their Physical Inter-SC Trades and are advised of the quantity that will be converted to an Inter-SC Trade at the Trading Hub (APN Trade) in the Post Market Validation process if the Generator's bid is not adjusted to accommodate the outstanding trades.

The Post-Market Validation evaluates whether the MWs cleared by a generator supporting ISTs in the IFM or the advisory HASP Schedule (if the ISTs are submitted in the Real-Time Market) is equal to or greater than those ISTs. If the generator has cleared less MW than scheduled through ISTs, then the residual quantity is converted to an APN trade priced not at the node but at the EZ Gen Hub price of the congestion zone where the generator is located.

¹⁰ "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/2005/03/17/200503171020425484.pdf>

¹¹ 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>

This physical validation procedure and settlement rule preserves the intent of the Seller's Choice contract and allows for dispatch efficiency.

7.1.4 Implications of Nodal Convergence Bidding

Nodal convergence bidding potentially changes 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.

In one example previously reviewed with stakeholders¹², there is a Seller's Choice contract for 200 MW. The seller has two generators at different nodes, one with 200 MW of capacity and one with 100 MW of capacity. The larger generator is located at low price node A, but can only physically deliver 150 MW due to congestion. So under the current MRTU rules, the contract would be fulfilled by also scheduling the second generator, at high price node B, for 50 MW. This physical constraint would not be found by the current Pre-Market Validation, which only ensures that the supplier does not sell above its P-max, but it would be picked up by the Post-Market Validation, because the IFM could only physically clear 150 MW @ node A and 50 MW @ node B. If the supplier tried to schedule only from A under the current rules, the IST would settle the 50 MW that actually came from B in the day-ahead market at the EZ Gen Hub price.

With nodal convergence bidding, the seller in this example could potentially pass the Post-Market Validation as well, because the IFM schedule will treat physical and virtual trades equally, establishing a feasible schedule that will not be physically checked until the RUC and then re-settled in the real-time market. For example, as suggested by the DMM, consider that the supplier in the Seller's Choice contract submits a nodal virtual demand offer at a \$500 price (i.e., price-taking) at node A, thus "resolving" the congestion that otherwise would occur in the IFM schedule and allowing all 200 MW of supply to clear at node A at the day-ahead price. This establishes a schedule that will require real-time redispatch and also allows the seller to clear its IST at a lower price than if it scheduled a feasible set of generators in the Day Ahead. However, it also earns less revenue through the IFM than if it scheduled a feasible set of generators. It can then recover this revenue in real-time, when the generator at B is

¹² This example, which will not be fully replicated here, is shown in the September 12, 2007 presentation by the CAISO's Department of Market Monitoring, available at <http://www.caiso.com/1c56/1c56ddb64d070.pdf>, as well as Attachment C of the November 2007 paper titled "Convergence Bidding: Department of Market Monitoring Recommendations" which is located at: <http://www.caiso.com/1807/1807996f7020.html>

scheduled. Hence, its net position is improved by the difference in settling the IST at the price with and without the virtual demand bid.¹³

These convergence bidding scenarios by suppliers could be counteracted by convergence bidding by the buyer to the Seller's Choice contract or by other parties. As noted by the DMM, the buyer could submit offsetting virtual supply bids to ensure that the IFM clears with a feasible schedule. In fact, convergence bidders in general should detect lack of price convergence between nodes caused by these seller's choice strategies. For example, in both examples above, the price at node A clears at a different price between day-ahead and real-time. This will alert other convergence bidders to the potential for profitable convergence bidding.

As will be discussed below, this suggests that the first step in evaluating the impact of nodal convergence bidding would be to monitor, but also to have additional rules in place to deter or diminish any bidding strategies considered to be counter to the objectives of the IST settlement.

7.1.5 Design Objectives and Options

For the reasons discussed above, the CAISO is exploring changes to scheduling, validation, bidding and/or settlement that diminish or eliminate the ability of parties to inappropriately benefit from the use of nodal convergence bidding in conjunction with the established rules under MRTU for IST settlements.

In evaluating possible additional rules, CAISO is seeking to balance the following primary criteria:

- 1) Consistency with the existing rules for scheduling and settlement of ISTs.
- 2) Preservation of short-term market and operational efficiency.
- 3) Minimize costs of implementation, particularly software modifications in Market Release 1A.

The CAISO has considered the following options:

7.1.5.1 Option 1: Market Monitoring

Market monitoring of scheduling under ISTs is the first procedure that would be employed by CAISO to determine the net impact of nodal convergence bidding on IFM and real-time market prices and settlements. As with the MRTU market prior to convergence bidding, it will be straightforward to determine the injection and withdrawal points and MW associated with a physical schedule that is used to support an IST in real-time. If this schedule is a deviation from the IFM schedule submitted by a seller, then it is also straightforward to establish the submission of nodal convergence bids in the IFM by the same party. If there is a pattern of submission of nodal convergence bids by another party that appear to have the impact on

¹³ Essentially, any virtual bidding strategy that lowers the IST settlement price more than any offsetting virtual re-settlements in the day-ahead and real-time markets will work in this fashion. However, what is important with respect to the IST settlement is the diminishment of the existing physical validations.

financial settlement of seller's choice contracts discussed here, then further investigation of that other party may be warranted.

Upon determination of a pattern of nodal convergence bidding that results in financial settlements counter to the intent of the IST settlement, CAISO will consider implementation of additional rules and procedures to enforce the terms of the IST settlement. These are discussed next.

7.1.5.2 Option 2: Restrictions on nodal convergence bidding by parties to Seller's Choice contracts

The additional rules that would meet the desired criteria most straightforwardly would be restrictions on nodal convergence bidding by parties to Seller's Choice contracts (all of which would still allow entities to submit LAP-level convergence bids). The most stringent such rule would be to disallow such entities to submit nodal convergence bids. The advantage of this option is its administrative ease. The disadvantage of this option is that sellers are the primary advocates of nodal convergence bidding to hedge outage risk associated with their units.

A less stringent bidding restriction, but one with potentially much more complicated implementation and administrative requirements, is to use a rule that only disallows parties to seller's choice contracts from submitting convergence bids at the nodes where they submit Physical Inter-SC Trades, and at nodes sufficiently close to those nodes to potentially cause congestion. For example, CAISO could identify nodes that have a sufficiently high shift factor on the binding transmission constraints that would cause congestion, such as the factor of .75 currently used by PJM to limit holders of FTRs from submitting virtual bids at the FTR injection or withdrawal nodes or electrically similar surrounding nodes. The potential disadvantage of this option is that it places a high informational burden on the CAISO and any such threshold may not prove to be sufficient. As such, the shift factor threshold could be re-examined after a few months of application.

Finally, the CAISO could impose position limits on nodal convergence bids, either on seller's choice parties or on all bidders (as is being evaluated). As discussed in the example above, a seller under a Seller's Choice contract could be limited to nodal convergence bids equal to no more than 10% of its ISTs sourced at a node. This would reduce any impact on IST settlements, but not eliminate them.

7.1.5.3 Option 3: Changes to Scheduling/Validation Requirements

There are potential solutions to this problem that do not require behavioral restrictions. The most viable of these is to make modifications to the current physical validations to account for the effect of nodal convergence bidding. In this approach, all Seller's Choice schedules would be subject to an evaluation of physical feasibility on the network prior to the IFM. This would require essentially a pre-IFM run with all supply offers and load bids, but without convergence bids. To preserve the integrity of the validated schedules, they would then be required to schedule the same quantity at the same location through the IFM, although it could also submit an offer curve. The result would be to remove the ability of the sellers to resolve congestion through virtual bids.

The addition of an additional pre-IFM run to validate Seller's Choice contracts is the option that scores highest in terms of consistency with current rules for ISTs and preservation of dispatch efficiency. Essentially, schedulers would see no change from the existing rules (under MRTU Stage 1). Moreover, they would have the flexibility, as with the existing rules, to make price

offers, which would support market efficiency. The only impediment to implementation is the cost and feasibility of an additional pre-IFM run. In particular, it is anticipated that the current IFM schedule could not be maintained with the additional IFM run. These factors make this option less desirable from the CAISO's perspective than behavioral restrictions.

7.1.5.4 Option 4: Changes to post-IFM Financial Settlement Rules

Finally, there are some other methods for determining the actual physical schedule associated with ISTs and then altering the existing financial settlement rules to account for the final schedule. For example, ISTs could be settled against real-time prices. This would inhibit the use of nodal convergence bids to affect IFM congestion by parties to Seller's Choice contracts. However, this type of option and others that require fundamentally altering the IST settlement procedure are clearly less attractive than the prior discussed options.

7.1.6 CAISO Recommendation

Nodal convergence bidding has the potential to adversely affect the existing settlement rules for Day Ahead Physical ISTs under MRTU. Because the convergence bidding strategies that would have an undesirable impact may also create the opportunity for other convergence bidders to respond, initially the CAISO will monitor the market to detect such impacts. However, the CAISO will also have additional rules in place should they be required to preserve the intent of the IST settlement.

The CAISO's preferred deterrent is to impose behavioral restrictions on nodal convergence bidding by specific parties to Seller's Choice contracts. Such restrictions have degrees of stringency, ranging from not allowing such entities to submit nodal convergence bids to position limits. The CAISO could also develop a validation rule that would reject virtual trades from Scheduling Coordinators and their trading partners at the same node where a physical trade between the parties is located and at surrounding nodes (i.e., those with .75 or greater shift factors.)

The CAISO would seek capability to easily turn on or off this validation rule, much like position limits could be turned on or off at specific nodes. The CAISO proposes further dialogue with stakeholders to develop the tariff language and business rules to specify the trigger for enforcing this rule upon individual Scheduling Coordinators when specific conditions (based on bidding behavior) are met.

Finally, a less preferred approach is to establish an additional pre-IFM procedure for physical validation of ISTs. This would allow nodal convergence bidding to continue unrestricted but likely has significant implementation costs and may affect timing throughout the Day Ahead market process.

The CAISO invites written comments, suggestions or questions from stakeholders on the potential interaction of nodal convergence bidding and Inter-SC Trades. Comments should be submitted to convergencebidding@caiso.com by November 30, 2007.