EPIC Merchant Energy Comments
CAISO Design Criteria for Convergence Bidding

Process Clarification
On June 14th 2006 the CAISO hosted a tutorial on Virtual Bidding[2] for the benefit of both board members and interested market participants at which the concept of virtual bidding was thoroughly explored[3]. In a recent compliance filing the CAISO undertook to present a Convergence Bidding proposal to the CAISO Board of Governors before the end of summer, for the board to vote on before the end of the year. This white paper is pursuant to that commitment.

[2] The terms Convergence Bidding and Virtual Bidding will be used interchangeably in this document. Unless otherwise specified both terms will refer to Explicit Virtual Bidding, not Implicit Virtual Bidding.

[3] Documents from this tutorial are available at:
http://www.caiso.com/docs/2005/06/09/2005060910374912494.html

Overall the draft design document identifies those issues that need resolution for the development process to continue. In fact, the document includes a number of items that are not directly related to 'Explicit Virtual Bidding' and tend to sidetrack the reader from focusing on the criteria for virtual bidding. EPIC will identify these issues through our comments at the end of each section of the paper.

The paper's purpose is to solicit feedback on the paper and provide a design proposal to the CALISO Board of Governors before the end of the summer. Then, the BOG will vote on the proposal by the end of the year. With the industry's past experience with the virtual market, EPIC finds this timeline unnecessarily long and should be shortened considerable. EPIC believes that a virtual market could and should be designed, approved and implemented with Phase 1 of the MRTU. The design process for virtual bidding could be considerably reduced by focusing directly on 'Explicit Virtual Bidding' and not those extraneous issues related to, for example, the physical market.

Virtual trading is not new, it has existed for years in the eastern ISO/RTO markets, the arguments that establish a new market have already taken place with the development of the eastern markets. Now, CAISO only has to select those items that best fit CAISO, e.g., Nodal or Zonal, then adopt and adapt that appropriate eastern model. There is no need to reinvent the wheel.

Reasons to expedite this design process:

- FERC has not answered CAISO's request for a delay in implementing a virtual market. We do know that FERC has repeatedly ordered the CAISO to implement virtual trading with Phase 1 MRTU and has found the CAISO out of compliance for not doing so. FERC may not be persuaded with CAISO's argument that virtual bidding would take a year of development after Phase 1 implementation,

especially knowing that these markets have already been designed and are operational and flourishing in the east.

- The benefits of a virtual market have been recognized by economists, Market Monitors, FERC and industry experts. As the eastern LMP markets mature the recognized value of a virtual market continues to increase. Presentations at the CAISO's June 13, 2006 Convergence Bidding Tutorial stressed the importance and value of a virtual market. The Convergence Bidding Tutorial increased the knowledge of many CAISO's stakeholders of the value of virtual bidding.

1. Importantly, virtual bidding improves the flexibility that supports price convergence between the day-ahead and real-time energy markets. Price convergence improves the efficiency of the day-ahead commitment and energy schedules, reduces the cost of hedging, allows for efficient settlement of FTRs, and makes it advantageous for parties to utilize the liquidity provided in the market. Although market participants with physical load or generation could also provide some of this arbitrage function, allowing for virtual bidding should greatly increase the competitiveness of the day-ahead market.[1]
2. "Virtual [convergence] bidding is an arbitrage mechanism that helps to converge prices in the two markets. Its use has caused market price differentials in New York to decrease by 11 percent over the past four years, yielding price savings for New York electricity customers."[2]

Introduction

This white paper is the first iteration of a Convergence Bidding design proposal for the CAISO. The purpose of this initial document is to detail both the nature of the design and the choices that face the CAISO, as well as to gather feedback from market participants regarding the design framework. Some of the design issues have been effectively decided by FERC precedent concerning other virtual bidding designs at the eastern ISOs. The nature of credit and collateral policies is a good example of a design element for which there is extensive guidance in the FERC record. There remain other choices for the ISO to make, the most significant being whether or not the CAISO should allow nodal virtual bidding as PJM, ISO-NE and MISO do, only allow virtual trading at the zonal level like the NYISO, or perhaps some hybrid. Other issues include safeguards against unintended consequences, opportunities for the exercise of market power, effects on other markets, such as the CRR market etc. All of these concerns and choices have implications for the functionality of the design.

Elements of Convergence Bidding Design

Explicit vs. Implicit

By definition the design must be based on Explicit Virtual Bidding, that is, virtual bids must be submitted with a flag that identifies them as virtual rather than physical. By submitting a virtual bid, the participant bids to take a forward financial position at a

[1] William Hogan, "Revenue Sufficiency Guarantees and Cost Allocation", May 25, 2005
[2] The Value of Independent Regional Grid Operators, a report by the ISO/RTO Council, November 2005

specific grid location that will be liquidated in real time. Submission of virtual bids will only occur in the Day-ahead Market (DAM). If accepted in IFM, such bids will be liquidated as price takers in the RTM. Virtual supply that is accepted in DA will require the seller to buy that same quantity of supply back in the RT market. Virtual load that is accepted in DA will require the buyer to sell that same quantity of load back in the RT market.

Deterrence of Implicit Virtual Bidding
Once Explicit Virtual Bidding (EVB) is implemented it would make sense to discourage Implicit Virtual Bidding (IVB) because of the deleterious effects on reliability that IVB causes. The experience at the NYISO has been that the incentive to engage in IVB decreases with the implementation of EVB, but does not disappear. In particular, participants engage in IVB to circumvent the onerous credit and collateral requirements that are often imposed on virtual bidding at startup. At the NYISO these credit and collateral requirements have gradually eased, as they have at other ISOs. The NYISO continues to monitor physical schedules for IVB.

The virtual market, or as designated in the EVB / IVB discussion above as 'Explicit Virtual Bidding,' is exclusively a financial market. Discussing issues related to moving or scheduling physical power is a divergence from the task at hand and should be handled outside the discussion on virtual bidding.

Virtual bids are submitted in the eastern markets through systems developed specifically for financial trading. Virtual bids cannot be confused with bids submitted to 'other' markets nor can 'other' market bids be construed to be virtual bids. Issues dealing with physical power delivery are not related to virtual/financial/convergence bidding, and cannot be solved in the design, development, or implementation of the virtual market. Issues such as IVB should be forwarded to groups that deal in physical power for resolution.

Pricing and Unit Commitment
Virtual bidding, to be meaningful, must be allowed to affect market clearing and price formation in the DA energy market. Therefore virtual bids will be included in the running of the IFM and will, as a result, also affect unit commitment in the IFM. Virtual bidding will not affect the unit commitment in the RUC process as RUC concerns itself solely with ensuring that enough physical supply is committed to serve the forecast physical load. However, to the extent virtual supply bids are accepted in the IFM, the need for system-wide RUC capacity may increase, and to the extent virtual demand bids compensate for otherwise underscheduled load in the IFM, the need for system-wide RUC capacity may decrease. Having said that, the impact of VB on local RUC capacity will depend on the other design features of VB, particularly, the geographical granularity (zonal, pocket, nodal, or other) permitted under the VB design.

Bid Quantity Pairs
Bids in the NYISO are limited to three price quantity pairs. The CAISO's physical design allows for ten price quantity pairs (eleven data points). Both PJM and the NYISO insist

that all load bids are price capped, meaning that virtual demand cannot act as a price taker in the DAM. This is another somewhat technical issue that is worth considering.

EPIC will comment later in this document on the advantages of nodal over zonal granularity. Bid segments for increments and decrements in PJM and NE are ten. The four segments in MISO and the three allowed in NY is too limiting.

LMP prices are not capped; therefore, a trader should be able to bid any price. Bidding price caps should not be imposed.

LDFs

Experience in the eastern ISOs indicates that whether one opts for a zonal or a nodal model the majority of the trading will occur at the hubs. In PJM almost all the trading occurs at the hubs even though nodal bidding is allowed. In all the eastern ISOs virtual load bids and virtual supply bids utilize the same designated virtual nodes. Moreover, when virtual bids are submitted to a LAP, the distribution factors used to distribute virtual bids are the same as the load distribution factors (LDFs) used to distribute physical load schedules and bids. Thus virtual load appears just like physical load on the network, and virtual supply is effectively negative virtual load.

EPIC does not see the need to discuss LDFs in this design document.

The ability to bid in a nodal virtual market is much more powerful that bidding zonally. Nodes provide many more points for bidding and opportunity for resolving congestion for a much smaller area. Nodal bidding also provides for more information to the ISO on the location of congestion. Nodal provides a better opportunity for hedging CRRs.

Physical power utilizes hubs but virtual traders are concerned with localized congestion; therefore, individual nodal bidding is needed. While the majority of trading may be done at hubs, allowing for trading at individual nodes help to ensure price convergence at a nodal level, as well as opportunities to hedge CRRs.

~~Market Power Mitigation~~

In the eastern ISOs virtual bids are traditionally not subject to LMPM procedures as they are not physical resources, but they are subject to the price caps. If the CAISO were to implement a similar system here then virtual bids would not considered in the first four passes of SCUC (i.e., CAISO's market power mitigation and local reliability determination process). Virtual supply and demand would only be considered in the fifth pass of SCUC (i.e., the DA IFM market run) where virtual supply and demand bids are used in the same way as physical bids. Virtual supply and demand bids would then be ignored in pass six, which is the DA RUC pass of SCUC.

Concerning gaming opportunities both PJM and the ISO-NE have rules to prevent the gaming of congestion revenues using virtual bids. It would seem prudent to consider including this provision should the CAISO opt for a nodal design where this might be an

issue. The number of virtual bids and virtual bid segments allowed may be another issue that may be related to whether or not virtual bids are subject to market power mitigation.

EPIC agrees the Market Monitor should have in place rules for virtual transactions and oversight of the market. Virtual trading can affect the outcome of CRRs if CRRs are priced against DA.

Credit and Collateral

Regarding credit and collateral issues the ISO intends to be guided by the opinions expressed by FERC concerning credit and collateral issues as they pertain to virtual bidding. The following design elements seem important.

FERC has said many things about credit and collateral to the various ISO/RTOs. EPIC requests that collateral and credit requirements be kept to a reasonable level, similar to the requirements at MISO, to allow full participation in this important market. Many virtual marketers are small entities without the vast resources of large trading companies.

Collateral Requirements

To engage in virtual trades participants have to post collateral as they do for other aspects of the CAISO markets (e.g. the CRR markets). FERC has previously ruled on the credit and collateral policies of the NYISO (Docket No.ER05-941-000, see Issuance of July 1st 2005) as well as separate rulings at PJM (see PJM, 104 FERC ¶ 61,309 at P 23-24 where FERC rejects a proposed four-day collateral requirement); and the Midwest ISO, (see MISO 108 FERC ¶ 61,163 at P 447-48 where FERC rejects a proposed six-day collateral requirement). It appears that when virtual trading first began in the eastern ISOs it was common to constrain it with credit requirements. As this concern proved unfounded the ISOs have moved to more conventional credit requirements under FERC orders. The CAISO can either follow the same path that the eastern ISOs followed, namely constrain and then liberalize under FERC orders, or simply jump straight to the end point which appears to be a one or two day collateral requirement. Another compromise position would be to constrain the initial release, but document a fairly rapid liberalization at predefined dates thereafter.

CAISO is correct in stating that credit and collateral requirements have been eased as the virtual markets have matured. EPIC sees no reason why CAISO should consider constraining the virtual market with unreasonable credit and collateral requirements as CAISO has the experience of the eastern markets to draw upon. Virtual bidding will be of value to the CALISO markets and California consumers. CAISO should encourage access and bidding in this market and keep credit and collateral requirements at reasonable levels while still protecting the ISO's members.

Proxy Clearing Price for Collateral Calculation

To calculate the collateral requirements the CAISO has to multiply the quantity virtually bid by a proposed proxy clearing price. FERC has recently required the eastern ISO to replace their initial calculation methodology, such as the NYISO's reference price which

is presumed to be the 97th percentile of the highest actual price experienced in the market over a three month period, with something more realistic. In its MISO decision FERC ordered MISO justify the 97% rule (see MISO, Docket No. ER04-691-004, p.107). The MISO subsequently moved to a 50th percentile rule.

New York's collateral requirements, as mentioned above, are onerous, unnecessary and continue to suppress the virtual market in NY. CAISO should encourage participation in its markets, especially the virtual market, and should not put unreasonable credit or collateral barriers in the path of accessibility to CAISO market. EPIC suggest that CAISO should use as a guideline the credit and collateral requirements defined in the MISO market. MISO had the benefit of reviewing and assessing the credit and collateral in operation for the LMP eastern markets. MISO's decided to adopt reasonable requirements that provided access to their market without jeopardizing their members.

Cost Allocation

The issue of cost allocation can hardly be over-emphasized. This issue has recently come to the fore due to a recent FERC MISO decision (see Docket No.ER04-691-065, " Order Requiring Refunds, And Conditionally Accepting In Part, And Rejecting In Part Tariff Sheets" Issued April 25, 2006). Briefly in this case the MISO tariff assessed the Revenue Sufficiency Guarantee (RSG, similar in concept to our BCR – Bid Cost Recovery) to the sum of real-time load that day, the resource uninstructed deviation quantities, and all virtual supply offers. Unfortunately the MISO did not implement the third part of this cost allocation (to virtual supply) and its Business Practices Manuals and tariff training materials both stated that virtual supply offers would not be included in the RSG charge calculation. Thus the tariff and the BPM/training materials contradicted one another, and it appears that the MISO believed that the BPM formulation was the appropriate policy regarding uplift, and the failure to correct the tariff was an oversight of some sort. Using the filed rate doctrine as the basis for its argument FERC ordered the MISO (paras 26-30) to recalculate the RSG charges and issue refunds where necessary. Turning to the prospective treatment of RSG allocation FERC instructed the MISO to make sure that virtual supply is allocated an appropriate share of the RSG payments (paras 48-49) as the virtual supply can cause RAC (Reliability Assessment Commitment – similar to our RUC, Residual Unit Commitment) costs. Clearly FERC is of the opinion that RUC-type costs should be assessed to virtual supply.

MISO understands the value that a robust virtual market brings to the ISO. EPIC takes exception to the statement, "Clearly FERC is of the opinion that RUC-type costs should be assessed to virtual supply," as nothing in FERC April 25, 2006 Order was clear. EPIC does not want to delve into the details of this docket but would like to note that FERC received an inordinately large number of filing to this document with a large majority supporting the virtual marketers' position.

The overall questions here are which entities pay RSG charges (OR charges in PJM) and what the allocation for each entities will be. RSG-type charges continue to be defined and adjusted in the eastern ISO/RTOs. EPIC has worked with all of the eastern ISO/RTO to keep RSG-type charges under control and allocated on a cost causation/benefit basis.

Unit Commitment Costs from the IFM and RUC

There is also a fair level of complexity in the allocation of the uplift charges at both the NYISO and at PJM[4]. ***PJM appears to allocate uplift from the DAM solution to DAM demand (real and virtual) and real-time uplift is allocated to any entity causing an uninstructed deviation from the DA solution (which implies that virtual demand and supply share in this cost allocation).*** The CAISO does not yet have an opinion on this cost allocation issue and intends to further research the approaches of the NYISO and PJM, however it should be pointed out that virtual demand increases unit commitment in the IFM and decreases commitment in RUC, whereas virtual supply (negative load) does just the opposite, it decreases unit commitment in the IFM and increases commitment in RUC. Using basic cost causation this suggests that virtual demand should pay a share of the IFM commitment costs similar to physical demand, whereas virtual supply should pay a share of the RUC commitment costs comparable to the allocation to metered load that was not scheduled in the DA IFM. Such a design would conform to the principles of cost causation as well as the FERC MISO decision mentioned above.

RSG-Type charges should be considered on a cost causation/benefit basis. PJM is currently reassessing Operating Reserve charges to virtual bidding – Note PJM's Operating Reserve Task Force and its work on Balancing Operating Reserve Analysis (BORA) The BORA calculation essentially determines virtual bidding's 'cost causation' for OR charges.

[4] See Technical Bulleting No. 82 at: (http://www.nyiso.com/public/documents/tech_bulletins/index.jsp?sort=name&order=descending&maxDisplay=149&=undefined

Ancillary Service Cost Allocation

In the eastern ISOs the reserve cost allocation differs between the PJM and NYISO model. PJM allocates DAM reserve costs to all demand, both real and virtual, whereas the NYISO allocates reserves costs to actual withdrawals. Neither makes mention of regulation costs. Although there is some choice over how AS costs are allocated the CAISO believes that the MRTU procurement methodology again gives a good indication as to how AS costs might be allocated. Under the MRTU design the procurement of Ancillary Services will be based on the CAISO forecast of CAISO demand, not on the IFM result. Thus virtual demand will not cause incremental procurement of AS and virtual supply will not create a real AS obligation. This would suggest that neither virtual supply nor virtual demand should be allocated any AS costs. Rather AS costs should be allocated to physical loads as occurs at the NYISO.

Nodal vs. Zonal

The nodal versus zonal debate has often been cast in the NY-style vs. PJM-style much like the Market Power Mitigation debate. Such a characterization risks over-simplifying the nature of the choices that the CAISO faces. Both PJM and the NYISO allow bidding at the zonal level. Indeed most of the virtual bidding in PJM is at the zonal level. As both the NYISO and PJM allow trading at the zonal level and the majority of the trading occurs at the zonal level a better way to phrase this design question is simply how deep one should push the level of disaggregation at which one allows virtual trading. Even if one decides to only allow zonal virtual bidding the question remains, which zones? For convergence in pricing it is best if the zones are uniform and do not contain constrained pockets where the pattern between DA and RT prices differs. This was the experience of the NYISO (2002, 9) where the load pockets within the 138kV zone were disparate. The Market Advisor recommended a re-evaluation of the load pocket modeling as well as virtual trading at the load pocket level to improve price convergence. Allowing virtual bidding at the pocket level would be one level of disaggregation greater than zonal. A further level of disaggregation would bring one to the nodal level. Another issue with the zonal implementation is that some of the hedging benefits that physical generators like are absent. These benefits were explained in the board presentation and material from that document is reproduced in Appendix One. The PJM model has better functionality than the NYISO model, and this may be part of the reason why subsequent implementations at the ISO-NE and MISO have followed the PJM nodal model as opposed to the NYISO zonal model. Certainly this issue of nodal vs. zonal, and if zonal then which zones, is an extremely important design characteristic.

Nodal bidding provides the market the utmost transparency for price signals. It allows market participants the ability to hedge any position. Nodal bidding provides flexibility to market participants by allowing the entity to buy or sell at a given node. A zonal market severely constrains hedging capability and flexibility while at the same time does not send true price signal to the market.

Other Design Elements
[Purposefully left open to account for stakeholder input for this iteration of the white paper]

Draft Proposals

NYISO Model
[Purposefully left incomplete for this iteration of the white paper]
The NYISO model only allows virtual bidding at the zonal level, not at the nodal level. Hedging for physical generating units is poor in this model.

PJM Model
[Purposefully left incomplete for this iteration of the white paper]

Under the PJM design participants can bid at any node for which there is a calculated price. This seems to include the inter-tie scheduling points. Nearly all virtual bidding is at the hubs, and there are some restrictions on bidding supply and demand at the same bus. Physical hedging functionality is complete in this model.

Modified CAISO Model?
[Purposefully left incomplete for this iteration of the white paper]

Evaluation Criteria
The evaluation criteria used to assess the proposed designs should include a number of different measures including;
1. Consistency with Previously Approved Designs: There are many advantages to implementing a previously approved design, such as the NYISO or PJM design. The main advantages are the fact that the design is tried and tested so that, in the absence of significant differences in the host system, the design should work. Whilst the CAISO market architecture is obviously different to that in the NYISO and PJM these are still fundamentally similar systems[5]. In addition previously approved designs face much lower regulatory risk as FERC has already approved the functionality elsewhere.
2. Level of functionality: Obviously the CAISO would like to maximize the functionality of the proposed design so that market participants have more rather than less functionality.
3. Other Criteria: [Purposefully left open to account for stakeholder input for this iteration of the white paper]
4. Simplicity; the best designs are often clean, simple and easy to implement.

Option	Consistency with Previously Approved Designs	Level of Functionality	Other	Simplicity
NYISO				
PJM				
CAISO1				
CAISO2				

[5] In some ways the CAISO architecture is closer to the NYISO design, e.g. both have DA markets for reserves and HASP and the NYISO's BME are similar, but in others it is closer to the PJM design, e.g. in PJM bid-in demand clears against bid-in supply to set the DA prices and quantities, followed by a reliability run, a structure that is very close to the MRTU design. At the NYISO the Day-Ahead market solution includes units required to support reliability.

Stakeholder Input
[Purposefully left open to account for stakeholder input for this iteration of the white paper]

Final CAISO Proposed Design

[Purposefully left incomplete for this iteration of the white paper]

Conclusion
[Purposefully left incomplete for this iteration of the white paper]

Reading List
Hogan, W.W. (2006, May 25) “Revenue Sufficiency Guarantees And Cost Allocation”
Available at http://ksghome.harvard.edu/~whogan/Hogan_RSG_052506.pdf
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