Draft Final Proposal for Design of Convergence Bidding

Margaret Miller
Senior Market Design and Policy Specialist

MSC/Stakeholder Meeting

September 18, 2009
Meeting Objectives

- To review policy and invite input on key implementation and policy features for virtual bidding

- Draft Final Proposal posted on September 14 at:
  http://www.caiso.com/1807/1807996f7020.html

- Written comments are requested by close of business October 2 to:
  mmiller@caiso.com
A number of key elements were added to the Draft Final Proposal

- SC certification
- Updated cost allocation proposal for IFM and RUC Tier 1 Uplift
- GMC charges for convergence bidders
- Proposal for CB at the interties
- Credit proposal updated to calculate nodal reference prices
- Updates to CRR settlement rule
- Proposal for bid volume limits
- Results of initial RUC testing
The ISO proposes that convergence bidding be implemented at the nodal level

- With 10% position limits per market participant to be phased out over the course of a year
  - 10% limit in place for first 8 months
  - 50% limit months 9 through 12
  - After 12 months no limit
  - No limits on hubs or LAPs

- Including LAPs, interties and trading hubs

*Market Participants continue to be divided on the issue of granularity of virtual bids*
Position limits would be set based on the following criteria:

<table>
<thead>
<tr>
<th>Generation Nodes</th>
<th>Load Nodes</th>
<th>Scheduling Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tied directly to the capacity of the generator</td>
<td>Either by maximum MW amount that flows over that node over a period of time, or by the MWh volume of the peak withdrawal at each node</td>
<td>MW value would be based on 10% of the rated capacity of the intertie.</td>
</tr>
</tbody>
</table>
There are three types of safeguards proposed for virtual bids

- **Bid volume limits**
  - Addresses software limitation on number of bids the system can handle

- **Position limits (lifted after 1 year)**
  - Addresses the potential exercise of market power at a specific node

- **Locational MW constraints**
  - These limits will only be used when AC solution is not attainable

*The ISO is committed to achieving an AC solution with the inclusion of virtual bids*
Timing of credit check versus bid volume check

- Credit check occurs upon submission of virtual bids and looks at reference price and MW
- Volume limits checked at the close of the Day-Ahead Market (10:00 a.m.)
- SCs with unused bids available will be reallocated to those who need them on a pro-rata basis
- SCs still over the bid volume limit will have bids extra rejected on a first in first out basis
Convergence Bid Volume Rules

- Each SC is initially allocated an equal share of virtual bids.
- At the close of the IFM submittal process, the CAISO will check if any SCs have used less than their limit. If so, any “extra” available bids will be reallocated on a pro-rata basis.
- At the completion of the re-allocation process, bids in excess of its volume limits will be subject to rejection based on a “last in, first out” rule.

Example

<table>
<thead>
<tr>
<th>SCID</th>
<th>Limit</th>
<th>Submitted</th>
<th>“Extra”</th>
<th>Re-Allocation</th>
<th>Rejected</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC 1</td>
<td>2,500</td>
<td>3,500</td>
<td></td>
<td>300</td>
<td>700</td>
</tr>
<tr>
<td>SC 2</td>
<td>2,500</td>
<td>6,500</td>
<td></td>
<td>1,200</td>
<td>2,800</td>
</tr>
<tr>
<td>SC 3</td>
<td>2,500</td>
<td>2,000</td>
<td>500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SC 4</td>
<td>2,500</td>
<td>1,500</td>
<td>1,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Credit / Convergence Bid Volume Process

PRE-MARKET PARTICIPATION (T-XX)

SC's Post Credit

PRE DAY-AHEAD MARKET (T-7 TO T-1)

SC submits VBs (T-7 to T-1)

CAISO performs Credit Check (MW * Reference Price)

Sufficient Credit?

YES

SC Bids available for Day-Ahead Market Clearing Process

NO

CAISO Reject Bids

SC's Revise VB's

DAY-AHEAD MARKET - OPEN (T-1 @ 1AM PT)

Day-Ahead Market Closes

Check Bid Volume

Exceeded Bid Limit?

YES

Extra Bids for Re-Allocation?

YES

CAISO re-allocates "extra" bids on a prorata basis to all SCs in excess

Bid Volume still exceeded?

YES

CAISO Reject Bids (Last in, First Out)

NO

Day-Ahead VB submitted for Day-Ahead Market Clearing

DAY-AHEAD MARKET - CLOSE (T-1 @ 1PM PT)

CAISO Posts Day-Ahead Results

CAISO Updates SC's Availability Credit based on Day-Ahead VB Award Amount
Changes to Pre-IFM Process

- Maintain the MPM/RRD run, but use Bid-in Demand rather than forecasted Demand
  - Virtual bids may impact the market power of physical bids
  - Aligns bid mitigation with the IFM
  - LECG recommendation and FERC directive to use Bid-in Demand
Initial testing performed on RUC to identify issues of compatibility with RUC and convergence bidding

Tests simulated:

- large quantities of virtual supply displacing physical supply in the IFM
- effect of nodal virtual demand changing the distribution of load clearing the IFM and thus altering the IFM supply schedule going into RUC.

- Results discussed with stakeholders on the August 27 conference call and are included as Attachment C
- Initial testing showed no anomalous or extreme RUC results in terms of quantities and costs of RUC capacity or RUC prices.
- Additional testing will be performed on RUC once the ISO has a system in place to submit virtual bids under market simulation conditions
# Comparison of Costs and Limits on Virtual Bids

<table>
<thead>
<tr>
<th>ISO</th>
<th>Min Max</th>
<th>Admin Fees</th>
<th>Transaction Fees</th>
<th>BCR Uplift Fees</th>
<th>Bid Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>PJM</td>
<td>.01</td>
<td>Yes $.045 per cleared bid</td>
<td>$.06 per bid segment</td>
<td>Yes</td>
<td>1. Ability to impose SC Daily Limit 3000 bid/offer segments</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2. Credit limits</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3. Nodal limits as needed</td>
</tr>
<tr>
<td>NYISO</td>
<td>1 MW for first bid segment</td>
<td>Yes</td>
<td>$.10 per submitted virtual bid regardless of segments</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$.05 for cleared bids (credited 50%)</td>
<td>Yes</td>
<td>1. Total Volume 2X Generation Capacity at Location</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sliding scale based on SCUC performance (min .03 – max $1.00)</td>
<td></td>
<td>2. Soft Bid Volume Cap</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3. Credit Limits</td>
</tr>
<tr>
<td>MISO</td>
<td>0.1MW</td>
<td>Yes $.085 per cleared bid</td>
<td>No transaction fees</td>
<td>Yes</td>
<td>1. Daily Virtual MW Limit can be imposed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2. Credit Limits</td>
</tr>
<tr>
<td>ISO-NE</td>
<td>1 MW</td>
<td>Yes $.06 per cleared bid</td>
<td>$.005 per bid segment</td>
<td>Yes</td>
<td>1. Bid limits unknown</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2. Credit Limits</td>
</tr>
<tr>
<td>CAISO</td>
<td>1 MW</td>
<td>Yes $.065 to .085 per gross MWH</td>
<td>No transaction fee</td>
<td>Yes</td>
<td>1. Credit Limits</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2. Bid volume limits</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3. Position limits</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4. Nodal limits as needed</td>
</tr>
</tbody>
</table>
Stakeholder process to address information release issues will launch in October

- ISO needs to take a broader look at information release now that new market design is in place
- Will address information release issues for physical as well as virtual bid data
Discussion on MPM Issues

Eric Hildebrandt
Convergence Bidding on the Interties

Gillian Biedler
Senior Market Design & Policy Specialist

Market Surveillance Committee / Stakeholder Meeting
September 18, 2009
Design Principles

- Intertie schedules cannot violate scheduling limits
  - NERC and WECC standards require this
  - Operators need this certainty to run the grid reliably

- Virtual and Physical bids must clear against each other to set one price per pricing node
  - Just as is the case for internal transactions, virtual bids on the interties must be able to offset physical bids in order to be meaningful market instruments
Two constraints will be enforced in the scheduling run

- Constraint [1] is that $PI + PE \leq \text{limit}$
- Constraint [2] is that $(PI + VI) + (PE + VE) \leq \text{limit}$.

In the pricing run, only constraint [2] will be enforced

- This will yield prices that reflect the interaction of physical and virtual
- Physical results from the scheduling run will act as un-priced constraints in the pricing run

Constraint [1], which exists in the market software today

- Ensures compliance with applicable WECC and NERC standards

A tagging requirement may be necessary

- This will be evaluated in a separate Stakeholder process
Some numerical examples…

- The following slides show examples of how various scheduling run scenarios play out in the pricing run.

- For these examples, we start with the following:
  - Internal load is 110 MW
  - Sign convention: Imports are negative
  - The scheduling limit in both the import direction is -100 MW, and is 100 MW in the export direction.
Case A: No congestion

[1] -0 + 0 < 100, not binding
[2] -(0 + 0) + (0 + 0) < 100, not binding

SCHEDULING RUN:
LMP @ A: $45
LMP_{physical} @ Tie: $45
LMP_{virtual} @ Tie: $45

PRICING RUN:
LMP @ A: $45
LMP @ Tie: $45
Case B, ex. 1: Physical and P+V congestion in the same direction

[1] \(-100 + 0 = -100\), binding in the import direction

[2] \(-(100 + 200) + (0 + 200) = -100\), binding in the import direction

\[\text{SCHEDULING RUN:}\]
- \(LMP @ A: $45\)
- \(LMP_{\text{physical}} @ \text{Tie}: $30\)
- \(LMP_{\text{virtual}} @ \text{Tie}: $32\)

\[\text{PRICING RUN:}\]
- \(LMP @ A: $45\)
- \(LMP @ \text{Tie}: $32\)
Case B, ex. 2: Physical and P+V congestion in opposite directions

[1] \(-100 + 0 = -100\), binding in the import direction

[2] \(-(100 + 10) + (0 + 210) = 100\), binding in the export direction
Case C, ex. 1: Virtuals create congestion

[1] -0 + 60 = 60, not binding

[2] -(0 + 0) + (60 + 40) = 100, binding in the export direction

SCHEDULING RUN:
LMP @ A: $45
LMP_{physical} @ Tie: $47
LMP_{virtual} @ Tie: $47

PRICING RUN:
LMP @ A: $45
LMP @ Tie: $47

VE: 40 @ $47
Case C, ex. 2: Virtuals create congestion

[1] -100 + 0 = -100, not binding – degenerate case
[2] -(100 + 0) + (0 + 0) = -100, binding in the import direction
Case C, ex. 3: Virtuals create congestion

[1] -0 + 100 = 100, not binding – degenerate case

[2] -(0 + 0) + (100 + 0) = 100, binding in the export direction

SCHEDULING RUN:
- LMP @ A: $45
- LMP @ Tie: $48
- LMP\text{\_physical} @ Tie: $48

PRICING RUN:
- LMP @ A: $45
- LMP @ Tie: $48
- LMP\text{\_virtual} @ Tie: $48
Case D, ex. 1: Virtuals relieve congestion

[1] -100 + 0 = -100, binding in the import direction
[2] -(100 + 10) + (0 + 200) = 90, not binding
Case D, ex. 2: Virtuals relieve congestion

[1] \(-100 + 0 = -100\), binding in the import direction

[2] \(-(100 + 10) + (0 + 200) = 90\), not binding

SCHEDULING RUN:
- LMP @ A: $47
- \(LMP_{\text{physical}}\) @ Tie: $30
- \(LMP_{\text{virtual}}\) @ Tie: $47

PRICING RUN:
- LMP @ A: $47
- LMP @ Tie: $47
- VE: 190 @ $47
Tagging Requirement

- The ISO is considering a tagging requirement for physical intertie schedules.

- There could be incentives to engage in implicit virtual bidding when virtual bidding is available although prices will discipline this behavior.

- The tagging requirement will be considered as part of a subsequent stakeholder process as discussed at the July 9th, 2009 stakeholder meeting.
Margaret Miller
Senior Market Design and Policy Specialist
MSC/Stakeholder Meeting
September 18, 2009
GMC for Convergence Bidding Proposal

- SMCR, Forward Schedule and Market Usage (DA) service charges applicable to Convergence Bidding
- However, current billing units poorly aligned with convergence bidding
- Proposal
  - SMCR unchanged – Applies to any CB choosing to be a SC
  - Create new service charge to recover Forward Energy and Market Usage (DA)
  - Billing Units: Gross MWh
  - Rate: $0.065 - $0.085. Consistent with other ISOs. Exact rate to be established in the 2011 GMC Extension stakeholder process beginning January 2010.
Average Dollars of BCR Uplift

Average Dollars of BCR Uplift

Average Dollars of BCR Uplift

Average Dollars of BCR Uplift

Average Dollars of BCR Uplift
Obligation for Virtual Demand to pay IFM Tier 1 Uplift

- Allocate IFM Tier 1 Uplift to virtual demand when system wide virtual demand is positive.
- Obligation for virtual demand based on how much additional unit commitment was driven by net virtual demand that resulted in IFM clearing above what was needed to satisfy measured demand
- Allocated to SCs with a positive net virtual demand position
IFM Tier 1 Uplift Formulas

Virtual Demand Obligation = \( \max(0, VD_{sw} - V_{sw}) + \min(0, PD_{sw} - AD) \)

IFM BCR Tier 1 Rate = \( \frac{\sum_i (\max(0, \text{IFM Demand}_i - \text{SS Supply}_i)) + \max(0, VD_{sw} - V_{sw}) + \min(0, PD_{sw} - AD)}{\$ \text{ IFM Uplift}} \)
Obligation for Virtual Supply to pay RUC Tier 1 Uplift

- Extent CAISO forecast ≤ actual load RUC Tier 1 Uplift paid by net virtual supply and underscheduled load
- Extent CAISO forecast > actual load RUC Tier 1 paid by measured demand by ratio share
- Allocate RUC Tier 1 Uplift to virtual supply when system wide net virtual supply is positive
- Virtual Supply obligation to pay RUC Tier 1 Uplift would be based on pro-rata share of the total obligation as determined by their total (net) virtual supply bids
RUC Tier 1 Uplift Formulas

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

RUC Tier 1 Uplift Rate = $\frac{\sum_{i} (\text{Max} (0, \text{IFM Demand}_{i} - \text{SS Supply}_{i}) + \text{MAX}(0, VS_{sw} - VD_{sw})}{\text{RUC Tier 1 Uplift}}$
Proposal for Real-Time Bid Cost Recovery

- Costs related to bid cost recovery for short-start units started in Real-Time as a result of a RUC schedule will be allocated to net virtual supply and underscheduled load.

- These costs would now be allocated through RUC Tier 1 Uplift rather than through Real-Time BCR Uplift.

- Costs attributed to other factors that result in Real-Time uplift will continue to be allocated to Measured Demand until two-tier charge is developed.
Next Steps

- Stakeholder comments due by close of business October 2
- ISO may make changes to proposal based on discussion today
  - If so, market notice will be sent with new comments deadline
- Implementation working group conference calls scheduled bi-monthly September to December
- Board of Governors meeting October 29,30