Virtual Bidding in MRTU

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Virtual Bidding – SCE’s Position

- SCE supports the implementation of Virtual Bidding (aka “Convergence Bidding”) as a Release 1A item
- Virtual bidding (VB) should not be implemented in California until MRTU has demonstrated proper functioning for a period (e.g. 12 months)
- Appropriate oversight and design rules must be in place to prevent market manipulation when VB is implemented
  - LAP level bidding only for initial implementation
  - Immediate release of all VB information
- A potential significant asymmetry would exist absent rules from the CPUC for VB use by IOUs
Why does SCE Support VB?

- VB provides a tool which transparently identifies “explicit” virtual transactions; conversely, it reduces likelihood of “implicit” virtual transactions
  - It is better for the CAISO to have visibility over financial transactions rather than have them “guess” if a bid is physical or financial
- The presence of VB puts to rest, once and for all, concerns that load may “underschedule” to depress prices
- In some cases, VB provides a legitimate tool to mitigate risks
  - Note that risk mitigation always comes at a cost, VB rules must not shift these costs inappropriately
Why does SCE Support VB only at the LAPs?

• **VB must not be allowed** to undermine the foundational justifications and design objectives of MRTU
  - Feasible schedules
  - An **efficient optimization** based on three-part bids
    - Sellers have incentives to bid their true production costs
  - Effective local market power mitigation
  - Effective market monitoring and a design that is less susceptible to manipulation

• In addition, nodal virtual bidding is *inconsistent* with the MRTU market design
  - Physical load is only allowed to bid at LAPs
  - The use of LDFs
  - Physical SC trades
Nodal VB: Impacts on Feasibility

• SCE has concluded that nodal VB can/will create infeasibility issues
  – Either MRTU cannot resolve these issue without a “manual work-around”, or
  – MRTU has the potential to address these issue in a very costly and inefficient manner
• The RUC process is designed to dispatch additional capacity given a feasible starting point
  – RUC cannot “decommit” units selected in the IFM or dispatch these unit down
  – Examples follow
• LAP-level VB largely addresses this issue
Nodal VB: Example on Feasibility

Consider the following “gen pocket”
- Total generation = 200MW
- XMSN capability = 150MW

Unlike today, the MRTU design (without VB) will prevent both generators from scheduling and overloading the line

Now consider the addition of a 50MW “Virtual Load” bid at one of the generators
Net “flow” is 150MW, and both generators can schedule total output in the IFM = INFEASIBLE SCHEDULES
RUC has no (efficient) way of solving this problem
Even if RUC commits enough capacity so that the problem can be resolved, the CAISO will have to redispatch the system in real-time to fix this problem
Nodal VB: Impacts on Optimization Efficiency

- At it core, any “problems” created by VB are solved by a very inefficient objective function
  - RUC minimizes startup and non-load costs, rather than total costs
- Any use of the “RUC” objective function reduces market efficiency
- While LAP level VB promises to reduce reliance on the “RUC” objective function, nodal level cannot make the same claim
  - In fact, nodal VB may increase reliance on the RUC objective
- As a result, the societal impacts of VB must account for potential efficiency losses created by VB
Nodal VB: Impacts on Optimization Efficiency

Consider cases with and without Virtual Bidding.

Without VB, if suppliers bid competitively, Owner A will be dispatched and Owner B will not run.

With VB, if Owner B offers VBs with a total least cost solution of $5,601, it will be selected.

- Owner B can submit a Virtual Bid to sell 100MWs @ $56/MWh and completely displace Owner A.

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Table 1 – Impact of Virtual Bids on the Physical Dispatch

<table>
<thead>
<tr>
<th>Owner</th>
<th>Size (MW)</th>
<th>Variable Cost ($/MWh)</th>
<th>Startup/no-load ($/MWh)</th>
<th>Long Startup?</th>
<th>Total Cost (1 hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>101</td>
<td>50.01</td>
<td>6</td>
<td>Yes</td>
<td>$5,601</td>
</tr>
<tr>
<td>B</td>
<td>101</td>
<td>55</td>
<td>2</td>
<td>No</td>
<td>$5,700</td>
</tr>
</tbody>
</table>
**VB: Shifting Objective Functions**

**Objective:**
- Minimize Total Cost
- Minimize Start-up & Min-load costs

**Day-ahead Market (HE1-24):**
- Virtual generation is selected (total cost of $5600 vs. $5601)

**Residual Reliability Commitment:**

**Real-time Market:**
- Physical Generation unit B selected (Startup cost of $2 vs $6)

**Timeline:**
- ≈T-18 hours
- ≈ T-6 hours
- T-0 hours
Nodal VB: Impacts on Optimization Efficiency

The most efficient outcome was not reached
- Rather than unit A running 100MW, unit A did not run
- Unit B ran at 100MW rather than 0MW

Both day-ahead and real-time prices increased because of the VB

The total cost to serve load increased about $200 (from $5,601 to $5,800)

The strategy was profitable to unit B – they made $100

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<table>
<thead>
<tr>
<th></th>
<th>Without Virtual Bids</th>
<th>With Virtual Bids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generator A Output</td>
<td>100MW</td>
<td>0 MW</td>
</tr>
<tr>
<td>Generator B Output</td>
<td>0 MW</td>
<td>100MW</td>
</tr>
<tr>
<td>Day-ahead Clearing Price</td>
<td>$50.01/MWh</td>
<td>$56/MWh</td>
</tr>
<tr>
<td>Real-time Price</td>
<td>$50.01/MWh</td>
<td>$55/MWh</td>
</tr>
<tr>
<td>Profit to Virtual Bidder</td>
<td>N/A</td>
<td>$100</td>
</tr>
<tr>
<td>Total Cost to Load</td>
<td>$5,601</td>
<td>$5,800</td>
</tr>
</tbody>
</table>
Nodal VB: Impacts on Physical Bidding

- On a nodal level VB can “undercut” a physical bid and displace physical generation
  - VB doesn’t have start-up and min-load (previous example)
  - Again this problem becomes a significant concern under nodal VB
- As a result, physical sellers, even if they fully expect they are economic and should run, may not clear the IFM
  - They may get picked up in RUC, but this is a capacity schedule, not an energy schedule
- As a result, physical generators may be forced to “Self-schedule” to clear IFM
  - Self-scheduling resources are not eligible for startup/min-load or bid-cost guarantees
  - As a result, the market has additional constraints, and sellers are not bidding their true costs
- Again, this reaction harms overall market efficiency and violates a key design object behind MRTU
Nodal VB: Concerns over Manipulation

- Compared to LAP level bidding, nodal level VB creates a host of additional market manipulation concerns
  - CRR/congestion manipulation
  - Local price distortions
  - Unit commitment distortions
  - VB + Uninstructed energy games
  - Virtual Withholding
  - False-triggering of LMPM
- The added complexity of nodal VB demands additional monitoring capability
- In addition, again nodal VB violates a key design objective of MRTU (to reduce the potential for manipulation)
Conclusions and Recommendations

• SCE supports Virtual Bidding at the LAP level & only after the core MRTU design has been tested/proven
  – VB gives the CAISO better visibility over “financial” transactions
  – LAP VB fully addresses “underscheduling”

• In contrast, the CAISO should not entertain any “enhancement” which undermines the original design objectives of MRTU
  – Compared to LAP level bidding, nodal VB threatens/undermines
    • Feasibility
    • Efficiency of the optimization
    • Incentives for participants to bid actual production costs
    • Efficacy of Local Market Power mitigation
    • Market Monitoring and a market design aimed at stemming opportunities for abuse
  – Don’t sacrifice reliability and market efficiency to accommodate speculation

• Until such issues are resolved implement VB only at the LAPs