Convergence bidding

Participating in the market
Day-ahead market positions and
Liquidating in the real-time market
Module objectives

By the end of this section, you will be able to:

• Identify the basic structure of the energy bid curves for virtual supply and virtual demand.
• Identify the maximum number of bid segments for virtual bids.
• Describe how the real-time price is determined for the liquidation of virtual awards.
Bidding rules for virtual bids

- Virtual bids in the day-ahead market must have a price and quantity.
- Virtual bidding provisions apply only to energy bids.
- Minimum bid is 1 MW for virtual bid.
- Virtual supply bids ($/MWh) would be submitted using monotonically increasing bid curve.
- Virtual demand bids ($/MWh) would be submitted using a monotonically decreasing bid curve.
Bidding rules for virtual bids

- Bid curve begins at zero (0)
- Maximum of 10 bid segments
- Virtual bids do not include start-up or minimum load costs
- Virtual bids are subject to the same energy bid caps as physical bids.
- Scheduling coordinator may only have one virtual supply bid and one virtual demand bid accepted for each virtual bidding location.
Convergence bids tab in SIBR
Convergence bidding

Submitting a virtual demand bid in SIBR
Virtual demand may be offered at supply nodes and trading hubs as well as at any other eligible Pnode.
Submitting a virtual demand bid

Select "Energy"

Select appropriate location
Submitting a virtual demand bid

Selecting the graph for the applicable hour will display its price curve.
Convergence bidding

Submitting a virtual supply bid
Submitting a virtual supply bid

Virtual supply may be offered at demand nodes and default LAPs as well as at any other eligible Pnode.
Submitting a virtual supply bid
Locating interchange OTC limits in SIBR
Locating interchange OTC limits in SIBR
Locating interchange OTC limits in SIBR

- Import and export limits may change hourly
- Limits may be different for the import direction than for the export direction
Day-ahead market mechanics – virtual bid aggregation

• Virtual bid aggregation to alleviate the potentially large number of virtual bids inundating the market software.
• For each bidding location, all virtual bids submitted for that location are aggregated together to be used in the Day-ahead market.
• One multi-segment virtual supply bid / one multi-segment virtual demand bid will be created for each node.
• The aggregated virtual supply bid and the aggregated virtual demand bid for each eligible location are used in the IFM process of the day-ahead market.
Day-ahead market mechanics virtual bid aggregation – example

- Andrew the CBE had his SC put in a virtual demand bid at Julie’s Beagle Point resource.
- Julie, the merchant generator tries to hedge for a potential outage, also puts in a virtual demand bid at her Beagle Point resource.
- Suppose these two virtual demand bids came into the market for the same trade date and trade hour, both bids would be aggregated together to form one aggregated virtual demand bid.
Day-ahead market mechanics virtual bid aggregation – example

- Beagle Point plant has a Pmax of 200MW

<table>
<thead>
<tr>
<th>Andrew’s bid</th>
<th>Julie’s bid</th>
<th>Aggregated bid curve</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Price Curve</strong></td>
<td><strong>Price Curve</strong></td>
<td><strong>Price Curve</strong></td>
</tr>
<tr>
<td><strong>Qty</strong></td>
<td><strong>Price [$$]</strong></td>
<td><strong>Qty</strong></td>
</tr>
<tr>
<td>0</td>
<td>125</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>75</td>
<td>10</td>
</tr>
<tr>
<td>15</td>
<td>70</td>
<td>17</td>
</tr>
<tr>
<td>20</td>
<td>70</td>
<td>20</td>
</tr>
</tbody>
</table>

Slide 18
Day-ahead market processes

- Virtual bids are considered during the MPM process but are not mitigated.
- Virtual bids are not eligible to participate in RUC.
- Virtual bids are only used in the IFM process.
- IFM process clears bid in supply and bid in demand, regardless of whether the bids are virtual or physical.
- Virtual bids have the ability to create or alleviate congestion.
- Virtual bids may cause additional resources to be committed through the RUC process.
Day-ahead market results

- Day-ahead market results are in CMRI and are financially binding.
- If a virtual bid is the marginal resource, it can set the price.
- When a virtual bid is the marginal resource, the aggregated bid curve will be disaggregated and prorated according to total portion of a participant’s MW offer divided by the total aggregated MW offer for the cleared volume.
Day-ahead market mechanics virtual bid disaggregation – example

- If LMP at Beagle Point Pnode is $75 and only 20MW cleared at that price, then bids will need to be disaggregated

Andrew's bid

<table>
<thead>
<tr>
<th>Qty</th>
<th>Price [$]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>125</td>
</tr>
<tr>
<td>5</td>
<td>75</td>
</tr>
<tr>
<td>15</td>
<td>70</td>
</tr>
<tr>
<td>20</td>
<td>70</td>
</tr>
</tbody>
</table>

Julie's bid

<table>
<thead>
<tr>
<th>Qty</th>
<th>Price [$]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>10</td>
<td>75</td>
</tr>
<tr>
<td>17</td>
<td>65</td>
</tr>
<tr>
<td>20</td>
<td>65</td>
</tr>
</tbody>
</table>

Aggregated bid curve

<table>
<thead>
<tr>
<th>Qty</th>
<th>Price [$]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>125</td>
</tr>
<tr>
<td>5</td>
<td>100</td>
</tr>
<tr>
<td>15</td>
<td>75</td>
</tr>
<tr>
<td>32</td>
<td>70</td>
</tr>
<tr>
<td>37</td>
<td>65</td>
</tr>
<tr>
<td>40</td>
<td>65</td>
</tr>
</tbody>
</table>
Day-ahead market mechanics virtual bid disaggregation – example

- Andrew offered 15MW at $75
- Julie offered 17MW at $75
- Only 20 MW cleared at $75
- Both virtual bid awards must be determined using a pro-rated value from the marginal segment, in addition to capacity with lower bid costs
- Total MW offered at $75 = 32MW
- 20 MW awarded; 5 MW of which is pro-rated based on the 17 MW in the marginal bid segment.
  - Of the 20 MW that clears in IFM, 15 MW comes from higher bid segments. That leaves 5 MW as marginal.

- Andrew gets 5 + (10/17 * 5) = 7.94 MW
- Julie gets 10 + (7/17 * 5) = 12.06 MW
Day-ahead positions

Andrew’s day-ahead position and settlement

- Long position
- Awarded 7.94 MW @ $75.00/MW = $595.50 (charge)

Julie’s day-ahead position and settlement

- Long position
- Awarded 12.06 MW @ $75.00/MW = $904.50 (charge)
Liquidating day-ahead positions in the FMM

- All day-ahead positions are liquidated in the FMM.
- Virtual demand liquidates (sells) the position back to the market at the FMM price.
- Virtual supply liquidates (buys) the position back from the market at the FMM price.
- The price used to liquidate virtual awards is based on the average of the four 15-minute intervals for the trade hour.
Example - Liquidating day-ahead positions in the FMM

- Prices in the FMM have been volatile due to unexpected outages and a lightening strike which caused a fire that threatens a major transmission line.
- Fortunately, fire crews were able to contain the fire quickly.

<table>
<thead>
<tr>
<th>IE:15</th>
<th>IE:30</th>
<th>IE:45</th>
<th>IE:00</th>
</tr>
</thead>
<tbody>
<tr>
<td>76.68</td>
<td>109.80</td>
<td>186.57</td>
<td>165.13</td>
</tr>
</tbody>
</table>

FMM price to liquidate virtual awards = $134.545
Liquidating the day-ahead positions - example

**Andrew’s day-ahead settlement**

- Awarded 10 MW @ $75.00/MW = $750.00 (charge)
- FMM – liquidate 10 MW @ $134.545 = $1,345.45 (payment)
- Net position = $595.45 (payment)

**Julie’s day-ahead settlement**

- Awarded 20 MW @ $75.00/MW = $1,500.00 (charge)
- FMM – liquidate 20 MW @ $134.545 = $2,690.90 (payment)
- Net position = $1,190.90 (payment)
Module summary

• Participants may submit a virtual supply and virtual demand bids at eligible locations including:
  – Internal supply nodes and scheduling points
  – Load nodes
  – Default LAPs
  – Trading hubs
• Virtual demand bid curves must be monotonically decreasing
• Minimum bid of 1.0 MW
• Incremental bid thereafter of 0.01MW
• Intertie position limits located in SIBR