Virtual Trading

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New York Independent System Operator

New York Market Orientation Course (NYMOC)
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Module Objectives

At the conclusion of this module, attendees will be able to:

- Define what is meant by virtual trading.
- Describe the benefits of the Virtual Market.
- Distinguish between virtual supply and virtual load bids.
- Calculate the settlement for a virtual supply and a virtual load bid.
What is Virtual Trading?

The submission of bids for the financial purchase or sale of energy.....rather than or in addition to the physical delivery or purchase of energy in the NYISO administered energy markets.
What is Virtual Trading?

- A Virtual Supplier bids and **sells** in the Day-Ahead Market and **buys** back automatically in the Real-Time Market

- Virtual Load bids and **buys** in the Day-Ahead Market, and **sells** back automatically in the Real-Time Market

**INTEND TO BUY LOW AND SELL HIGH**
Virtual Trading

- Financial Transactions only
  - *No actual production or consumption of energy*
  - *No Effect on RT Physical Energy Consumption*
  - *Does not Compromise Physical Commitment of Energy Resources for System Reliability*

- Role in DAM LBMP calculation
  - *Illustration to follow*
Benefits of Virtual Transactions
Benefits of Virtual Trading

- Allows companies outside the electric industry to participate in the NY Energy Market
  - *Potential opportunity to hedge a financial position*

- Assists in bringing Price Convergence between Day-Ahead and RT Market prices
  - *Illustration to follow*
Role of Virtual Bids in DAM LBMP

Day Ahead Scheduling Process
- Uses SCUC Software
- Evaluation and scheduling of Bids and Offers

First SCUC Pass: DAM LBMP initially calculated here
Final SCUC Pass: Final ‘Dispatch’ and Final DAM LBMP produced

Refer to Day-Ahead Scheduling Manual, Section 4.3.1 for details
Virtual Bids in DAM and Effect on Price with and without Virtual Bids

- Scenario where VL is greater than VS

<table>
<thead>
<tr>
<th>Day-Ahead Market Load</th>
<th>MWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Load Bid</td>
<td>200</td>
</tr>
<tr>
<td>(+) Virtual Load Bid</td>
<td>0</td>
</tr>
<tr>
<td>(-) Virtual Supply Bid</td>
<td>0</td>
</tr>
</tbody>
</table>

Day-Ahead Load is: 200

to be supplied by:

Gen A 50 MW @$20  50
Gen B 50 MW @$25  50
**Gen C 110 MW @$30**  100
Gen D 150 MW @$40

Marginal Energy Cost is **$30** in the DAM

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</tr>
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<td>+150</td>
</tr>
<tr>
<td>(-) Virtual Supply Bid</td>
<td>-50</td>
</tr>
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</table>

Day-Ahead Load is: 300

to be supplied by:

Gen A 50 MW @$20  50
Gen B 50 MW @$25  50
Gen C 110 MW @$30  110
**Gen D 150 MW @$40**  90

Marginal Energy Cost is **$40** in the DAM
Virtual Bids in DAM and Effect on Price with and without Virtual Bids

- Scenario where **VS is greater than VL**

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<td><strong>200</strong></td>
<td></td>
</tr>
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</tr>
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<td></td>
</tr>
<tr>
<td><strong>200</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Marginal Energy Cost is $25 in the DAM</strong></td>
<td></td>
</tr>
</tbody>
</table>
**Price Convergence**

**Virtual Bids in DAM and Effect on Price**

**VL bids** - buying power day-ahead ...more demand thus driving price up

**VS bids** - selling power day-ahead ...more supply offered, more competitive, thus driving price down

**VL bids** – automatically selling back those MWs in RT

**VS bids** – automatically buying back those MWs in RT
Let’s Review

Virtual Trading has an impact on RT Physical Energy consumption.

a) True
b) False

Virtual Trading plays a role in which LBMP calculation?

a) DAM LBMP
b) HAM LBMP
c) RT LBMP
d) Both DAM LBMP and RT LBMP
Virtual Supply and Virtual Load Bidding
Virtual Trading Bid Process

- Bidding is done at the zonal level
- Bids submitted at the bus level specific to a zone
  - 999 MW bid cap on each virtual bus for each hour if credit qualified
  - Allowed up to 3 VL and 3 VS buses per zone
  - Bus naming convention:
    Example: MPORGNAMVT_VL(VS)_Zone
MIS Bid Screen

MP selects virtual bus name and date

Again, MPs can have 3 VS and 3 VL buses per zone

MP can enter up to 3 bids for each hour, per bus
Virtual Supply Bid Process

Sell DAM

- Places up to 3 DAM Price Capped Bids per bus
  x 3 buses max per zone
  = up to 9 Supply Bids per zone per hour
- Bid represents minimum price VS Bidder is willing to be paid @ DAM Price
- Bids due by 5 AM

Buy RT

- No Action Required (or possible)
- Automatically Buy Back @ RT Price
Virtual Supply Bid Example

<table>
<thead>
<tr>
<th>Virtual Supply</th>
<th>DAM Bids</th>
<th>DAM LBMP</th>
<th>Accepted or Rejected?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price Cap #1</td>
<td>50 MW</td>
<td>$28/MW</td>
<td>Accepted</td>
</tr>
<tr>
<td>Price Cap #2</td>
<td>50 MW</td>
<td>$29/MW</td>
<td>Accepted</td>
</tr>
<tr>
<td>Price Cap #3</td>
<td>50 MW</td>
<td>$32/MW</td>
<td>Rejected</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Accepted DAM MWs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual Supply</td>
</tr>
<tr>
<td>100 MWs</td>
</tr>
</tbody>
</table>
Virtual Load Bid Process

Market Evaluation

- **Buy DAM**
  - Places up to 3 DAM Price Capped Bids per bus
    - x 3 buses max per zone
    - = up to 9 Load Bids per zone per hour
  - Bid represents the maximum price the VL bidder is willing to be charged @ DAM Price
  - Bids due by 5 AM

- **Sell RT**
  - No Action Required (or possible)
  - Automatically Sell Back @ RT Price
## Virtual Load Bid Example

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</table>

### Total Accepted DAM MWs

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</tr>
</thead>
<tbody>
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<td>50 MWs</td>
</tr>
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</table>
Let’s Review

How many price cap bids can a virtual bidder enter for each individual hourly bid?

a) Only 1 price cap bid per bid hour
b) Up to 2 price cap bids per bid hour
c) No more than 9 price cap bids per bid hour

A Virtual Supplier’s offer represents the minimum price they are willing to be paid.

a) True
b) False
Virtual Transaction Bid Process

- Post Bid Submittal
  - Check the status for each Bid hour
    - ‘Validation Passed’ if all required data has been entered
    - ‘Validation Failed’ need to review, correct, and re-submit

  **Note:** Bids undergo a **credit evaluation that occurs upon submission and continues until the DAM closes**

- Changing Bid
  - Up to 5 AM

- Check Final Bid Status
  - ‘Evaluating’
  - ‘Bid Accepted’
  - ‘Bid Rejected’
Virtual Transaction Settlement Process
Virtual Transaction Settlement Process

- **Two Settlement System**
  - **DAM Settlement**
    - Hourly Price
  - **RT Settlement**
    - RTD (~5 min) level interval price
    - Interval settlements summed to the hour
  - **Settlements based on Zonal Prices**
Virtual Transaction Settlement Process

- **Two Settlement System**
  - **Virtual Suppliers**
    - Virtual Supply Sells in DAM @ DAM LBMP if accepted
    - Virtual Supply Buys Back in RT @ RT LBMP
  
- **No Action Required in RT**

**DAM:** Virtual Supply Sells 10MW @ $30

**RT:** Virtual Supply Buys 10MW @ $20

Net Revenue of $100 on Virtual Supply Trade at these prices
Virtual Transaction Settlement Process

- **Two Settlement System**
  - *Virtual Loads*
    - Virtual Load Buys in DAM @ DAM LBMP if accepted
    - Virtual Load Sells Back in RT @ RT LBMP
  - **No Action Required in RT**

**DAM:** Virtual Load *Buys 10MW @ $40*

**RT:** Virtual Load *Sells 10 MW @ $45*

Net Revenue of $50 on Virtual Load Trade at these prices
Virtual Transaction Exercises
### Let’s Review

#### Virtual Supply Settlement

**Sell DA, Buy Back RT**

<table>
<thead>
<tr>
<th>HB</th>
<th>DAM/RT MW</th>
<th>Sell @DAM LBMP</th>
<th>DAM Stlmnt $</th>
<th>Buy @RT LBMP</th>
<th>RT Stlmnt $</th>
<th>Net Profit/(Loss)</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>10</td>
<td>$20</td>
<td>$200</td>
<td>$5</td>
<td>($10)</td>
<td></td>
</tr>
<tr>
<td>01</td>
<td>10</td>
<td>$30</td>
<td>$300</td>
<td>($10)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>10</td>
<td>$40</td>
<td>$400</td>
<td>$45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>10</td>
<td>$50</td>
<td>$500</td>
<td>$60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>10</td>
<td>$60</td>
<td>$600</td>
<td>$65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>10</td>
<td>$70</td>
<td>$700</td>
<td>$70</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>$2,700</strong></td>
<td></td>
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</tbody>
</table>

**Note:** This exercise is for illustration only. The RT settlement calculation actually occurs at the RTD interval level and is then summed to the hour.
Let’s Review
Virtual Load Settlement
Buy DA, Sell Back RT

<table>
<thead>
<tr>
<th>HB</th>
<th>DAM/RT MW</th>
<th>Buy @DAM LBMP</th>
<th>DAM Stlmnt $</th>
<th>Sell @RT LBMP</th>
<th>RT Stlmnt $</th>
<th>Net Profit/(Loss)</th>
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<tbody>
<tr>
<td>00</td>
<td>10</td>
<td>$52</td>
<td>($520)</td>
<td>$70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>01</td>
<td>10</td>
<td>$55</td>
<td>($550)</td>
<td>$77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>10</td>
<td>$55</td>
<td>($550)</td>
<td>($31)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>10</td>
<td>$68</td>
<td>($680)</td>
<td>$25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>10</td>
<td>$83</td>
<td>($830)</td>
<td>$68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>10</td>
<td>$87</td>
<td>($870)</td>
<td>$142</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>($4,000)</td>
<td></td>
<td></td>
<td></td>
</tr>
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</table>

Note: This exercise is for illustration only. The RT settlement calculation actually occurs at the RTD interval level and is then summed to the hour.
Credit Requirements

- Credit requirements are based on the price differential between the energy prices in the DAM and RT market

- Credit evaluation occurs at the zonal level
  - Bids are submitted at the bus level. If there are bids for multiple VL (or VS) buses for the same zone and hour, then the VL bus (or VS) MW values are summed by zone and then the credit evaluation occurs.

- Distinction between Virtual Load (VL) and Virtual Supply (VS) credit requirements
Let’s Review

Virtual Transactions are financially settled in the DAM only.

a) True  
b) False

A Virtual Load bidder buys in the DAM and sells in RT.

a) True  
b) False

Which price is used for a Virtual Supplier’s settlement calculation?

a) Generator Bus LBMP  
b) NYISO Reference Bus  
c) Zonal LBMP
Summary

- Define what is meant by a virtual bid
  - Financial Transaction Only

- Describe the benefits of the Virtual Market.
  - Allows companies outside the electric industry to participate in the NY Energy Market
  - Assists in bringing Price Convergence between Day-Ahead and RT Market prices

- Distinguish between virtual supply and virtual load bids.
  - VS sells in DAM and buys back in RT
  - VL buys in DAM and sells back in RT

- Calculate the settlement for a virtual supply and a virtual load bid.
  - Two settlement system using Zonal prices at respective Market (DAM or RT) multiplied by MWs
Additional Resources

- **NYISO Manuals**
  - *Day-Ahead Scheduling Manual*

- **MST (Market Services Tariff)**
  - *Attachments B and K*

- **MPUG (Market Participant’s User’s Guide)**
  - *Section 7.7*
The mission of the New York Independent System Operator, in collaboration with its stakeholders, is to serve the public interest and provide benefit to consumers by:

- **Maintaining and enhancing regional reliability**
- **Operating open, fair and competitive wholesale electricity markets**
- **Planning the power system for the future**
- **Providing factual information to policy makers, stakeholders and investors in the power system**

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