New York ISO

# Virtual Trading

## E-Learning Module

# Virtual Trading

## MODULE OBJECTIVES:

- Explain the basic concepts that apply to Virtual Transactions
- Describe the Bidding process for Virtual Transactions
- Identify the Credit requirements for Virtual Load (VL) and Virtual Supply (VS) bids
- Calculate the Financial Settlements associated with Virtual Transactions

# Presentation Roadmap

# Virtual Trading Basics

# Virtual Trading Basics

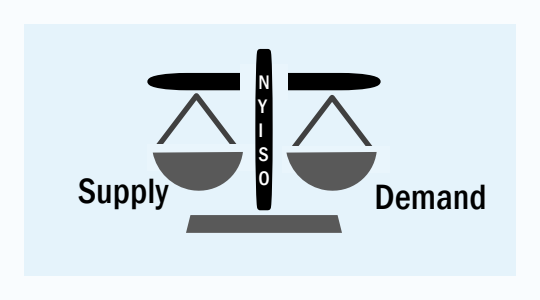
- **Financial transactions only:**
  - Virtual Supplier sells in Day-Ahead Market and then buys back in real time
  - Virtual Load buys in the Day-Ahead Market and then sells back in real time

# Virtual Trading Basics

- No effect on real time physical energy consumption
  - No actual production or consumption of energy
- Does not compromise physical commitment of energy resources for system reliability
- Virtual bidding impacts Day-Ahead LBMP calculation
  - Virtual bids can set price

# Virtual Trading Basics

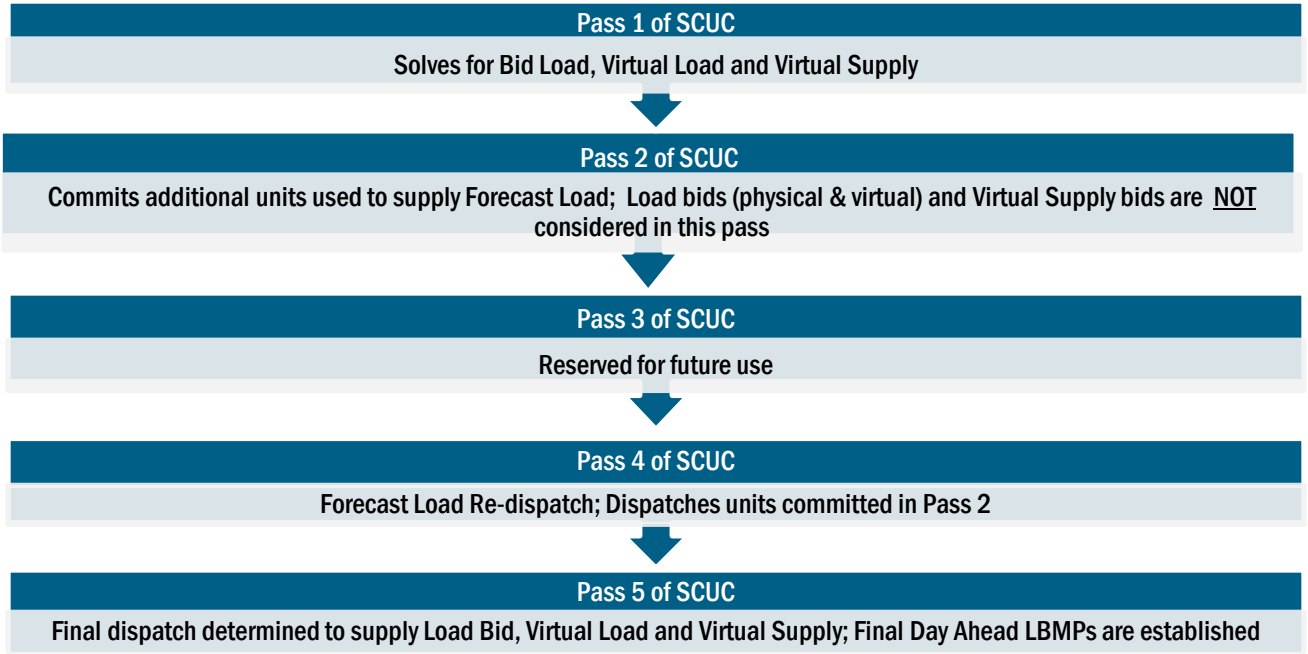
In Pass 1 of the Security Constrained Unit Commitment
( for the Day-Ahead Market)




$$\text{Physical Supply} = \text{Physical Load} + \text{Virtual Load} - \text{Virtual Supply}$$

Virtual Bids compete with the physical bids and can affect unit commitment

# Virtual Bids/Offers and SCUC Passes



# Effect of Virtual Bids on Day-Ahead Market Price

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Virtual Load is greater than Virtual Supply (VL > VS)

| Day-Ahead Market Load | MWh |
|---|---|
| Physical Load Bid | 200 |
| (+) Virtual Load Bid | 0 |
| (-) Virtual Supply Bid | 0 |
| Day-Ahead Load = | 200 |
| | |
| Supply stack that supplies Load: | |
| | |
| Resource A 50 MW @ $20 | 50 |
| Resource B 50 MW @ $25 | 50 |
| Resource C 110 MW @ $30 | 100 |
| Resource D 150 MW @ $40 | |
| | 200 |
| Marginal Energy Cost is $30 in the DAM | |

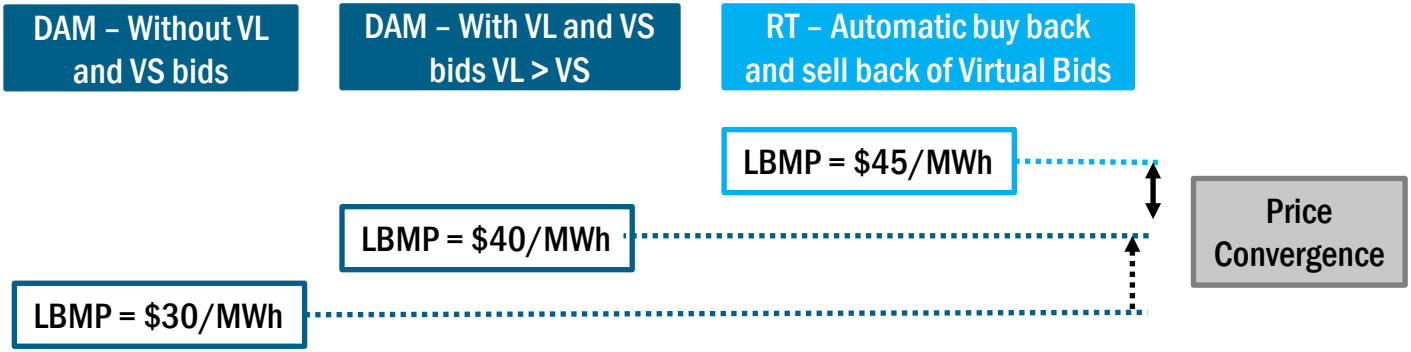
| Day-Ahead Market Load | MWh |
|---|---|
| Physical Load Bid | 200 |
| (+) Virtual Load Bid | +150 |
| (-) Virtual Supply Bid | -50 |
| Day-Ahead Load = | 300 |
| | |
| Supply stack that supplies Load: | |
| | |
| Resource A 50 MW @ $20 | 50 |
| Resource B 50 MW @ $25 | 50 |
| Resource C 110 MW @ $30 | 110 |
| Resource D 150 MW @ $40 | 90 |
| | 300 |
| Marginal Energy Cost is $40 in the DAM | |

# Price Convergence

- Facilitates price convergence between Day-Ahead and Real-Time Market prices

Scenario: Virtual Load is greater than Virtual Supply (VL > VS)

VL Bidders speculate that RT LBMP will be higher than DAM LBMP



# Effect of Virtual Bids on Day Ahead Market Price

New York ISO

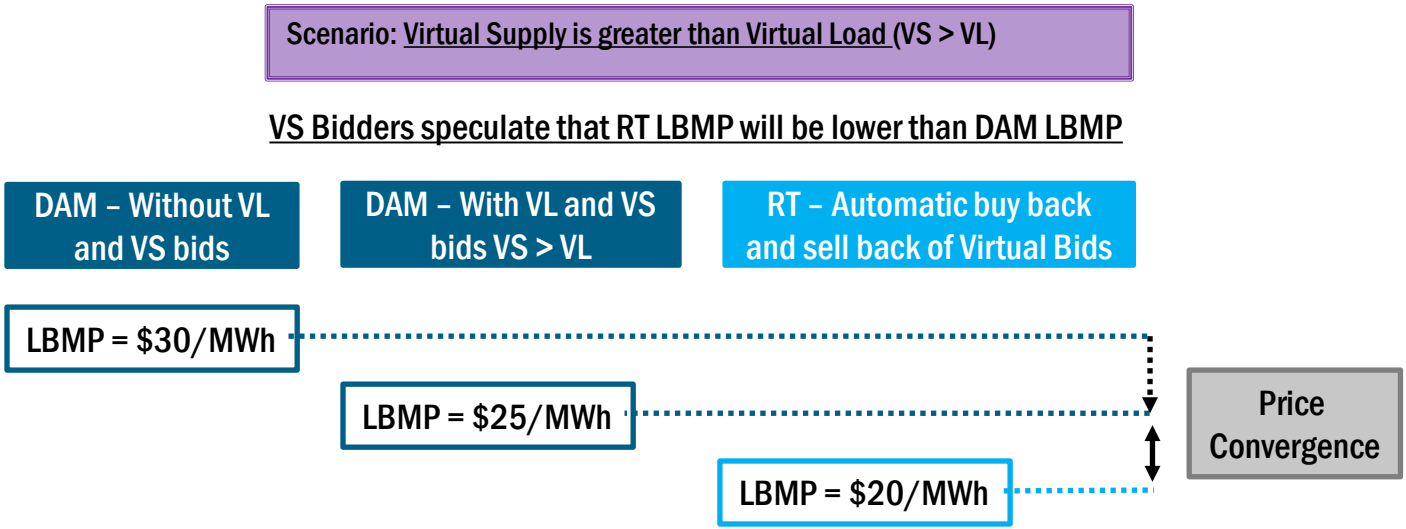
Virtual Supply is greater than Virtual Load (VS > VL)

| Day-Ahead Market Load | MWh |
|---|---|
| Physical Load Bid | 200 |
| + Virtual Load Bid | 0 |
| - Virtual Supply Bid | 0 |
| Day-Ahead Load = | 200 |
| | |
| Supply stack that supplies Load | |
| | |
| Resource A 50 MW @ $20 | 50 |
| Resource B 50 MW @ $25 | 50 |
| Resource C 110 MW @ $30 | 100 |
| Resource D 150 MW @ $40 | |
| | 200 |
| Marginal Energy Cost is $30 in the DAM | |

| Day-Ahead Market Load | MWh |
|---|---|
| Physical Load Bid | 200 |
| + Virtual Load Bid | +50 |
| - Virtual Supply Bid | -175 |
| Day-Ahead Load = | 75 |
| | |
| Supply stack that supplies Load | |
| | |
| Resource A 50 MW @ $20 | 50 |
| Resource B 50 MW @ $25 | 25 |
| Resource C 110 MW @ $30 | |
| Resource D 150 MW @ $40 | |
| | 75 |
| Marginal Energy Cost is $25 in the DAM | |

# Price Convergence

- Facilitates price convergence between Day-Ahead and Real-Time Market prices



# Virtual Supply and Virtual Load Bidding

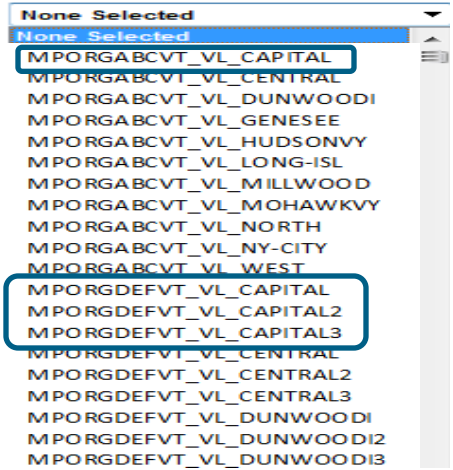
# Bidding Requirements

- Pass Virtual Trading Competency Exam
  - Before NYISO activates bidding rights for MP
  - Self-learning training module available on the NYISO's website
- Pass Credit Evaluation
  - Bids that receive an initial bid status of Validation Passed will be subject to a Virtual Bid credit evaluation
  - Occurs at the zonal level
  - Credit requirements are based on the historical price differential between the energy prices in the DAM and RT market
  - Insufficient credit to cover exposure of all the submitted bids and offers will fail the credit check

# 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

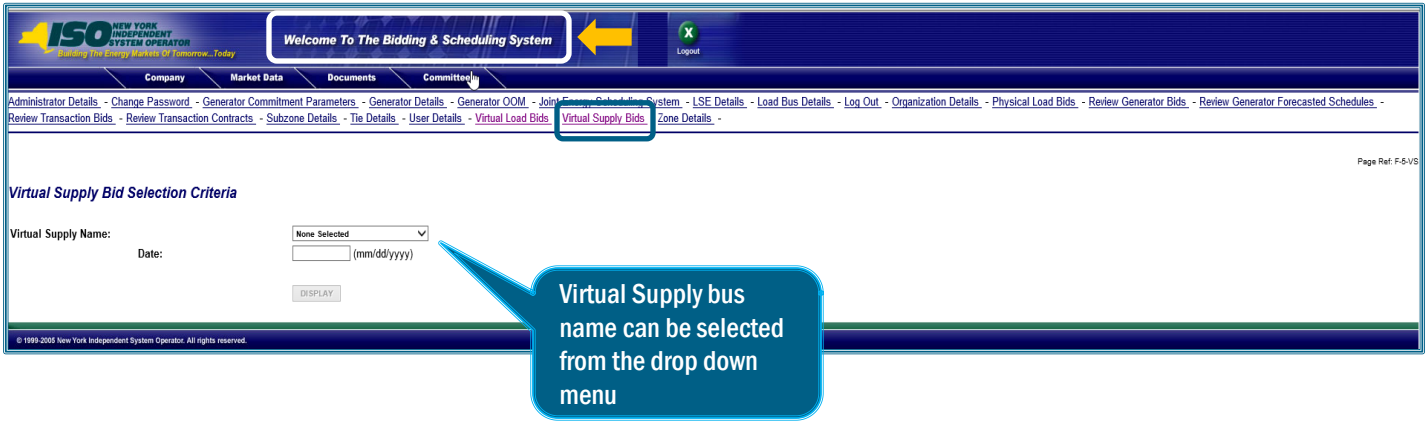


# Virtual Supply Bid Process

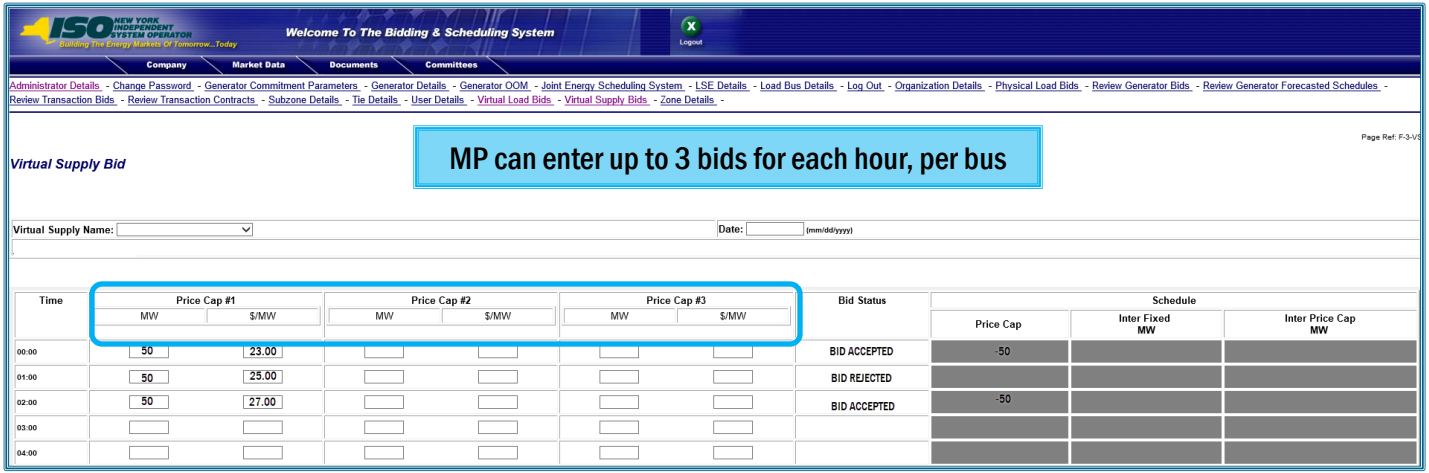
## Market Evaluation

- Sell Day-Ahead Market
  - Places up to 3 DAM Price Capped Bids per VS bus
  - Bid represents minimum price VS Bidder is willing to be paid at DAM Price
  - Bids due by 5 AM
- Buy Real–Time Market
  - No action required (or possible)
  - Automatically buy back @ RT Price

# Virtual Supply Bidding



# Virtual Supply Bidding



# Virtual Supply Bid Example

| Virtual Supply | DAM Bids | | DAM LBMP | Accepted/Rejected |
|---|---|---|---|---|
| Price Cap Bid #1 | 50 MW | $28/MWh | $30/MWh | Accepted |
| Price Cap Bid #2 | 50 MW | $29/MWh | | Accepted |
| Price Cap Bid #3 | 50 MW | $32/MWh | | Rejected |

| Total Accepted DAM MWs | |
|---|---|
| Virtual Supply | 100 MWs |

# Virtual Load Bid Process

## Market Evaluation

- Buy Day-Ahead Market
  - Places up to 3 DAM Price Capped Bids per VL bus
  - Bid represents maximum price VL Bidder is willing to be charged at DAM Price
  - Bids due by 5 AM
- Sell Real-Time Market
  - No Action Required (or possible)
  - Automatically sell at RT Price

# Virtual Load Bid Example

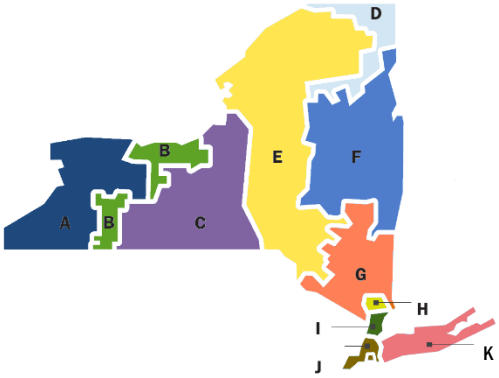
| Virtual Load | DAM Bids | | DAM LBMP | Accepted/Rejected |
|---|---|---|---|---|
| Price Cap Bid #1 | 50 MW | $28/MWh | $30/MWh | Rejected |
| Price Cap Bid #2 | 50 MW | $29/MWh | | Rejected |
| Price Cap Bid #3 | 50 MW | $32/MWh | | Accepted |

| Total Accepted DAM MWs | |
|---|---|
| Virtual Load | 50 MWs |

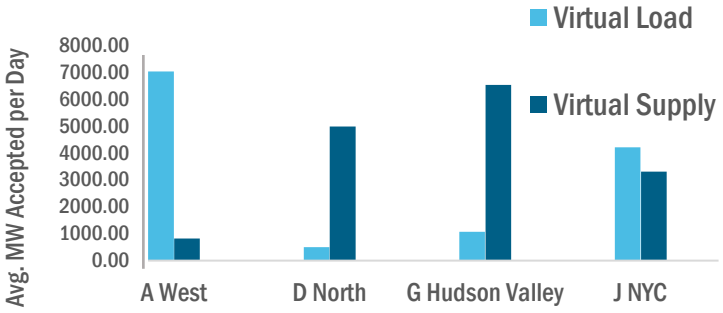
# Bid Submittal Status/Message

| Bid Status | Bid Message | Action |
|---|---|---|
| Validation Passed | Valid. Passed subject to credit evaluation | Bid passed validation pending credit approval |
| Validation Passed | Credit evaluation processing | Credit check in progress |
| Validation Failed | Valid. Failed due to Insufficient Credit | Failed Credit Check; Bid is released |
| Validation Passed | None | Credit Check is complete |
| Evaluating | None | SCUC evaluation in progress |
| Bid Accepted | n/a | Accepted by SCUC; Credit is held |
| Bid Rejected | n/a | Rejected by SCUC; credit is released |

# Virtual Supply and Load Bids: Bidding by Internal Zones, Example Month




Representative Month –May 2019




Virtual Supply and Load, May 2019: Average MWs Accepted per Day

| | West A | North D | Hudson Val G | NYC J |
|---|---|---|---|---|
| Virtual Load | 7022 | 498 | 1064 | 4207 |
| Virtual Supply | 818 | 4977 | 6518 | 3305 |

# Virtual Trading – Credit Requirements

# Credit Requirements

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

| | | |
|---|---|---|
| Credit limit for Virtual Transactions /hour ($) | = | Price Differential x MWh |

- Credit evaluation occurs at the zonal level
  - Bids submitted at a bus for a specific zone
  - MWs from bids for multiple VL (or VS) buses for the same zone and hour are summed by zone, credit evaluation then occurs
- Distinction between Virtual Load (VL) and Virtual Supply (VS) credit requirements

# Credit Requirements

- Stratification of credit requirements based on grouping transactions with similar risk characteristics
  - Virtual Supply credit requirements vary based on:

| | | | |
|---|---|---|---|
| Load Zone | - A, B, C, D, E, F, G, H, I, J, K | | |
| Time of year | - Summer (May to Aug)<br>- Winter (Dec – Feb)<br>- Rest of year (Mar-Apr and Sept-Nov) | | |
| Time of day (on peak/off peak) | **Summer:**<br>HB 07-09, HB 10-12, HB 13-17, HB 18, HB 19-20, HB 21-22<br>Weekend/Holiday (HB 07-08)<br>Weekend/Holiday (HB 09-12)<br>Weekend/Holiday (HB 13-14)<br>Weekend/Holiday (HB 15-16)<br>Weekend/Holiday (HB 17-18)<br>Weekend/Holiday (HB 19-22)<br>Night (HB 23, HB 00)<br>Night (HB 01-06) | **Winter:**<br>HB 08-09, HB 10-12, HB 13-15, HB 16-17, HB 18-20, HB 21-22<br>Weekend/Holiday (HB 16-20)<br>Weekend/Holiday (Other HB 07-22)<br>Night (HB 00,01, 23)<br>Night (HB 02-05)<br>Night (HB 06-07) | **Rest of year:**<br>HB 07-10, HB 11 – 14, HB 15-19, HB 20-22<br>Weekend /Holiday (HB 17-20)<br>Weekend/Holiday (other HB 07-22)<br>Night (HB 00, 06, 23)<br>Night (HB 01-05) |

# Credit Requirements

- Stratification of credit requirements based on grouping transactions with similar risk characteristics
  - Virtual Load credit requirements vary based on:

| | | | |
|---|---|---|---|
| Load Zone | - A, B, C, D, E, F, G, H, I, J, K | | |
| Time of year | - Summer (May to Aug)<br>- Winter (Dec – Feb)<br>- Rest of year (Mar-Apr and Sept-Nov) | | |
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# Credit Requirements

Credit requirements for VL and VS for the same day, hour and zone will be offset as follows:

**Upon submittal of bids:**

- Credit requirements for offsetting bid positions will equal the greater of the VL credit req. or the VS credit req.
- Example:

  VS Requirement = $209

  VL Requirement =$429

  Credit Requirement based on VL requirement of $429

**Upon acceptance of bids:**

- Credit requirements will be based on net MW position of VL and VS bids
- Example:

  Accepted VS Bid = 10 MW

  Accepted VL Bid = 15 MW

  Credit requirement based on VL of 5 MW

* Reminder: Credit evaluation occurs at zonal level. Multiple VL (or VS) bus bids in the same zone for the same hour by the MP will be summed before credit evaluation

# Credit Requirements, Example #1

A Market Participant (MP) has $10,000 in credit posted with NYISO
MP intends to bid as a Virtual Supplier (VS)
MP submits VS bids totaling 100 MW in Zone G (Hudson Valley), for HB 07, 08 and 09 for dispatch day of May 6th (weekday)
The current VS price differential for the summer, for Zone G, for HB 07, 08 and 09 is $22.94

Will the VS Bids pass Credit Evaluation?

Assume the following:
MP makes no other bids for the hours mentioned, and zone; MP has no other bids that have not yet settled, and
MP has no unpaid losses on Virtual Transactions

Calculation:
Credit Limit for the VS transaction = 100 MW x 3 hrs x $22.94 = $6,682
This bid submittal requires $6,682 in credit support

MP has sufficient credit posted to support bids and the VS bids will pass credit evaluation

# Credit Requirements, Example #2

A Market Participant (MP) has $10,000 in credit posted with NYISO
Current Virtual Transaction credit requirements total $5,000
($10,000 -$5,000 = $5000 available in credit support)
MP enters VS Bids totaling 100 MW, in Zone G (Hudson Valley), for HB 07, 08 and 09 for dispatch day of May 6th (weekday)
The current VS price differential for the summer, for Zone G, for HB 07, 08 and 09 is $22.94

Will the VS Bids pass Credit Evaluation?

Calculation:
Credit Limit for the VS transaction = 100 MW x 3 hrs x $22.94 = $6,682
This bid submittal requires $6,882 in credit support

The VS bid will not pass credit evaluation
Total credit requirement = $5,000 + $6,882 = $11,882, greater than the posted credit support of $10,000. MP has insufficient credit posted to support bids

# Credit Requirements, Example #3

A Market Participant (MP) has $10,000 in credit posted with NYISO
Current Virtual Transaction credit requirements total $3,000
($10,000 -$3,000 = $7000 available in credit support)
MP enters VS Bids totaling 100 MW, in Zone G (Hudson Valley), for HB 07, 08 and 09 for dispatch day of May 6th (weekday)
The current VS price differential for the summer, for Zone G, for HB 07, 08 and 09 is $22.94
Will the VS Bids pass Credit Evaluation?

Calculation:
Credit Limit for the VS transaction = 100 MW x 3 hrs x $22.94 = $6,682
This bid submittal requires $6,882 in credit support

The VS bid will pass credit evaluation
Total credit requirement = $3,000 + $6,882 = $9,882, greater than the posted credit support of $10,000. MP has sufficient credit posted to support bids

# Credit Requirements, Example #4

A Market Participant (MP) has $10,000 in credit posted with NYISO

MP enters VS Bids totaling 100 MW, in Zone G (Hudson Valley), for HB 07, 08 and 09 for dispatch day of May 6th, AND

MP also submits VL Bids totaling 90 MW in Zone G for HB 07,08 and 09 for the same day

The current VS price differential for the summer, for Zone G, for HB 07, 08 and 09 is $22.94

The current VL price differential for the summer, for Zone G, for HB 07,08 and 09 is $40.12

Will these Virtual Bids pass Credit Evaluation?

Assume the following:

MP makes no other bids for the hours mentioned, and zone; MP has no other bids that have not yet settled, and MP has no unpaid losses on Virtual Transactions

Calculation:

Credit Limit for the VS transaction = 100 MW x 3 hrs x $22.94 = $6,682

Credit Requirement for VL Transaction = 90 MW x 3 hrs x $40.12 = $10,832.40

The VS bid will not pass credit evaluation

VS and VL Bids offset each other as they are for the same hours, same zone and same day. Bid submittal requires $10,832.40 worth of credit support (greater of VS or VL requirement). MP has insufficient credit to support bids

# Frequently Asked Questions

### Do I have to bid every day or hour?

No, in fact you have the option of not bidding at all on any given day/hour.

### Can a bidder enter VS and VL bids in the same day?

Yes, keeping in mind that you cannot exceed your credit limit. Also, you must have the appropriate bidding privileges set up. Note: MPs can only have up to 3 VL and VS buses per zone with an allowance of up to 3 bids per virtual bus.

### What happens if I exceed my credit limit when I enter my bids?

The bids will receive a "validation failed" status and be rejected. Market Participants can provide additional collateral or allocate additional unsecured credit to support their bids. If provided and receipt is acknowledged prior to the DAM market close, the Market Participant must resubmit their bids to be considered for that day's market close.

### If I want to trade/bid additional MWs beyond what my current credit limit is, what do I need to do?

Market Participants must have sufficient credit support available to increase participation in the Virtual Transactions market. Market Participants may utilize the Credit Management System to support additional trading activity. Note: The NYISO Credit Department does not monitor MWs; it only monitors credit requirements in dollar amounts.

### What happens if my bids receive a "bid rejected" status?

If a "bid rejected" status is received, SCUC did not schedule the bids for the day. As such, credit support for those bids will be released.

# Virtual Trading - Settlements

# Virtual Trading Settlement Process

**Virtual Supply**

Sells in DAM at DAM LBMP ($)

Buy back in RT at RT LBMP ($)

**Virtual Load**

Sells in DAM at DAM LBMP ($)

Buy back in RT at RT LBMP ($)

- Settlement based on Zonal Prices as follows:
  - Day-Ahead Settlement – Hourly Prices
  - Real-Time Settlement – Nominal 5 minute interval price
    - Interval settlements summed to the hour

# Virtual Supply Settlement - Exercise

| HB | DAM MW Sells | DAM LBMP ($/MW) | DAM Settlement ($) | RT MW Buys | RT LBMP ($/MW) | RT Settlement ($) | Net Profit/ (Loss) ($) |
|---|---|---|---|---|---|---|---|
| 12 | 100 | $38.50 | $3850 | 100 | $24.75 | ($2475) | 1375 |
| 13 | 100 | $44.33 | $4433 | 100 | $25.70 | ($2570) | 1863 |
| 14 | 100 | $46.92 | $4692 | 100 | $26.10 | ($2610) | 2082 |
| 15 | 100 | $51.41 | $5141 | 100 | $26.05 | ($2605) | 2536 |
| 16 | 100 | $56.89 | $5689 | 100 | $26.32 | ($2632) | 3057 |
| 17 | 100 | $53.19 | $5319 | 100 | $26.57 | ($2657) | 2662 |
| | | Total | $29,124 | | | ($15,549) | $13,575 |

($) represents a charge to the MP

Net Profit = $13,575

# Virtual Load Settlement - Exercise

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| HB | DAM MW Buys | DAM LBMP ($/MW) | DAM Settlement ($) | RT MW Sells | RT LBMP ($/MW) | RT Settlement ($) | Net Profit/ (Loss) ($) |
|---|---|---|---|---|---|---|---|
| 14 | 100 | $17.55 | ($1,755) | 100 | $3.38 | $338 | ($1,417) |
| 15 | 100 | $18.15 | ($1,815) | 100 | $9.55 | $955 | ($860) |
| 16 | 100 | $20.89 | ($2,089) | 100 | $16.17 | $1,617 | ($472) |
| 17 | 100 | $26.14 | ($2,614) | 100 | $23.12 | $2,312 | ($301) |
| 18 | 100 | $26.84 | ($2,684) | 100 | $26.81 | $2,681 | ($3) |
| 19 | 100 | $26.69 | ($2,669) | 100 | $23.47 | $2,347 | ($322) |
| | | Total | ($13,626) | | | $10,251 | ($3,375) |

Net Loss = $3,375

($) represents a charge to the MP

# Presentation Roadmap

# Additional Resources

- Day-Ahead Scheduling Manual
- MST (Market Services Tariff)
  - Attachment K : Credit Requirements
- Market Participant's User's Guide (MPUG)
- Day Ahead Scheduling Manual

# Questions?

For any future assistance, please contact NYISO Stakeholder Services at stakeholder_services@nyiso.com or by phone at (518) 356-6060