Virtual Bidding in the NYISO

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Agenda

✓ 30 minutes – Virtual Bidding in New York
  ▪ NYISO overview
  ▪ Zonal Virtual Bids to Purchase and Offers to Sell
  ▪ Settlement
  ▪ Collateral Requirements
  ▪ Uplift Allocation
  ▪ Monitoring of Virtual Bidding
  ▪ New York Experience

✓ 90 minutes - Questions & Answers
Highlights

- New York electricity markets went live in December 1999
- Day-Ahead and Real-Time market for energy, reserve, and regulation.
  - Three reserve locations
  - Three reserve types (Spinning, 10 minute nonsync, 30-minute)
- Transmission Congestion Contract (TCC) and Capacity markets
- Other ancillary services: voltage support and black start
- Market volume ~$10.7 Billion (2005)
- Virtual Bidding was introduced in November 2001 after many months of spirited discussions with market participants.
2005 Energy Market Activity

- Day-Ahead (%): ~50+
- Bilateral (%): ~45+
- Real-Time (%): ~4

For Discussion Only
September 6, 2006
Eleven load zones (A-K)
Four neighboring control areas (M-P)
Energy flow is largely West to East and North to South delivering energy to the greater NYC area

Congestion is common
New York Control Area has ~4000 MW of quick-start combustion turbines (~12% of peak load)
Load, virtual load, and virtual supply settle at zonal prices
Generators settle at bus prices
Day-Ahead Market Evaluation generates prices and schedules for the next day. It involves multiple SCUC runs to:

- **Commit and schedule generators to satisfy bid load, virtual load, and virtual supply**
- **Commit additional generators to satisfy forecast load (if needed for reliability)**
- **Apply mitigation (if needed)**
Virtual Trading – Rationale

✓ Virtual trading is the arbitrage of day-ahead to real-time energy price differences.
  - Virtual energy purchases are sold back in real-time by the virtual trader.
  - Virtual energy sales are bought back in real-time by the virtual trader.
✓ Allows physical load/generation to hedge positions between the day-ahead and real-time.
✓ Converges Day-Ahead and Real-Time energy prices.
✓ Provides a better Day-Ahead commitment.
✓ Increases liquidity because more participants are in the day-ahead energy market.
✓ Provides more degrees of freedom in finding an optimum solution to the security-constrained unit commitment and dispatch problems therefore more certainty of converging to a solution.
Virtual Trading Rules

✓ Roughly speaking, the collateral requirements are designed to cover two days of “bad losses.” The DA-RT price spread for the most recent 90 days at the 97% level is used to determine the potential for “bad losses.”

✓ Virtual Load/Supply must have an associated price. It is scheduled only if the price is right.

✓ Virtual Load/Supply is always zonal and must be placed at one of NY’s 11 load zones.

✓ Virtual Load/Supply settles at zonal prices.

✓ Virtual supply may incur a portion of day-ahead uplift costs.
COMPARISON of CREDIT REQUIREMENTS

Credit requirements are calculated separately for each market:

Energy: based on highest month of energy purchases in the prior equivalent capability period, extrapolated over 50 days

UCAP: credit must equal amount of desired bid amount, and once bids clear, credit must equal billed, but not paid or unbilled UCAP obligations

TCC: credit must equal amount of desired bid amount, and once bids clear, a credit requirement to hold TCCs is calculated based on market clearing price of bids and duration of TCC held

Virtual Transactions: credit equals MWHs daily trading limit x $ per MWH x 2 days where $ per MWH is calculated as the highest 97th percentile value (across the 11 zones) of the price delta between DAM and RT.
Day-Ahead Commitment Process

1. Generator Offers, Load Bids, Virtual Bids & Offers
   - Units committed to meet bid load & virtual supply
2. Generator Offers, Load Forecast
   - More units committed to meet forecast load
3. More units committed for Local Reliability

Bid Load Passes
1. #1
5. #1

Forecast Load Passes
2. #2
3. #3
Uplift Allocation

✓ Some generating units are committed to meet accepted load bids less accepted virtual supply bids
  ▪ Uplift of these generators is allocated to physical load

✓ Some generating units may be committed to secure the system using the ISO’s best estimate of the next day’s load
  ▪ Uplift of these generators is allocated to (i) virtual supply and (ii) physical load that under-bought day-ahead.

✓ Some generating units may be committed for local reliability
  ▪ Uplift of these generators is assigned to the affected LSEs
NYISO Price Convergence
DAM and Real Time LBMP - NYCA Wide

Values closer to zero indicate price convergence. In order to smooth day to day variations, a 28-Day Moving Average of ABS((RT/DAM) - 1) is used.

(Data through 8/6/2006)
Building the Energy Markets of Tomorrow . . . Today

NYISO Virtual Trading - Average MWh per day

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Monitoring

✓ Primarily concerned that Virtual Trading does NOT cause price divergence between Day-Ahead and Real-Time. It is supposed to converge prices.
✓ Convergence between DAM and RT is monitored.
✓ Off-line Security-Constrained Unit Commitment (SCUC) is used to evaluate the DA market without Virtual Trading.
✓ The Portfolio Ownership Bid Evaluation program (PROBE) is also used to evaluate the DA market without Virtual Trading but looks at portfolio positions as well.
  ▪ Capable of monitoring, flagging, and screening the bidding patterns of generators, marketers and LSEs bidders (collectively, Portfolio Owners or “PO’s”).
  ▪ Detects incidents of possible anti-competitive bidding behavior by these PO’s in the presence (or not) of transmission congestion.
✓ Evidence of an interaction of Virtual Trading with TCCs has been observed.
Conclusion

✓ Increased convergence

  - Evidence of LBMP convergence
    - The mean yearly absolute percent deviation between DAM and RT LBMPs is decreasing
    - There is evidence that the deviation between DAM and RT is decreasing over time

  - Evidence of TCC revenue convergence
    - Virtual bidding allows DAM TCC revenues to more closely resemble the revenue the contracts would have received had they been settled with Real Time prices.

✓ Zonal virtual bids/offers.
✓ More stable Day-Ahead solution.