Introduction to the NYISO & NY’s Wholesale Electricity Markets

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Topics

- NYISO’s Origin & Roles
- NYISO Market Structure
- Markets at Work
- Integrating Renewables into the New York Electricity Market
What We Do & How We Got Here

NYISO’S ROLES & ORIGIN
The NYISO is one of nine Independent System Operators (ISOs) and Regional Transmission Organizations (RTOs) in North America.

They serve 2/3 of U.S. electricity customers & more than 1/2 of Canadian consumers.
NYISO Facts & Figures

- New York State population
  - 19 million
- Retail Electricity Customers
  - 8.1+ million
- 2015 Load Forecast
  - 160,121 GWh
- 2015 Required Installed Capacity
  - 39,273 MW
- Record peak
  - 33,956 MW (July 19, 2013)
- Power Generation
  - 700+ units
- High-Voltage Transmission
  - 11,000+ circuit-miles
- Average Annual Market Transactions
  - $7.5 Billion
- Market Participants
  - 400+
What is the NYISO?

- Independent by design, the NYISO is a non-profit, non-government organization.
- NYISO’s federally approved tariffs stipulate independence and impartiality.
- The 10-member Board of Directors — and all staff — have no direct business or financial relationships with market participants.
- NYISO’s system of shared governance provides all market participants — from electricity consumers to power providers — a voice in the operation and evolution of the marketplace.

The average electricity customer pays less than 50¢ per month for the work we do to keep the lights on throughout New York State.
Roles of the NYISO

Reliable operation of the bulk electricity grid

- Managing the flow of power on 11,000 circuit-miles of transmission lines from hundreds of generating units

Administration of open and competitive wholesale electricity markets

- Bringing together buyers and sellers of energy and related products and services

Planning for New York’s energy future

- Assessing needs over a 10-year horizon and evaluating projects proposed to meet those needs

Advancing the technological infrastructure of the electric system

- Developing and deploying information technology and tools to make the grid smarter
Power Grid Operations

*Every six seconds...*

NYISO dispatches power from hundreds of power plants...

Over thousands of miles of transmission lines...

To meet the needs of millions of electricity consumers
Reliability Standards

- NYISO answers to federal, state, and regional regulators
  - Subject to the most rigorous reliability standards in the nation
  - Meeting ~1,000 individual reliability requirements
Market Origins

- NYISO wholesale electricity markets were created through federal & state restructuring of the electric industry in the 1990s.
Designed for Progress

NYISO MARKET STRUCTURE
NYISO Markets

• The reliable supply of electricity depends on a set of markets for:
  ▪ Energy *that flows constantly through the wires*
  ▪ Capacity *needed when demand is the greatest*
  ▪ Ancillary services *that keep the system running safely and securely*
Energy Markets

• A “two-settlement process” sets the price of energy based on market and grid conditions at specific times
  ▪ The first settlement is based upon day-ahead bids and the corresponding schedule and prices, or day-ahead commitment
  ▪ The second settlement is based upon the real-time bids and the corresponding real-time commitment and real-time dispatch

• As a result of the day-ahead commitment process, a set of generators is scheduled to produce energy in each hour of the next day to match corresponding demand bids submitted by utilities and other load serving entities
  ▪ From this schedule, day-ahead prices are computed

• During real-time operation, changes in operating conditions, additional real-time supply offers, and variations in actual load will cause real-time needs to differ from the day-ahead schedules
  ▪ These differences in generation levels and in load consumption are settled at the second settlement, or real-time price.
Capacity Market

• NYISO administers an Installed Capacity (ICAP) Market to maintain adequate power supplies to meet New York’s electricity demands,
  - The capacity market enables utilities and other load serving entities to satisfy their obligations to meet the peak demands of their retail customers while also securing reserves for reliability purposes via:
    • A six-month seasonal period (Capability Period, or Strip) Auction
    • A Monthly Auction
    • A monthly Spot Market Auction
Ancillary Services

• Ancillary Services are necessary to support the reliable transmission of energy from generation resources to consumers
  ▪ Regulation and Operating Reserves
  ▪ Energy Imbalance (Market-based pricing)
  ▪ Voltage Control and Black Start (Cost-based services)
Demand Response

- Demand response resources enlist consumers who can reduce energy use during periods of high demand such as summer heat waves.
- Large power customers and aggregated sets of smaller consumers participate in several demand response programs developed in NYISO markets.

When NY set a new record peak in July 2013, demand response programs helped to “shave” the peak by about 1,000 MW.
Wholesale Energy Costs


2015 Energy Cost
Lowest in the history of NYISO markets

Includes Energy (Locational Based Marginal Price - LBMP) and Ancillary Services (NYPA Transmission Adjustment Charge – NTAC, Reserve, Regulation, NYISO Cost of Operation, Uplift Costs, Voltage Support and Black Start). Excludes Installed Capacity (ICAP).
New York State Fuel Mix
Generating Capacity by Fuel Source

Natural gas supplies 56% of statewide generating capacity
(46% is dual-fuel capacity that can use oil as an alternate fuel)

Regional Fuel Mix
Generating Capacity by Fuel Source

Lower Hudson Valley: 2015
- Gas: 14%
- Oil: 4%
- Renewable: <1%
- Hydro: 1%
- Nuclear: 14%

New York City: 2015
- Dual Fuel (Gas & Oil): 57%
- Gas: 17%
- Oil: 5%

Long Island: 2015
- Dual Fuel (Gas & Oil): 65%
- Renewables: 3%
- Oil: 24%
- Gas: 8%


Value of Competition

MARKETS AT WORK
New Infrastructure

- Locational market signals have driven investments in both generation and transmission to high demand regions

- Majority of new investments have been directed to metropolitan Southeastern NY region where both energy and capacity prices are the most attractive

80% of new generation built in South/East where demand is greatest

All new interstate transmission built in South/East
Increased Fuel Efficiency

Electricity System Fuel Efficiency: 2000-2013

Data Source: U.S. Energy Information Administration

Fuel Cost Savings

$6.4 Billion in fuel cost savings

Lower Reserve Requirements

$540 Million in savings due to reduced reserve requirements

Reduced Emissions

From 2000 through 2014...

- SO_2 94%
- NO_2 78%
- CO_2 39%

Cultivating Green Power

INTEGRATING RENEWABLES
Growing Wind Power

Wind capacity grew from 48 MW in 2003-2005 to 1,746 MW in 2015.

Wind generation grew from 112 GWh in 2004 to 3,986 GWh in 2014.

Growing Solar Power

Distributed Solar Photovoltaics in New York: Historic and Forecast
Installed Capacity and Peak Impact

- Historic Installed Capacity
- Forecast Installed Capacity
- Impact at Time of Peak Load

NOTE: Data represent "behind the meter" solar photovoltaic only.


Solar Integration

• Solar forecasting system *(under development for implementation in 2017)*
  - Day-ahead and real-time operations
  - Small number of large grid-connected solar farms
  - Thousands of small distributed units in each zone

• Solar capacity (as of September 2015)
  - 31 MW grid-connected solar farm
  - 455 MW installed nameplate capacity behind-the-meter

• Expanding capacity
  - Behind-the-meter solar capacity is growing by ~15 MW/month
  - 173 MW (from 5 large solar farms in NYISO interconnection queue) could be completed by end of 2016
Energy Storage

• NYISO -- *First grid operator in US to implement market rules enabling storage systems to participate in the markets as frequency regulation providers*

• Beacon Power 20-MW flywheel project in Stephentown -- *First full-scale flywheel energy storage facility to provide frequency regulation service in US*
For More Information

• **NYISO Markets: New York’s Marketplace for Wholesale Electricity**

• Available via NYISO website – [www.nyiso.com](http://www.nyiso.com)
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*

[www.nyiso.com](http://www.nyiso.com)