

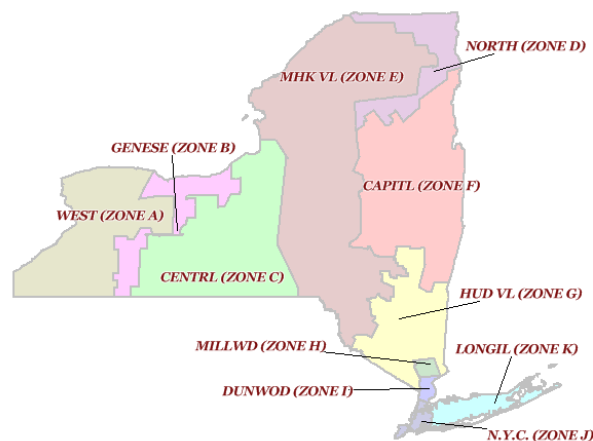


New York Independent System Operator

History and Geography of New York ISO

The New York Independent System Operator (NYISO)¹ was established as a non-profit corporation in 1999. NYISO is responsible for maintaining and enhancing reliability, establishing and overseeing competitive wholesale electricity markets, and planning the power system for the future for New York State's electrical grid. NYISO has eleven load zones². As of November 2012, NYISO dispatches approximately 39,570 MW of generating capacity and 2,173 MW of demand resources over 11,016 miles of transmission lines providing electric service to 19 million people^{3,4}. An all-time peak demand of 33,939 MW was set on August 2, 2006.

Exhibit 1 NYISO market area – load zones



Map developed by NETL. Source: ABB Velocity Suite⁵

Similar to other ISOs, a primary function of NYISO is to facilitate the energy markets in its service area, maintain minute-to-minute reliable electricity service in a cost-effective manner, manage wholesale markets, and develop bulk power system planning processes. NYISO operates the electricity (energy, capacity, and ancillary services) markets to serve load and meet reserve obligations with the lowest-cost resources possible. It has designed a locational market structure to ensure that transmission capability is used efficiently and that energy prices reflect the marginal cost of providing the service at each location. While the wholesale electric energy includes capacity and ancillary services to ensure reliable supply of power, as seen in Exhibit 2, the majority of the electricity price in NYISO is dominated by energy cost

¹ Many of the technical terms used in this primer are defined in a companion *Glossary for Power Market Primers*.

² According to the NYISO glossary, a load zone is a geographical area located within New York. All loads located within the same load zone pay the same price for energy purchased in those markets. New York ISO. (2012). *Glossary*. Retrieved on November 30, 2012, from

http://www.nyiso.com/public/markets_operations/services/customer_support/glossary/index.jsp

³ New York ISO. (2012). *NYISO Key Facts*. Retrieved on November 30, 2012, from

http://www.nyiso.com/public/media_room/key_facts/index.jsp

⁴ IRC ISO/RTO Council. (2012). *New York Independent System Operator*. Retrieved on November 30, 2012, from

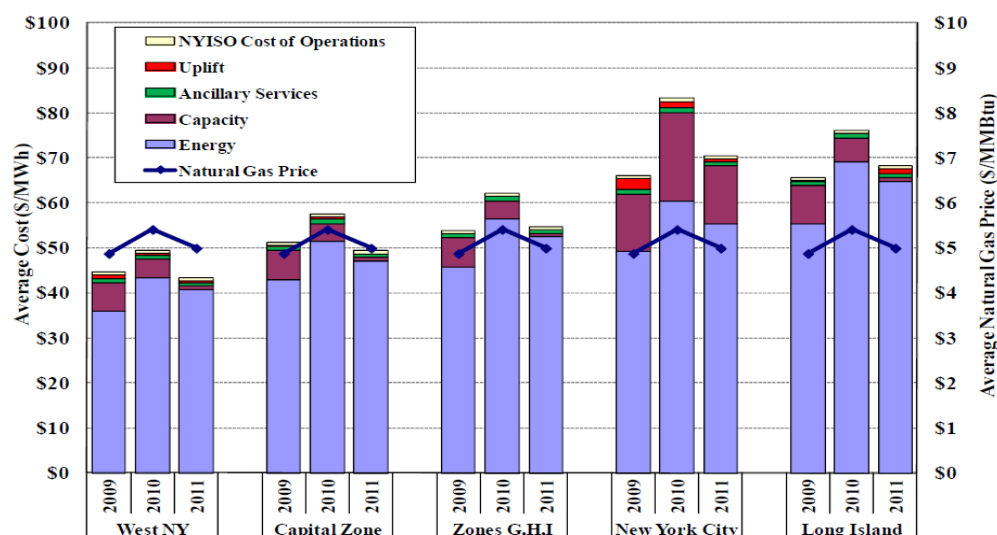
<http://www.isorto.org/site/c.jhKQIZPBImE/b.2604613/k.CC49/NYISO.htm>

⁵ ABB Velocity Suite. (2012). *Intelligent Map – NYISO Load Zones*. Retrieved on November 29, 2012, from

<https://velocitysuite.globalenergy.com/Citrix/MetaFrame/auth/login.aspx>

(i.e., the cost of generating power, which includes fuel costs, operation and maintenance for generators, and reimbursement for the capital cost of generators).

Exhibit 2 NYISO average wholesale electricity price 2009, 2010, and 2011 (\$/MWh)



(Used with permission from New York ISO. ⁶)

NYISO Products and Services

NYISO manages competitive markets that provide energy services and reliability services through a day-ahead energy market, real-time energy market, capacity market, financial transmission rights (FTR) market, and an ancillary services market. In 2011, these markets aggregated billings of over \$6.7 billion.⁷

Energy Market

NYISO's main role as an ISO is to coordinate an energy market throughout the service area, which consists of facilitating the continuous buying, selling, and delivery of wholesale electricity, providing dispatch requests to generators, and acting as a data clearinghouse. In addition to acting as a clearinghouse for bilateral power contracts, NYISO manages a day-ahead market and a real-time market for power delivery. In each market NYISO "clears the market," i.e., coordinates which generators will operate, at what time, and at what price, to meet electricity demand. The price of electricity is based on the cost of bringing the next marginal unit of electricity on line at specific locations throughout the New York control area. This method of calculating electricity price is called locational marginal pricing (LMP) or locational based marginal pricing (LBMP).

The day-ahead market clears both energy and operating reserves for each hour of the next operating day by matching energy demand bids at each LBMP node and by operating reserve requirements throughout the system with the generator's ability to provide power. Thus, NYISO ensures scheduling adequate resources to meet the next day's expected demand, taking into account physical limiting factors such as transmission capacity and the generators' scheduled maintenance.

⁶ New York ISO. (2012). *2011 State of the Market Report for the New York ISO Markets – Potomac Economics (Figure1)*. Retrieved on November 29, 2012, from

http://www.nyiso.com/public/webdocs/documents/market_advisor_reports/2011/SOM_Report-Final_41812.pdf

⁷ New York ISO. (2012). *2011 Annual Report – New York Independent System Operator*. Retrieved on November 29, 2012, from http://www.nyiso.com/public/about_nyiso/nyisoatagance/annual/index.jsp

Generators participate in the real-time market by submitting bids to provide electricity at a certain price at least 75 minutes prior to the identified hour of operation (i.e., the hour in which the generator proposes operating and providing the electricity). NYISO then sends the generator's dispatch signals every five minutes based on the current demand and the generator's bid price—with the lowest-cost resources dispatched first.⁸

Installed Capacity (ICAP) - Capacity Market

NYISO established a forward capacity market, ICAP, to provide appropriate price signals to attract new generation, transmission and demand resource investments, and maintain existing resources in order to ensure the reliability of the New York bulk power system.⁹ The capacity market ensures resource adequacy, guarantees market stability, and provides price signal for investments. Load-serving entities (LSE) are responsible for contracting for capacity services above and beyond the anticipated demand in their service area. Thus, LSEs calculate a share of expected-peak demand and add an additional amount for the installed reserve margin. NYISO conducts a capability period auction at least 30 days prior to the start of the capability period, a monthly auction at least 15 days prior to the start of the month, and a spot market auction two to four days prior to the start of the month.

Ancillary Services Market

NYISO facilitates an ancillary services market to ensure the reliability of electricity production and transmission. The ancillary services include operating reserve and regulation as well as frequency control.

Operating reserve service provides backup generation in the event of a system contingency, such as unexpected failure of generator, transmission line, or other electrical equipment. The operating reserve must be from units and demand-side resources within the New York control area or reserve sharing agreements. The operating reserve market is a locational reserve market where the clearing prices are based on the cost of serving the next increment of reserve at specific locations throughout the New York control area.⁹

Regulation service allows NYISO to manage small changes in the system's electrical load by increasing or decreasing the generator's output by sending a control signal to adjust output every six seconds. The regulation service is accomplished by committing online generators, demand-side regulation providers, and limited energy storage resources in day-ahead and real-time markets. The regulation clearing price is computed based on the actual cost to provide the next available MW of regulation.⁹

NYISO offers two specialized ancillary services: voltage support and black-start capability. The voltage support is used to maintain transmission voltage in real-time while black-start capability is used to restart the transmission system following a system-wide blackout.⁹

Transmission Congestion Contracts (TCC)

The TCC market provides a financial instrument for market participants to hedge against congestion costs in the system, and they are settled in the day-ahead market only. In the absence of any transmission constraints, all LBMP nodes would price at the lowest-priced generation resource. However, there is not enough physical transmission to deliver electricity from low-cost resources to the place demanding the electricity at all times. Thus, some nodes will, by necessity, use power from higher-cost resources and therefore the LBMP at that node will be higher. The difference in LBMPs between two nodes that is attributable to the transmission constraints multiplied by the transfer amount is called "congestion cost" or "the cost of congestion," because, but for the lack of transmission capacity, a lower-cost resource would be used to meet demand. A TCC can be thought of as a "reservation" for access to a specific transmission

⁸ New York ISO (NYISO). (2012). *Market Participants User's Guide (June 2012)*. Retrieved on November 29, 2012, from http://www.nyiso.com/public/markets_operations/documents/manuals_guides/index.jsp

⁹ New York ISO (NYISO). (2011). *Previous Course Materials: Ancillary Services*. Retrieved November 18, 2011, from http://www.nyiso.com/public/markets_operations/services/market_training/library/index.jsp

path (e.g., between LBMP nodes) for a specific timeframe, but does not actually correspond with a physical right to deliver energy. Rather, a TCC will create a revenue stream (or charges) based on the difference between two day-ahead LBMP prices at specific times.

Transmission Planning and Resource Adequacy

NYISO is responsible for maintaining the operations and reliability of the grid in its service area and, as such, conducts periodic reviews of grid adequacy. NYISO and its stakeholders developed a comprehensive system planning process that includes local transmission owner planning process, NYISO's reliability planning process, congestion assessment, and resource integration study. The output of this process is a comprehensive reliability plan for the 10-year study period that is used for economic planning. The NYISO does not have the authority to license or construct projects, but it monitors progress of the proposed projects and reports its findings annually.

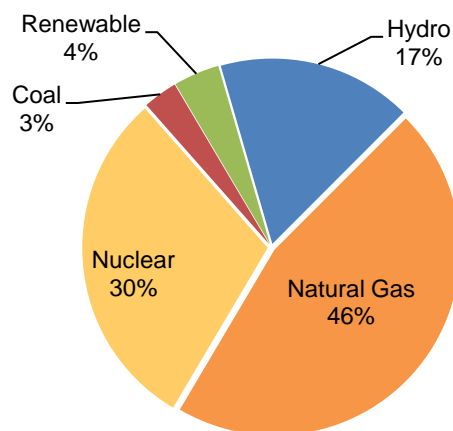
Tariff Administration

As an ISO, NYISO is responsible for administering its "Open Access Transmission Tariff." This tariff is filed with the Federal Energy Regulatory Commission (FERC) and outlines how NYISO will determine rates for transmission service, evaluate and approve requests for transmission service, perform transmission impact studies, and coordinate use and administration with other transmission providers in the region, among other activities. With FERC's approval of the tariff, NYISO is the sole decision-making authority on the provision of transmission service in accordance with the tariff. However, in the case of a dispute, when the dispute cannot be solved internally, it may be submitted to non-binding mediation or arbitration, or may commence legal proceedings before FERC or a court of competent jurisdiction.¹⁰

NYISO Generation Profile

While NYISO does not own or directly operate power generation facilities, it is responsible for managing scheduled outages for maintenance and maintaining reliable electricity service at the lowest cost possible, as provided by the different generators on the system. Thus, to maintain reliability, NYISO continually evaluates the fuel mix of generation assets in the region. As seen in Exhibit 3, the majority of the region's power comes from natural gas generation facilities.

Exhibit 3 New York ISO generation by fuel type (as of December 2012)¹¹



¹⁰ NYISO. (2013). *MST 11 Dispute Resolution Procedures*. Retrieved on January 17, 2013, from http://www.nyiso.com/public/webdocs/markets_operations/documents/Tariffs/Market_Services/Tariff_Documents/NYISO_MST_11_Dispute_Resolution_Procedures.pdf

¹¹ ABB Velocity Suite. (2012). *Power/Regional Report Analysis/ISO Region/New York ISO*. Retrieved December 3, 2012, from <https://velocitysuite.globalenergy.com/Citrix/MetaFrame/site/default.aspx>