NYISO Markets

New York’s Marketplace for Wholesale Electricity
Competitive wholesale electricity markets preserve system reliability with pricing signals that attract investments to the grid when and where they are needed. They place a value on energy that reflects system conditions, and shift the risks for investment in the grid from consumers to investors. By creating an atmosphere of financial discipline, NYISO markets drive efficient solutions to meet reliability needs in a least-cost manner. NYISO designs, refines, and administers its markets in a manner that seeks optimal economic efficiencies to provide reliable supply of electricity, attracting investment when and where it is needed to address reliability needs.

Markets Complement Environmental Quality

The design of NYISO markets encourages generators to reduce costs and maximize efficiencies, or risk being left out of the supply mix in favor of less costly resources. This economic discipline encourages investment in facilities that most efficiently convert fuel into electricity. Improved generator efficiencies result in fuel savings, reduced emissions, and lower operating costs. In regulated markets, generators have less incentive to improve their operational efficiencies because the revenues they receive are typically guaranteed and based on the costs associated with the generator rather than the value of the energy it produces. Competitive markets favor resources with lower operating costs or fuel expenses, such as wind power and hydroelectricity; because these resources tend to be less costly to operate than those that burn fuels that require extensive emissions controls.
Markets Cultivate Innovation

America’s most prolific inventor, Thomas Edison, once remarked, “I can only invent under powerful incentive. No competition means no invention.” The competitive marketplace for electricity cultivates innovation by providing a level play field, through open access to the grid. Markets offer rewards commensurate with risk and make those rewards transparent to facilitate informed investment decisions. The NYISO’s competitive markets for wholesale electricity have fostered innovations relating to the development of demand-side resources, renewable energy, and new energy storage systems.

Markets Work in Harmony with Planning

The considerable lead-time required to build grid-level projects makes long-term system planning essential to sustaining the electric grid. Planning works within a competitive marketplace by identifying needs rather than dictating solutions. NYISO’s planning processes provide comprehensive technical analysis of emerging reliability needs as well as an economic assessment of the cost to consumers of transmission system congestion. The results of these analytical processes are presented to the New York marketplace where the NYISO solicits solutions to reliability needs and congestion costs directly from market participants, who may offer increased transmission capacity, increased generation capacity, demand response resources, or any combination of these resources to meet the identified needs. In response to federal directives, the NYISO is implementing complementary planning processes to address transmission system investment needs driven by public policy requirements and goals adopted by government entities.
NYISO Markets in Brief

NYISO’s competitive markets are carefully designed to drive reliability and efficiency to ensure that New Yorkers from the heart of Manhattan to the remote stretches of the Adirondack wilderness have the electricity they need in their daily lives. The NYISO has created a number of wholesale energy market products and services that support a reliable, efficient, and environmentally sound bulk power system.

ENERGY MARKETS

The energy market provides a mechanism for Market Participants to buy and sell energy at prices established through a competitive auction process designed to meet energy demands, or “loads,” with the least-cost resources available; or, through contractual, bilateral transactions where quantities and prices are arranged directly between wholesale suppliers and “load-serving entities” (LSEs) such as utilities. For energy purchases arranged through the NYISO’s auctions, the NYISO administers day-ahead and real-time auctions, resulting in a two-settlement process that sets the price of energy based on market and grid conditions at specific times. Further, the NYISO’s auctions reflect geographic conditions, establishing “Locational Based Marginal Prices” (LBMP) for energy that reflect local demand and supply conditions as well as any constraints that may exist when moving energy across the grid to meet demand. The first settlement is based upon the 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 (RTC) and real-time dispatch (RTD). Market Participants may participate in the DAM and/or the real-time market. Roughly 94% of energy is scheduled in the day-ahead market, while the remaining 6% is accounted for in the real-time market. About 40% of the energy settled in the day-ahead market is scheduled through bilateral contracts.

As a result of the day-ahead commitment process, a set of generators is scheduled to be available for dispatch in each hour of the next day and a set of LSEs is scheduled to buy a certain amount of load at the day-ahead price. The generators designated to be available for the next day are scheduled against the LSE bid-in load and transmission losses. From the schedule, LBMPs are computed, and forward contracts are established for generation and load accordingly. Subsequently, during real-time operation, changes in operating conditions, the influence of additional real-time supply offers, and variations in actual load will cause the real-time schedules and prices to be different from the day-ahead schedules and prices. Differences in generation levels and in load consumption, as compared to the first settlement values, are settled at the second settlement, or real-time price.

CAPACITY MARKET

As invaluable as uninterrupted electric service may be for New York’s residents and businesses, reliability must be affordable. In the NYISO’s markets, making reliability affordable starts with clearly defining the need for capacity in order to meet projected demand levels plus reserve margin requirements, and relying on competitive market efficiencies to offer enough capacity to meet those needs and requirements at the least possible cost. The requirement levels are established so that the peak demands of retail customers can be met.

In order to ensure that New York State has

MARKET OUTCOMES
From 2000-2014, New York added
- 10,000+ MW of new generation capacity
- 2,300+ MW of new transmission capability
- 1,100+ MW of demand response resources
adequate capacity available to meet the electricity demands, the NYISO administers an Installed Capacity (ICAP) Market. The ICAP Market provides a means for LSEs to purchase capacity from suppliers to satisfy their respective obligations to address the peak demands of their retail customers. This market is facilitated by the NYISO through a series of auctions where suppliers offer their capacity, and LSEs bid to purchase the capacity. Approximately 45% of the state’s capacity requirements are transacted through the NYISO-administered capacity auctions, at an annual dollar volume of over $850 million. Due to transmission constraints into certain areas, some LSEs must procure at least some of their ICAP requirements from resources electrically located within that region. New York has such locational requirements for New York City, Long Island, and the lower Hudson Valley combined with New York City (the “G-J Locality”).

The NYISO conducts three types of capacity auctions: the six-month seasonal period – or Capability Period (Strip) Auction, the Monthly Auction, and the monthly Spot Market Auction. These auctions provide the LSEs with the opportunity to secure the required capacity and suppliers to offer their capacity in an open and competitive market environment. The market is designed to “stack” the offers from lowest to highest, and then move up the supply curve in price until demand and reserve requirements are satisfied. This creates incentive for capacity providers to be efficient and cost effective in order to be selected. Further, it creates price signals for new capacity to enter the market if it can supply capacity at prices below the clearing price. At the same time, the market provides price signals for existing suppliers to exit the market if they are unable to beat the clearing price.

**DEMAND RESPONSE**

Demand Response resources allow energy users to participate in the NYISO’s competitive wholesale markets by removing demand from the grid, effectively helping to lower wholesale prices for all consumers by reducing the supply needed to meet demand while also potentially avoiding reliability problems in times of supply shortages.

The NYISO administers reliability-based programs, the Emergency Demand Response Program (EDRP), the ICAP Special Case Resources (SCR), and a Targeted Demand Response Program that is limited to Con Edison’s service territory. These programs provide load reduction in response to NYISO directives for a discrete period of time to supplement generation when operating reserves are forecast to be short or when there is an actual Operating Reserve Deficiency. Resources in the SCR program are allowed to participate in the NYISO’s ICAP market where, if selected, they receive capacity payments for the “declared value” of the demand reduction they can offer to

Demand Response provided more than 1,000 MW of peak-shaving load reduction when a record peak of 33,956 MW was set on July 19, 2013.
the market. NYISO imposes mandatory testing requirements for Demand Response providers to ensure that they receive payment for only their demonstrated capability.

The NYISO’s economic-based programs provide load reduction as a competitive alternative to increased generation capacity and are scheduled in the market by the NYISO in a comparable manner as generation based on the offers received. The economic-based demand response programs include the Day-Ahead Demand Response Program (DADRP) and the Demand-Side Ancillary Service Program (DSASP). Both programs allow the resource provider to determine when to participate in the market by allowing them to bid as a supply resource.

ANCILLARY SERVICES MARKETS

Ancillary Services are services necessary to support the transmission of energy from generation resources to consumers, while maintaining the reliable operation of New York’s transmission system. These services include Regulation and Operating Reserve, Energy Imbalance (using market-based pricing), and the cost-based services of Voltage Control and Black Start. By selecting units with the lowest total production cost to provide these ancillary services, the NYISO minimizes the cost of serving load.

Regulation Service is the continuous balancing of resources with load to assist in maintaining scheduled interconnection frequency at 60 Hz. This is accomplished by committing on-line generators with output that is raised or lowered as necessary using Automatic Generation Control to follow moment-by-moment changes in load.

Voltage Support Service is the ability to produce or absorb reactive power and the ability to maintain a specific voltage level subject to the limitations of the resource’s stated reactive capability.

Black Start is the ability of a generating unit to go from a shutdown condition to an operating condition, and start delivering power without assistance from a power system.

TRANSMISSION CONGESTION CONTRACT (TCC) MARKET

A Transmission Congestion Contract (TCC) may be procured by market participants through competitive auctions and represents the right to collect, or obligation to pay, the Day-Ahead Market Congestion rents associated with the movement of energy between a specified point of injection and a specified point of withdrawal. TCCs are financial instruments used to hedge costs resulting from transmission system congestion, effectively enabling market participants to buy through any transmission congestion constraints in order to deliver power from a point of injection to a point of withdrawal. It provides an economic signal by placing a value on transmission congestion, allowing market participants to determine what “premium” they are willing to pay to move power from one point to another before investment is needed to either alleviate or avoid transmission constraints.

**Competition Sparks Efficiency**

Power plant availability increased more than 10% since onset of markets in New York, providing the equivalent of nearly 3,300 MW of additional generation.

Power plant fleet efficiency also increased from 2000 to 2012, with a 30% improvement in the system-wide heat rate.
INTEGRATION OF RENEWABLES

The NYISO seamlessly integrates wind energy resources into the operation of the grid. Due to its variable nature, wind resources complicate grid operations by introducing uncertainty as to the amount of energy production that can be relied upon to meet demand. By incorporating a centralized wind forecasting tool, the NYISO is better able to plan for wind resources, scheduling other resources around the availability of wind in both the day-ahead and real-time markets.

To further our ability to support the development of wind resources, NYISO has integrated wind resources into its Security Constrained Dispatch procedures. By enabling wind resources to indicate their economic willingness to generate, the NYISO can signal wind operators to curtail output in order to avoid potential reliability problems based upon the price established by the wind operator. This process minimizes limitations on wind energy and allows the NYISO to use market-based signals to identify the most cost efficient resources to avoid potential reliability problems that might arise if wind facilities were to continue to produce at the full level afforded by the “fuel” availability.

By incorporating a centralized wind forecasting tool the NYISO is better able to plan for wind resources, scheduling other resources around the availability of wind in both the day-ahead and real-time markets.

SHORTAGE PRICING

The NYISO was the first ISO to establish a shortage pricing protocol to establish a pricing mechanism during periods of supply shortages. At times when demand approaches the amount of available supply, the NYISO’s shortage pricing initiative uses a demand curve in the day-ahead and real-time markets to develop prices for the energy and ancillary service products so that the markets clear with an established price reflective of the level of the shortage, even when the desired reserves are not available at any price. This approach ensures prices are set in a manner that does not exceed the economic value of the product. The program provides a transparent price
signal to the market, placing a clear value on reserve capacity and protects consumers during shortage situations by ensuring prices reflect costs so that consumers pay no more than is necessary to maintain reliability.

Scarcity pricing provides transparent price signals that place a clear value on reserve capacity and protect consumers during shortage situations by ensuring prices reflect costs so that consumers pay no more than is necessary to maintain reliability.

TREATMENT OF VIRTUALS

The NYISO was the first ISO to implement a Virtual Trading feature in its energy markets, effectively improving the efficiency and accuracy of the day-ahead energy markets by allowing market participants to schedule financial transactions that arbitrage the price difference between the day-ahead market and the real-time market. Virtual trading reduces the risk premiums in the day-ahead markets by allowing market participants to account for uncertainties such as wind resource output, weather changes or unexpected transmission outages. Virtual trading results in a more efficient and competitive selection of resources to meet real-time conditions and encourages participation in the day-ahead market.

Virtual transactions are financial transactions only. No physical energy is traded as a result of these transactions. These financial transactions serve to influence the price of energy in the day-ahead market with the goal of converging day-ahead and real-time prices to optimize market efficiency. Convergence between day-ahead and real-time prices generally signals that an efficient set of resources are being scheduled and costs to consumers are reduced.

With adoption of virtual trading, price disparities - as well as the volatility of the differences - between Day Ahead and Real Time markets have been reduced.

ADJUSTING BIDS IN REAL TIME

Fuel-price volatility creates uncertainty for generators participating in the day-ahead market as they offer into that market without full knowledge of the price of the fuel that they need to purchase in order to produce the energy they commit to the market. Without the ability to account for this uncertainty, generators run the risk of offering prices into the market that do not accurately reflect their costs, creating potential for insufficient returns if the price of their fuel escalates and their actual costs no longer reflect the assumed costs factored into their initial offer.
The ability for generators to increase the offer price of energy already scheduled day-ahead provides an opportunity to manage the risk of these unexpected fuel cost increases and protects reliability by allowing resources to remain available. The opportunity to re-offer energy already scheduled day-ahead at a higher price in real-time allows generators to reflect the cost implications of circumstances that arose following the day-ahead commitment, such as fuel outages or fuel cost increases. Consumers otherwise potentially pay inflated prices for energy supplies to help generators hedge against the prospect of fuel price increases after their offers have been accepted. Generators able to update their real-time offers in the event of real-time cost increases may include a lower risk premium in their day-ahead market offers, appropriately benefiting loads by moving the risk for potential cost increases to the real-time market. The ability additionally enhances reliability by providing resources an alternative to removing themselves from physical operation.

Adjusting bids in real time ensures that submitted bids reflect actual costs rather than hedges against fuel price volatility, benefitting consumers by ensuring the price paid for supply in the market is no more than is necessary to meet energy needs reliably.

The NYISO is the first ISO/RTO to allow generators to increase their day-ahead offers in real time, which ensures that submitted offers reflect actual costs rather than hedges against fuel price volatility.

ENERGY STORAGE RESOURCES

In 2009, the NYISO became the first grid operator in the nation to implement federally approved market rules and systems for Limited Energy Storage Resources (LESR) such as flywheels or advanced battery systems. They assist in balancing supply with load to maintain the proper frequency on the grid. Such resources may play a significant role in helping to accommodate increasing levels of variable energy resources, such as wind, with minimal environmental impact as they are capable of ramping up or down with no direct emissions.

REAL-TIME COMMITMENT: LOOK AHEAD AND PRICE FORMATION

The NYISO has designed its market to complement the real-time dynamics of conditions on the grid. Through its Real-Time Commitment (RTC), executed every 15 minutes, the NYISO consistently looks out over a 2.5-hour horizon to make economically-based decisions about start-up and shut-down of resources to maintain system balance, as well as decisions about transactions scheduled across market borders. During periods of generation resource over commitment, prices are effectively artificially suppressed, causing generators to lose revenue and resulting in “uplift” charges, ultimately borne by consumers, to make them whole. Under commitment of resources results in unnecessary price spikes, also borne by consumers. To make the most efficient use of the available resources, NYISO continually adjusts the energy and reserve schedules on resources through the use of its simultaneous co-optimization software algorithms. By more efficiently scheduling these resources, NYISO is optimizing the efficiency of the market by reducing the level and extent of resource over- or under-commitment.
Another feature unique to the NYISO market that further serves to minimize the need for uplift charges is the manner in which the NYISO markets’ price Gas Turbines (GTs). Through its hybrid pricing feature, the NYISO is able to acknowledge the operational constraints of these resources in its physical dispatch, but treat them as flexible resources for pricing purposes in order to achieve more efficient pricing signals.

The NYISO has implemented five-minute settlements in its real-time markets to provide added incentive for resources to ramp up or down rapidly in response to price signals that reflect the need for more or fewer resources to maintain reliability. Five-minute settlement rewards resources for actively following the NYISO’s schedules and encourages resources to provide more flexibility in their operation to maximize their opportunities in the market. The ability to settle in five-minute increments is another tool the NYISO uses to balance supply with demand under dynamic operating conditions.

The NYISO settles its market in five-minute increments, giving suppliers accurate price signals as incentive to respond to dynamic load conditions.

Near-term focus on capacity enables more certainty over the accuracy of forecasts, providing greater assurance that the prices established in auctions are truly reflective of market needs.

While NYISO Market Participants can and do enter into forward bilateral capacity market contracts and other transactions to hedge against capacity price risks, and can participate in the forward Strip and Monthly Auctions coordinated by the NYISO, LSEs have no obligation to secure capacity prior to the Spot Market Auction.

To provide visibility into longer-term capacity needs, the NYISO and its Market Participants rely on the NYISO’s Comprehensive Reliability Planning Process (CRPP),
CAPACITY MITIGATION MEASURES

To guard against the opportunity for Market Participants to exploit market rules or unduly influence the Market Clearing Prices in order to unfairly gain economic advantage, the NYISO monitors market outcomes, and Market Participant conduct. The NYISO’s ICAP market mitigation measures are designed to monitor the capacity market for the exercise of market power and allay its impacts when necessary.

In the Capacity Market, the NYISO has adopted rules for applying “supplier side” and “buyer-side” mitigation measures to restrict buyers and sellers of capacity from exercising market power in their bidding strategies.

In New York City and G-J locality, supplier side mitigation measures are placed on any capacity provider deemed to be a “Pivotal Supplier,” i.e., a capacity provider that controls a specified amount of unforced capacity and that controls unforced capacity necessary to meet the Locational Minimum Installed Capacity Requirement in an ICAP Spot Auction. Any entity deemed a Pivotal Supplier is required to offer all capacity under its control at the time of the Spot auction at the identified reference price. This measure is designed to prevent that entity from withholding capacity in order to raise prices by creating an artificial scarcity.

The buyer-side mitigation measures are designed to prevent “uneconomic entry” of capacity that would artificially suppress capacity prices. All new capacity entering the New York City and the G-J locality markets is subjected to two different tests to determine if they are exempt under either. If the new capacity is not exempt, it is subject to a capacity price offer floor. The offer floor is set at the lower of the provider’s own cost or the price calculated based on the ICAP Demand Curve (referred to as the default Offer Floor). Establishing a capacity price offer floor for new market entrants helps to avoid situations where capacity providers might use out-of-market revenues to reduce their bids, establishing an artificial pricing signal that could ultimately force other capacity providers out of the market or obscure the possible need for additional capacity in order to preserve reliability.

ZONAL-BASED CAPACITY PRICING: ALL MEGAWATTS ARE NOT EQUAL

The value of capacity depends heavily on the location of that capacity, particularly because the transmission system faces congestion and constraints that limit the ability to deliver energy from one region of the state, where it may not be needed, to another region where it is needed. By establishing capacity zones that recognize transmission
constraints that are preventing supply from reaching those areas, the NYISO’s capacity market reflects the value of capacity in each region. Allowing prices to move higher in a location sends a price signal to market participants that additional capacity in this area is more valuable. As a result, Market Participants and potential developers have a signal to invest in, or develop new capacity.

**MARKET-ORIENTED LONG-TERM PLANNING**

Underlying the NYISO’s planning process is a market-based philosophy that strives to achieve market-based solutions whenever possible. NYISO markets and location-based marginal pricing provide strong pricing signals to identify investment needs while allowing developers and investors to assess the risks of such investments.

Capacity zones serve as a tool to signal the value of capacity in each region. Capacity additions in New York have been responsive to market signals -- with 80% of new capacity being located east of transmission constraints that block capacity deliverability from upstate generators to downstate markets.
Reliability Planning -- NYISO's Comprehensive Reliability Planning Process (CRPP) establishes a 10-year planning horizon within which the NYISO seeks to identify any reliability needs resulting from possible transmission security or resource adequacy requirements. If, in this Reliability Needs Assessment, the NYISO finds reliability needs at any point in the planning timeframe, the process seeks market-based solutions as well as regulated backstop solutions should the market solutions fail to materialize. These solutions are "resource neutral" and can include investments in new generation capacity, new transmission capacity, or demand response resources that serve to preserve reliability by reducing demand. If a regulated backstop solution is chosen, the costs are assessed on a "beneficiaries pay" principle where ultimately those in need of the solution to maintain reliability of the system are responsible for providing cost recovery in a manner comparable to the level of benefit they receive.

Economic Planning -- The NYISO incorporates an economic planning process to help assess where market inefficiencies currently exist, in the form of transmission congestion, so that market participants can develop infrastructure investment strategies to reduce or eliminate those inefficiencies. The NYISO's Congestion Analysis and Resource Integration Study (CARIS) works to assess the economic needs of the system by identifying the most congested elements of the grid and providing that information to the market for potential solutions to alleviate that congestion. Like the CRPP, CARIS looks out ten years to identify the most congested elements of the grid, studies them, and then seeks proposals to reduce the congestion. Evaluation of each proposal includes analyzing the benefits, identifying the beneficiaries, and allocating the costs of the proposals according to the same "beneficiaries pay" principle as applies to reliability planning. Moving forward with a proposed solution under CARIS requires approval from 80% or more of those market participants identified as beneficiaries.

Public Policy Planning -- Consistent with FERC Order 1000, the NYISO is implementing a complementary planning process to identify potential transmission solutions for needs driven by public policy. In some cases, market forces alone will not serve to support system investments for needs beyond reliability and economic efficiency. State and federal policy makers often desire to see specific outcomes in the energy sector, such as increased renewable resource penetration, that the market would not support on its own based on typical cost/benefit analysis. The process NYISO has adopted to comply with FERC draws on NYISO's experience with its reliability and economic planning processes, seeking solutions to needs identified by public policymakers, evaluating the costs and benefits of those solutions, and determining cost allocation based on the same "beneficiaries pay" approach.

“In many respects, NYISO stands as a model of a well-functioning electric market that relies extensively on competitive markets to provide benefits to the state's electricity consumers.”

How Today’s Markets Developed

During the 1990s, frustration with “perceived shortcomings of traditional cost-based regulation” contributed to the enactment of the Energy Policy Act of 1992, which among other things removed the impediments to wholesale competition.

Under authority granted by the new law, the Federal Energy Regulatory Commission (FERC) initiated the restructuring of the electric industry in 1996 by requiring that transmission lines be open to competition. FERC suggested formation of independent entities to manage the transmission facilities as a possible means to assure open, nondiscriminatory access. FERC also called for the unbundling, or functional separation, of services for generation, transmission and distribution, and ordered the power pools in the Northeast to open their membership to other entities.

In New York State, the PSC outlined its plan for the state’s future regulatory regime and structure of a competitive electric industry in 1996. The PSC’s vision included an electric system “operated by an entity that is independent of all energy suppliers who are participants in the new competitive market. Along with a market exchange mechanism that will determine the price of generation, a system operator will ensure customers continue to enjoy the high level of reliability that exists today.”

The PSC proposed to deal with concerns about market power by having the existing vertically integrated utilities divest either generation or transmission and distribution facilities and “strongly encouraged” the divestiture of generation facilities.

This confluence of Federal and State actions led the electric utilities and power authorities of the New York Power Pool to propose the formation of an independent system operator (NYISO) in a filing with FERC that was approved in 1997. The NYISO assumed operational control of the power grid and began the operation of competitive wholesale electricity markets in December 1999.

Under the unique shared governance system established with the creation of the NYISO, an independent Board of Directors works with stakeholders – transmission owners, generation owners, other suppliers, end-use consumers, public power and environmental parties – in the ongoing operation and design of New York’s marketplace for electricity.

NYISO stakeholders share responsibility with the NYISO Board in developing and approving proposed changes to the NYISO’s governing documents, including its federally-approved tariffs. By maintaining an open, collaborative process, the various elements of the NYISO’s mission and expanding roles are better understood by all who participate. This interdependent system and commitment to consensus building is an invaluable asset as the NYISO moves forward to address future challenges.
The New York Independent System Operator (NYISO) is a not-for-profit organization responsible for operating the state’s bulk electricity grid, administering New York’s competitive wholesale electricity markets, conducting comprehensive long-term planning for the state’s electric power system, and advancing the technological infrastructure of the electric system serving the Empire State.