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NEW YORK INDEPENDENT SYSTEM OPERATOR

# POWER TRENDS 2010

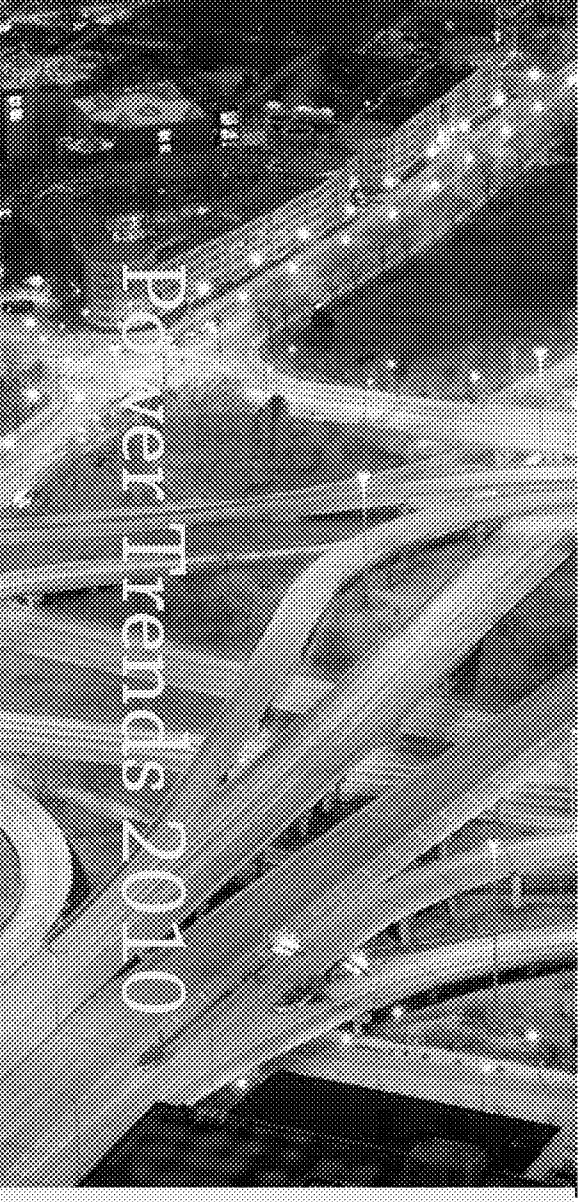
economy

environment

technology

energy

## NEW YORK'S EMERGING ENERGY Crossroads




# Table of Contents



NEW YORK'S EMERGING ENERGY

# Crossroads

# List of Figures

Power Trends 2000
NETWORKS EMERGING FROM
Crossroads

# Executive Summary

New York is facing an emerging energy crossroads. As we look ahead, there are a number of challenges that will shape the outlook not only for electric power, but also for our state's economic vitality and environmental sustainability.

The primary concern is the state of the economy. The recession continues to challenge consumers and businesses, as well as local and state governments. While energy prices have declined as the price of fuel dropped, the pace of economic recovery will be a key driver in determining future energy consumption patterns and related changes in electricity market dynamics.

Improving New York's fuel diversity is an important challenge that still needs to be addressed. Without the continued development of new and renewable power resources, the state will remain at the mercy of volatile fossil fuel markets.

In addition, energy efficiency remains a major area of focus. The recent economic downturn depressed the use of electricity, but recovery can be expected to spur a resurgence of power demands. The production and use of electricity must become more efficient, as must the power system itself.

Technology is also being developed that could revolutionize the power system, but without careful planning and considered action, the promise of Smart Grid technologies and electric vehicles may be delayed or left incompletely realized.

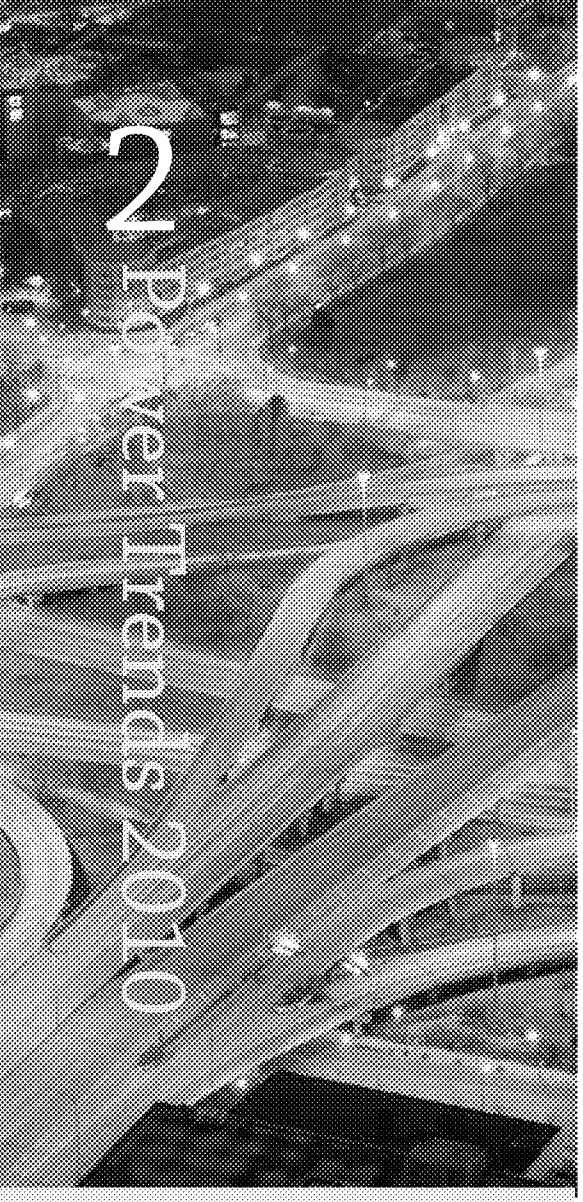
A key development in the New York power system is adjusting to the variable nature of wind power, which is among the fastest growing energy resources. Additional balancing, storage, and ramping capabilities through new technology deployments and broader regional resource management will be vital to meeting the Empire State's renewable power goals without a degradation in reliability.

The full benefit of wind power and other variable, renewable resources can be accomplished with a combination of new technologies (such as advanced energy storage systems) and removing barriers to trade among regional power markets. Improved coordination will strengthen the ability of grid operators to adjust to the dynamic changes in system conditions, such as the ebb and flow of wind power.

Fortunately, steps are being taken to address these and other challenges:

- *New York State has set ambitious goals for encouraging conservation, energy efficiency, and renewable power.*
- *The NYISO's planning, grid operations, and market design processes work in unison to provide a foundation for reliability while facilitating the integration of renewable resources into the power system and identifying the most beneficial areas of future resource development.*
- *In addition, collaboration continues between New York and its neighbors to most efficiently use the region's resources to serve the energy and reliability needs of the Northeast.*

Many of the energy choices we face are not easy. New York's leadership in the field of energy, however, depends upon seeing opportunities in the challenges that lay ahead. Through hard work and continued collaboration among market participants, policy makers and regulators, we can hone the vision needed to provide a brighter future for New Yorkers.





# Introduction

Over the past decade, New York's electricity outlook has improved dramatically.

In 2001, New York faced a widening generation gap. The New York Independent System Operator (NYISO), among others, projected that available generation would be incapable of reliably serving increasing levels of electricity use. New York was at a crossroads. Without concerted effort, the issue stood to threaten system reliability and increase the cost of electric power, particularly in the downstate region.

Fortunately, the calls for action were heeded, and today the state has a sufficient supply of generation for years to come.

In 2010, another set of energy crossroads are emerging, and the choices we make will similarly determine the electricity outlook going forward. A host of issues and challenges lay ahead. At stake are the economic vitality and environmental sustainability of the Empire State, as well as the technological future of the power system.

A number of variables have the potential to impact New York's energy future – for better or worse. These include the adoption of Smart Grid technologies, the impact of energy efficiency programs, the development of electric-powered vehicles, the achievement of renewable energy goals, the effect of fuel cost changes, and the emergence of carbon controls and increasingly rigorous environmental standards. Perhaps of most importance is the pace of economic recovery, as this will have a significant impact on all of the foregoing items.

In this report we look at each of these variables, and examine the opportunities and risks associated with them. While the ability of the NYISO, or any other single party, to exert influence on many of these issues may be limited, they demand our attention as they will have a significant impact on consumers, the markets, and the future of the power system.

# Where We Have Been

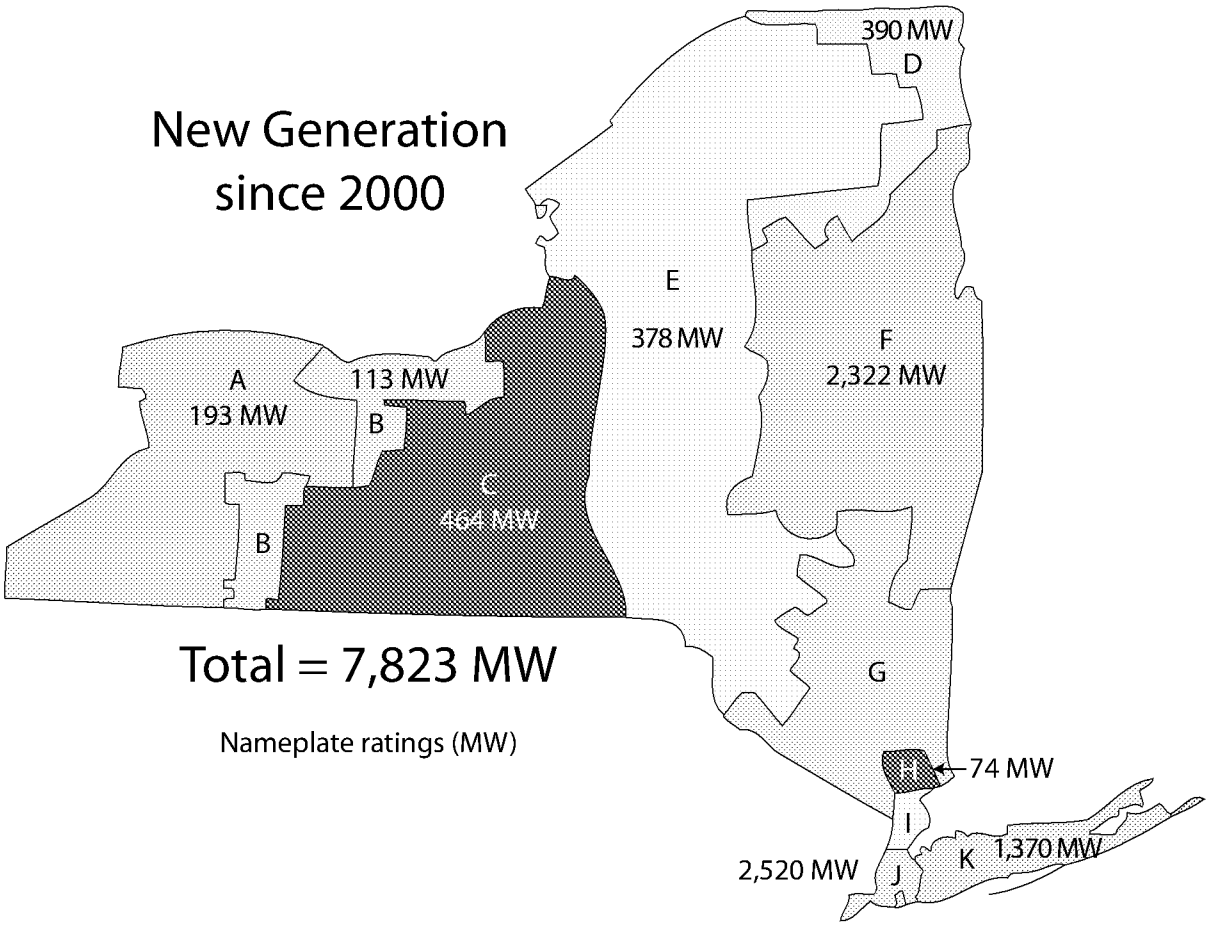
The transformation of the electricity outlook in New York over the past ten years has been remarkable.

In 2001, with competitive markets in their infancy, a crisis appeared on the horizon. That year the NYISO issued a report called *Power Alert: New York's Energy Crossroads*, which cautioned that, if nothing was done to increase New York's electricity resources, "Prices will rise. Reliability will decline. Air quality will decline."[1]

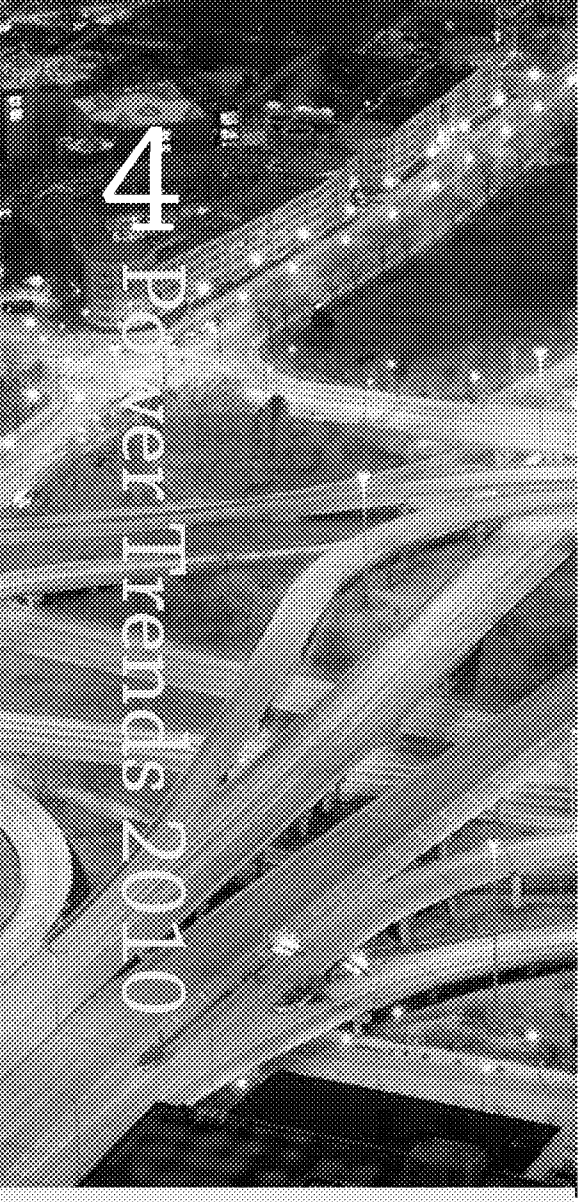
The report recommended an increase of thousands of megawatts of new generating capacity, with a significant portion located in New York City. Additional reports were issued in subsequent years, providing progress reports, and continuing to bring the urgency of the problem to the fore. Thanks to the efforts of many, the issue was addressed by the addition of new generation, demand response, and interstate transmission.

Since 2000, over 7,800 megawatts (MW) of new generation have been built by public and private suppliers, with 80 percent sited in New York City, on Long Island and in the Hudson Valley, the regions where demand is greatest. [See Figure 1.] Over 1,200 MW of transmission capability have been added to bring more power to the downstate region from out of state. [See Figure 2.]

***Figure 1. New Generation in New York State: 2000-2009***




1 *Power Alert: New York's Energy Crossroads*, New York Independent System Operator, March 2001.



# 4 Power Trends 2010

As we look back on a crisis averted, it is easy to forget the challenges that had to be overcome. Yet, through addressing these challenges, New York enjoys a much different electricity outlook today.

The ability of a bulk electric power system to meet the needs of all electricity customers at all times is established by rigorous standards. The standard for resource adequacy in New York State determines the amount of installed capacity that the New York system is required to have in order to provide for planned and unplanned facility outages — over and above the amount that would meet forecasted peak demand.

This amount, the installed reserve margin (IRM), is determined annually by the New York State Reliability Council (NYSRC), and is subject to final regulatory approval. The statewide IRM for the 2010/2011 capability year is 18 percent. Based on the IRM, the NYISO has determined the installed capacity requirements, which total 38,970 MW. The total capacity available to the state is expected to be roughly 43,000 MW, which includes 37,416 MW of in-state resources, and 2,645 MW of import capability that could be used to supply capacity from neighboring regions to New York. [See Figure 3.]

Looking ahead, the NYISO's latest assessment of the electric system's reliability needs concludes that New York has sufficient installed generation to reliably serve load through 2018. Not only was the crisis averted, but we can also reasonably predict that no generation gap will appear for years to come.[2]

Nevertheless, many challenges remain, including the impact of the recent recession on the electricity industry, trends in electricity demand, fuel costs, energy taxes, energy efficiency, Smart Grid technology, energy storage, electric vehicles, and carbon controls.

2 *2009 Reliability Needs Assessment*, New York Independent System Operator, January 2009.

*Figure 2. New Transmission: 2000-2009*

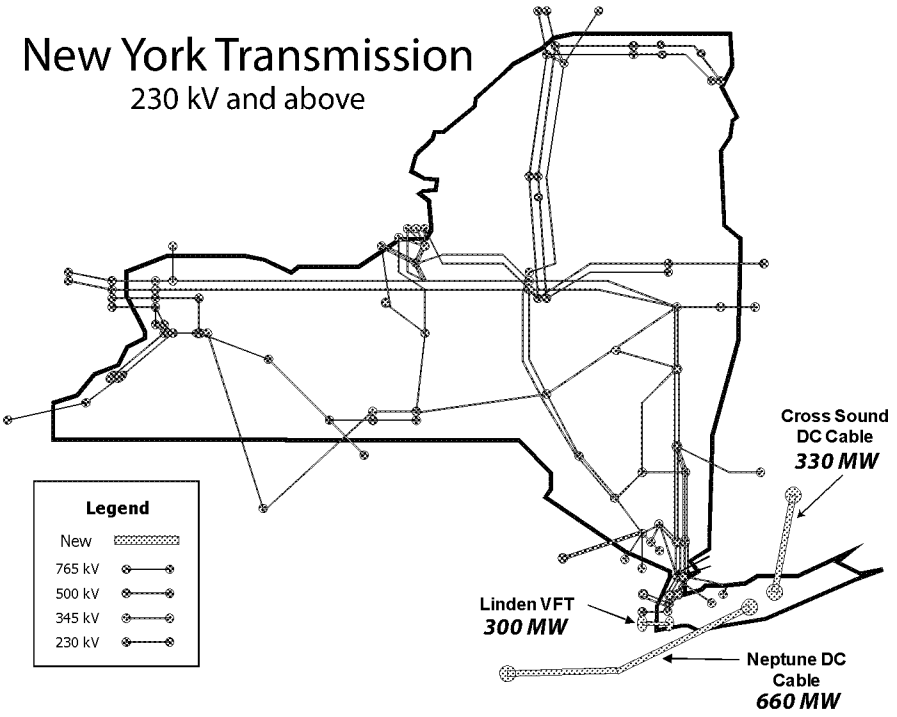
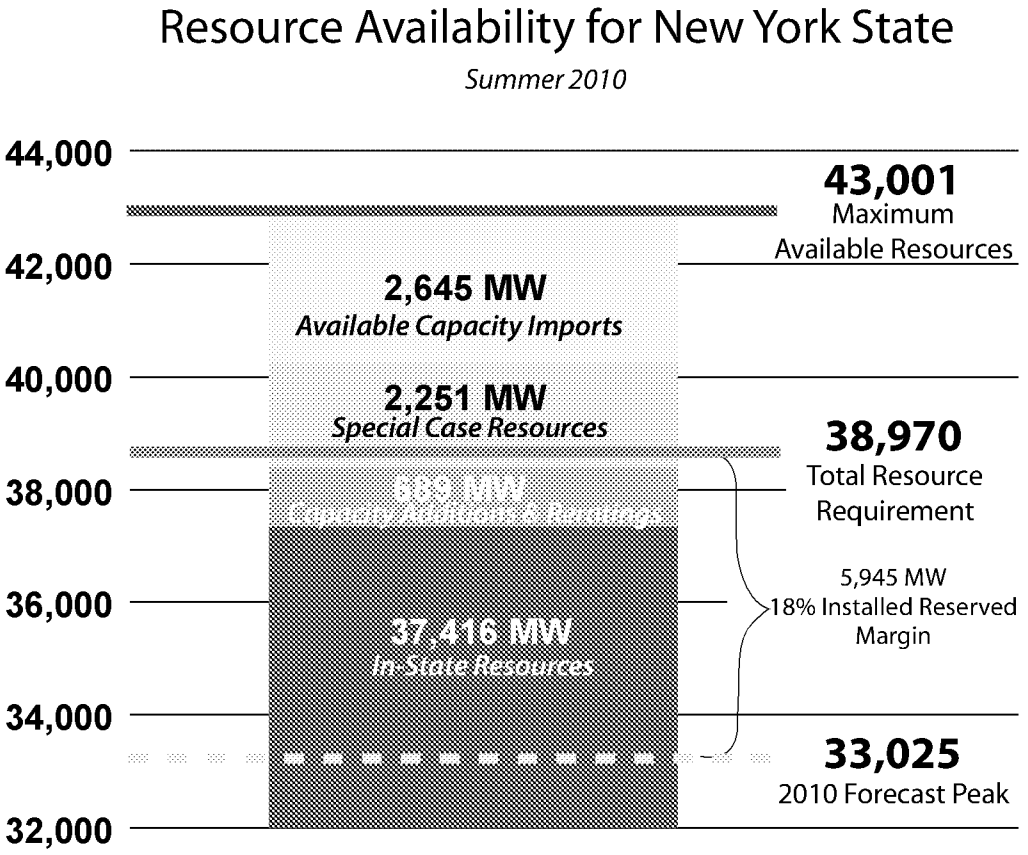
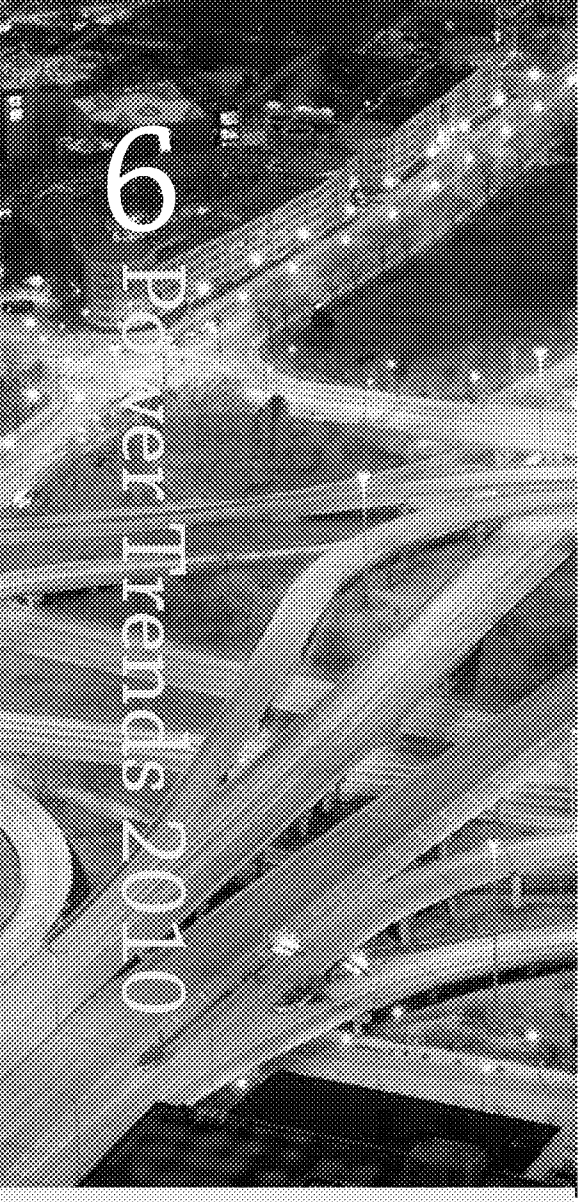



*Figure 3. New York Resource Availability*







# Where We Are Going

The current electricity outlook in New York is complex. While sufficient generation supplies are not an immediate concern, there is an array of other factors that will influence the ability of the power system to reliably, efficiently, and economically serve New York State's changing energy needs.

## The Recession and Electricity

The recession and the disruption of the financial markets resulting from the credit crisis significantly impacted investment in the development of new power resources. Various projects were delayed or deferred in the wake of the economic downturn. The dampening effect was especially evident in the fastest growing segment of New York's generation resources — windpower projects. While windpower capacity tripled in the previous year, the start-up of new windpower projects slowed to a crawl in 2009.

However, a snapshot of developments that took place in November of 2009 offers a brighter picture as projects came to fruition and new proposals were announced.

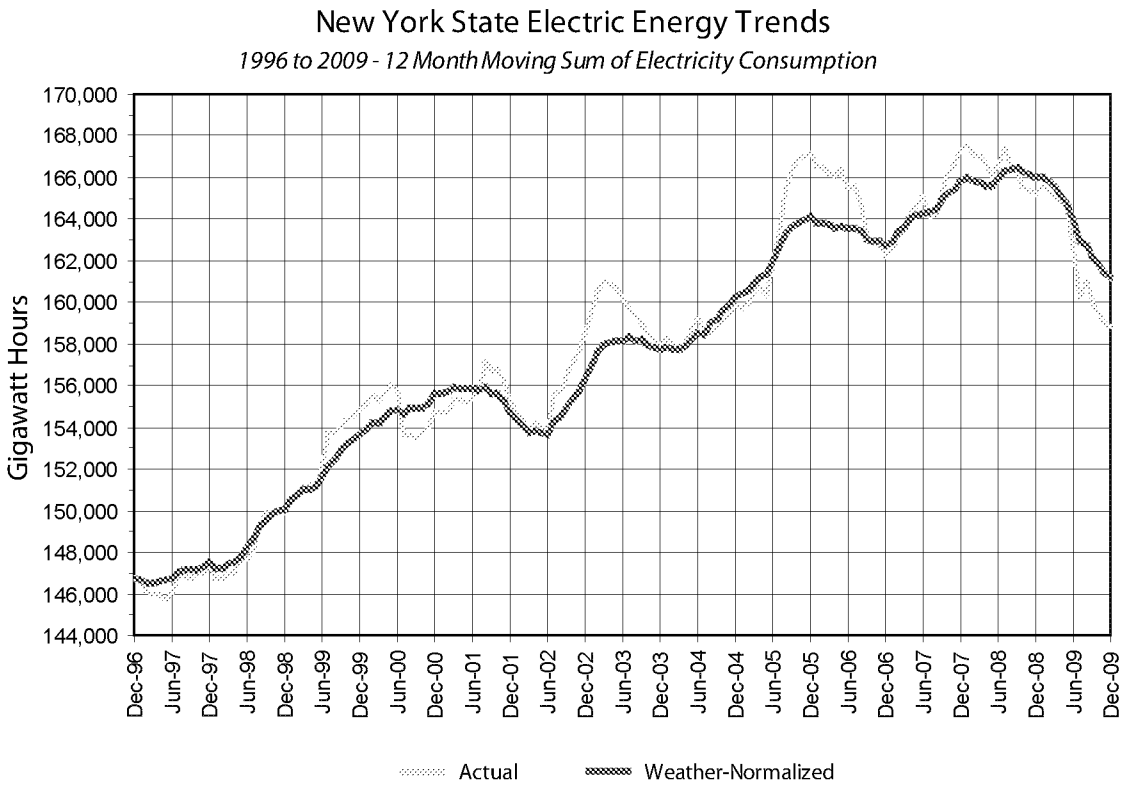
- *On November 1, the Linden VFT transmission project began commercial operation, increasing energy supply to New York. The merchant transmission project, announced by General Electric in late 2006, increased the transfer capability between PJM and NYISO by 300 MW.*
- *On November 4, Advanced Power AG, a Swiss power development company filed an application with the Town of Dover, N.Y., as it began the process of developing a 1,000-MW, combined-cycle natural gas plant. The Cricket Valley project would be located about 70 miles north of New York City.*
- *On November 12, the New York State PSC approved a 345-kV underwater transmission line that would connect a proposed 512 MW natural gas-fired power plant in Bayonne, N.J., to the Gowanus substation in Brooklyn, N.Y.*
- *On November 19, Beacon Power conducted a ground-breaking ceremony for its Stephentown, N.Y. flywheel energy storage plant. When completed in 2012, the 20 MW project is expected to become the nation's first full-scale flywheel system to provide grid regulation services.*

# Trends in Electricity Demand

The economic downturn significantly impacted electricity consumption throughout the nation. According to the Edison Electric Institute (EEI), the annual output of the U.S. electric industry declined by 3.7 percent from 2008 to 2009. The decline was the largest annual drop since 1938 and the era of the Great Depression. EEI said the recession, coupled with a mild summer, contributed to the decline, and noted that it was the second straight annual decline, as electric output had also dropped 0.9 percent in 2008.

Prior to the onset of the economic downturn, demand for electricity had been trending upward. Since 1996, annual electricity use in New York had grown from roughly 147,000 gigawatt-hours (GWh) to 168,000 GWh by mid-2008, a 12.5 percent increase. [See Figure 4.]

***Figure 4. New York State Electric Energy Trends: 1996 - 2009***




In 2008, demand began to drop, with an even more precipitous decrease in 2009. Total annual usage declined by 1 percent from 2007 to 2008, and 2009 saw a 4.1 percent drop from 2008 levels. [See Figure 5.] The decline in New York's electricity consumption during 2009 was due to milder weather and reduced economic activity.

***Figure 5. Annual Electric Energy Usage: 2008 and 2009***

| ANNUAL ELECTRIC ENERGY USAGE | | | |
|---|---|---|---|
| | 2008 GWh | 2009 GWh | Change percent |
| **New York State** | **165,613** | **158,780** | **-4.1** |
| *New York City* | 54,835 | 53,100 | -3.2 |
| *Long Island* | 22,461 | 21,892 | -2.5 |
| *Upstate* | 88,316 | 83,788 | -5.1 |

Nevertheless, power demand is expected to increase as the economy emerges from the recession. The NYISO forecasts that usage will resume a steady increase beginning in 2010. [See Figure 6.] While it is likely that the pace of economic growth will dictate the need for more electricity, there are several other factors that may contribute to sustained future growth in demand.

Among the factors that may be most evident among the general public is the expanding scope of consumer electronics. Large-screen TVs, computers, and an array of other consumer electronics and information technology products have combined to add new demand to the power grid. In U.S. households, the number of consumer electronic products in every household had reached 25 in 2009, compared to an average of three in 1980.[3] Across the globe, consumer electronics are expected to triple over the next two decades, according to the International Energy Agency.[4]

## Fuel Costs

New York's electricity market is highly responsive to changes in fuel prices, particularly natural gas. As the price of natural gas came down during 2009, the price of electricity followed it closely. [See Figure 7.] The average price of natural gas in New York was $4.87/MMBtu (one million BTUs) in 2009, down over 50 percent from $10.13/MMBtu in 2008. The average cost of a MWh of electricity was $48.63, 49 percent below the previous year's cost of $95.31 per MWh.

3 *Plugged-In Age Feeds a Hunger for Electricity*, New York Times, September 19, 2009.

4 *Gadgets and Gigawatts: Policies for Energy Efficient Electronics,* International Energy Agency, 2009.

***Figure 6. New York State Energy Trends – Actual and Forecast: 2000 – 2020***

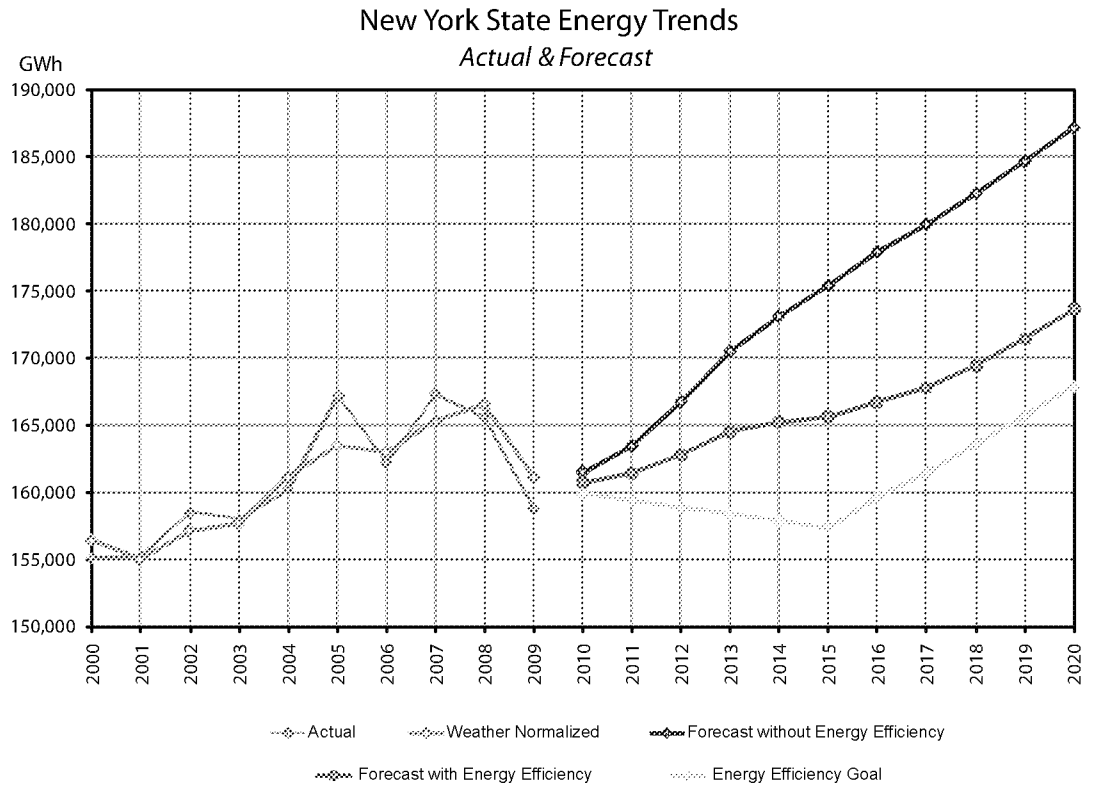
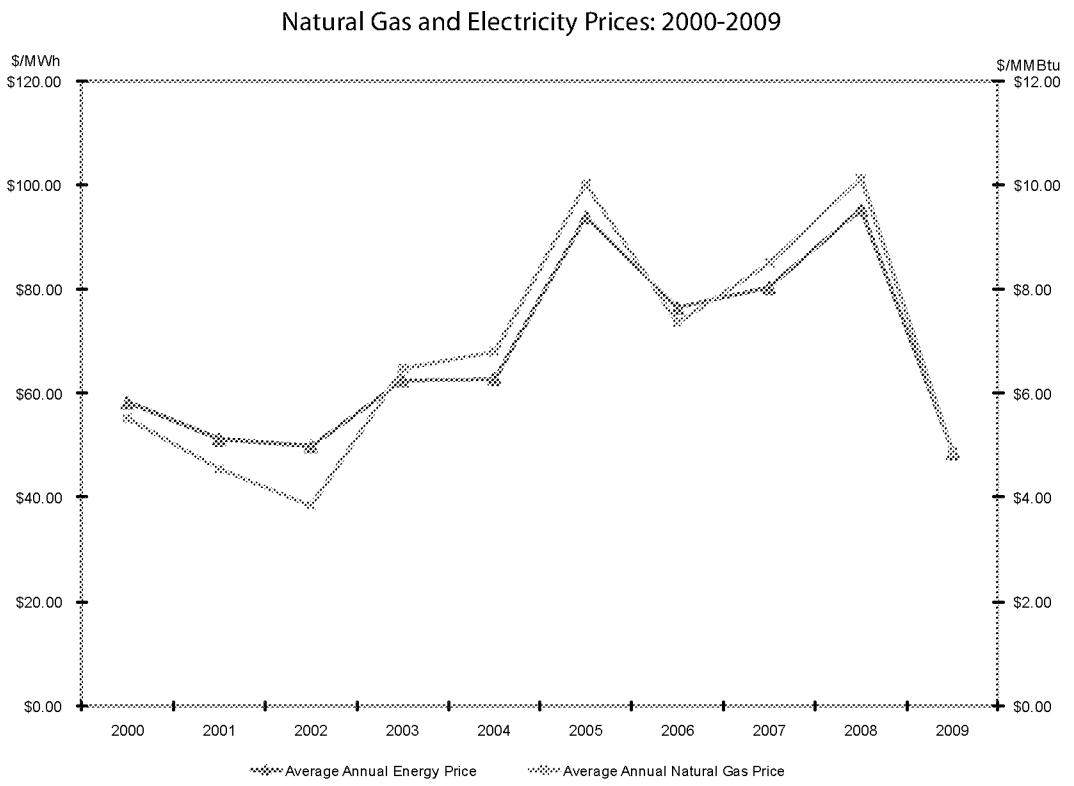


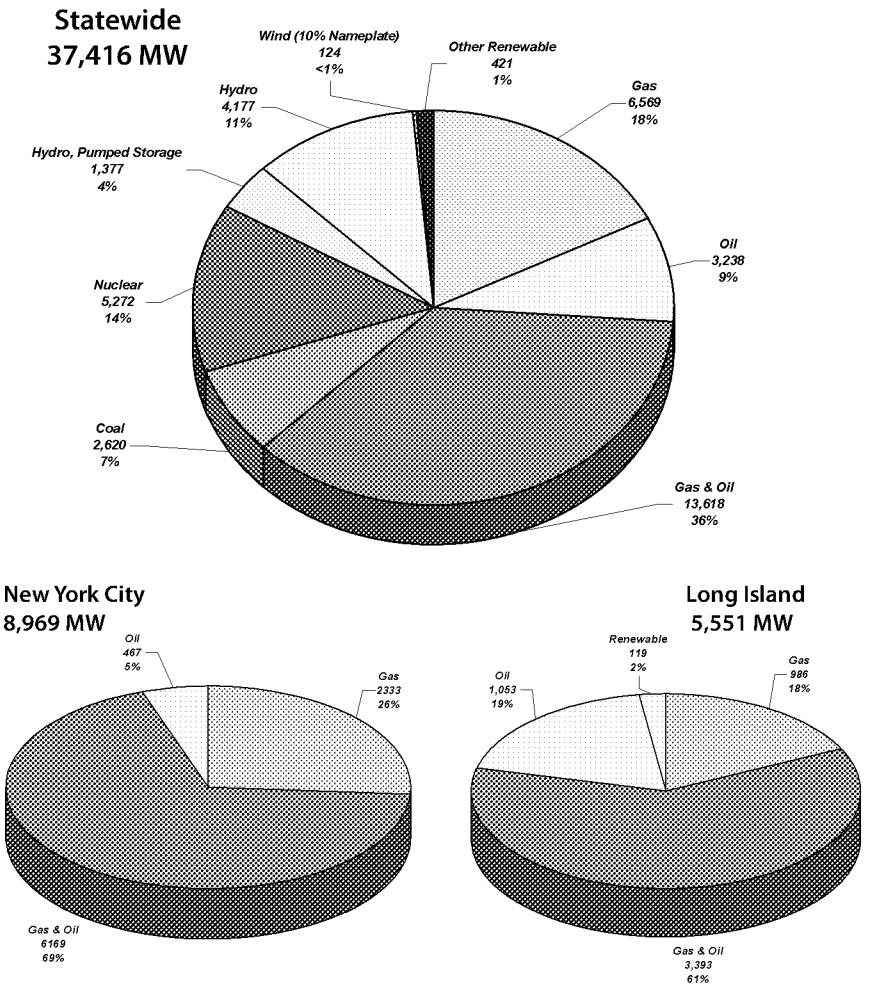

***Figure 7. Natural Gas and Electricity Prices: 2000 - 2009***



Analysts anticipate an increase in natural gas prices as the economy recovers and demand increases. However, the impact on electricity prices will also be influenced by changes in the cost of other fuels, as well as changes in inventories and the availability of new sources of natural gas. There is an increasing interest in accessing natural gas trapped in shale formations throughout various regions of the United States, including New York. However, it remains to be seen how robust the development of these new sources will be.

The demand for oil is also anticipated to increase, led primarily by increased usage in China. In 2010, worldwide demand for oil is expected to rebound after two years of decline, according to the International Energy Agency. While a rise in domestic demand is not in the forecast, prices in the U.S. will be influenced by global dynamics. New York relies on a significant amount of oil-fired and dual-fuel (gas or oil) generation. [See Figure 8.]

***Figure 8: Generating Capacity in New York State by Fuel Source: 2010***



# Energy Taxes

Taxes and other levies on electricity in New York State are the highest in the nation. For every dollar that New Yorkers paid in their electricity bills during 2009, twenty-six cents went to state and local taxes, assessments, and fees.[5]

New York's power industry paid an estimated $6.367 billion in state and local taxes, assessments, and fees in 2009, a 15 percent increase over 2008 according to the Public Policy Institute (PPI), an affiliate of the Business Council of the State of New York.

In 2008, New York electricity taxes and fees totaled $5.5 billion, compared to $3 billion in California and $2.5 billion in Texas, the states with the next highest levies on electricity.

"On average, more than one-quarter of customers' electric bills in New York is made up of state and local taxes. Increased taxes and fees have more than made up for the 18 percent drop in wholesale electricity costs since 2000," the Business Council said in a news release announcing the energy tax study.[6]

The NYISO has estimated that the total fuel-adjusted cost of wholesale power (both energy and capacity) in New York has declined by 18 percent since 2000, which equates to over $2 billion in annual saving for consumers.[7] However, as the Business Council notes, the impact of the savings from market efficiencies has been diminished by rising taxes, fees, and assessments on electricity.

## Energy Efficiency

New York State has an ambitious set of goals for encouraging conservation, energy efficiency, and renewable power. However, questions remain as to whether the government programs designed to meet these goals will be funded to the extent required to fulfill their promise.

While the recent economic decline has significantly decreased energy usage, additional efficiencies will have to go into effect in order to achieve the "15x15" target. The goal involves reducing annual electric usage from 2007 levels by 15 percent, to a level below 157,000 GWh, by 2015.

The 2009 State Energy Plan reports that funding committed to energy efficiency programs by investor-owned utilities and public power authorities in New York State grew from an annual total of $25 million in 1984 to over $700 million in 2009.[8]

In creating the Energy Efficiency Portfolio Standard (EEPS) in 2008, the New York State Public Service Commission (NYS PSC) ordered total electricity revenue collections of over $300 million annually for energy efficiency programs through the end of 2011.[9]

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5 *Short-circuiting New York's Recovery - How Energy Taxes Contribute to High Electric Rates in New York*, Public Policy Institute of the Business Council of the State of New York, March 2010.

6 *Public Policy Institute report finds high taxes on electric power an economic drain,* News release from the Business Council of the State of New York, March 4, 2010.

7 *2009 State of the Markets Report,* ISO/RTO Council, October 2009.

8 *Energy Efficiency Assessment, New York State Energy Plan 2009*, December 2009.

9 *New York State Public Service Commission Order Establishing Energy Efficiency Portfolio Standard And Approving Programs*, Issued and Effective June 23, 2008.

New York State budget issues have created funding concerns for energy efficiency incentives and conservation programs. However, the State has been able to employ federal stimulus funding to help pay for certain initiatives, including rebates for the purchase of energy efficient appliances. For example, "New York's Great Appliance Swap Out" provided $16.8 million in rebates for consumers in the first few months of 2010.

## Smart Grid Technologies

In 2009, the NYISO was awarded $37.4 million in federal stimulus funds for two important Smart Grid initiatives. The funds will support the creation of a statewide Phasor Measurement Network and the installation of capacitor banks in various locations throughout the state. These investments will provide the NYISO with better system visibility and improve the efficiency of power flows.

The Smart Grid involves an entirely new vision of the interaction between the operation of the transmission and distribution systems, and the end use electricity customer. Customers will be empowered with access to detailed pricing information, while system operators such as the NYISO will have more and better tools to manage an increasingly sophisticated bulk electricity system. A smarter grid will have more digital, remotely managed processes and sensors allowing operators to have far better visibility into actual system conditions.

While most electricity customers do not yet know how the Smart Grid will affect them, many seem anxious for a new approach. According to The Nielsen Company's Jonathan Drost who led a survey of American's attitudes toward energy, "95 percent of households say they are willing to change the way they consume energy."[10 11]

Smart Grid will require significant adjustments to grid operations, as operators will have access to a vast new array of power system information. Yet, without the ability to process and properly utilize this information, the promise of the Smart Grid will be lost.

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10 *Consumers Have Little Awareness of Smart Grid and Smart Meters*, Harris Interactive, February 25, 2010.

11 *Saving Green the Main Driver for Consumers to Go Green*, NielsenWire, October 21, 2009.

The NYISO has identified a need for a new control facility to accommodate the additional tools and personnel that will be required to fully realize the potential of the Smart Grid. This vital addition to the state's power infrastructure would pave the way for new tools and technologies that will provide the foundation for the power system of the future.

## Energy Storage

At the heart of the electric system is the need to balance supply and demand on a moment-to-moment basis. Energy commodities such as natural gas, oil, and coal can be readily stored in massive quantities. In contrast, the storage of electricity has been relatively limited, costly, and complex. However, several emerging technologies are beginning to address the challenge of electricity storage. These technologies include flywheels, advanced batteries, compressed air energy storage (CAES) and plug-in electric vehicles (PEVs). They represent a new class of resource that has the potential to create a more robust power system and lower costs to consumers. They may work with Smart Grid technology to support the integration of large amounts of renewable energy into the electric grid.

Federal and state energy regulators have acknowledged the important role that energy storage plays in the implementation of Smart Grid technologies. The NYISO, in 2009, developed new market rules and related software that specifically support the integration of new energy storage systems.[12 13 14]

## Electric Vehicles

Studies suggest that a sizeable number of New Yorkers will likely be among the early adopters of grid-connected electric vehicles.[15] The impact of a significant number of electric vehicles on the power system will depend greatly on how vehicles and systems are designed to manage charging. Ideally, vehicle charging should be staggered across the off-peak (late night/early morning) hours to maximize the use of more affordable power, and minimize the addition of daytime load.

While preference for staggered charging is commonly understood, the methodology for accommodating electric vehicle integration with the power system has yet to be established.

Consumers may actively respond to price, perhaps via Smart Grid tools. Vehicles may be managed remotely. PEVs may be programmed to automatically begin charging at a certain time. The roles of the consumer, utility company, and electric system operator are, as yet, undefined.

In addition, electric vehicles may be capable of providing ancillary services to the grid. Grid operators may one day be able to utilize the stored energy in vehicle batteries to balance local power needs.

While the potential value of electric vehicles is immense, significant work needs to be done to integrate them, securely and effectively, into the power system.

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12 FERC Docket No. PL09-4-000; Smart Grid Policy; Pg. 48; July 16, 2009.

13 NYPSC Case 09-E-0310; In The Matter of the American Recovery and Reinvestment Act of 2009 – Utility Filings for New York Economic Stimulus; Appendix A; Pg. 8; July 24, 2009.

14 FERC Docket no. ER09-836-000; Limited Energy Storage Devices; March 12, 2009.

15 *PlaNYC Exploring Electric Vehicle Adoption in New York City*; January 2010. *Assessment of Plug-in Electric Vehicle Integration with ISO/RTO Systems*, ISO/RTO Council, March 2010.

## Carbon Controls and Environmental Standards

While there is a growing consensus about the need to reduce carbon emissions, there remains a lack of agreement among policymakers on how to put carbon controls into effect. Absent legislative agreement, the United States Environmental Protection Agency (U.S. EPA) has moved to assert its authority to regulate the emission of carbon and other greenhouse gas pollutants.

The possibility of regulatory action may have the effect of prompting legislative action. The design of legislation will ultimately determine "who pays" for carbon control and who benefits from it.

The cost of carbon may be directly manifest in energy prices, or it may be paid through a separate mechanism. Without accounting for the cost of carbon, markets operate at an imbalance with higher-emission resources enjoying a competitive advantage.

In New York State, power plant emissions of carbon dioxide, as well as sulfur oxide and nitrogen oxide, declined by double-digits over the past decade as newer, more efficient, and cleaner generation has been added.[16] [See Figure 9.]

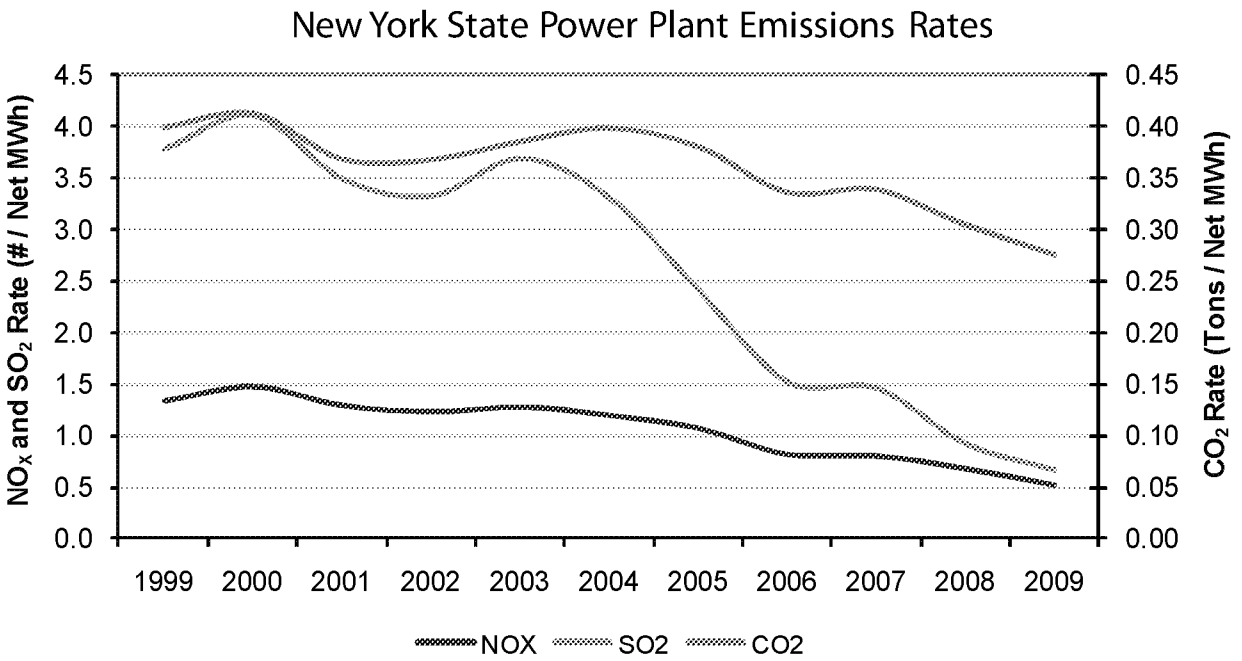
New York is already part of the Regional Greenhouse Gas Initiative (RGGI), which is a compact of ten eastern states designed to restrict carbon emissions from power plants. Currently the cost of obtaining emissions allowances is passed through by power producers to the electricity market, and is reflected in the NYISO's power prices.

The RGGI represents a functioning market for emission allowances that may complement a national plan, or may ultimately be supplanted by a larger framework.

In addition to carbon controls, various other environmental regulations are expected to impose more rigorous standards for power plants over the next few years. These include nitrogen oxide emissions limitations, ozone standards, and water quality protections. The cumulative effect of this array of regulations on the electric power system will require continued analysis and assessment.

16 *New York State Power Plant Emissions,* New York Independent System Operator, April 2009.

*Figure 9: New York Emission Rates from Electric Generation: 1999-2009*




# How We Will Get There

While there are clearly opportunities ahead, there are also risks, and a great deal of hard work will be required to mitigate the risks and realize the opportunities. If properly managed, each of the issues outlined in this document has the potential to improve the electricity outlook. Given the intertwined nature of many of the challenges, and the various constituencies involved in addressing them, there is no one clear path of action. However, New York does have a vision for the future.

## New York's Energy Future

In December 2009, the New York State Energy Planning Board approved and the Governor accepted the 2009 State Energy Plan. The State's new energy plan is the first since 2002.

The 2009 State Energy Plan establishes an overarching framework of policy objectives and strategic recommendations to be implemented over a ten-year horizon in order to maintain the availability of reliable, affordable, and sustainable energy for New Yorkers. Its primary objectives are to facilitate the continued development of and investment in energy efficiency, in-state energy resources, clean, renewable energy technologies, and Smart Grid infrastructure.

The Governor, in a "45 X 15" Clean Energy Strategy, set a goal to meet 45 percent of the State's electricity demand through efficiency and renewable energy by 2015. To reach this goal New York must simultaneously reduce energy use by 15 percent through efficiency, and supply 30 percent of its energy needs through renewable electric generation.

In Executive Order No. 24, Governor David A. Paterson also set a goal to reduce greenhouse gas pollution in New York State by 80 percent below the levels emitted in 1990 by the year 2050. As part of that initiative, a Climate Action Council was created to prepare a draft Climate Action Plan by September 30, 2010. The draft plan will focus on the ways various sectors of the economy, including power supply and delivery, may contribute to reduction of greenhouse gas emissions.

## Integration of Renewables

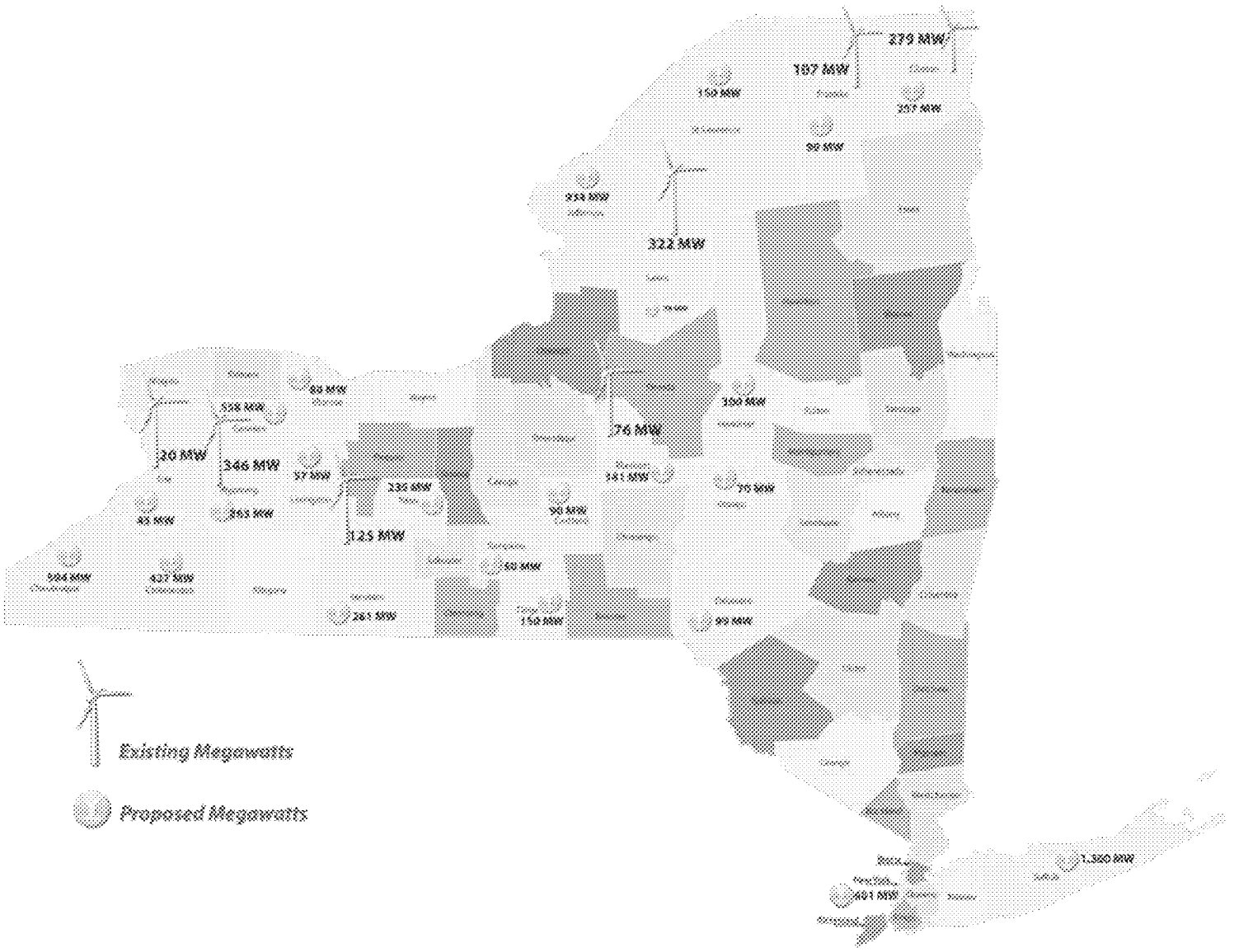
Expanding renewable sources of energy is a vital aspect of the New York State Energy Plan. Renewables are essential to meeting environmental goals, and diversifying the array of fuels used to generate electricity. New York has been a leader in the integration of renewables, pioneering key policies and programs that have encouraged a significant growth in renewable sources of energy. In 2009, electricity produced by hydropower, windpower, and other renewable resources totaled 22 percent of New York's generation.

In 2008, the NYISO instituted one of the first state-of-the-art wind forecasting systems in the United States. The centralized system enables the NYISO to better utilize and accommodate wind energy by forecasting the availability and timing of wind-powered generation. Last year, the NYISO became the first grid operator to dispatch windpower fully balancing the reliability requirements of the power system with the use of the least costly power available, so-called "economic dispatch."

In 2009, nearly 1,300 MW of wind-powered generation was in operation in New York State. Some 7,000 MW of additional windpower have been proposed for interconnection with the New York electric grid. [See Figure 10.]

Generating facilities using renewable resources, such as wind, tend to be sited in locations distant from population centers. As a consequence, transmission upgrades or expansion may be required to effectively supply the power demands of New York State with this renewable power.

***Figure 10: Windpower in New York State – Installed and Proposed: 2010***




A 2004 study of wind power in New York State determined that New York could reliably manage 3,300 MW of interconnected wind generation. In the intervening years, it became apparent that more than 3,300 MW of wind might be interconnecting to New York bulk electricity system in the near future and the impacts of this increased amount of wind generation required evaluation. The NYISO is conducting an extensive study of the impact of up to 8,000 MW of wind resource integration on system variability and operations, installed capacity requirements, transmission infrastructure, production costs, and emissions.

## Robust Power System Planning

Planning is the key to maintaining a reliable and efficient power system. As stated earlier, New York's reliability outlook is good. Assuming no large units are unexpectedly retired, and expected new units are successfully brought on-line, this positive outlook for resource adequacy extends to 2018. The NYISO has a comprehensive process for evaluating system reliability and will continue to plan to maintain an adequate, reliable power supply to meet demand.

Solutions to reliability needs are solicited through the planning process. Such solutions may include new power generation and/or transmission to boost the availability of supply, as well as demand-side resources to reduce electricity use. Competitive market-based solutions are given first priority because of their reduced risk to rate-paying consumers.

In addition, the NYISO's planning and interconnection study processes facilitate the integration of renewable power projects that will help to diversify our fuel mix and meet our renewable energy goals. While these projects are not driven by reliability concerns, they are an important part of the future of the state's energy system.

## Assessing Reliability Needs

As previously noted, the NYISO's planning process has found that the anticipated supply of generating capacity and other resources exceed the needs to reliably supply forecasted consumer demands over the next decade. However, the NYISO also identified risk scenarios that could adversely impact reliability of the electric system.[17]

At the end of 2009, the NYISO revisited its findings. While it did not identify any new reliability needs through 2019, it did confirm that reliability needs could arise within the 10-year planning horizon under certain scenarios, including:

- *Proposals to reduce nitrogen oxide (NOx) emissions limitations from fossil-fueled power plants in New York, which could lead to early retirement of some power facilities, impacting system reliability during periods of peak demand. If such circumstances arise and replacement resources are not available, reliability concerns could develop as soon as the program starts in 2012.*

- *Unexpected retirement of one of the two Indian Point nuclear units, which, due to their location in a constrained part of the system, would create reliability needs if other resources were not made available in an appropriate location.*

In addition, the NYISO noted the need for completion of planned upgrades by transmission owners in order to maintain system reliability.

17 *2009 Reliability Needs Assessment*, New York Independent System Operator, January 2009. *2009 Comprehensive Reliability Plan*, New York Independent System Operator, May 2009.

# Addressing Transmission Congestion

The NYISO's recently enhanced planning process includes an important mechanism for increasing the economic efficiency of the power system. Optimal use of the least costly available generation can be limited by congestion, which occurs when there are not enough power lines to move lower-cost power to consumers. Transmission congestion increases the cost of electricity.

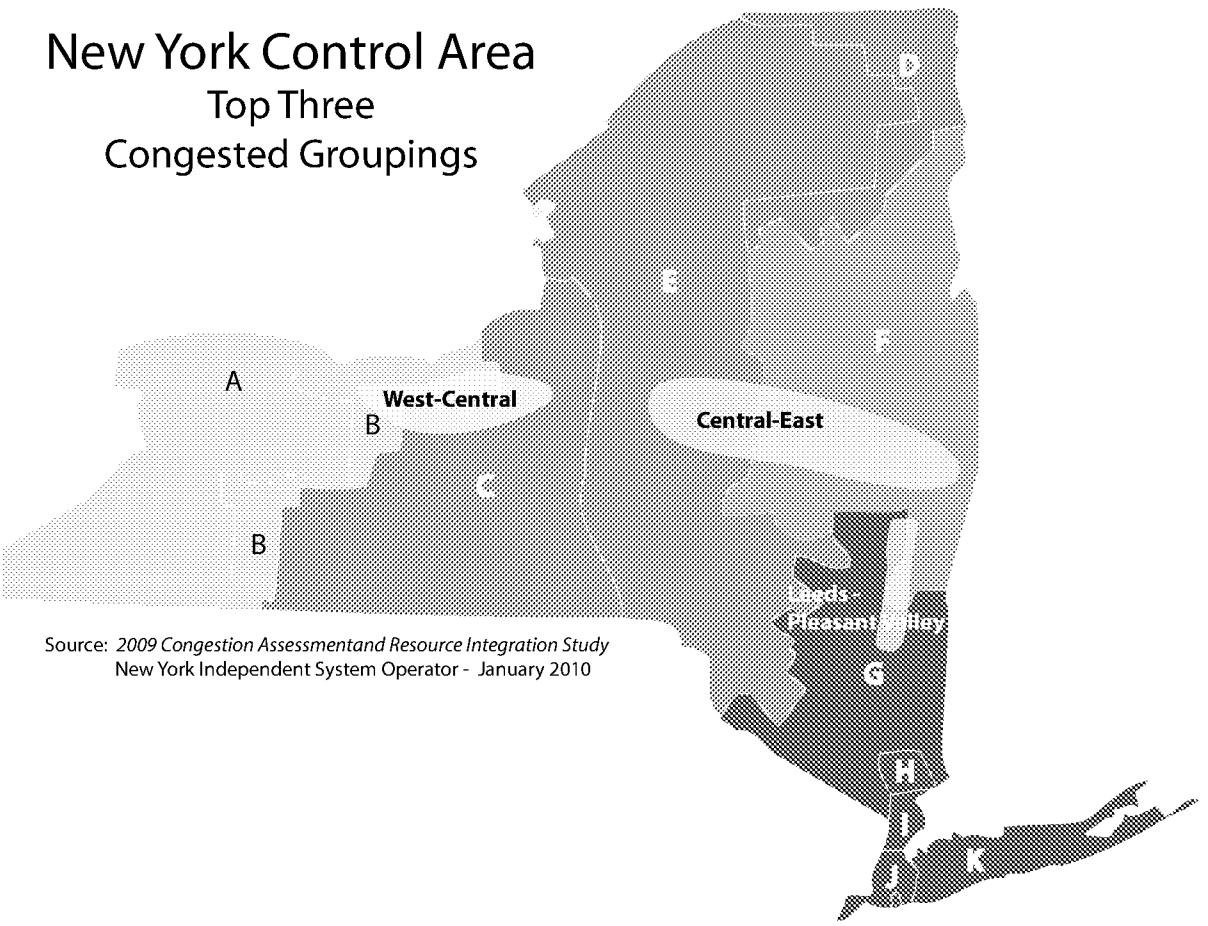
In January 2010, the NYISO issued a first-of-its-kind economic analysis of transmission congestion on the New York State bulk power system and the potential costs and benefits of relieving congestion. Called the Congestion Assessment and Resource Integration Study (CARIS), it is part of the NYISO's expanded comprehensive planning process.

Transmission congestion results from physical limits on how much power high-voltage lines can reliably carry. Solutions to congestion may include building or upgrading transmission, building a less expensive power source in closer proximity to an area needing supplies, or reducing the demand for power in the downstream region.

The study, developed with extensive stakeholder input, identified the three most congested parts of the New York bulk power system based upon historic data as well as estimates of future congestion. [See Figure 11.]

The NYISO developed and analyzed generic solutions involving transmission, generation, and demand response projects for each of the three congested areas. No routing, siting, engineering, or other specific analyses were conducted for any of the generic solutions, as these details can best be addressed by project developers.

***Figure 11: Transmission Congestion in New York State***




Source: *2009 Congestion Assessmentand Resource Integration Study*
New York Independent System Operator - January 2010

During the next phase of the CARIS process, developers are being invited to propose specific transmission projects to address congestion on the New York bulk power system. The NYISO will perform an analysis of the benefits and costs for each specific proposed transmission project.

If the developer of a project seeks regulated cost recovery under the NYISO tariff, and satisfies the benefit/cost threshold requirements, the costs of the economic transmission upgrade would be allocated on a "beneficiaries pay" model that requires the consent of a super-majority (80 percent) of the project's beneficiaries.

As a complement to the NYISO planning processes, in 2008 the owners of the interconnected electricity transmission grid in New York State initiated a joint study of the reliability of the state's bulk power system to help meet future electric needs, support the growth of renewable energy sources, and protect the reliability of the power system.[18]

Called the New York State Transmission Assessment and Reliability Study (STARS), it will make a significant contribution to the NYISO planning process by examining the lifecycle of New York's existing transmission assets and identifying reliability concerns based on the anticipated remaining serviceability of these assets. New York has an aging power transfer infrastructure, with two-thirds of New York's high-voltage transmission lines built before 1974. The study will suggest long-range plans for addressing these infrastructure concerns.

In January 2010, the Transmission Owners announced completion of the first phase of STARS, which identified the need for additional transmission transfer capability to meet statewide reliability requirements under several alternative future scenarios. The second phase of STARS will combine reliability analysis with assessment of existing transmission infrastructure and evaluate beneficial transmission investments for both reliability needs and renewable resources, and is expected to be completed in mid-2010.

18 The transmission system owners in New York State are Central Hudson Gas & Electric Corporation, Consolidated Edison Company of New York, Inc., Long Island Power Authority, National Grid, New York Power Authority, New York State Electric and Gas Corporation, Orange & Rockland Utilities, Inc., and Rochester Gas & Electric Corporation.

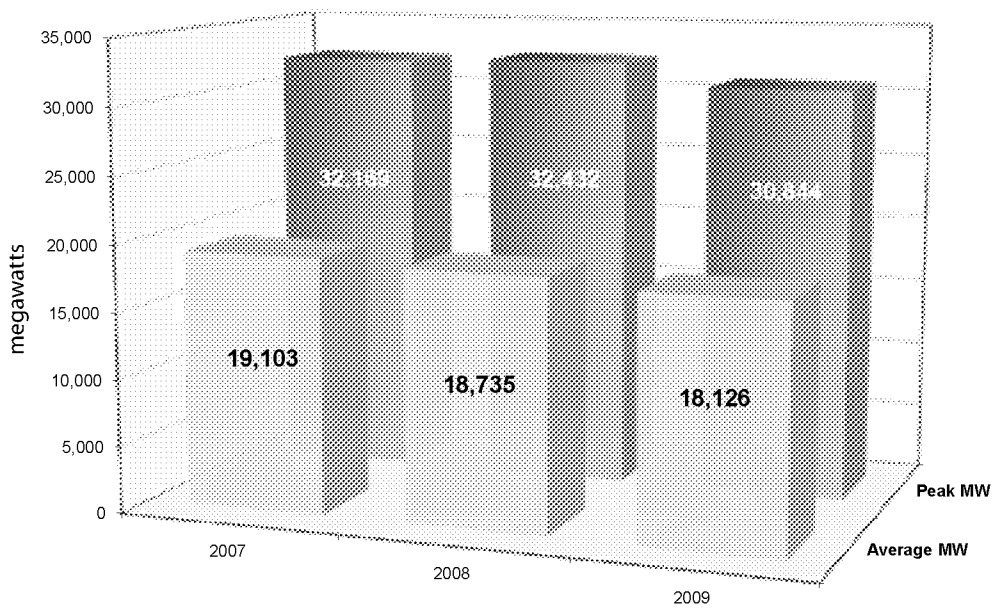
In 2009, the New York City Economic Development Corporation (NYCEDC) completed *A Master Electric Transmission Plan for New York City.*[19] Conducted in coordination with electric utilities, state regulatory agencies in New York and New Jersey, and regional grid operators, the study analyzed the potential for major new transmission projects to expand power imports from neighboring regions.

Among it key findings, the NYCEDC study notes that due to a projected surplus of generating capacity for the foreseeable future, decision-makers have adequate time to choose which projects should move forward. NYCEDC plans to update the study as new transmission projects are proposed.

# Demand Response

Electricity demand changes constantly as consumers use different amounts of power during the day and as their power needs alter throughout the seasons of the year. For example, power usage increases sharply during times of extreme summer weather conditions. It is common for New York State's summer peak demand to spike nearly 40 percent above the average level of electricity use. [See Figure 12.]

***Figure 12: Peak vs. Average Demand: 2007-2009***




The additional demand during such peaks equates to the output of approximately 30 power plants (of 500 MW capacity) to supply the increased electricity needs of New Yorkers. Over the past decade, a new category of power resource - demand response programs - was developed to offer an alternative to traditional generation supplies.

19 *A Master Electric Transmission Plan for New York City,* Charles River Associates for the New York City Economic Development Corporation, May 2009.

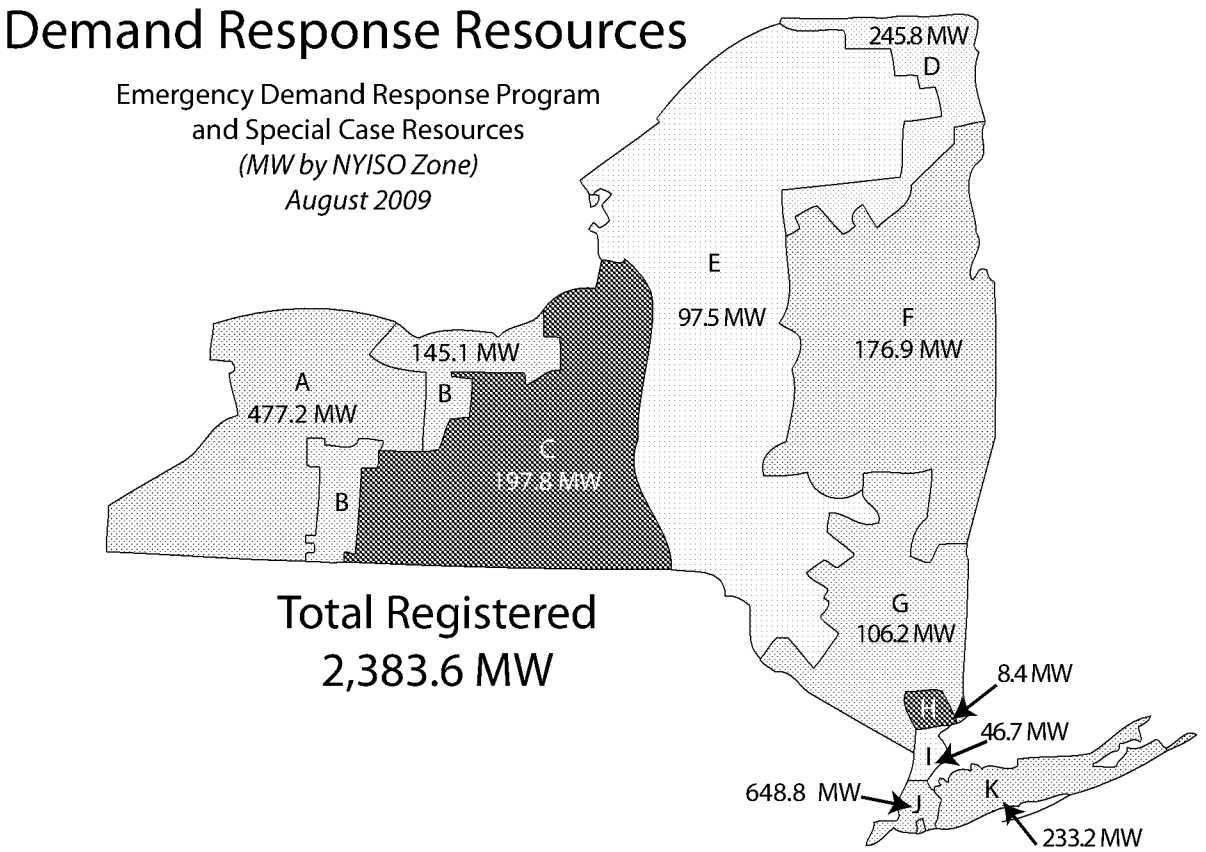
New York's demand response resources have grown more than ten-fold since the programs began in the early years of New York's wholesale marketplace for electricity. Their value was most notably demonstrated when New York State experienced its all-time record peak demand (33,939 MW) on August 2, 2006, as demand response programs helped to "shave" the peak by 1,000 MW.

Demand-side resources have continued to grow. As usage increases and if adequacy margins decrease, the value of demand response resources will continue to increase.

In August 2009, two of the NYISO's major demand response programs, the Emergency Demand Response Program and the Special Case Resource program, had a total of 4,067 end-use locations enrolled providing over 2,380 MW of demand response capability, a 13 percent increase over the 2008 enrollment level. The demand response resources in NYISO reliability programs represent 7.7 percent of the 2009 Summer Capability Period peak demand of 30,844 MW, an increase of 1.2 percent from 2008.[20] [Figure 13.]

20 NYISO Report on Demand Response Programs to the Federal Energy Regulatory Commission, January 2010.

*Figure 13: Demand Response Resources in New York State: 2009*




# Working Together

Collaboration is the key to addressing the energy challenges of the future. By working with our neighbors, we can improve efficiencies in several areas that will provide a range of benefits. New York has taken a leadership role in the development of broader regional markets and expanded interregional planning.

## Broader Regional Markets

While the NYISO has long focused on continually improving the energy markets in New York, there remain inefficiencies on the borders, or seams, between New York and our neighbors.

Currently, the NYISO is limited in its ability to use resources in neighboring states to help balance short-term in-state needs. By increasing coordination with our neighbors, we can expand the availability of resources for all power systems in the region. More efficient use of the region's collective power resources can also lower the overall cost to all the region's consumers.

The benefits of regional collaboration will increase as additional variable, renewable resources (such as windpower) are added to the system. More frequent scheduling of transactions would improve market and operational efficiency by grid operators and allow for faster adjustments to dynamic changes in system conditions.

In order to improve coordination of power transactions, enhance efficiency, and provide cost-savings to consumers, the NYISO, in conjunction with grid operators serving the Mid-Atlantic, Midwest, and New England regions of the United States and the Canadian province of Ontario, proposed a series of "Broader Regional Markets" initiatives to FERC in January 2010.

The effort was in response to a FERC directive to develop and submit a report on a long-term, comprehensive solution to address issues that affect grid operators and market participants in the region.

The NYISO collaborated extensively with Ontario's Independent Electricity System Operator (IESO), the Midwest Independent Transmission System Operator (MISO), PJM Interconnection (PJM), and ISO New England (ISO-NE) in developing the proposals. The proposals submitted in the filing with FERC include both market-based and physical solutions. The market solutions include:

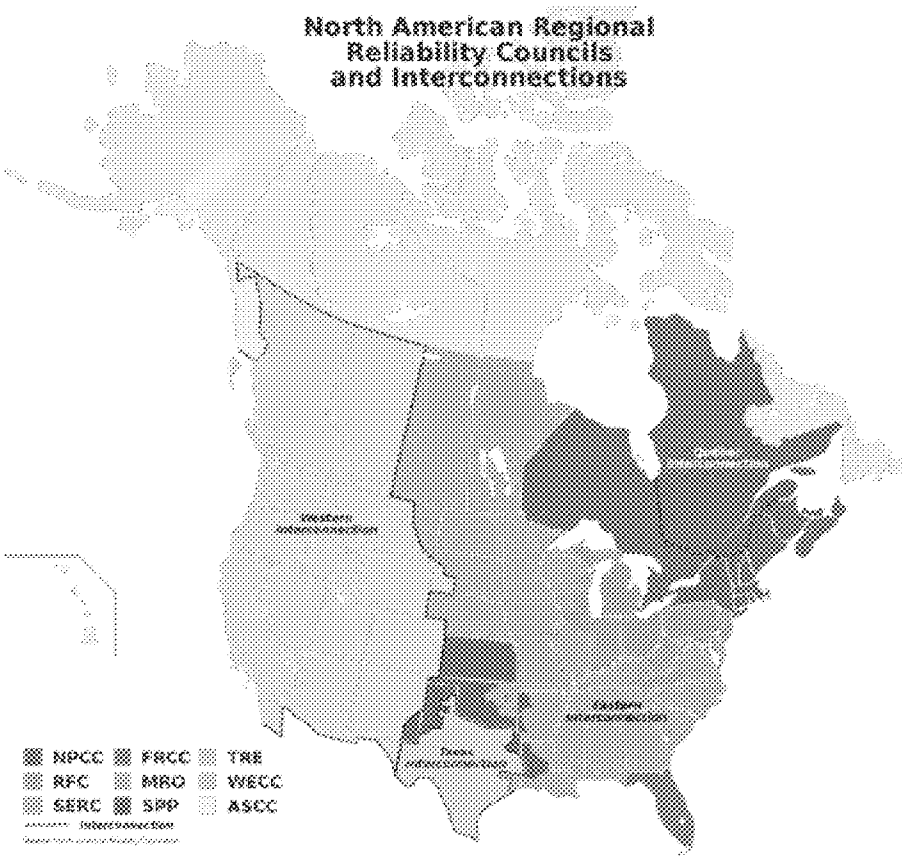
- *Buy-through of congestion, which would require that the congestion cost of a transaction be charged based on the physical flow of power, unlike the current settlement determination that is based only on the contract path.*
- *Market-to-market coordination, which would increase the level of collaboration in congestion management between system operators in the region.*
- *Interface pricing revisions, which would improve the pricing at the points at which energy moves between individual grid operators to allow for more efficient regional power transfers.*
- *Inter-regional transaction coordination, which would lower total system operating costs as transaction schedules more quickly adjust to market-to-market pricing patterns.*

In addition, the proposal recommends the completion and activation of a set of Phase Angle Regulators (PARs) on the Michigan-Ontario border. PARs are electrical devices that can enable the redirection of power from one circuit to another. When fully operational, these are expected to help align the actual power flows around Lake Erie with the corresponding level of scheduled transactions.

# Expanded Interregional Planning

Because New York is connected to a host of other transmission networks, planning is another important area where we are committed to working with our neighbors. Since no organizations had previously existed in the Eastern part of the country to look at interconnection-wide planning, the NYISO took a leadership role in a grass roots effort called the Eastern Interconnection Planning Collaborative (EIPC) in early 2009. The EIPC was formed under an agreement by two dozen electric system planning authorities from the Eastern United States and Canada. The Eastern Interconnection includes forty states and several Canadian provinces from the Rocky Mountains to the Atlantic Ocean and from Canada south to the Gulf of Mexico.

***Figure 14: Major Interconnections - North America***




The EIPC focus is on a "bottom-up" approach to planning which starts with a roll-up of the existing grid expansion plans of electric system planning authorities such as ISOs, RTOs and utilities, in the Eastern Interconnection. Integral to the process will be the identification and analysis of a large number of resource expansion scenarios, as well as sensitivity analyses of options selected through a transparent stakeholder process that includes representatives from the entire interconnection. The results of EIPC's technical analyses will identify alternative transmission facilities that are needed to reliably address policy scenarios such as the delivery of large new quantities of wind power and other renewable resources across the region as well as integration of enhanced demand-side strategies and programs. These studies will likely be used by federal and state regulators and other policy makers as they debate such important public policy issues.

The importance of this effort was recognized by the U.S. Department of Energy in December 2009 with the award of $16 million to support the efforts of the collaborative.

## Continued Collaboration

*Power Trends 2010* has outlined a number of challenges and opportunities. Meeting these challenges and taking advantage of these opportunities will require concerted, cooperative efforts among all of New York's electric system stakeholders.

America's first Secretary of Energy, James Schlesinger, said, "... the United States oscillates in its view of energy matters between complacency and panic."[21]

The path to the stable, middle ground between complacency and panic is paved with objective information, unbiased analysis, and a commitment to collaboration.

The NYISO will continue to work with all sectors of market participants, as well as state and federal policy makers and regulators, in an effort to see that New York's electricity outlook continues to improve.

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21 *America at Century's End*, James Schlesinger, New York: Columbia University Press, 1989.

# GLOSSARY

The following glossary offers definitions and explanations of terms and used in *Power Trends 2010* and other phrases generally used in discussions of electric power systems and energy policy.

"45 X 15": An energy policy initiative announced by the Governor of the State of New York in the 2009 State of the State Address, the "45 X 15" plan establishes the goal of New York State meeting 45 percent of its electricity needs through improved energy efficiency and clean renewable energy by 2015. The plan includes increasing the state's Renewable Portfolio Standard (See "Renewable Portfolio Standard") to 30 percent and decreasing electricity usage by 15 percent from forecasted levels (See "Energy Efficiency Portfolio Standard").

Adequate: A system is considered adequate if the probability of having sufficient transmission and generation resources to meet expected demand is greater than the minimum standard to avoid a blackout. A system has adequate resources under the standard if the probability of an involuntary loss of service is no greater than one occurrence in 10 years. This is known as the loss of load expectation (LOLE), which forms the basis of New York's installed capacity (ICAP) requirement.

Advanced Metering Infrastructure (AMI): Also known as "smart metering," AMI consists of two separate and distinct elements: (1) meters that use technology to capture the energy use information of a utility's customer, and (2) communication systems that capture and transmit such information in real time. Smart meters are capable of measuring and recording usage data in time-differentiated registers, including hourly or such interval as is specified by regulatory authorities. They also allow electricity consumers, suppliers, and service providers to participate in all types of price-based demand response programs.

Article X: The New York siting process (Article X of the state Public Service Law) for new large power plants, which expired Dec. 31, 2002. Article X provided a streamlined process to review, approve, and locate new generation facilities in the state.

Bulk Electricity Grid: The transmission network via which electricity flows from suppliers to local distribution systems that serve customers. New York's bulk electricity grid includes all electricity generating plants, high voltage transmission lines, and interconnections with neighboring electric systems.

Capability Period: The Summer Capability Period lasts six months, from May 1 through October 31. The Winter Capability Period runs from November 1 through April 30 of the following year.

Cap and Trade: An environmental regulation mechanism that sets an overall limit on the emissions of a certain pollutant (such as $CO_2$) but allows emission sources to trade their individual emission allowances. In theory, "cap-and-trade" systems use the marketplace to reduce emissions in a cost-effective and flexible manner. In practice, a cap is established that limits emissions from a designated group of polluters to some level below their current emissions. The emissions allowed under the new cap are then divided into individual permits – usually equal to one ton of pollution – that represent the right to emit that amount. The permits can be bought and sold bilaterally or through an auction mechanism.

**Comprehensive Reliability Plan (CRP):** A study undertaken by the NYISO that evaluates projects offered to meet New York's future electric power needs, as identified in the Reliability Needs Assessment (RNA). The CRP may trigger electric utilities to pursue regulated solutions to meet reliability needs if market-based solutions will not be available to supply needed resources. It is the second step in NYISO's reliability planning process.

**Comprehensive System Planning Process (CSPP):** The NYISO's ongoing process that evaluates resource adequacy and transmission system security of the state's bulk electricity grid over a 10-year period and evaluates solutions to meet those needs. The CSPP contains three major components -- local transmission planning, reliability planning, and economic planning. Each two-year planning cycle begins with the local transmission plans of the New York transmission owners, followed by NYISO's Reliability Needs Assessment (RNA) and Comprehensive Reliability Plan. Finally, economic planning is conducted through the Congestion Analysis and Resource Integration Study (CARIS).

**Congestion:** Transmission paths that are constrained, which may limit power transactions because of insufficient capacity. Congestion can be relieved by increasing generation or by reducing load.

**Congestion Analysis and Resource Integration Study (CARIS):** Part of the NYISO's Comprehensive System Planning Process (CSPP), CARIS evaluates the economic impact of proposed system changes. It consists of congestion studies developed with market participant input as well as additional studies that individual market participants may request and fund. The CARIS is based on the most recently approved Comprehensive Reliability Plan.

**Constraint:** A transmission system restriction that limits the ability to transmit power.

**Day-Ahead Market (DAM):** A NYISO-administered wholesale electricity market in which capacity, electricity, and/or ancillary services are auctioned and scheduled one day prior to use. The DAM sets prices as of 11 a.m. preceding the day these products are bought and sold, based on generation and energy transaction bids offered in advance to the NYISO. More than 90 percent of energy transactions occur in the DAM.

**Day-Ahead Demand Response Program (DADRP):** A NYISO demand response program to allow energy users to bid their load reductions into the day-ahead energy market, as generators do.

**Demand Response Programs:** A series of programs designed by the NYISO to maintain the reliability of the bulk electricity grid by calling on electricity users to reduce consumption, usually in capacity shortage situations. The NYISO demand response programs include Day-Ahead Demand Response Program (DADRP), Emergency Demand Response Program (EDRP), and Special Case Resources (SCR).

**Distributed Generation:** A small generator, typically 10 megawatts or smaller, attached to the distribution grid. Distributed generation can serve as a primary or backup energy source, and can use various technologies, including wind generators, combustion turbines, reciprocating engines, and fuel cells.

**Eastern Interconnection:** The Eastern Interconnection is one of the three electric grid networks in North America. It includes electric systems serving most of the United States and Canada from the Rocky Mountains to the Atlantic coast. The other major interconnections are the Western Interconnection and the Texas Interconnection.

**Electric Reliability Organization (ERO):** Under the Energy Policy Act of 2005, the Federal Energy Regulatory Commission (FERC) is required to identify an ERO to establish, implement and enforce mandatory electric reliability standards that apply to bulk electricity grid operators, generators and transmission owners in North America. In July 2006, the FERC certified the North American Electric Reliability Corporation (NERC) as America's ERO.

**Emergency Demand Response Program (EDRP):** A NYISO demand response program designed to reduce power usage through voluntary electricity consumption reduction by businesses and large power users. The companies are paid by the NYISO for reducing energy consumption upon NYISO request.

**Energy Efficiency Portfolio Standard (EPS):** A proceeding initiated on May 16, 2007 by the New York State Public Service Commission (NY PSC) to establish targets for energy efficiency, similar to the existing Renewable Portfolio Standard (RPS), and other programs intended to reverse the pattern of increasing energy use in New York. The NY PSC determined that New York possesses sufficient potential energy efficiency resources to reduce electricity usage by 15 percent of projected levels by 2015.

**Energy Independence and Security Act of 2007:** An extensive federal energy statute approved in December 2007. The stated purposes of the act are "to move the United States toward greater energy independence and security, to increase the production of clean renewable fuels, to protect consumers, to increase the efficiency of products, buildings, and vehicles, to promote research on and deploy greenhouse gas capture and storage options, and to improve the energy performance of the Federal Government, and other purposes."

**Energy Policy Act of 2005 (EPAct):** An extensive energy statute approved in August 2005 that requires the adoption of mandatory electricity reliability standards and gave the Federal Energy Regulatory Commission (FERC) the authority to site major transmission lines under certain circumstances in National Interest Electric Transmission Corridors (NIETC) identified by the U.S. Department of Energy (DOE). The EPAct also made major changes to federal energy law concerning wholesale electricity markets, fuels, renewable resources, electricity reliability, and the energy infrastructure needs of the nation.

**Federal Energy Regulatory Commission (FERC):** The federal energy regulatory agency that approves the NYISO's tariffs and regulates its operation of the bulk electricity grid, wholesale power markets, and planning and interconnection processes.

**High Electric Demand Days (HEDD):** Days of high electricity demand, which can dramatically increase ozone-forming air pollution from electric generation, often resulting in nitrogen oxide (NOx) emissions that can be greater than two times their average levels. Days of high electricity use often coincide with days with high ozone levels.

**Installed Capacity (ICAP):** A generator or load facility that can supply and/or reduce demand and qualifies as installed capacity in the New York Control Area (NYCA).

**Installed Reserve Margin (IRM):** The amount of installed electric generation capacity above 100 percent of the forecasted peak electricity consumption that is required to meet New York State Reliability Council (NYSRC) resource adequacy criteria.

**Interconnection Queue:** A queue of merchant transmission and generation projects that have submitted an Interconnection Request to the NYISO to be interconnected to the state's bulk electricity grid. All projects must undergo three studies – a Feasibility Study (unless parties agree to forgo it), a System Reliability Impact Study (SRIS), and a Facilities Study – before interconnecting to the grid.

**Load:** A consumer of energy (an end-use device or customer) or the amount of energy (megawatt hour - MWh) or demand (megawatt - MW) consumed.

**Locational Installed Capacity Requirement:** A NYISO determination of that portion of the statewide installed capacity requirement that must be located electrically within a locality to provide sufficient available capacity to meet reliability standards.

**Loss of Load Expectation (LOLE):** The amount of generation and demand-side resources needed to minimize the probability of an involuntary loss of firm electric load on the bulk electricity grid. The state's bulk electricity grid is designed to meet LOLE that is not greater than one occurrence of an involuntary load disconnection in 10 years, expressed mathematically as 0.1 days per year.

**Market-Based Solutions:** Investor-proposed projects that are driven by market needs to meet future reliability requirements of the bulk electricity grid as outlined in the Reliability Needs Assessment. Those solutions can include generation, transmission and demand response programs. Market-based solutions are preferred by the NYISO's planning process. The NYISO is responsible for evaluating all solutions to determine if they will meet the identified reliability needs in a timely manner.

**Megawatt (MW):** A measure of electricity equal to 1 million watts.

**New York Independent System Operator (NYISO):** Formed in 1997 and commencing operations in 1999, a not-for-profit organization that manages New York's bulk electricity grid, administers the state's competitive wholesale electricity markets and provides system and resource planning for the state's bulk power system. The organization is governed by an independent Board of Directors and a governance structure made up of committees with market participants and stakeholders as members.

**New York Control Area (NYCA):** The area under the electrical control of the NYISO. It includes the entire state of New York, divided into 11 load zones.

**New York Power Pool (NYPP):** Established July 21, 1966 in response to the Northeast Blackout of 1965, a voluntary collaboration of the state's six investor-owned utilities plus New York's two power authorities created to coordinate the operations of the New York State power grid. The NYISO assumed this responsibility in 1999.

**Peak Demand:** The maximum instantaneous power demand averaged over any designated interval of time and measured in megawatts (MW). Peak demand, also known as peak load, is usually measured hourly.

**Peaking Unit:** Description referring to power plants that generally run only when there is the highest consumption of, or peak demand for, electricity (See "Peak Demand.")

**Regulated Backstop Solutions:** Proposals required of certain Transmission Owners to meet reliability needs as outlined in the Reliability Needs Assessment. Those solutions can include generation, transmission, or demand response. Non-Transmission Owner developers may also submit regulated solutions. The NYISO may call for a gap solution if neither market-based nor regulated backstop solutions meet reliability needs in a timely manner. To the extent possible, the gap solution should be temporary and strive to ensure that market-based solutions will not be economically harmed. The NYISO is responsible for evaluating all solutions to determine if they will meet identified reliability needs in a timely manner.

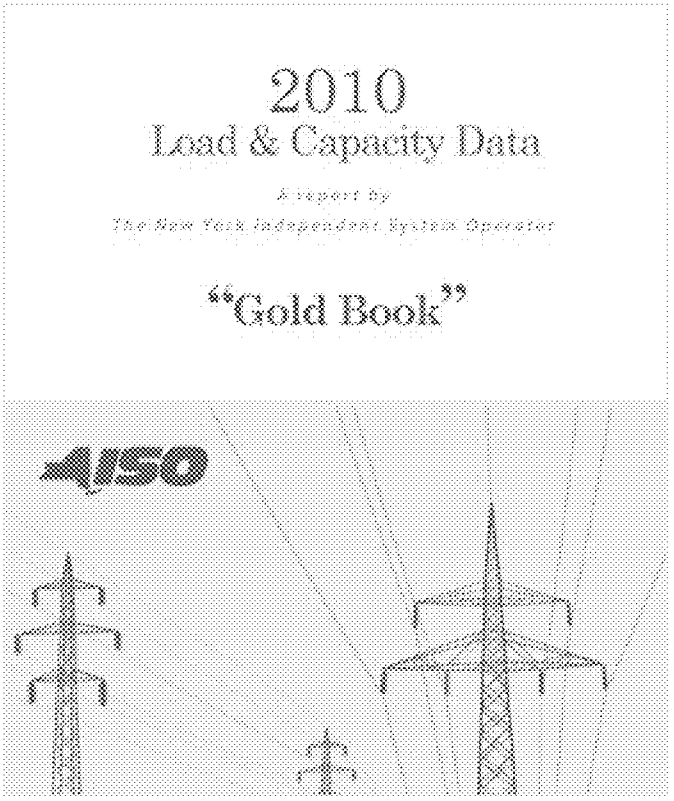
**Reliability Needs Assessment (RNA):** A report that evaluates resource adequacy and transmission system security over a 10-year planning horizon, and identifies future needs of the New York electricity grid. It is the first step in the NYISO's reliability planning process.

**Renewable Portfolio Standard (RPS):** The New York State Public Service Commission (NY PSC), in September 2004, issued its "Order Approving Renewable Portfolio Standard Policy" that calls for an increase in renewable energy used in New York State from the then current level of approximately 19 percent to 25 percent by the year 2013. In December 2009, the NYS PSC increased the RPS goal to 30 percent and extended the target date to 2015.

**Special Case Resources (SCR):** A NYISO demand response program designed to reduce power usage by businesses and large power users qualified to participate in the NYISO's installed capacity (ICAP) market. Companies that sign up as SCRs are paid in advance for agreeing to cut power upon NYISO request during periods of system stress. SCRs must demonstrate their ability to reduce load.

**Transfer Capability:** The amount of electricity that can flow on a transmission line at any given instant, respecting facility rating and reliability rules.

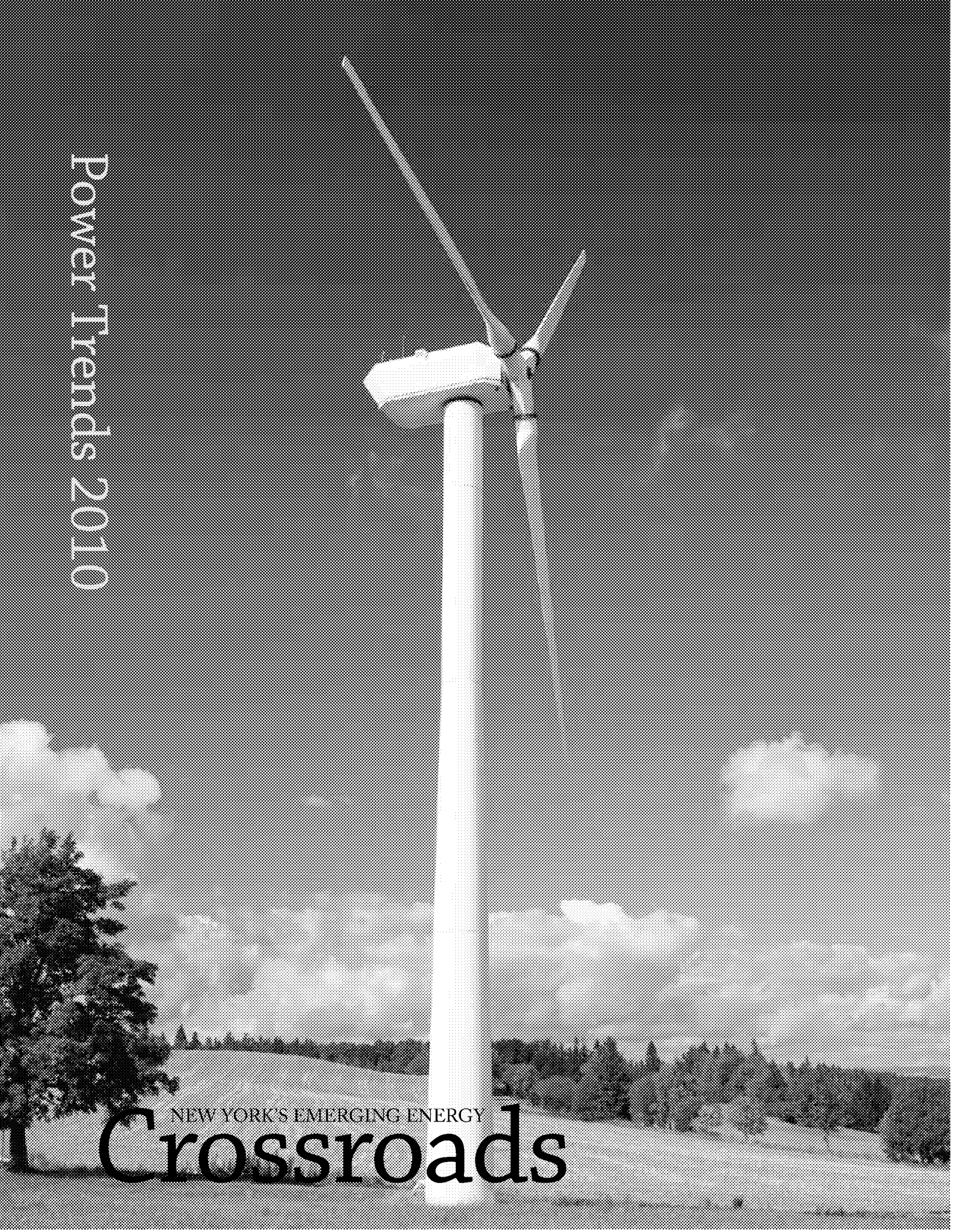
**Transmission Constraints:** Limitations on the ability of a transmission facility to transfer electricity during normal or emergency system conditions.




Data used in *Power Trends 2010*, unless otherwise noted, are from the *2010 Load and Capacity Data* report (also known as the "Gold Book").

Published annually by the NYISO, the "Gold Book" presents New York Control Area system, transmission and generation data and NYISO load forecasts for the 2010 – 2020 period. It includes forecasts of peak demand, energy requirements, energy efficiency, and emergency demand response; existing and proposed resource capacity; and existing and proposed transmission facilities.

For more information on the report, please go to the NYISO website, www.nyiso.com.



# Power Trends 2010

NEW YORK'S EMERGING ENERGY

# Crossroads

# The New York Independent System Operator (NYISO)

The New York Independent System Operator (NYISO) is a not-for-profit corporation 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.

The NYISO is governed by an independent Board of Directors and a committee structure comprised of a diverse array of stakeholder representatives. It is subject to the oversight of the Federal Energy Regulatory Commission (FERC) and regulated in certain aspects by the New York State Public Service Commission (NYSPSC). NYISO operations are also overseen by electric system reliability regulators, including the North American Electric Reliability Corporation (NERC), Northeast Power Coordinating Council (NPCC), and the New York State Reliability Council (NYSRC).

The members of the NYISO's 10-member Board of Directors have backgrounds in electricity systems, finance, academia, information technology, communications, and public service. The members of the Board, as well as all employees, have no business, financial, operating, or other direct relationship to any market participant or stakeholder. The NYISO does not own power plants or transmission lines.

The NYISO's independence means that its actions and decisions are not based on profit motives, but on how best to enhance the reliability and efficiency of the power system, and safeguard the transparency and fairness of the markets.

The mission of the NYISO, in collaboration with its stakeholders, is to serve the public interest by:

- *Maintaining and enhancing regional reliability*
- *Promoting and operating a fair and competitive electric wholesale market*
- *Planning for the power system of the future*

The NYISO manages the efficient flow of power on nearly 11,000 miles of electric transmission lines on a minute-to-minute basis, 24 hours-a-day, seven days-a-week. As the administrator of the competitive wholesale markets, the NYISO conducts auctions that match the retail electric service companies looking to purchase power and the suppliers offering to sell it.

In addition to these functions, the NYISO has an expanding and increasingly important planning function to assess New York's electricity needs and evaluate the ability of planned new power facilities and other options to meet those needs. This planning process involves stakeholders, regulators, public officials, consumer representatives, and energy experts who provide vital information and input from a variety of viewpoints.

The NYISO is committed to transparency and trust in how it carries out its duties, in the information it provides, and in its role as the impartial broker of the state's wholesale electricity markets. *Power Trends* is the NYISO's annual analysis of factors influencing New York State's bulk power grid and wholesale electricity markets. Begun in 2001 as *Power Alert*, the report provides a yearly review of key developments and emerging issues.

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