Power Alert:
New York's Energy Crossroads

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Report by
The New York Independent System Operator

NEW YORK INDEPENDENT SYSTEM OPERATOR

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Forward

A healthy economy in New York State and the concomitant rise in demand for electricity have outpaced the State's process for approval of additional power generation. This situation, which would have developed with or without the restructuring of the State's electric industry, is recognized as dangerous from the perspective of reliable supply, especially in the populous downstate region. That same restructuring, however, can work to solve the problem. The marketplace is responding with a host of proposals to add generating plants, and to establish price sensitive load and customer choice programs. This report examines the consequences of allowing the market to solve the problem and of not allowing the solution. Surprisingly, it concludes that the market solution can work both to improve the natural environment and moderate the wholesale price of electricity. If the marketplace response is permitted to transpire, the restructuring will have fulfilled its promise to make New York an even better place to live and do business.

I. Executive Summary

The purpose of this report is to examine the consequences of a change in the pace of building power plants and in pursuing investments in consumer options like energy conservation, in New York State. Such consequences affect the availability and reliability of the State's supply of electricity, the impact on the natural environment, and the price of this essential product. In order to illustrate these consequences, the report compares over a time frame of five years, what will happen if electric generation capacity is expanded in New York State, and what will happen if it is not. This report was prepared by the New York Independent System Operator (NYISO) with analysis and modeling by GE Systems. A list of assumptions and technical data regarding the modeling is found in Appendix D.[1]

New York faces a growing disparity between electricity demand and in-State supply. Between 1995 and 2000, while statewide demand for electricity rose by 2,700 megawatts (MW), generating capacity increased by only 1,060 MW. With no major new generating plants in downstate New York fully approved for construction at this juncture, this gap will continue to widen, especially in the critical downstate area as well as statewide.

California's recent woes, with sharp electricity price increases and major disruptions in service, provide an important warning for New Yorkers. New York must reverse the trends of recent years and bring the State's supply and demand of electricity into greater balance, especially in the downstate region. New Yorkers must turn around the decade long trend of avoiding responsibility to provide for future generations' social and economic vitality through modern, safe, state-of-the art power generation and transmission infrastructure along with enhanced conservation and load management options. Failure to achieve this goal will signal environmental degradation, a gradual decrease in the reliability of our electric infrastructure, and higher prices.

AVAILABILITY AND PRICE

In preparing this report, the NYISO projected several alternative generation expansion scenarios for New York State's immediate future and two cases were selected in preparing this report. A review of the two cases studied for this report clearly indicates that to avoid a replication of California's "market meltdown," with its attendant price increases and rolling blackouts, New York must attend to its growing supply/demand imbalance. This reversal is required in order to maintain the State's enviable reliability record, continue its economic growth, and improve the competitiveness of the New York electricity markets. Modeling of the scenarios studied indicates that by 2005, statewide prices are likely to be more than 20 - 25 percent lower in the case in which new plants are built than in the case where they are not, under the assumptions employed in this analysis. In New York City, the price to consumers of electric power could be reduced by as much as 28 percent when compared to the case of no new supply or load management programs

To ensure reliable supply and achieve the projected savings, this report recommends the addition of 8,600 MW of new installed electric capacity by 2005. New York State must also approve a substantial amount of new generation, in the range of 4,000-5,000

[1] The New York Independent System Operator (NYISO) administers the State's wholesale electric energy markets, maintains the reliability of the state's bulk power system and operates the State's high voltage electric transmission system. It is a not-for-profit corporation established in 1999 to facilitate the restructuring of the electric industry in New York State. Its interest in the subject matter of this report is grounded in the fact that the markets it administers must have adequate competition among suppliers if the markets are to operate efficiently and in the public interest; and that adequate reserve generating capacity is vital to ensuring New York a reliable energy supply.

MW in the 2001 timeframe. These projections for additional generation are based on a modest economic growth rate assumption of 2.5 percent per year.[2] New York City, because it is both a major consumer of electrical power and also a "load pocket" (with limited ability to import power from outside the city over existing transmission lines) must have 2,000-3,000 MW of this additional capacity approved within its own area. New York State should also approve approximately 1,000 MW of generating capacity statewide each year for the next three-to-four years, with more than 50 percent of it located in New York City and on Long Island.

RELIABILITY

Increasing New York's generating capacity will also lessen the State's escalating and risky reliance on out-of-State sources of electricity. Since 1999, New York State has been unable to cover its reserve requirements (the generation capability needed to ensure delivery of power during periods of peak demand) from in-State sources.

In order for New York to meet the national and regional reliability criteria, the New York State Reliabilty Council (NYSRC) has determined that generating capacity must exceed peak demand by a minimum of 18 percent. This required excess, known as installed reserve, does not reflect the newer, higher reliability requirements for the "information economy." Nor does this 18 percent installed reserve capacity ensure the robust competition needed for a healthy deregulated market for electricity.

Absent more in-State generating capacity, the State's reliance on out-of-State sources of electrical power to meet reserve requirements will continue to grow. In fact, if no new in-State generation comes on-line in the next five years, in-State reserve margins of electricity generation will shrink from a current 14.9 percent above peak demand to a dangerously low 8.4 percent by 2005. As has been evident in California, increased reliance on out-of-State sources of power can subject electrical suppliers and customers in New York to transmission restrictions and political and economic considerations beyond the control or influence of responsible New York State entities.

PROTECTING THE ENVIRONMENT

Securing approval for new generating plants does not require a lessening of environmental responsibilities. Indeed, some of the greatest benefits of increasing generation capacity and introducing consumer options including more energy conservation and price-sensitive load, will be environmental. Modern natural gas-powered generation plants have far less effect on air and water quality than the other fossil fuel technologies currently employed in New York. Under the expanded generation scenario analyzed in this report, there would be 28 percent less sulfur dioxide and 43 percent less nitrogen oxides emitted in New York State in 2005 compared with the no expansion scenario. When such new facilities are brought on-line, older, uneconomic, less efficient generating stations will operate at considerably reduced levels or be shut down entirely except during periods of maximum load demand.

Altering New York State's attitudes and making a commitment to generation expansion, and consumer choice options including energy conservation, and price-sensitive load programs should also encourage "green power" and distributed generation to invest in New York State. Wind and solar developers, for example, could find incentives to do business in New York under such programs as the existing "System Benefits" charge program.

COMPETITION

One of the principal purposes of electric industry restructuring was to permit competition to determine the price of electricity. Robust competition

[2]Economic growth of 2.5 percent/year is consistent with the NYISO's forecasted growth in electric demand of 1.2 - 1.4 percent/year.

would produce both a healthy market and lower prices for consumers than under the old regulated industry model. Competition, however, depends upon adequate supply, and the inability to date of New York State's licensing system to process siting applications, has constricted supply to the point that scarcity threatens the very competition upon which the system depends.

Construction of additional generation plants, coupled with customer choice based price-sensitive load programs, will increase competition and help to moderate prices. [3]

THE SITING LAW

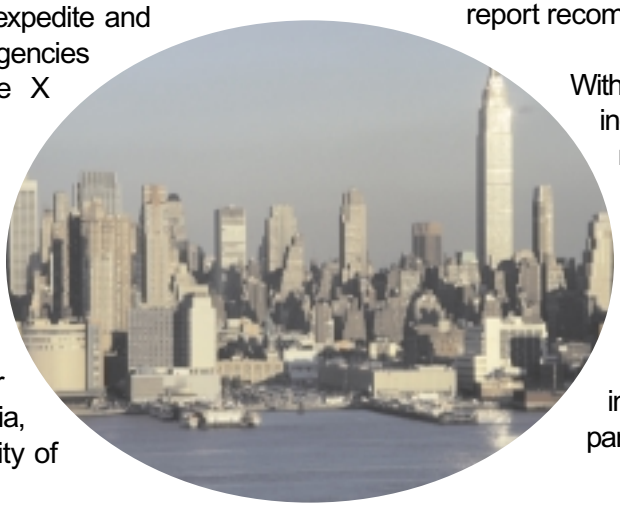
Achieving the benefits of the expanded generation case will require important reforms at the State level. Specifically, New York State's Public Service Law, Article X[4] governing siting and construction of power generation facilities must work to site plants more expeditiously or be changed. Moreover, the restructuring of New York's electric sector has diffused responsibility for getting plants built. The "Load Serving Entities" (formerly electric utility companies) are no longer expected to build power plants. Private companies will now build new generating plants when the energy markets indicate they are needed. The Article X process requires the cooperation of multiple State agencies. A clear designation of a lead agency and the adoption of an "ombudsman program" to expedite and coordinate the work of the agencies responsible for the Article X process must be made.

NEW YORK AT THE CROSSROADS

On a positive note, the restructured market for power in New York is far healthier than that in California, due in large part to the ability of New York's utilities to enter into long-term power contracts. The basic structure of the New York market will also reduce unwarranted price spikes and other market disruptions through mitigation programs which automatically correct price spikes due to market power abuses.

Nevertheless, California's experience raises a caution flag for all New Yorkers. The deregulated market in New York cannot achieve lower costs through competition without an increase in generating capacity similar in magnitude to the recommendations of this report, along with simultaneous efforts to institute greater conservation, better load management and alternative energy supply initiatives. Additionally, closer integration with regional suppliers of power is both inevitable and beneficial. The NYISO is working to facilitate better coordination of the transmission infrastructure in New York State and throughout the Northeast region.

It is also important to remember the positive aspects of mounting electricity demand in New York State. Increased demand is an indicator of economic health; New York's heightened demand for electricity results directly from the growing economy and the consequent improved standard of living for most New Yorkers. But keeping New York State's economy healthy and growing requires the well-coordinated energy policy this report recommends.



With demand for electricity increasing and generating reserves dwindling, even if the new plants this report recommends are expeditiously licensed and constructed, it will be difficult in the short run to avoid disruptions in service. This will be true particularly in New York City

[3]Ultimately, all retail customers will have to be metered and billed real-time prices. When this is achieved, the customers themselves will be in control of their usage and the price they are willing to pay.

[4]Appendix C contains a description of the Article X process.

and on Long Island and during extreme weather conditions. Moreover, if these plants do not materialize to fuel the competition upon which successful restructuring depends, prices will increase sharply; unnecessary environmental degradation will occur; and the economic and political consequences for all New Yorkers will be severe.

Key Observations, Recommendations and Projections

OBSERVATIONS:

- Reliability-wise New York is on the thin edge:
  - Between 1995 and 2000, while statewide demand for electricity rose by 2,700 megawatts (MW), generating capacity increased by only 1,060 MW;
  - Demand for electricity is expected to increase at an annual rate of 1.2 - 1.4 percent each year in the near future;
  - After 18 months under the revised Article X process, only two plants have been approved (both upstate) and neither have yet to begin construction; and
  - To avoid a replication of California's price increases and rolling blackouts, New York must attend to its growing supply/demand imbalance.

RECOMMENDATIONS:

- New York State should approve a substantial amount of new generation, in the range of 4,000-5,000 MW during 2001;
- New York State should also approve approximately 1,000 MW of generating capacity statewide each year for the next three to four years, with more than 50 percent of it located in New York City and on Long Island;
- New York City, because it is both a major consumer of electrical power and also a "load pocket" (with limited ability to import power from outside the city over existing transmission lines) must have 2,000-3,000 MW of this additional capacity approved within its own area;
- By 2005, projections show 8,600 MW of new generation would provide significant economic and environmental benefits;
- Because of the current problems with siting new capacity in New York State, a clear designation of a lead agency and the adoption of an "ombudsman program" to expedite and coordinate the work of the agencies responsible for the Article X process must be made;
- To further enhance a competitive wholesale electricity market in New York, demand response and price-sensitive load initiatives should be developed on an expedited basis; and
- The State needs to develop a market in renewable energy.

LONG-RANGE RECOMMENDATIONS:

- Transmission infrastructure upgrades and expansions and distributed generation should be encouraged through market design;
- As part of its energy policy, the State must consider matters of fuel diversity in addition to the issues of economics and adequacy of energy supply; and
- To facilitate the development of additional natural gas-fired combined cycle plants, the State must examine the expansion of its natural gas transmission infrastructure.

PROJECTIONS:

The following projections are made by

comparing the results of the two cases analyzed in this report; one case considers the addition of 8,600 MW and the other case considers no additions in capacity. Both cases offer results in terms of wholesale prices and are not indicative of what retail prices may be nor do the results indicate that prices in either case will be lower than present day prices because of uncertainties such as fuel costs. On a relative basis, however, we believe the contrasts between the outcomes of the two cases are accurate and instructive.

If the recommended additional capacity of 8,600 MW is added by 2005:

- wholesale prices could be more than 20-25 percent lower than in the no addition case;[5]
- in New York City, the wholesale price to consumers of electric power could be reduced by as much as 28 percent as compared to the no addition case;
- for the State as a whole, this could amount to a savings of more than $1.4 billion annually; and
- there will be 28 percent less sulfur dioxide and 43 percent less nitrogen oxides emitted in New York State, resulting in a total reduction of 88,000 tons of SO_2 and 45,000 tons of NO_X per year.

If the recommended additional capacity is not added by 2005:

- statewide prices could be expected to continue to increase each year even assuming no increase in fuel or other costs; and
- if no new generation is added, the in-State reserve margins of electricity will shrink from a current 14.9 percent above peak demand to a dangerously low 8.4 percent.

II. UNDERSTANDING NEW YORK'S WHOLESALE ELECTRICITY MARKET AND ITS NEEDS

With daily newspaper stories highlighting the electricity shortages and skyrocketing electricity prices in California, it begs the question, " Will the same things happen in New York?" While both States have restructured their wholesale markets for electricity, California and New York have employed very different approaches.

California has relied heavily on electricity imports and its market structure initially did not permit distribution companies to enter into long-term contracts. While New York suffers from neither of these obstacles, it does share major problems with California: the lack of new electric energy supplies to support a competitive electricity market; and significant transmission limitations.

Restructuring's promise to New York's electricity consumers was that competition would make the industry more efficient and transparent, thereby leading to the potential lowering of prices. The key to keeping this promise lies in assuring the presence of vigorous competition. However, competition won't be present to affect prices to consumers if demand is allowed to outstrip supply. The challenge facing New York State is to foster competition by permitting growth in the supply of electricity and adopting demand altering measures to assure a competitive relationship between supply and demand.

Indeed, New York has the opportunity to adopt prudent policies to minimize the likelihood of California's problems happening here. New York State must act expeditiously and choose a sound policy direction if its electricity infrastructure is to support continued economic growth.

[5]An intermediate case which would only include enough generation to meet "minimum" reliability standards would produce proportionally lower economic and environmental benefits.

This is especially true in the New York City metropolitan area that is the de facto financial capital of the world. "Electrification"-- electricity's increasing share of overall energy use -- is one of the primary enablers of the new information economy. This new economy paradigm has resulted in strong growth in productivity and an increase in the standard of living.

Demand for electricity is increasing. Reserves of generating capacity are dwindling. There is very little customer demand response (customer response to price) , and no major new generating plants have been approved for the critical New York City and Long Island area at this juncture. Given these factors, New York faces declining reliability of service, environmental degradation, and rising electricity prices. The NYISO is moving as rapidly as possible to improve the wholesale markets for electricity and increase competition. But immediate action also must be taken to expedite the review and approval of major new generating plants, and to facilitate the development and implementation of price-sensitive load programs, particularly in New York City and on Long Island. Failing to pursue such policies will put the State's economy, environment and electric reliability in jeopardy.

RELIABILITY, COMPETITION AND PRICE

Because power plants and transmission lines are sometimes out of service for maintenance or repair, and because forecasts of electric demand can never be 100 percent accurate, engineering modeling based on historical data has determined that generation reserve margins of 18 percent are required simply to maintain minimum reliability standards. It is important to understand, however, that the 18 percent figure only assures a reasonable minimum reliability margin. It does not ensure robust competitive markets, nor does it reflect the increased reliability requirements of the information economy (just two days of rolling blackouts in January resulted in tens of millions of dollars of increased costs in Silicon Valley alone).

If no new generation comes on line in the next five years, in-State reserve margins will shrink

Figure 1

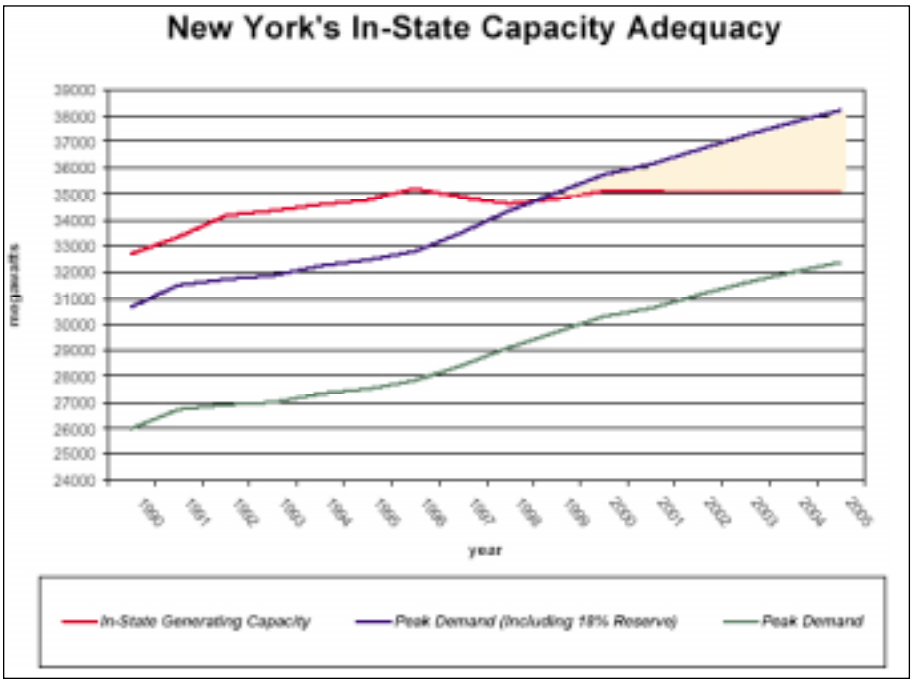
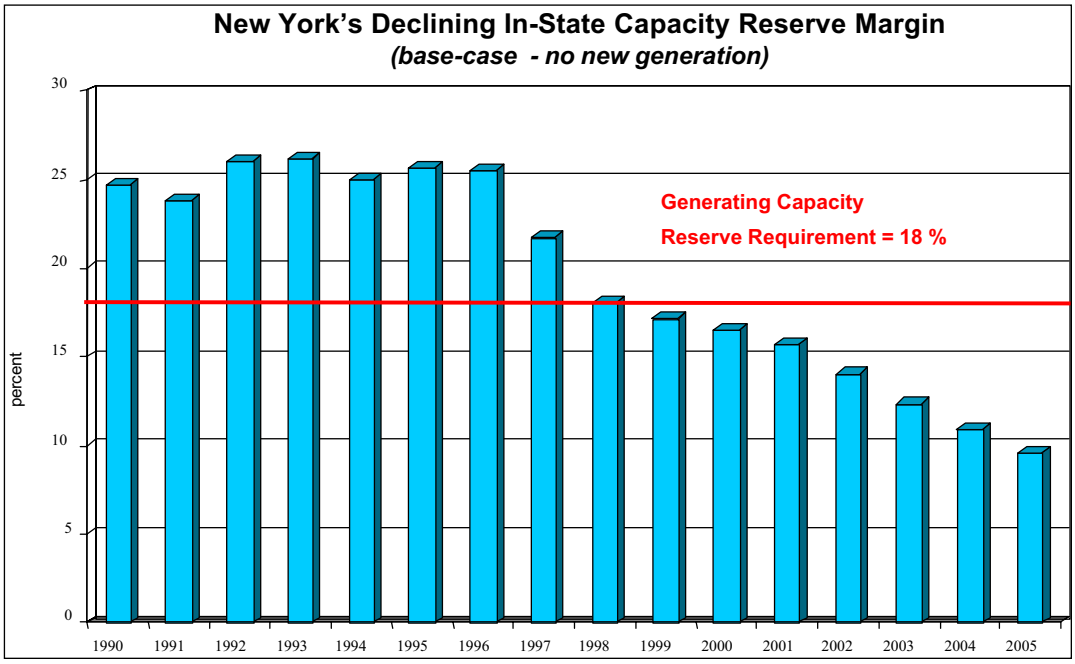


Figure 2



from 15 - 8 percent and as shown in the body of the report, prices are likely to increase 10 -15 percent statewide between the years 2000 and 2005, and 15 - 20 percent in New York City, even assuming no increase in fuel or other costs.

As Figure 1 depicts, beginning in 1999, New York's overall in-state supply could not meet reliability requirements without power purchases from outside the State. Not shown here, is the 300 MW generation deficit in New York City in year 2000.

Approximately 3 percent of New York State's capacity requirement came from out-of-State resources in 2000 (see Figure 2). If New York does not add generation within its borders, the State will become increasingly dependent on outside sources to "keep the lights on," precisely the problem being encountered in California today.

Again, Figure 2 shows that since 1999, New York was unable to cover its reserve requirement from in-State generating sources. Available supply has fallen short of meeting the required generating capacity (installed generating capability equivalent to 18 percent greater than the projected peak load) with in-State resources. This shortfall is projected to increase between now and 2005, with attendant increased probability of blackouts, reduction in market competitiveness (leading to much higher prices) and environmental degradation.

Purchases of electricity from outside New York and interruptible resources are now required to maintain the reliability standard. While the availability of external capacity broadens the resource base and increases competition, transmission restrictions and the priorities of neighboring areas call into serious question whether sources of supply purchased external to New York are, in times of crisis, as dependable as facilities actually located in New York.[6] Recent newspaper accounts contain stories of political

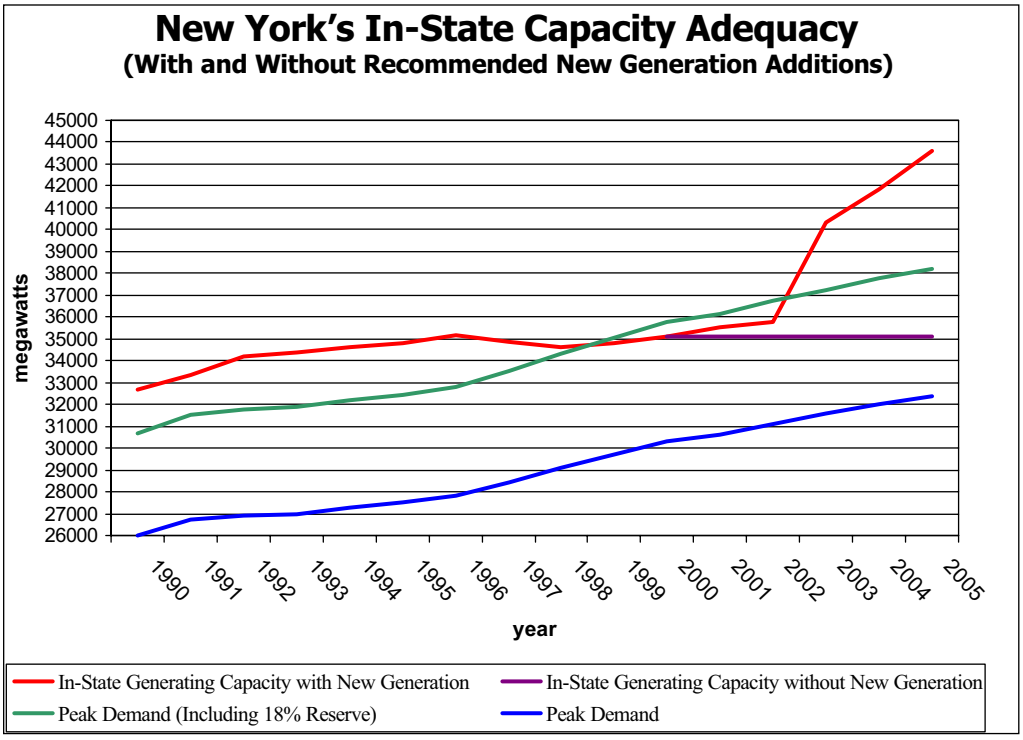
[6] The NYISO is playing an important role in seeking to create markets across State and ISO boundaries that will reduce impediments to transactions across those boundaries, thus somewhat reducing the danger of reliance on out-of-state resources.

leaders in neighboring states proposing to dedicate in-State generators to only serve load in their home State.

The situation in New York City and on Long Island is even more critical because these areas are "load pockets." A load pocket is an area where the import capability of the transmission system, together with the local generating capacity, is insufficient to meet the electricity demand in all hours. The risk of not being able to supply the electricity demand in such areas is highest in the event of a generator or transmission outage. Import capability into New York City and Long Island has remained essentially fixed, while electricity demand in both locales has continued to escalate.

Therefore, it's critical that new plants be located "in-city" and "on-island" to maintain reliability, enhance competition and support economic growth. The New York Power Authority's (NYPA) installation of up to 450 MW of combustion turbines in New York City is urgently needed and will provide some short-term reliability support if they can be built in the face of local opposition and numerous lawsuits. These turbines will lower prices somewhat during periods of relatively high demand. However, they are less efficient overall than larger new "base load" units. Similarly, while load management, conservation and distributed generation (small, locally situated generators) are all being pursued; in the near term they will provide only marginal improvements in reliability and in competitive prices.[7]

Figure 3

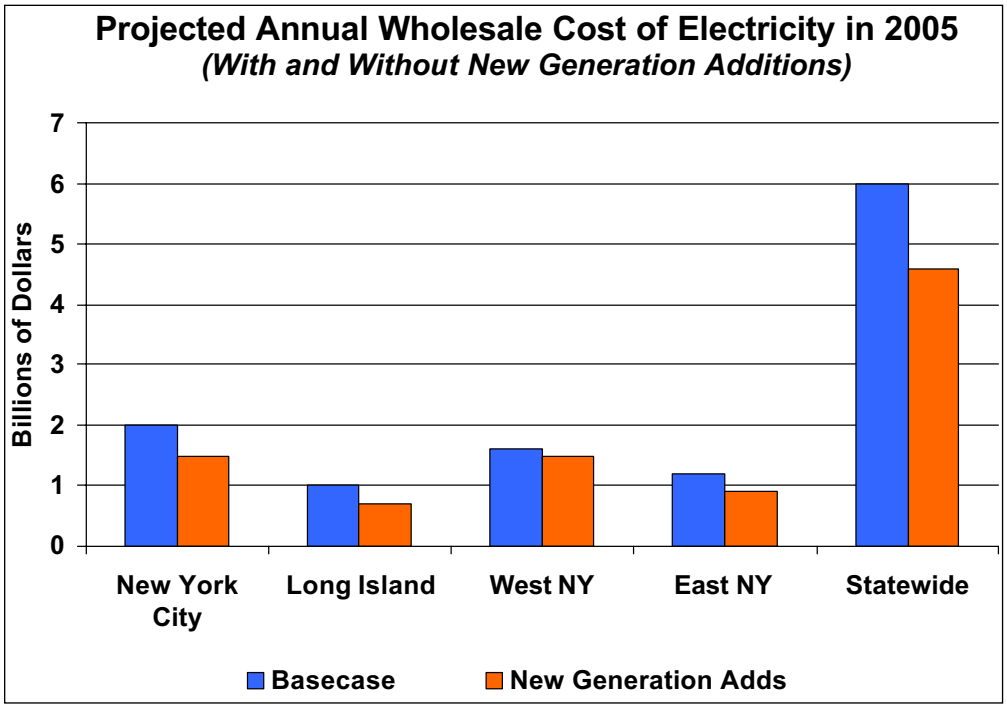


[Note: Throughout this discussion, for illustrative purposes, the NYISO will be discussing the following example of new generating capability. The details are presented later in the discussion (See Section I. A. Table 2).

Base Case:	**No New Generation**
New Generation:	**8600 additional Megawatts by June 2005]**

[7] The NYISO/GE analyses did account for demand side response programs, but their impact on average price levels was small.

Figure 4

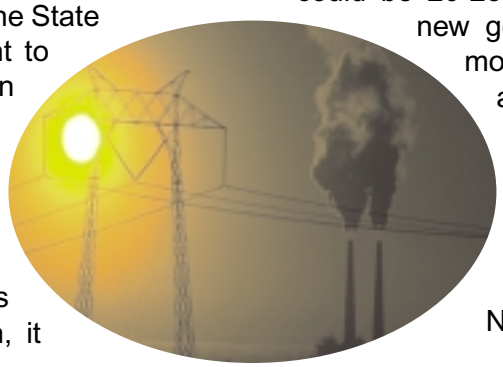


The choices New York faces for reliability and electricity prices can be summarized in the following two (2) graphs:

Figure 3 shows that the generation additions this report recommends would not only provide the reserve capacity NY needs to maintain reliability, but will also provide the additional supply to create a robust, competitive market and to permit newer more efficient plants to displace older facilities.

Figure 4 includes cases that examine 1) adding and 2) not adding, new generation. The above graph shows the dramatic reduction in electricity costs that will result if significant new generation is added. For the State as a whole, this would amount to a savings of over $1.4 billion annually in 2005.

For almost a century, pricing in the United States electric markets has been based on cost of electricity production plus a regulated profit. Regulation, it was said, was a substitute for competition. Restructuring and deregulation of generation supply in New York State have made it possible to restore competition to its traditional place in the marketplace. However, the transition to competitive markets can only be successful if adequate supply permits vigorous competition. This report argues that growth in supply has been hindered in recent years in New York. If this trend continues and no new generation is added in New York, by 2005 statewide prices could be expected to increase by about 14 percent from present levels. If supply is allowed to grow, modeling indicates that 2005 statewide prices should actually decrease and could be 20-25 percent lower than if no new generation is added. The modeling does not include any inflation or fuel cost increases.

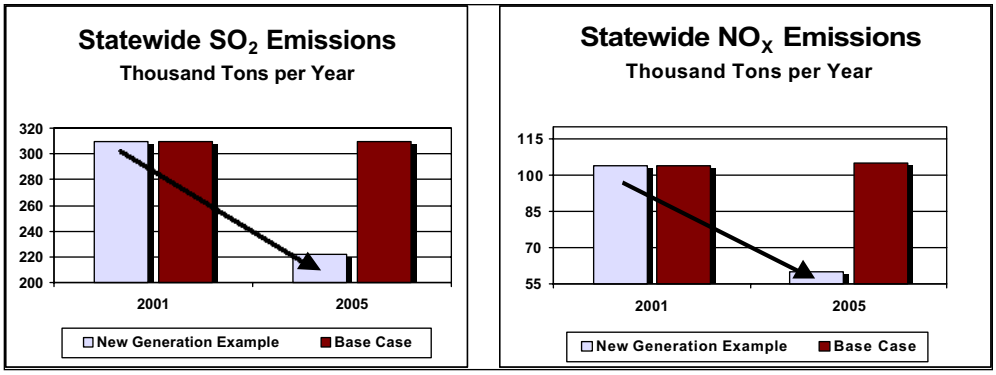


PROTECTING THE ENVIRONMENT

New state-of-the-art power

plants burn much cleaner fuel (gas), and do so far more efficiently than most of the existing fleet of plants. Because of this heightened efficiency, modern plants will have lower operating costs and, therefore, will be able to operate for more hours than the older plants. Thus, cleaner energy will significantly displace more polluting energy from far less efficient plants if streamlined siting procedures can be established. Adding the 8,600 MW of new generation as called for, would represent, respectively, a 28 percent and 43 percent reduction in emissions for SO_2 and NOx as compared to the no new generation case (See Figure 5 below). These reductions amount to a total reduction of 88,000 tons of SO_2 and 45,000 tons of NOx per year, a significant reduction in air emissions produced in New York State.

Figure 5



THE CONCLUSIONS ARE INESCAPABLE:

New York State must improve its competitive power market place by balancing its growing electrical demand with new sources of electricity and load management on an urgent basis.

WHAT NEEDS TO BE DONE

The effects of doing nothing to increase New York's generating resources (Base Case/No New Generation) are clear:

- PRICES WILL RISE;
- RELIABILITY WILL DECLINE; AND
- AIR QUALITY WILL DECLINE.

Alternatively, installing new, efficient, and environmentally superior generation will dramatically reduce future electricity prices from levels they might otherwise reach, while significantly improving reliability and air quality.

Based on the facts, the direction New York must choose at its energy crossroads seems clear: it must move aggressively to build new plants. Why then, with over 29,000 MW of proposed new generation in the siting pipeline, is New York in imminent danger of experiencing higher prices coupled with declining reliability and air quality?

The answer, unfortunately, is that while New York's siting process provides for the appropriate environmental and legal reviews, so far this process has not resulted in timely siting decisions.

At the policy level, New York State must:

1. Streamline New York's Article X laws and establish single point accountability for meeting the law's statutory deadlines. Article X contains a nominal one-year time limit for processing applications, but the year is measured from the time the application is deemed complete. At present, it takes too long (in some cases, years) for an application to be deemed complete. There needs to be better coordination between the Article X agencies, to more effectively process and review the applications. The State should take a proactive posture towards working with applicants to complete applications, by strengthen-

ing communications between the applicants and the siting authorities. For example, an "ombudsman" approach has been used by the Empire State Development Corporation to aid and attract businesses to locate in the State and could be used as a model to facilitate navigating the siting process.

2. Accelerate New York's consumer conservation options including price-sensitive load programs and move quickly to "real-time" retail metering, pricing, and billing.

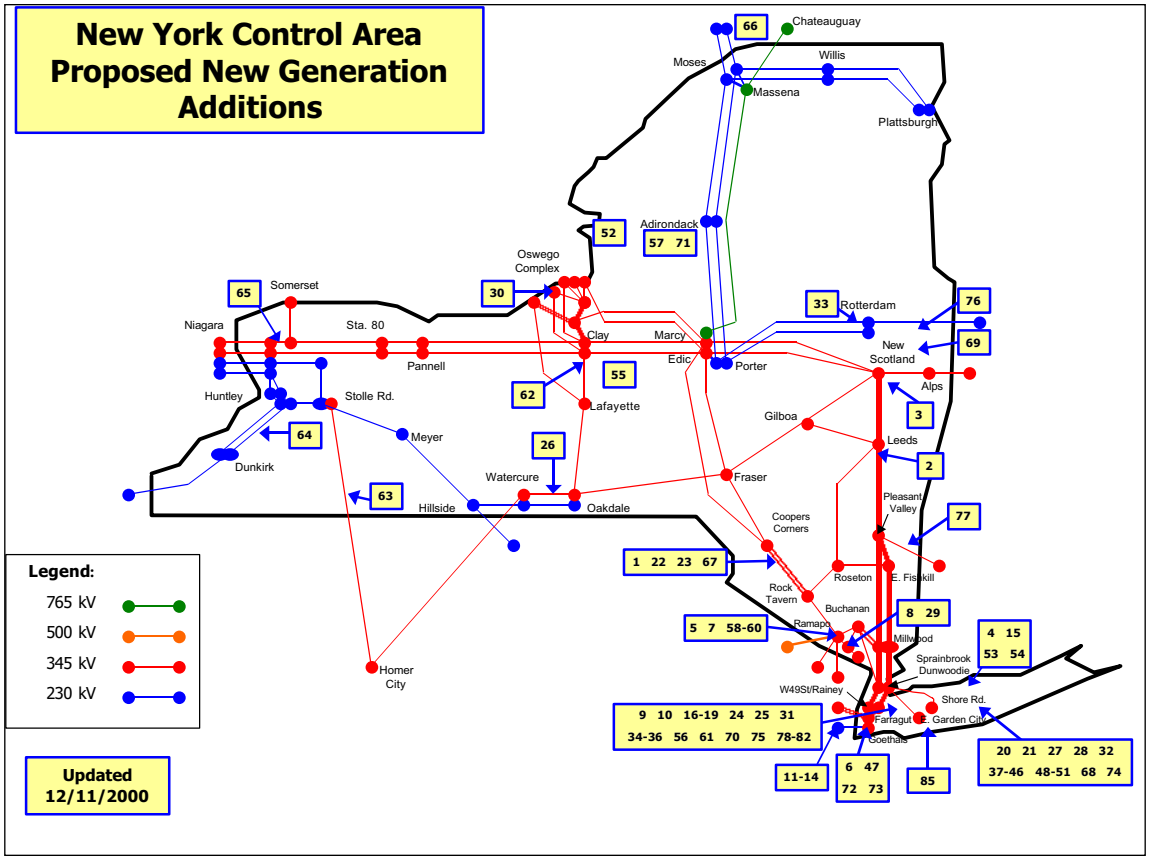
3. Upgrade New York's and the Northeast region's transmission infrastructure.

4. Support more integrated electricity markets in the Northeast.

The wholesale electricity markets administered by the NYISO are working successfully to provide economic incentives to invest in power plants to serve the State. Care must be taken lest market-intrusive measures hastily embraced to moderate the price impact of the power plant shortage result in removing those incentives and exacerbate the shortage.

The situation in New York is better than that of California, due in large part to the ability of New York's utilities to enter into long-term power contracts and the more efficient basic design of the New York markets. Also, the basic structure of the New York market works toward reducing unwarranted price spikes and other market disruptions. However, the market in New York cannot achieve lower costs through competition without lowering demand through conser-

Figure 6



Note: Each number shown above represents proposed new generation project. See Appendix A for further information about each of these proposed projects.

vation and adding generation. In the short run, over the next five years, the generation option will have to provide the largest contribution towards bringing suppy and demand into better balance.

Enlightened public policy requires that the State adopt a vigorous, cooperative and proactive policy toward assisting developers proposing power projects in the State. Among other things, the State of New York should expedite the review (and where appropriate, the approval) of a sufficient number of the plants shown in Figure 6 to reach generation levels such as those shown for the new generation case outlined in this report. These levels should be regarded as a minimum because it is unlikely that all projects that receive State approval will ultimately be completed. On a statewide basis, a total of 4,000-5,000 MW should be approved during 2001 with 2,000-3,000 MW of that total being in New York City. Both price and emission reductions would be greater if the assumptions in the new generation example were exceeded.

A comparison of New York and California is shown below in Figure 7. A comparison with other areas that have restructured their markets is shown in Appendix E.

The coming summer of 2001 will see the electric system as well as the wholesale markets challenged again. While improvements to the market have been instituted by the NYISO to minimize price volatility, the continued growth in demand will likely cause some increase in the overall price of electricity.

One measure to ameliorate the potentially tight capacity problem is to develop and implement demand response programs, including

Figure 7

New York versus California

Differences and Similarities

	New York	California
Peak Demand (MW)	**30,311**	**45,570**
Population Served (millions)	19	27
Reserve Capacity (%)	**18**	**9.3**
Power Imported at Peak Demand (%)	**< 5**	**25**
Installed Generating Capacity (MW)	34,700	50,300
New Plants Built 1995-2000 (MW)	**1,084**	**672**
Long-term (bi-lateral) Contracts	**Yes**	**No**
Energy Markets - Day-ahead	Yes	Yes
- Hour-ahead	Yes	Yes
Ancillary Services (Market or cost-based)	Market	Market
Installed Capacity Market	Yes	No
Method of Congestion Management	Financial	Physical
Average Energy + A/S Price in 2000 ($/MWh)	**$58.15**	**$117.18**
Market Volume * in 2000 ($)	**$ 5.2 billion**	**$ 28.0 billion**
(million-MWh)	**160.7**	**238.7**
Energy Bid Cap ($/MWh)	**$1,000**	**$250**
Market Model	LBMP	Zonal
Control versus Power Exchange Functions	Combined	Separate

* - includes energy, ancillary services, ICAP and TCC auctions

price-sensitive load mechanisms. The NYISO and New York's utilities are currently implementing two programs. One provides for greater demand response during emergency conditions, and a second allows customers on interruptible rates to sell reductions in consumption into the day-ahead market. In both cases, it is essential to pay participating consumers for their response, since costs to curtail are real and energy will subsequently be consumed to compensate for lost production. The amount of demand reduction achievable from these procedures cannot be predicted with precision, but even 200-300 MW should yield significant benefits on the handful of days when, absent the active participation of price-responsive load, system operation would be in jeopardy and/or prices could reach very high levels.

To achieve the full benefits of electricity market deregulation, some customers need to be exposed to the true price (determined either in the day-ahead market or in real-time) of electricity. One of the many lessons learned from the recent California experience is that, in the presence of a capacity shortfall, when retail rates and wholesale prices are disconnected in time and space, the results can be disastrous.

Customers exposed to real-time prices will make appropriate energy use choices by delaying or altering consumption within and across days, or by reducing consumption altogether. The ability to shift consumption in response to higher prices can have a significant impact on the supply and demand equation and result in the mitigation of price spikes. Price responsiveness by customers forces suppliers to consider the consequences of their bids and adjust their strategy accordingly. Suppliers have even greater incentive to bid their marginal cost.

In a survey of four real-time pricing programs (three domestic and one foreign), a common theme emerged; as the ratio of peak to off-peak prices increased by 10 percent, 1.5 percent of electricity use by program participants shifted from peak to off-peak periods. On average, customers in each study shifted roughly the same percentage of electricity consumption from high to comparably low-priced hours.[8] However, the results indicated that there were large differences in customers' ability to respond to high prices. Real-time pricing programs run by Duke Power seem to confirm these results: as prices increased from $50/MWhr to $250/MWhr, roughly 200 MW (out of 1,000 MW participating in the program) shifted from high-priced to lower-priced periods.[9] Assuming a typical mix of customer participation and response in New York, and assuming that half of the load (15,000 MW) was exposed to real-time pricing, peak prices that are 10-15 times higher than off-peak would shift roughly 10 percent (1,500 MW) of the participating load from peak to off-peak hours. That should be sufficient to mitigate extreme price spikes and surges.[10]

Beneath the seemingly simple motivation to respond to fluctuating price signals lies the challenge to structure programs that appeal to

[8] Expanding Customer Access in New York State Electricity Markets. Draft Report prepared by Neenan and Associates, LLC. under contract with the NYISO. January 2001.

[9] Hirst, Eric, and Kirby, Brendan. Retail Load Participation in Competitive Wholesale Electricity Markets. Edison Electric Institute. January 2001.

[10] Caves, Douglas, Eakin, Kelly, and Faruqui, Ahmad. Mitigating Price Spikes in Wholesale Markets through Market-Based Pricing in Retail Markets. The Electricity Journal. Elsevier Science, Inc. April 2000.

a broad and diverse mixture of commercial, industrial and residential loads. Flexibility of response, end use value, and automated response capability all influence how various types of load will respond to time-varying prices. For example, the Edison Electric Institute has estimated that, nationwide, industrial customers represent 0.4 percent of all customers but account for 30 percent of total electrical demand. The most significant shifts in price-sensitive energy consumption will take place within a relatively small set of customers. However, it is important to encourage a wide variety of programs to capture the curtailment diversity as well and the curtailment quantity so that the portfolio of resources is diverse and resilient.

III. BACKGROUND AND ANALYSIS

A. Adequacy And Reliability Of Supply

Statewide, New Yorkers used 30,200 MW --seasonally adjusted-- of electricity during the peak day of the summer of 2000. This demand is expected to increase each year in the near future, at an annual average rate of 1.2 - 1.4 percent. The amount of electricity used during the peak day in the winter is usually about 75 percent of the previous summer's peak.

With only a few exceptions, the storage of electricity in large amounts is not technically possible. Therefore, electricity must be generated at the instant it is used. To help ensure that electricity will always be available during the peak usage days, the New York State Reliability Council (NYSRC) has directed the NYISO to have generation capability equal to 118 percent of the expected peak load. This additional capacity, or "installed reserves," is needed to prevent the sudden, unexpected loss of a generation facility or a transmission line (a contingency) from causing a loss of the ability to serve electric consumers. However, in order to have a robust and efficient wholesale electricity market, more than 18 percent of reserve capacity will be required. The marketplace must have sufficient, competitively priced generators to function and keep prices down. Importing electricity from other areas (if and when those areas have excess generating capacity for sale) may satisfy a small portion of this generating capacity requirement, but transmission limitations largely preclude importing from any additional external sources, especially into New York City.

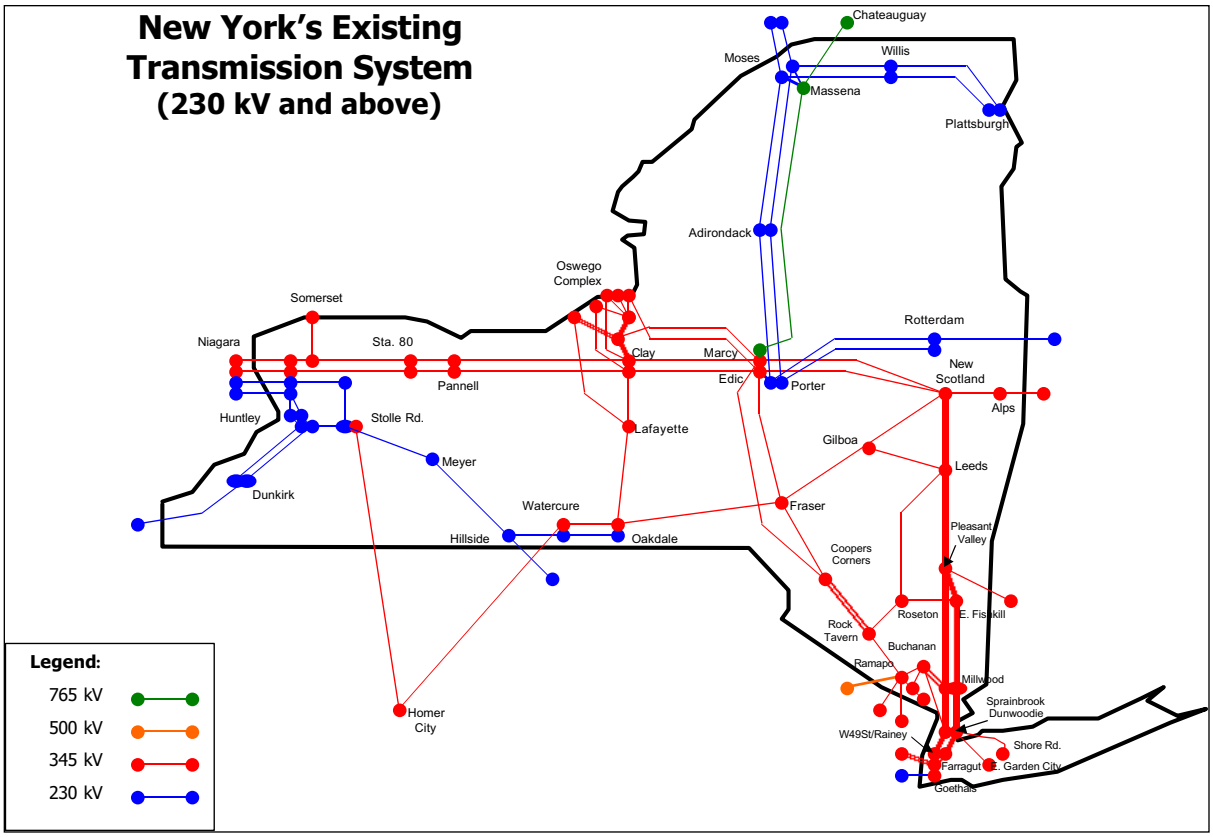
The ability to generate electricity is only part of the story. The system must also be able to deliver it to wherever it is needed. This requires physical connections, transmission lines, between the generators and the end users. Just as generators have a maximum output, transmission lines have a maximum electricity carrying capability. The combination of generation and transmission must be capable of supplying the entire demand in the State. The amount of generation capacity by region is shown in Table 1 and the major transmission lines are shown in Figure 8.

The operation of the State's high voltage transmission system requires understanding a

TABLE 1
Year 2000
Summer Peak Load
Installed Generating Capacity

AREA	Summer Peak Load (MW)	Installed Generating Capacity (MW)
NYC	10340	8031
LI	4564	4507
UPSTATE		
- East	6156	8116
- West	9140	14693
UPSTATE TOTAL	15296	22809
ENTIRE STATE	30200	35347

Figure 8



complex mixture of technical, economic and geographic considerations. The location of power plants, the availability and capacity of transmission lines and points of congestion on the transmission system all affect both the economics and the technical adequacy of the system.

A breakdown by region for the peak loads and generating capabilities for the summer of 2000 is shown in Table 1. Note that New York City and Long Island must meet additional reliability requirements. One requirement is the same 118 percent reserve as the rest of the State, but the other is that installed in-city generating capacity must equal at least 80 percent of the City's projected peak demand (also called the "in-city requirement) because of the City's energy needs and limitations in importing additional power over existing transmission lines. Long Island, for similar reasons, must have 98 percent of its peak demand located "on-island."

1. NEW GENERATION ADDITIONS

Detailed projections for electrical peak demands in future years are prepared regularly by the NYISO and are included in Tables 3, 3A and 3B below. The starting point (Summer 2000) is as shown in Table 1. For future years, the base case assumes that peak demand increases at a rate of 1.2 to 1.4 percent each year and no additional generation is built.

A "new generation" example is presented for illustrative purposes. New generation is assumed to be operational as indicated in Table 2.

If the generating additions shown in Table 2 were to take place, the results of such additions with respect to adequacy of supply would be as shown in Table 3. The two areas of the State most in need of additional generation are New York City and Long Island. New York City and Long Island are also unique in having

"Locational Installed Reserve Requirements" applicable to them. It is important to note that New York City and Long Island must each meet more stringent requirements--the generally applicable statewide reserve requirement and a Locational Installed Reserve Requirement. In the case of New York City, a locational requirement is necessary because the City's excessive dependence on distant capacity would leave it unacceptably vulnerable to transmission outages such as lightning hits. Long Island has limited transmission on and off the island because of its geography. Table 3A shows the installed reserve situation with and without such additions for New York City. Table 3B shows the results for Long Island.

TABLE 2
New Generation Example

AREA	MEGAWATTS ADDED	DATE OF OPERATION
NEW YORK CITY	300	06/2001
	200	06/2002
	1300	06/2003
	500	06/2004
	500	06/2005
LONG ISLAND	200	06/2001
	300	06/2003
	800	06/2004
	500	06/2005
UPSTATE (East & West)	3000	06/2003
	200	06/2004
	800	06/2005
STATE TOTAL	8600	

2. TRANSMISSION ADDITIONS (Increases to Import Capability)

While the additional transmission capacity to relieve the major constraints in New York would be beneficial to both the reliability of the system as well as to the wholesale markets, the licensing and construction of additional transmission lines in New York State is, if anything, more fraught with obstacles than those presented to generating plants. Transmission lines tend to draw opposition from neighbors all along the length of the lines. New York State's Article VII of the Public Service Law governs the siting of transmission lines. Right-of-way acquisition is difficult and costly. Moreover, deregulation and restructuring make investment decisions for transmission lines riskier than under regulation. In its recent Regional Transmission Organization (RTO) filing with the Federal Energy Regulatory Commission (FERC), the NYISO has proposed a mechanism for arranging for transmission lines needed for reliability purposes, but

TABLE 3
New York State
Installed Capacity Requirement vs. Installed Generating Capacity
New Generation Example

YEAR	Installed Capacity Requirement (MW) [1]	Installed Generating Capacity (MW)
2001	36132	35847
2002	36722	36047
2003	37256	40647
2004	37752	42117
2005	38199	43947

1. The Installed Capacity Requirement is 118% of the peak demand, in conformance to the requirements of the NYSRC.

TABLE 3A
New York City
Projected Peak Demand Vs. In-City Generating Capacity
New Generation Example

Year	Summer Peak Demand (MW)	Required In-City Generating Capacity (1) (MW)	Actual In-City Generating Capability (MW)	Amount (Under) or Over Required In-City Generation (MW)
2001	10535	8428	8331	(97)
2002	10700	8560	8531	(29)
2003	10850	8680	9831	1151
2004	10995	8796	10331	1531
2005	11120	8896	10831	1935

(1) In-City Generation is required to be at a minimum 80% of the projected peak demand, in accordance with the requirements of the NYISO. This is the current requirement that is expected to increase as the load grows and transmission import capability remains constant. In order to maintain the current level of reliability, the NYISO estimates that the locality requirement will have to increase to 85% by 2005. This increase is not reflected in the above analysis.

TABLE 3B
Long Island
Projected Peak Loads Vs. Generating Capacity
New Generation Example

Year	Summer Peak Demand (MW)	Required Long Island Generating Capacity (1) (MW)	Actual Long Island Generating Capacity (MW)	Amount (Under) or Over Required Long Island Generation (MW)
2001	4733	4638	4707	69
2002	4805	4709	4707	(2)
2003	4873	4776	5007	231
2004	4936	4837	5807	970
2005	4993	4893	6307	1414

(1) Long Island Generation is required to be at a minimum 98% of projected peak demand, in accordance with the requirements of the NYISO

the mechanism must await approval from the FERC.

Only one major addition to the transmission system is currently scheduled. A line may be built connecting Long Island with Connecticut, with an import capacity of approximately 300 MW into Long Island. Originally proposed for operation in 2002 which is unlikely, it would increase the State's import capacity by about 4 percent and, when loaded to capacity, would constitute about 7 percent of Long Island's current peak demand.

Another underwater connection between Long Island and New England has been discussed, but is not definite. It could potentially add between 600-1,000 MW to the State's import capability and, when fully loaded, would constitute about 15 percent of Long Island's current peak demand.

3. ENSURING ADEQUACY AND RELIABILITY

As has been shown above in the review of the "new generation" example, clearly, the addition of new generation assures that the increasing demand for electricity could be met reliably and that the wholesale market would be vigorous.

Conversely, if the base case - no new generation - is allowed to occur, the results are potentially very serious. Table 4 shows New York State, as a whole, running short of its reliability requirements in 2005. Indeed, if only in-State generation is considered, the State has been short of its reliability requirements since 1999.
As described above, the impact on prices of such a shortfall is felt long before reliability is impacted and the lights begin to go out. Given the time required for licensing (even on an accelerated basis) and construction, it is clear that an expedited permitting process must begin immediately. Table 4 shows an increasing reliance on imports if no new in-State capacity is licensed. Since it is not clear that sufficient imports will even be available, regardless of price, the situation shown is unacceptable.

Table 4A shows an even more pessimistic picture for New York City. Because New York City is a large importer of electricity, it is vulnerable to transmission outages resulting from many causes, including lightning strikes. With the City's crucial economic importance, its dense population and its aggregation of high-rise buildings, blackouts are correctly regarded as even more unacceptable there. For these reasons, there has long been a requirement that there be enough generating capacity inside the City to supply at least 80 percent of the City's peak demand. As Table 4A shows, the City is now deficient and will fall far short of this requirement in the coming years if no new capacity is added. Consequently, the New York Power Authority is planning to install simple cycle combustion turbines on a "fast track" basis

TABLE 4
New York State
Base Case – No New Generation

YEAR	Installed Capacity Requirement (MW)	Installed Generating Capacity (MW)	Imports Required (MW)
2001	36132	35347	(785)
2002	36722	35347	(1375)
2003	37256	35347	(1909)
2004	37752	35347	(2405)
2005	38199	35347	(2852)

TABLE 4A
New York City
Projected Peak Demand Vs. In-City Generating Capacity
Base Case – No New Generation

Year	Peak Demand (MW)	Required In-City Generating Capacity (MW)(1)	Actual In-City Generating Capacity (MW)	Amount (Under) In-City Generating Requirement (MW)
2001	10535	8428	8031	(397)
2002	10700	8560	8031	(529)
2003	10850	8680	8031	(649)
2004	10995	8796	8031	(765)
2005	11120	8896	8031	(865)

(1) In-City Generation is required to be a minimum of 80% of the expected peak load. As previously stated, the locality requirement will increase over time as the load grows. This is not included in the above analysis.

this summer. These will partially alleviate the shortfall and allow New York City to meet the minimum reliability requirements for this summer. These turbines, however, are expensive to operate and will not do much to moderate anticipated high prices during the upcoming summer period.

Table 4B shows Long Island increasingly dependent on imports. This situation is even worse than it appears, since a high proportion of the generating capacity on Long Island consists of expensive to run simple cycle combustion turbines.

TABLE 4B
Long Island
Projected Peak Demand Vs. Long Island Generating Capacity
Base Case – No New Generation

Year	Peak Demand (MW)	Required Long Island Generating Capacity (MW)(1)	Actual In-City Generating Capacity (MW)	Amount (Under) Long Island Generating Requirement (MW)
2001	4733	4638	4507	(131)
2002	4805	4709	4507	(202)
2003	4873	4776	4507	(269)
2004	4936	4837	4507	(330)
2005	4993	4893	4507	(386)

(1) The Long Island generating capacity is required to be a minimum of 98% of the expected peak load.

B. The Economics Of Restructuring

As a result of the restructuring of the wholesale electricity business, a majority of the generating stations in New York have been sold by local utilities to outside investors who operate through independent generating companies. The local utilities retain their distribution facilities and have the responsibility for purchasing the amount of electricity needed to serve their end-use customers. In the process, the price paid for electricity has been separated into its component costs.

The price to consumers for transmitting and distributing the power remains regulated, as determined by the New York State Public Service Commission (PSC). The wholesale price of the electricity itself may be set by long-term bi-lateral supply contracts with generators or may be determined through an auction process on a daily and hourly basis administered by the NYISO. Both the PSC and the Federal Energy Regulatory Commission (FERC) have approved this auction process.

The auction process begins with the load serving entities (LSEs), utilities and other wholesale market buyers determining the amount of electricity they need for the next day. These demands are totaled by the NYISO and compared to the offers from the generating companies. The amount of generation needed is "stacked up" by the offering price bid against the amount needed (including reserve requirements), and the offer that just satisfies the need determines the price paid to all of the generating companies. This price is called the "market-clearing" price. It is paid by the LSEs to the generators, and is then collected from their end-use consumers.

As with any commodity, whenever demand for electricity is high, and supply of generation is limited, price will rise. In addition, different generating facilities have different costs. Fuel is one of the largest cost components in generating electricity. Hydroelectric plants naturally have the lowest fuel cost. Historically, nuclear fuel has usually been the next least expensive, with coal being next, followed by natural gas, and then oil. During days of peak usage, however, essentially all generating stations in the State, plus additional resources within import range, are needed to serve consumer demand. This means that the price of electricity will be at its highest during those periods. Since the existing fleet of power plants and transmission lines were developed under a fully regulated regime for operation by regulated monopolies, care must be taken to assure that conditions for competition are preserved where they exist or created where they do not exist. One of the responsibilities of the NYISO is to monitor market behavior to assure that competition exists even during conditions of scarcity. The NYISO has instituted measures that will prevent market manipulation by automatically reviewing and, when necessary, mitigating improper day-ahead generator offers.

C. The Need For Demand Response

In a market system based on supply and demand, it is elementary that demand gets curtailed when prices are perceived as too high. This can mean switching to another product or service or it can mean canceling or deferring the purchase. In general, the demand for electricity does not now display this "price elasticity." With most goods or services the consumer can simply curtail purchasing if the price gets too high. In the past this has not generally been the case with electricity. For many uses, electricity is a necessity and would be consumed at almost any price. Many users, however, could and would curtail their use of electricity when prices spike if they were aware of the spikes, and if they could actually save the "spike price" rather than just the "average price" they now pay. The NYISO is working on measures to permit such "demand response."

Building additional generating capacity is needed both in the short and long term for electricity supply in New York State. Implementing price-responsive mechanisms for interruptible loads (customers who are willing to have their service interrupted for an incen-

tive) will produce many of the same system benefits, moderate price spikes, increase participation in the energy markets, and may provide some modest relief in time for the summer of 2001. It will also reduce the need for some of the new generating plants. There is broad agreement among all stakeholders that increased participation by interruptible loads is essential to a fully competitive market.

Payment for performance is the key ingredient to an effective price-responsive load program. When an industrial or commercial facility identifies that certain manufacturing processes can be shut down, it foregoes the revenue from product sales during the period of interruption. It also incurs expenses for employee demobilization and equipment shutdown. For such a facility to reduce its demand, it needs to be paid a fair and reasonable amount to cover these expenses.

Interruptible load programs are not a new concept. In 1998, more than 500 utilities nationwide reported load curtailment programs involving a peak capacity reduction potential of over 27 gigawatts, about 4 percent of the nationwide demand for electricity. Program expenses exceeded $450 million, with roughly 65 percent of that amount paid to customers for participating.

The NYISO is currently implementing two programs that recognize the importance of demand response:

1) An Emergency Demand Response Program (EDRP), and

2) A Day-Ahead Demand Bidding Program.

The Emergency Demand Response Program

In response to an impending reserve deficiency, NYISO operations personnel invoke the Emergency Demand Response Program (EDRP). The program is open to both interruptible loads and facilities with local emergency generation. It is important to note that, when called under the EDRP, the local emergency generation can only be used to serve local load and cannot feed the grid.

Customers who agree to participate in the EDRP can be accommodated through one of four types of Curtailment Service Providers (CSPs):

- Load Serving Entities (LSEs), either currently serving the load or another LSE;
- NYISO-approved Curtailment Customer Aggregators;
- Directly as a Customer of the NYISO; and
- As a NYISO-approved Curtailment Program End Use Customer (EUC).

When called upon, loads are paid the greater of $500 per megawatt hour (MWh) or the Real-Time Zonal (LBMP) per MWh of verified load reduction. The NYISO intends to work as much as possible with existing LSE programs and new Aggregators and EUCs to promote participation in the EDRP. For the summer of 2001, the NYISO expects to see between 200 to 300 MW of load and local emergency generation in the program.

Day-Ahead Demand Bidding Program

The Day-Ahead Demand Bidding Program allows consumers to offer reductions in consumption into the market. If selected, these offers would be paid for whatever demand reduction is offered, with differences settled in the real-time market.

While many of the program details have been agreed upon, the Day-Ahead program is still currently being formulated. The NYISO expects that with approval by the FERC, a fully formed program will be ready to be put in place for the summer of 2001.

Finally, the demand side measures mentioned earlier are surrogates for the "end-state" of customer choice in a deregulated energy market. Conservation and true supply/demand pricing will occur only when all customers can see the real-time price of electricity and decide for themselves whether to pay the price or not take the product.

D. Environmental Effects

Most of the power plants being proposed today are combined cycle combustion turbines, fueled by natural gas. These plants burn far less fuel to produce a kilowatt-hour of electricity than older plants. What is more, plants burning natural gas produce far less emissions than oil or coal-fueled plants.

The use of natural gas in today's combustion turbine-based plants produces less impact on the surrounding air and water compared with oil and coal technologies. All of the additional generating projects mentioned as possibilities in the next several years are of this type. When these new facilities are brought on line (except during the very few hours of the year when peak loads exist and all generation is running), there will be a reduced impact on the air and water quality in New York State. This is because the older, less efficient generating stations will be operating at reduced levels or be shut down completely. This displacement of energy from older, more polluting plants with energy from clean new plants will actually improve air quality by reducing total emissions.

E. Ensuring Supply Of Natural Gas

Natural gas, like electricity, must be transported. It is delivered to New York via large pipelines, principally originating in the southern United States, with one major pipeline delivering gas to New York from Canada. At the present time, during the winter, in the New York City and Long Island areas most natural gas is used for heating, and there is little, if any, additional pipeline capacity available to deliver gas to electric generating stations. During the coldest winter days, the new plants will have to be able to use an alternate fuel, usually oil. The Federal Energy Regulatory Commission (FERC) has licensed only one pipeline expansion, called the Market Link. This expansion will ease the supply situation somewhat (it is hoped to begin operation by early 2002). Three other pipeline projects have been proposed and are in the FERC licensing process. A detailed study of the need for additional natural gas pipeline capacity to support the additional generation of electricity is extremely important and urgently needed.

Natural gas, which is so critical to the heating of homes and is being used in many industrial processes in addition to the generation of electricity, has seen considerable price spikes in recent months. Gas futures on the New York Mercantile Exchange have traded for over $7.00 a therm, when just a year ago they were in the $2 - 3.00 range. While these prices are somewhat reflective of an early, cold winter, prices have been predicted to remain above $5.00 per therm throughout the year 2001. Production throughout the 1990s was relatively flat, and well below the increasing rate of consumption. Imports from other countries have barely been able to fill the gap.

As part of its energy policy, the State must consider matters of fuel diversity in addition to the issues of economics and adequacy of energy supply. New York through the auspices of its Energy Planning Board needs to study the state's increased reliance on natural gas as the fuel of choice for electricity production.