Case: 98-F-1968

RAMAPO ENERGY LIMITED PARTNERSHIP

REBUTTAL TESTIMONY

OF

GUY MARCHMONT

CHRISTOPHER REIN

STEVE JACK

CASE: 98-F-1968

REBUTTAL TESTIMONY

MARCHMONT /REIN/JACK

Q. Messrs. Marchmont and Rein, you have previously provided direct testimony in support of the Ramapo Energy project, is that correct?

A. Yes.

Q. What is the purpose of your testimony at this time?

A. To provide rebuttal testimony to the direct testimony of Andrew Harvey submitted by Department of Public Service Staff, John Shafer submitted by the County of Rockland.

Q. Have you had an opportunity to review the direct testimony of these individuals?

A. Yes.

Q. What is the primary focus of their testimony?

A. Mr. Harvey's testimony focuses on the impact of the addition of the Ramapo Energy project on competition in New York State electric markets and consumers that depend on these markets. Mr. Shafer's testimony focuses on the decommissioning plan for the project.

Q. Mr. Jack, please state your name, affiliation, title, address and whom you are representing.

A. My name is Steve Jack, I am currently Project Manager Closed Sites with Innogy PLC and I reside in the United Kingdom. In this proceeding, I am representing Ramapo Energy Limited Partnership providing consultation on decommissioning and demolition and rebuttal testimony to the direct testimony provided by John Shafer.

Q. Mr. Jack, please describe your educational background.

A. I was educated in the United Kingdom and received a Higher National Certificate (HNC) with endorsements from the East Ham College of Technology in 1975, and in 1977 passed the entrance examination to the Institution of Structural Engineers.

Q. Describe your professional experience.

A. For the past 15 years I have been managing the decommissioning and demolition of power plants for my company. Innogy was formerly National Power PLC, which in turn was formed from the privatization of the Central Electricity Generating Board, the nationalized entity, which provided electricity to the whole of the United Kingdom. During my 15 years I have been involved in the demolition of over 30 power plants ranging in size from 100 MW to 2000 MW.

Q. Are you a member of any professional organizations?

A. Yes. I am a fellow of the Institute of Demolition Engineers, where I sit on the Council of Management. Also, I sat on the committee, which drafted the new British Standard Code of Practice for Demolition. I am also an Associate Member of the Institution of Structural Engineers.

Q. What, if any, other professional certifications do you have?

A. I am an Incorporated Engineer (I.Eng CEI)

Q. Are you familiar with the Ramapo Energy Project?

A. Generally speaking, yes.

Q. Have you had an opportunity to review the decommissioning proposal outlined in the Ramapo Energy Project?

A. Yes.

Q. Have you had an opportunity to review the direct testimony of John Shafer?

A. Yes.

Q. Messrs. Marchmont and Rein, turning your attention to Mr. Harvey's testimony first, do you agree with his statement on page 2 that there is a "clear necessity for the addition of electric generating capacity, particularly in the Eastern New York State area, in which the Ramapo Energy project is located."

A. Yes. It seems clear that there is a need for additional supply in New York State in order to provide competitively priced electricity to consumers and meet the state's growing demand. In a report, dated March 2001, the New York Independent System Operator (NYISO) issued a report, entitled "Power Alert: New York's Energy Crossroads," in which NYISO estimated that an additional 8,600 MW of new installed electric generation capacity would be needed by 2005 in order to "ensure reliable supply [of electricity] and achieve project savings." (page 2). A copy of this report is attached as Rebuttal Exhibit MRJ-1. The report states that "[b]etween 1995 and 2000, while statewide demand for electricity rose by 2,700 megawatts (MW), generating capacity increased by only 1,060 MW" and specifically notes that there are "no major new generating plants in downstate New York fully approved for construction at this juncture." Thus, the NYISO report supports Mr. Harvey's statement.

The NYISO report further notes on pages 2-3 that New York State must approve new generation in the amount of "4,000-5,000 MW in the 2001 timeframe."

According to the report, the new generation is needed to ensure reliability, promote robust competition and protect the environment. The NYISO report notes that additional in-State capacity is needed to ensure reliability and enhance robust competition; and that over-reliance on out-of-State capacity may leave New York State vulnerable to the type of weaknesses in pricing and available generation experienced in California in the last year. The report also notes, on page 3, notes that adding more efficient generation will result in reductions of nitrogen oxides and sulfur dioxide, which results in an additional public benefit.

Separate reports recently issued by Commissioner Helmer, Senator Schumer, Attorney General Spitzer and The Business Council of New York State, all support NYISO's position.

Q. Does the NYISO report reach any conclusions regarding the addition of 8,600 MW of generating capacity?

A. Yes. On page 5, the NYISO Report projects, based on a MAPS analysis, that if 8,600 MW of capacity is added by 2005:

- Wholesale prices could be more that 20-25 percent lower than in the no addition case;
- For the State as a whole, the reduction in wholesale price to consumers for electric power could result in a savings of more than $1.4 billion annually;

- 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.

Q. Has there been any MAPS analysis done for the Ramapo Energy project specifically?

A. Yes. In response to a Department of Public Service request (DPS-16), Ramapo Energy retained General Electric International, Inc. through its Power Systems Energy Consulting (PSEC) to conduct a MAPS analysis for the Ramapo Energy project. A copy of the Ramapo Energy MAPS report is attached to this testimony as Rebuttal Exhibit MRJ-2.

Q. What was Ramapo Energy's participation in the study?

A. We provided only the plant's performance data. PSEC then used these data as input to its MAPS program, which is the same program referenced by NYISO in its Power Alert report.

Q. Did you have any influence on how PSEC conducted the study?

A. The only instruction we gave PSEC was to conduct a study similar in nature to the one prepared for the Brookhaven Energy Project, which was a stipulated requirement, and incorporated into its Article X Application submitted to the NYSDPS last June.

Q. What did the Ramapo Energy MAPS report assess?

A. The MAPS report presents the findings of a study conducted by PSEC for Ramapo Energy to determine the overall economic and environmental impact of the Ramapo Energy Project. MAPS is a production simulation program and it is used to accurately model the operation of an interconnected utility power system and determine the production costs. The major objective of multi-area production simulation is to simulate the least cost operation of a power system while insuring the system's security constraints are not violated. Security constraints include the operating limits and capabilities of generation sources, constraints and contingencies imposed by the transmission system and the operational limits such as minimum operating reserve levels.

The specific objectives are as follows:

- Determine the annual energy and capacity factor of the Ramapo Energy Combined-cycle units.
- Determine the change in average Location Based Marginal Prices (LBMPs) due to the addition of the Ramapo Energy project in the following NYISO control area zones: Hudson Valley-G, Millwood-H, and New York City-J (see www.nyiso.com/oasis/nyca/nyca_zonemaps.pdf for definition of zones).
- Determine the change in total air emissions (SO_2, NO_x and CO_2) in the study area (New York State and PJM) and NYISO Zone G due to the addition of Ramapo Energy combined-cycle facility.

MAPS runs were performed without and with the Ramapo Energy project unit for the year 2004.

Q. What did the Ramapo Energy MAPS Report conclude?

A. The MAPS Report predicts that marginal prices in three downstate zones will experience significant reductions. In Zone G (Hudson Valley), the zone in which the Project site is located, average spot prices would be reduced by $1.00/MWh, or 3.49%, by the addition of the Ramapo Energy project. In Zones H and J, the average spot price would be reduced by $0.96/MWh (3.28%) and $0.66/MWh (2.28%), respectively. The MAPS report projects that the addition of the Ramapo Energy project will result in a reduction of the average spot price for New York State of $0.52/MWh. Thus, while the addition of the Project will be broad-based, the greatest benefit will be experienced locally in Zone G where the project is located.

Similarly, the addition of the Ramapo Energy Project is projected to reduce statewide emissions of SO_2, NO_x and CO_2 by 25,000 tons (2.47%), 9,000 tons (2.64%) and 2,257,000 tons (1.11%) per year, respectively. Locally, the impact is even more dramatic. In Zone G, the addition of the project is anticipated to reduce emissions of SO_2 and NO_x by 5,000 tons (45.7%) and 2,000 tons (41.9%) per year, respectively. There is some increase in the total annual tons of CO_2 in Zone G because of the increase in the total amount of generation, however, the rate of emissions of CO_2 per GWh of energy produced does decrease by nearly 20%. Overall, the greatest benefit will be felt locally.

The NYISO and GE MAPS reports seem to support Mr. Harvey's statements regarding the need for additional new generating capacity in New York, and Downstate New York in particular.

A. That is correct. Mr. Harvey states at one point in his testimony that the "Ramapo Energy project proposal represents an important option in enhancing the emergence of an effective competitive electric market in New York State." These documents support that conclusion.

Q. Are there any aspects of Mr. Harvey's testimony that you find troubling or unclear?

A. Yes. On page 2 of his testimony, Mr. Harvey states that "it is important to have an electric market emerge in which there are many market suppliers each holding small market shares." On page 5, he goes on to opine that "[i]deally, in the long term, the addition of three new entrants to th[e] market, each with 333 MW would be preferred" over the addition of the 1,100MW Ramapo Energy project. In making this statement, Mr. Harvey acknowledges the practical difficulties of achieving his stated preference. However, it is important to note that neither Ramapo Energy, nor any of its affiliates currently has a generating facility in New York State. Since the addition of Ramapo Energy's 1,100 MW project represents only about 3.6% of New York's peak demand, it will not result in any significant concentration of market power such that the efficient operation of the electric generation market would be jeopardized. In fact, the Ramapo Energy MAPS report demonstrates that the project will not only benefit the market, but also provides any additional environmental benefits by reducing emissions of SO_2, NO_x, and CO_2. In this regard the size of the Ramapo Energy project is beneficial, and a smaller project would likely have less beneficial impacts on prices and emissions.

Q. Mr. Jack, turning your attention to Mr. Shafer's testimony, please provide information on the most recent three projects on which you have worked that would be similar to the Ramapo Energy Project.

A. At present I am managing 4 demolition projects, at Blyth Power Station, Pembroke Power Station, Willington Power Station and Norwich Power Station. All of these projects are located in the United Kingdom.

Q Messrs. Marchmont and Jack, on page 12 of his testimony, Mr. Shafer states that "The Applicant's scenario assumes a situation where the plant is constructed but has not yet been operated". Do you agree with this statement?

A. No. It is clear from Sections 2.6 and 9.4.3 of the Application that the decommissioning will take place at the end of the plant's operating life.

Q. Mr. Shafer considers that an equipment explosion on startup is a likely scenario that would cause Ramapo Energy to abandon the project. Do you agree?

A. No. As described in Section 2.3 of the Application and as represented on the plant layout drawing, C-2, the plant is made up of four separate modules, each comprised of a gas turbine, a steam turbine and an electric generator on a common shaft. Each gas turbine exhausts into its own heat recovery steam generator. The plant is designed so that each module can operate independently or in concert with any of the other modules. The layout also shows that blocks of two modules are located to both sides of the switchyard, providing a significant separation of more than 300 feet. In the unlikely event of an explosion during startup, only one module would be affected, not all four. That is insufficient reason to abandon the project, even if the affected module is completely destroyed. Furthermore, Mr. Shafer has ignored the fact that the project will carry insurance to protect its economic viability in the event of such an incident.

It is worth noting that the recent explosion that occurred at the Lovett Station certainly did not give Mirant sufficient reason to even think about abandoning Lovett.

Q. Mr. Shafer mentions explosions at Mirant's Lovett plant and Cayuga's South Glen Falls Plant. Are these plants similar to the Ramapo Energy project?

A. No, neither one is a combined cycle plant using a gas turbine and a waste heat recovery boiler. Lovett is what is termed in the industry as a steam plant. That is, it fires a fuel directly into a boiler for the sole purpose of generating steam. The explosion at Lovett occurred within the plant's boiler, which in design and technology, is far removed from that to be employed at the Ramapo Energy project. The South Glen Falls plant is a hydroelectric plant that uses water flow to turn a turbine. Once again, the technology used at the South Glen Falls plant bears no relationship to the Ramapo Energy project.

Q. Mr. Shafer indicates that after "say, 20 years or longer, and due to a significantly changed electric energy market, the owner decides to cease operation." Do you agree?

A. No, I do not. I am not sure what significant changes Mr. Shafer believes will occur, but I believe the market will still be a competitive one. The interesting point here is that by the 20th year, the project will have paid off all of its debt to lenders. Without this burden the project's expenses will be reduced to just the fixed and variable operating costs improving its competitive position in the market.

Q. Mr. Shafer states "The salvage value of equipment on site would be severely diminished by wear and tear and obsolescence." Do you agree?

A. There is no question that the resale value of the equipment diminishes each year, but that does not mean that it vanishes completely. It is important to remember that the project will be maintained in excellent condition throughout its life, by following a rigid maintenance program, particularly for the gas turbine. This program ensures that the plant operates at its most efficient performance at all times. Thus, the impact of wear and tear is kept to a minimum.

No-one can project the impact of obsolescence. This plant cannot be compared to a consumer product that is obsolete in a few years. The industry has made giant strides over the last decade in developing a combined cycle plant that has a fuel to electricity efficiency of greater than 55%. The driving force behind that efficiency has been the improvements made in the performance of the gas turbine. It is reasonable to expect small improvements over current performances in the future, but as the past has shown, these improvements come at a cost.

With regard to salvage or scrap value, the age of the plant is irrelevant. The scrap value is determined by the weight of the scrap material, not how old it is. Furthermore, the material used in the gas turbines and steam turbines are more exotic than plain carbon steel and as scrap, would command a much higher price per pound than carbon steel. From Innogy's experience, the scrap value of the plants that is has demolished has, in fact, substantially supported the cost of its removal.

Q. Mr. Shafer states that the Application does not disclose any "arrangement that would bind ANP to make such funds available to Ramapo Energy, LLP now or in the future". How do you respond to that?

A. In Section 2.6 of the Application it states very clearly that "The Applicant expects that the establishment, use and disposition of the Decommissioning Account will be subject to an agreement between the Applicant and the Town of Ramapo". Thus, Ramapo Energy's commitment to this funding and the control of its use will be incorporated into the PILOT agreement between Ramapo Energy and the Town.

Such an agreement will ensure that, even if ownership of the plant ever changes, the Town will retain control over how the decommissioning fund is spent.

Q. Who will put the money aside for the decommissioning account?

A. As noted in Section 2.6 of the Application, Ramapo Energy will establish the account, place funds into the account on an annual basis and the Town will control the uses of the funds.

Q. Do you agree with Mr. Shafer that the "most likely decommissioning scenario would be operation for a decade or more, then dismantling the entire energy facility with no or minimum salvage value of the structures or equipment".

A. No. We fully expect and have designed the plant, to operate competitively for much longer than a decade. Although, it can be argued that technology advances will ultimately challenge the proposed project, it will take a lot more than a decade before that challenge becomes competitive. Also, the contention that there would be no scrap value has been addressed in another answer above.

Q. Mr. Shafer states that "the removal sequence would generally be a reverse of construction". Do you agree?

A. No, this overstates the process by which the demolition of a project such as this is performed. Such a statement infers that the plant will be "de-engineered", which is not true. The process described by Mr. Shafer is an extraordinarily expensive and impractical way to approach demolition. In fact, the plant would be demolished in a controlled and safe manner, using machine-mounted attachments such as shears or grapples, which literally rip through the plant tearing it to the ground. However, the machinery such as the gas turbines and steam turbines may be removed more carefully prior to demolition of the plant's structures, to preserve their resale or scrap value. The process of de-engineering is rarely followed in the demolition of structures, such as sports arenas, for the sole reason that it is far too expensive. The same argument applies here. There is little incentive to demolish an unwanted structure in the most expensive manner.

Q. How will Ramapo Energy dispose of the construction debris?

A. Based on previous experience, construction debris, which is mainly concrete, will be crushed with the reinforcement bars sold as scrap and the crushed concrete sold for reuse.

Q. How will you dispose of residual petroleum and chemical products?

A. Prior to demolition activities all petroleum and chemical products will be removed from storage tanks and pipes for disposal in a licensed facility.

Q. Mr. Jack, have you reviewed the Decommissioning Cost Analysis presented by Mr. Shafer?

A. Yes.

Q. What is your opinion of this analysis?

A. I believe that Mr Shafer's analysis is far too high for the reasons explained below. Without specific knowledge of, and long term experience in, power plant demolition developing reasonable costs becomes judgmental at best.

There are a number of items included in Mr. Shafer's cost estimate that should be deleted:

Phase I:

1. Filling of underground utilities using fillcrete. This is not required since underground utilities would be removed.

2. Earthwork to level the site. This is not required since the site will be left in its terraced condition with each terrace elevation level.

3. Excavate H piles. This is not required since the project is located on rock, therefore there are no piles to be removed.

Phase II:

1. Dismantling of all buildings. This is far too expensive and unnecessary. Demolishing machines will be used, not the de-engineering approach advanced by Mr. Shafer.

Conditions included:

1. Site returned to original topography. The site will be left in its terraced state and each terrace seeded and planted.

There are other questionable items in the cost estimate charts that make the whole estimate suspect:

1. Under the heading Building/Structures Included in Decommissioning the three consecutive chart headings are Blgd. Area, sf; Height, ft; Volume, cy. For the Turbine Buildings the respective entries are 17,589, 72, and 5,065,632. To obtain the volume of the turbine buildings, the first two numbers are multiplied together giving 1,266,408 cubic feet. There are four buildings so the total volume is 5,065,632 cubic feet, the same number

noted as the volume in cubic yards. This error occurs throughout this table and casts doubt on the complete cost estimate.

2. Under the heading Cut and Fill Calculations the volume shown in cubic yards is not relevant to the estimates since the site will be left in its terraced state.

3. Under the heading Roadway/Pavement Removal the length, width and thickness of the roadway is given in feet. The removal price is given in square yards rather than volumetric measure. The calculations show that the thickness of the roadway is not taken into account. There seems to be no logic to this approach.

Q. Mr. Jack, Ramapo Energy's estimate for the cost of demolition assumes that the value of the above-ground equipment and structures will offset the cost of its demolition and removal. Is that a reasonable assumption?

A. Based on my experience over the last 15 years, this is a reasonable assumption, especially in light of the fact that the gas turbines and steam turbines are made of exotic materials and the electric generators contain a significant amount of recoverable copper.

Q. What do you believe is a reasonable estimate for the demolition of the plant, removal of foundations and reseeding/planting of the plant site?

A. $2.5million

Q. What sources did you use for estimating the costs?

A. This was estimated using a previous similar estimate carried out for a power plant in Gorham, Maine and tendered demolition contracts for differing sizes and types of power plant received in the last year or so.

Q. Mr. Shafer states that he used another plants, Athens, as a benchmark. How does your estimate for Ramapo Energy compare with previous projects?

A. The important thing to remember about Athens is that it has not been demolished. Not being aware of how the costs were developed for the Athens project it is difficult to comment.

In the case of the Ramapo Energy project, it can be compared with the Norwich, Blyth and Gorham plants. In the case of Norwich (110_ MW, simple cycle gas turbine plant) and Blyth (1600_MW, two-unit coal-fired plant) the actual cost of demolition including the value of scrap of the plant were £300k ($450k) and £1.5m ($2.25m) respectively, and the estimate for Gorham (825 MW, combined cycle plant) was $2.0m. Thus, $2.5 million cost estimate for decommissioning the Ramapo Energy project, which takes credit for the scrap value of the plant, is clearly reasonable.

Q. Does this conclude your testimony at this time?

A. Yes.

EXHIBIT MRJ-1

Power Alert: New York's Energy Crossroads
March 2001 NYISO Report

Power Alert: New York's Energy Crossroads

March 2001
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

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[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

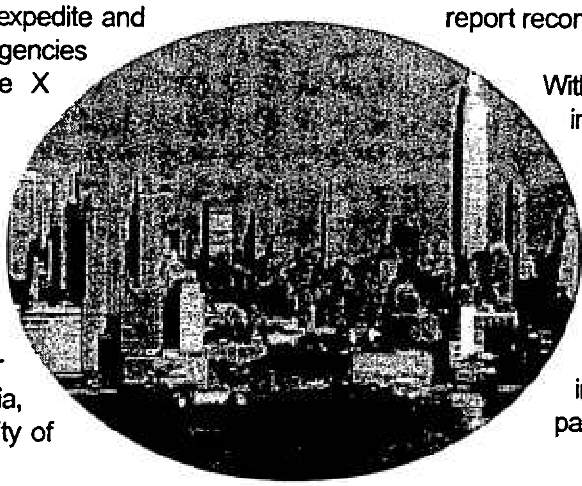
Achieving the benefits of the expanded generation case will require important reforms at the State level. Specifically, New York State's Public Service Law, Article X[4] governing siting and construction of power generation facilities must work to site plants more expeditiously or be changed. Moreover, 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

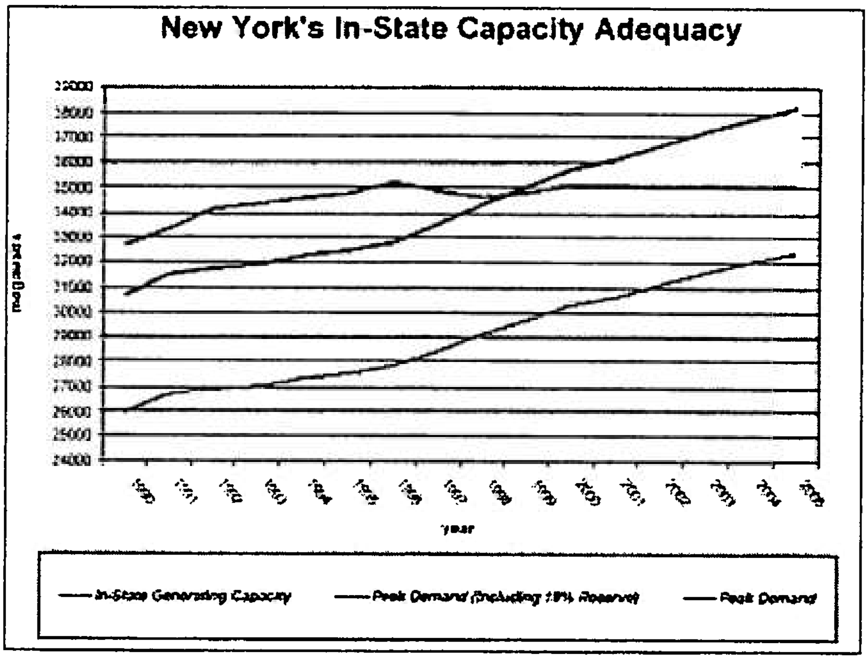
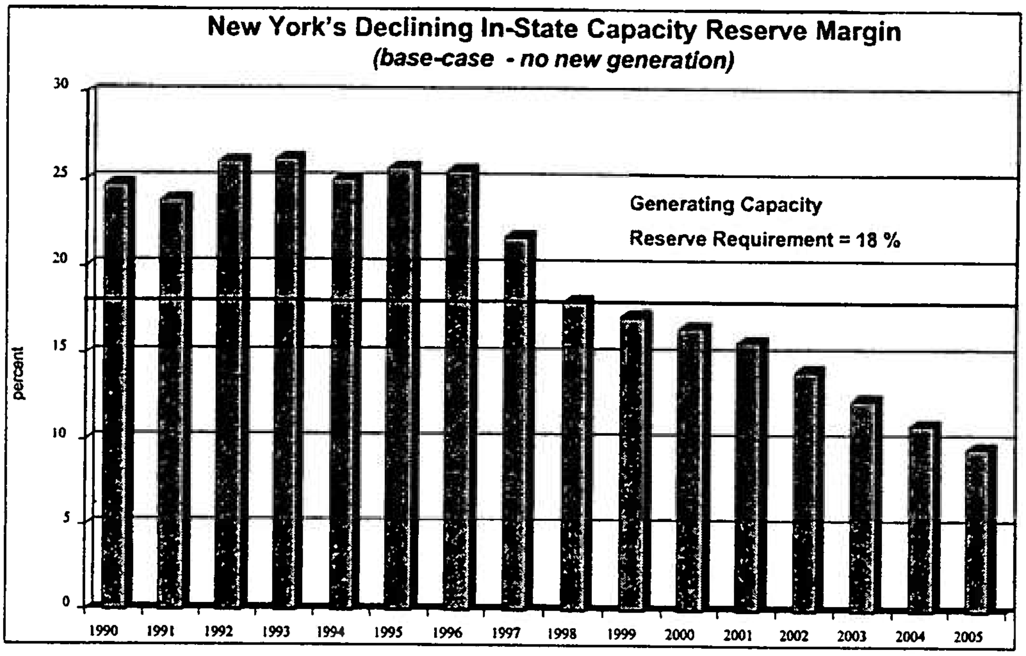


Figure 2



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

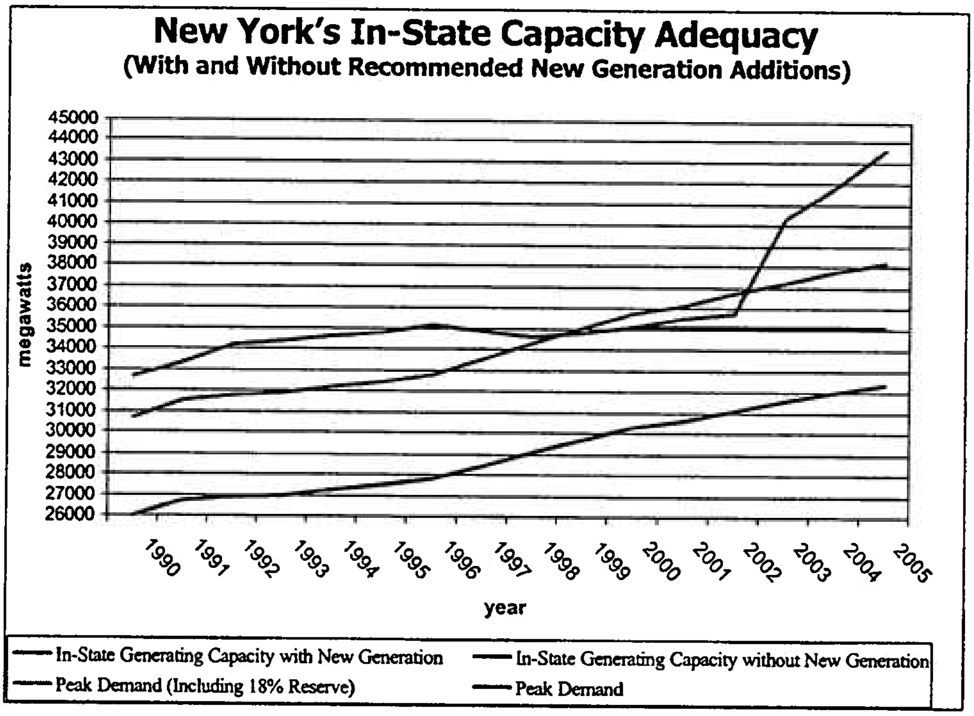
[6] The NYISO is playing an important role in seeking to create markets across State and ISO boundaries that will reduce impediments to transactions across those boundaries, thus somewhat reducing the danger of reliance on out-of-state resources.

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

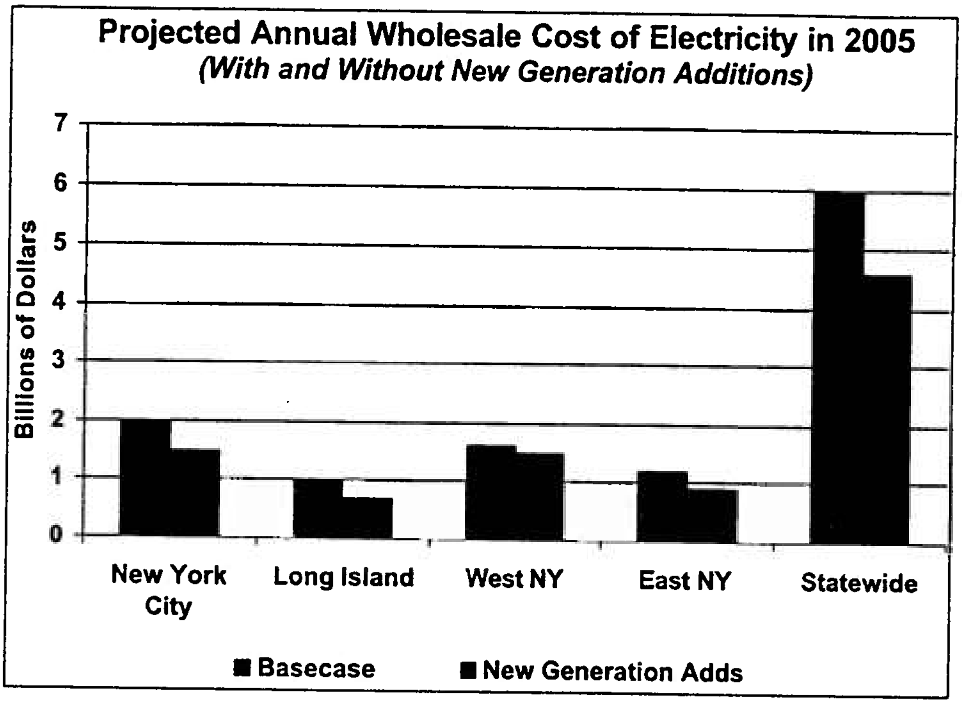


[Note: Throughout this discussion, for illustrative purposes, the NYISO will be discussing the following example of new generating capability. The details are presented later in the discussion (See Section I. A. Table 2).

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.

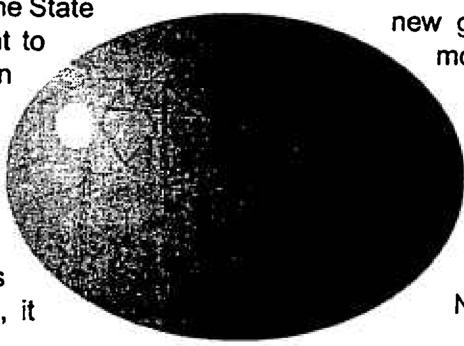
Figure 4



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.



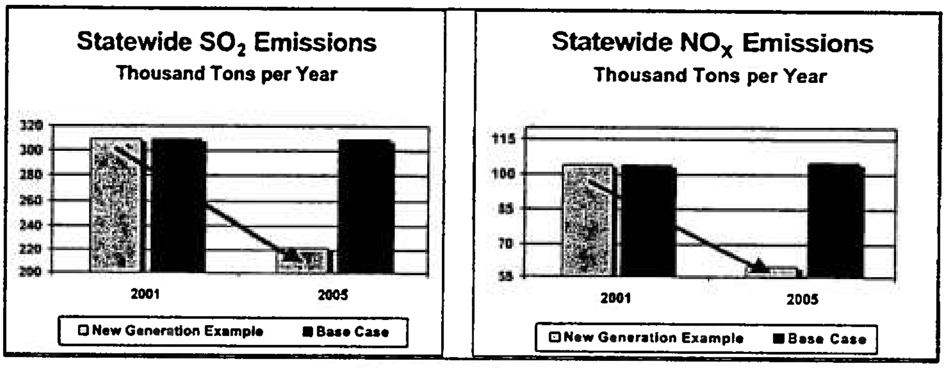
For almost a century, pricing in the United States electric markets has been based on cost of electricity production plus a regulated profit. Regulation, it was said, was a substitute for competition. Restructuring and deregulation of generation supply in New York State have made it possible to restore 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



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 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.

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 pro-active 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.

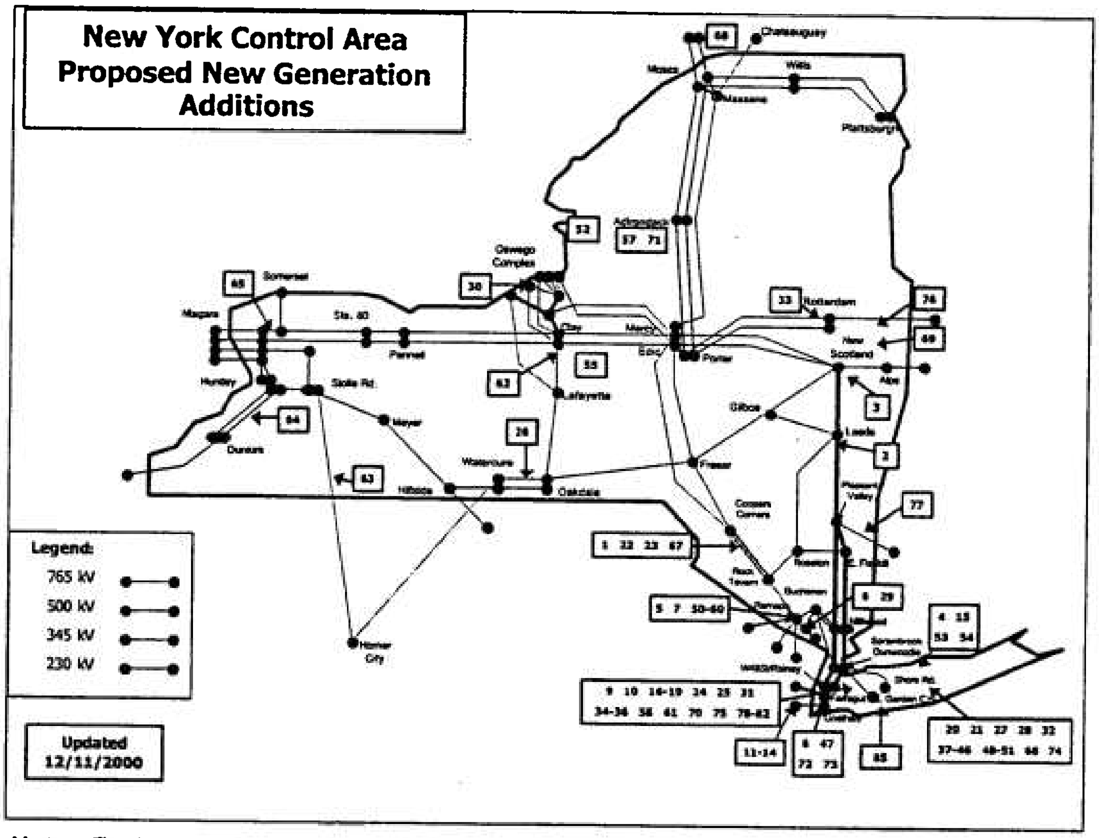
3. Upgrade New York's and the Northeast region's transmission infrastructure.

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

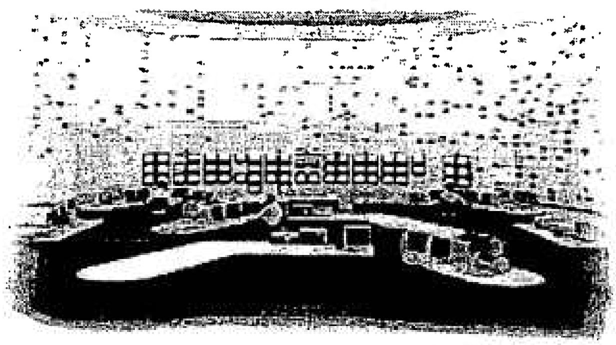
Figure 7

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.

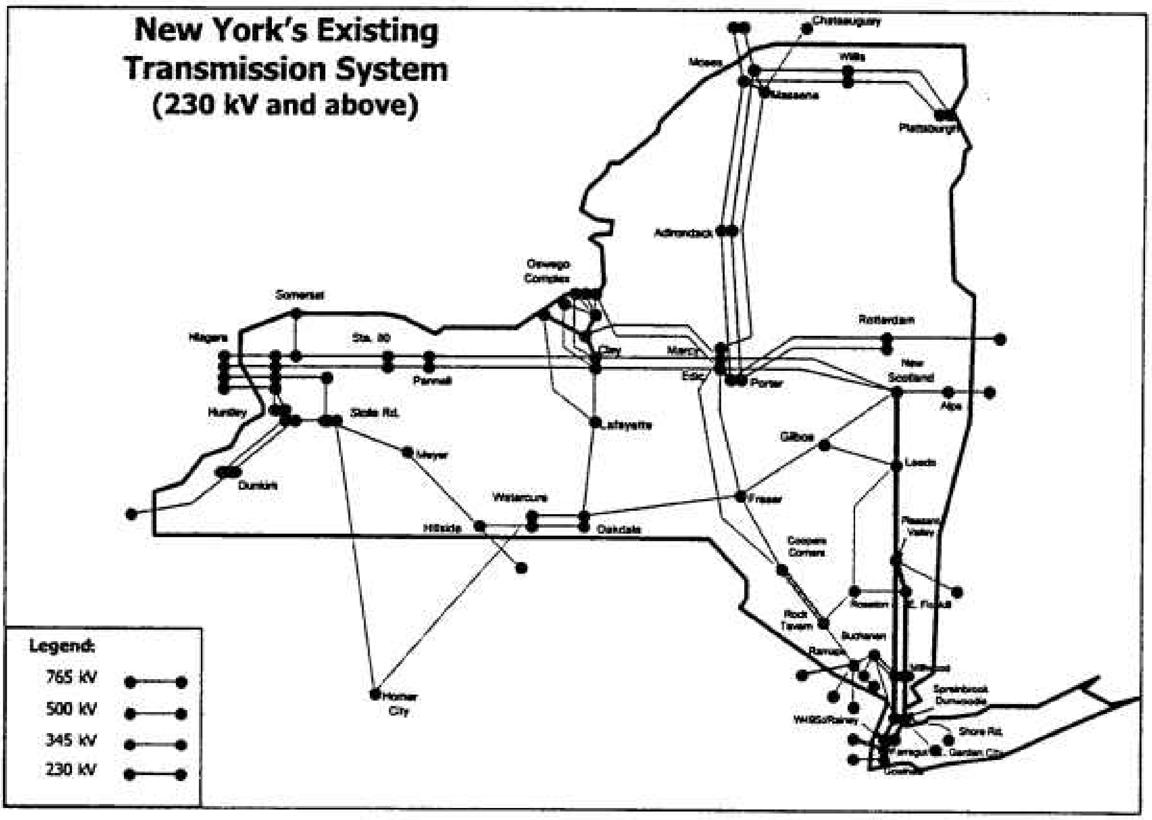
The ability to generate electricity is only part of the story. The system must also be able to deliver it to wherever it is needed. This requires physical connections, transmission lines, between the generators and the end users. Just as generators have a maximum output, transmission lines have a maximum 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 West	 6156 9140	 8116 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 [illegible] 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 [illegible] 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 incentive) 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.

Power Alert: New York's Energy Crossroads

Appendices

March 2001
Report by
The New York Independent System Operator

Appendices

Appendix A
List of Proposed Generating Projects

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Site #	Project Name	Owner/Developer	Size (MW)	Date of Study Application	S	Interconnection Point	Utility	Status of Article X	Proposed In-Service
1	Middletown Station	Con Edison	N/A	09/15/89	C	Coop Com-Rock Tav Lines	NYPA	N/A	2001
2	Athens Gen	Athens Gen Co./ PG&E	1080	04/27/98	C	Leeds-Pl.Val. 91 Line	NMPC	Approved 6/13/00	2002
3	Bethlehem Energy Center	PSEG Power NY	350	04/27/98	C	Albany	NMPC	Appl filed 11/27/98	2002
4	CT-LI DC Tie-line	LIPA/ Trans Energie US	330	07/20/98	R	Shoreham, Long Island	LIPA	N/A	2002
5	Torne Valley Station	Sithe Energies	860	01/28/99	R	Ramapo	CONED	Appl filed 11/15/99	2003
6	Sunset Energy Fleet	Sunset Energy Fleet LLC	520	02/17/99	C	Gowanus	CONED	Appl filed 7/26/00	2002
7	Ramapo Energy	American National Power	1100	02/23/99	R	Ramapo	CONED	Appl filed 11/29/99	2003
8	Grassy Point	Columbia Electric Corp.	1100	02/23/99	A	West Haverstraw	CONED	re-app filed 09/24/99	2003
9	Millennium 1	Millennium Power Gen Co. LLC	160	02/23/99	A	Hell Gate/Bruckner	CONED	(No Filing)	2003
10	Millennium 2	Millennium Power Gen Co. LLC	320	02/23/99	A	Hell Gate/Bruckner	CONED	(No Filing)	2003
11	East Coast Power-Linden	East Coast Power-Linden Venture LP	20	03/25/99	A	Goethals	CONED	N/A	2001
12	East Coast Power-Linden	East Coast Power-Linden Venture LP	70	03/25/99	A	Goethals	CONED	N/A	2001
13	East Coast Power-Linden	East Coast Power-Linden Venture LP	160	03/25/99	A	Goethals	CONED	N/A	2002
14	East Coast Power-Linden	East Coast Power-Linden Venture LP	160	03/25/99	P	Goethals	CONED	N/A	*(None)*
15	CT-LI AC Tie-line	AEP Resources Service Corp.	600	04/13/99	I	Shoreham, Long Island	LIPA	N/A	*(None)*
16	ABB Oak Point Yard	ABB Development Corp.	1075	04/15/99	A	Hell Gate/Bruckner	CONED	Prelim filed 6/30/00	2003
17	KeySpan Ravenswood	KeySpan Energy, Inc.	270	04/21/99	R	Ravenswood	CONED	Appl filed 7/28/00	2003
18	Poletti Expansion	NYPA	500	04/30/99	R	Astoria	CONED	Appl filed 8/18/00	2004
19	SEFCO	NYC Energy LLC	79.9	05/07/99	R	Kent Ave	CONED	N/A	2001
20	Spagnoli Road CC Unit	KeySpan Energy, Inc.	250	05/17/99	A	Spagnoli Road	LIPA	(No Filing)	2003
21	Shoreham Gen Station	KeySpan Energy, Inc.	250	05/17/99	A	Shoreham	LIPA	(No Filing)	2003
22	Wawayanda Energy Cente	Calpine Eastern Corporation	500	06/10/99	A	Coop Com-Rock Tav Lines	NYPA	Prelim filed 7/27/00	2003
23	Calpine Two Energy Cente	Calpine Eastern Corporation	1080	06/25/99	I	Coop Com-Rock Tav Lines	NYPA	(No Filing)	2003
24	Astoria Repowering-Phase	Orion Power	499	07/13/99	A	Astoria	CONED	Prelim filed 9/5/00	2003
25	East River Repowering	Consolidated Edison of NY	360	08/10/99	R	E. 13th St.	CONED	ppl accepted 7/31/00	2002
26	Twin Tier Power	Twin Tier Power, LLC	520	08/20/99	A	Watercure-Oakdale 31 Line	NYSEG	re-app filed 07/19/99	2003
27	Far Rockaway Barge	ENRON	60	09/08/99	N/A	Far Rockaway	LIPA	N/A	2001
28	Spagnoli Road GT Unit	KeySpan Energy, Inc.	79.9	09/08/99	A	Spagnoli Road	LIPA	N/A	2002
29	Bowline Point Unit 3	Southern Energy, Inc.	750	10/13/99	R	W. Haverstraw	CONED	ppl accepted 8/10/00	2002
30	Heritage Station	Sithe Energies	800	10/29/99	C	Independence (Oswego)	NMPC	ppl accepted 4/21/00	2003
31	Astoria Energy	SCS Energy, LLC	1000	11/16/99	R	Astoria	CONED	Appl filed 6/19/00	2003
32	Brookhaven Energy	American National Power	580	11/22/99	A	Holbrook-Brookhaven Line	LIPA	Prelim filed 3/28/00	2003
33	Glenville Energy Park	Glenville Energy Park, LLC	810	11/30/99	R	Rotterdam	NMPC	relim filed 12/29/99	2003

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Site #	Project Name	Owner/Developer	Size (MW)	Date of Study Application	S	Interconnection Point	Utility	Status of Article X	roposed n-Service
34	North First Street	York Research Corp.	500	01/11/00	P	Con Ed System	CONED	(No Filing)	2004
35	Gotham Power - Bronx I	1st Rochdale Coop Group	79	01/12/00	P	Parkchester/Tremont	CONED	N/A	2001
36	Project Neptune DC Tie	Atlantic Electric, LLC	1200	01/21/00	A	Con Ed System, Brooklyn	CONED	N/A	2004
37	Kitchen	Caithness Energy, LLC	750	01/28/00	P	Riverh'd-Brookh'n-Holb'k	LIPA	Prelim filed 8/17/00	2002
38	Far Rochaway Gen Ext.	KeySpan Energy, Inc.	79	02/01/00	P	Far Rockaway	LIPA	N/A	2002
39	E. F. Barrett Gen Ext	KeySpan Energy, Inc.	79	02/01/00	P	Barrett	LIPA	N/A	2002
40	Riverhead Gen Station	KeySpan Energy, Inc.	79	02/01/00	A	Riverhead	LIPA	N/A	2002
41	Southampton Gen Ext.	KeySpan Energy, Inc.	79	02/01/00	A	Southampton	LIPA	N/A	2002
42	Holbrook Energy	PP&L Global, Inc.	300	02/01/00	P	Holbrook	LIPA	(No Filing)	2003
43	PPL Kings Park	PP&L Global, Inc.	300	02/01/00	A	Pilgrim	LIPA	Prelim filed 8/10/00	2002
44	Ruland Energy	PP&L Global, Inc.	300	02/01/00	P	Ruland Road	LIPA	(No Filing)	2003
45	Freeport Energy	PP&L Global, Inc.	100	02/01/00	P	Freeport	LIPA	(No Filing)	2003
46	Brookhaven Energy	PP&L Global, Inc.	300	02/03/00	P	Brookhaven	LIPA	(No Filing)	2003
47	GenPower DC Tie-line	GenPower, LLC	800	02/09/00	P	West 49th Sreet	CONED	N/A	2003
48	PPL Kings Park Ext.	PP&L Global, Inc.	300	02/10/00	I	Pilgrim	LIPA	(No Filing)	2002
49	Brookhaven Energy Ext.	PP&L Global, Inc.	300	02/10/00	P	Brookhaven	LIPA	(No Filing)	2003
50	AES Smithtown Gen	AES Long Island, LLC	510	02/10/00	P	LIPA System	LIPA	(No Filing)	2004
51	Wading River Gen Ext.	KeySpan Energy, Inc.	150	02/15/00	P	Wading River	LIPA	(No Filing)	2002
52	Fort Drum Gen Exp.	Nia Mo Energy/Black River Power	50	03/06/00	P	Fort Drum	NMPC	N/A	2001
53	CT-Ruland, LI DC Tie	TransEnergie US, Ltd	300	03/07/00	P	Ruland Road	LIPA	N/A	2003
54	CT-Pilgrim, LI DC Tie	TransEnergie US, Ltd	300	03/07/00	P	Pilgrim	LIPA	N/A	2003
55	Fenner Wind Energy Fa	Canastota Wind Power, LLC	50	03/14/00	P	Fenner-Whitman	NMPC	N/A	2001
56	Gotham Power - Brookl	1st Rochdale Coop Group	79	03/17/00	P	Kent Ave	CONED	N/A	2001
57	Flat Rock Windpower	Flat Rock Windpower, LLC	100	03/21/00	P	Lowville-Boonville	NMPC	(No Filing)	2001
58	Lovett #3 Repowering	Southern Energy Lovett, LLC	180	03/23/00	P	Lovett	CONED	(No Filing)	2004
59	Hillburn Unit #2	Southern Energy NY Gen, LLC	79.9	03/23/00	P	Hillburn	CONED	N/A	2003
60	Hillburn #2 Conversion	Southern Energy NY Gen, LLC	40	03/23/00	P	Hillburn	CONED	N/A	2005
61	Greenpoint Energy Park	GTM Energy, LLC	500	04/19/00	P	Rainey-Farragut Lines	CONED	(No Filing)	2004
62	Project Orange	Project Orange Associates, LP	420	05/08/00	P	Temple St.	NMPC	(No Filing)	2002
63	LSA Station A	Lewis Staley Associates, Inc.	650	05/11/00	P	Homer City-Stolle Rd Line	NYSEG	(No Filing)	2002
64	LSA Station B	Lewis Staley Associates, Inc.	600	05/12/00	P	Dunkirk-Gardenville Line	NMPC	(No Filing)	2002
65	Lockport II Gen Station	Fortistar Power Marketing, LLC	79.9	05/15/00	P	Harrison Station	NYSEG	N/A	2001
66	Langlois Converter	TransEnergie HQ	100	06/02/00	P	Langlois, Quebec	NMPC	N/A	2001
67	Wallkill Energy	Titan Development, LLC	1080	06/21/00	P	Coop Corn-Rock Tav Lines	NYPA	(No Filing)	2003

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Site #	Project Name	Owner/Developer	Size (MW)	Date of Study Application	S	Interconnection Point	Utility	Status of Article X	Proposed In-Service
68	Ruland Energy Ext.	PP&L Global, Inc.	300	06/23/00	P	Ruland Road	LIPA	(No Filing)	2003
69	Empire State Newsprint	Besicorp/Empire State	475	07/14/00	P	Reynolds Road	NMPC	(No Filing)	2004
70	Astoria Repowering-Phase 2	Orion Power	800	08/18/00	P	Astoria	CONED	Prelim filed 9/5/00	2005
71	Mill Creek Wind Plant	Mill Creek Wind Plant, LLC	50	09/08/00	P	Lowville	NMPC	N/A	2001-02
72	Island Generating Station	Fortistar Power Marketing, LLC	79.9	09/08/00	P	Fresh Kills	CONED	(No Filing)	2002
73	Island Generating Station #2	Fortistar Power Marketing, LLC	500	09/08/00	P	Fresh Kills	CONED	(No Filing)	2002
74	Oceanside Energy Center	FPL Energy, LLC	560	10/10/00	P	Barrett	LIPA	(No Filing)	2004
75	Gotham Power - Bronx II	1st Rochdale Coop Group	79	10/17/00	P	Hell Gate/Bruckner	CONED	N/A	2002
76	Waterford	SkyGen Energy, LLC	530	10/30/00	P	NMPC 230 or 115 kV	NMPC	(No Filing)	2004
77	Dover Energy	Titan Development, LLC	1000	11/17/00	P	Pl. Valley-Long Mt. Tie-Line	CONED	(No Filing)	2005
78	Ravenswood Repowering Pt	KeySpan Ravenswood Services, L	440	12/04/00	P	Vernon Substation	CONED	(No Filing)	2005
79	Harlem River Yards	NYPA	79.9	12/05/00	P	Hell Gate Substation	CONED	N/A	2001
80	Hell Gate	NYPA	79.9	12/05/00	P	Hell Gate Substation	CONED	N/A	2001
81	Vernon Blvd	NYPA	79.9	12/05/00	P	Vernon Substation	CONED	N/A	2001
82	N First St and Grand Ave	NYPA	44	12/05/00	P	Vernon-Greenwood line	CONED	N/A	2001
83	23rd St and 3rd Ave	NYPA	79.9	12/05/00	P	Gowanus Substation	CONED	N/A	2001
84	Fox Hills	NYPA	44	12/05/00	P	Fox Hills Substation	CONED	N/A	2001
85	Brentwood	NYPA	44	12/05/00	N/A	Brentwood 69 kV	LIPA	N/A	2001
			####						

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Appendix B
NYISO Price Sensitive Load Programs

The NYISO expects to have in place this summer two price-responsive load programs. They are:

1. Emergency Demand Response Program (EDRP)

2. Day-Ahead Load Curtailment Program

Each of the programs is described in detail on the following pages.

In general, the EDRP is implemented when the NYISO is short operating reserves and has implemented its emergency operating procedures. Participants are paid the higher of $500 per MWH or LBMP for the energy they save, either through load interruption or use of standby generation. They do not participate in establishing the market-clearing price.

The day-ahead program allows price sensitive load to offer into the day-ahead market. These offers are used in establishing the day-ahead market-clearing price. Participants are paid the higher of LBMP or their curtailment initiation cost for the energy they save or produce.

The NYISO Management Committee and Board Of Directors have approved the emergency response program. At this time, the load curtailment program still awaits Management Committee and Board Approval.

Overview of the Emergency Demand Response Program

1. **Participation** - End Use Customers can be accommodated through one of four types of Curtailment Services Providers (CSP):
   - through an LSE, either that currently serving the load or another LSE
   - through NYISO-approved Curtailment Customer Aggregators
   - as a Customer of the NYISO
   - as a Curtailment Program End Use Customer (reduced membership requirements for only this program)

2. **Effective Date** - The program will be effective beginning May 1, 2001 and will continue through October 31, 2002. At the end of each capability period, the program will be evaluated and changes recommended as necessary.

3. **Performance Requirements** - Participation is voluntary – no penalties are incurred if the load does not perform as requested.

4. **Compatibility with LSE-Sponsored Programs -** Any LSE curtailment program participants would be entitled to participate in the program. An individual End Use Customer can not be signed up for the ISO program by more than one entity for the same metered load.

5. **Metering** - CSPs will be required to provide appropriate hourly interval metering to validate performance.

6. **Verification** - Actual load reduction will be verified by the NYISO through data submitted by the CSP within 45 days of the load reduction event.
7. **Activation** – Program is limited to when called by the NYISO as a part of the In-day Peak Hour Forecast response to an Operating Reserve Peak Forecast Shortage (Section 4.4.1 of the NYISO Emergency Operations Manual) or in response to the major emergency state (defined in Section 3.2 of the Emergency

Operations Manual). Program can be called in conjunction with Special Case Resources (except there won't always be 24 hours notice.)

8. **Contacts** - Each CSP will designate a contact person responsible for interfacing between the NYISO and the CSP. The NYISO will contact this individual to initiate a curtailment within the program. The CSP will be responsible for establishing procedures to communicate with load reduction customers.

9. **Payments** - Payments will be the greater of the real-time zonal LBMP or $500/MWh for all hours where the emergency exceeds 4 hours. Where the emergency is less than 4 hours, payments will be the greater of the realtime zonal LBMP or $500/MWh for the first two hours of an event and at the zonal LBMP for an additional 2 hours. Payments will be paid directly to the CSPs.

10. **Event Duration** - Every ISO event has a four hour minimum run time; the verification process will determine when the customer started to respond to the program.

11. **Minimum Load Reduction** - CSPs should be able to provide load reduction of at least 100 kW and be able to respond within two hours of emergency notification.

12. **Restrictions** - Customers under a contract that prevents them from curtailing energy are prohibited from participating in the program.

13. **Cost Allocation** - The program is intended to support the New York State power system during emergency periods. As such, NYISO reserves the right to call upon whatever ECP resources are needed to relieve system emergencies. The costs to administer this program will be allocated on a system-wide basis to purchasers of energy in proportion to their net energy purchases during the hours requested. If this program is activated by the NYISO to respond to a zonal emergency the funds will be charged to all LSEs in the Zone.

14. **Compatibility with Special Case Resources** - Customers participating in the ECP may also participate in the NYISO's Special Case Resources Program.

Overview of the Day-Ahead Load Curtailment Program

The details of this program are as follows:

1) **Bidding** - The NYISO would implement a Zonal Price-Cap curtailable Load Bid (a.k.a. "Generator Offset Bid") program with the capability for an LSE (LSE or CSP in future) to bid on behalf of an End-User for a specific MW curtailment (in minimum increments of 1 MW by Zone) for a minimum duration (e.g., either in one hour contiguous "strips", or in pre-determined contiguous strips of time such as 4 hours, 8 hours, and/or 12 hours only). The Price-Cap Curtail Bid would include the Day-Ahead LBMP above which the Load would not consume, and could also include a "Curtailment Initiation Cost".

2) **SCUC Objective Function** - The objective function for SCUC would be to eliminate Price-Cap Curtail Load from Day-Ahead Bid Load when the total Bid Production Cost over the 24 hour Dispatch Day would be reduced compared to serving that load (including consideration of paying the Price-Cap Curtail Bid and any bid "Curtailment Initiation Costs"). Thus curtailments would not be scheduled unless they reduced total Day-Ahead production costs. The NYISO would include a portion, all or none of Day-Ahead curtailed load in its Day-Ahead Forecast Load above Bid Load (for which it would need to schedule Capacity, but not Energy) based upon its experience and expectations for the given penalty/ reward system in place.

3) **Setting LBMP** - Curtailed Price-Cap Load could set Day-Ahead LBMP just as a comparably bid Generator.

4) **Customer Baseline Load** - An End-User's Customer Baseline Line (CBL) would provide a reference to verify its compliance with a scheduled curtailment. The CBL will be determined using a method similar to that of the Emergency Demand Reduction program (i.e., something akin to using the rolling average of the End-User's load for the previous ten days with certain qualifications).

5) **Curtailment Determination** - The amount of actual Real-Time curtailment determined for an End-User would be equal to its CBL less its actual Real-Time consumption during the specified curtailment.

6) **Administration** - Initially, the program would be administered by the NYISO and host LSEs only; but would be open to Curtailment Service Providers (CSPs) after one year

7) **Payments** - LSEs (LSEs and CSPs in the future) with an End-User that curtailed would avoid Energy charges from the NYISO (with the exception specified in Item 12 below). Additionally, for Loads that curtail, (as scheduled Day-Ahead by the NYISO), the NYISO would pay the higher of its Price-Cap Curtail Load Bid **or** Day-Ahead LBMP. This incentive payment would include a supplemental payment, if needed, as a "Bid Curtailment Cost Guarantee" to allow full recovery of the "Curtailment Initiation Cost".

8) **Payment Sharing** - The Total incentive payment would be made to the host LSE (LSE or CSPs in the future) with the portion that would be transferred to the End-User to be arranged between the host LSE (LSE or CSP in future) and the End-User. Transmission Owners, except for LIPA and NYPA, shall designate in their retail tariff the actual numeric percentage of the incentive payment that it will share with Loads that curtail use under this program and that they apply such percentage in a non-discriminatory manner. LIPA and NYPA agree to implement the intent of the preceding sentence in a consistent manner.

9) **Cost Allocation of Incentives** - "Incentive" payments made would be cost allocated back to Loads on a Zonal basis in proportion to benefits received by each Zone (this methodology to be determined; and allocations may be based upon off-line studies which result in "rule-of-thumb" values).

10) **Non-Performance Penalties** - For LSEs (LSEs and CSPs in future) with End-Users that were scheduled for Price-Cap curtailments that fail to curtail will be charged 110% of the higher of Day-Ahead or Real-Time LBMP for non-curtailed Load. The premium paid over Real-Time LBMP would be applied to reduce costs allocated to Loads for Price-Cap Curtail incentive payments (on the same Zonal basis).

11) **End-User Requirements** - End-Users would be need to have interval billing metering, and would be responsible for any incremental metering and billing system implementation and administration costs in accordance with applicable retail tariffs.

12) **Small Generator Eligibility** - The program would open to small "behind-the-fence" generators "behind the meter" (except diesel generators), provided generator has separate interval meter (and other

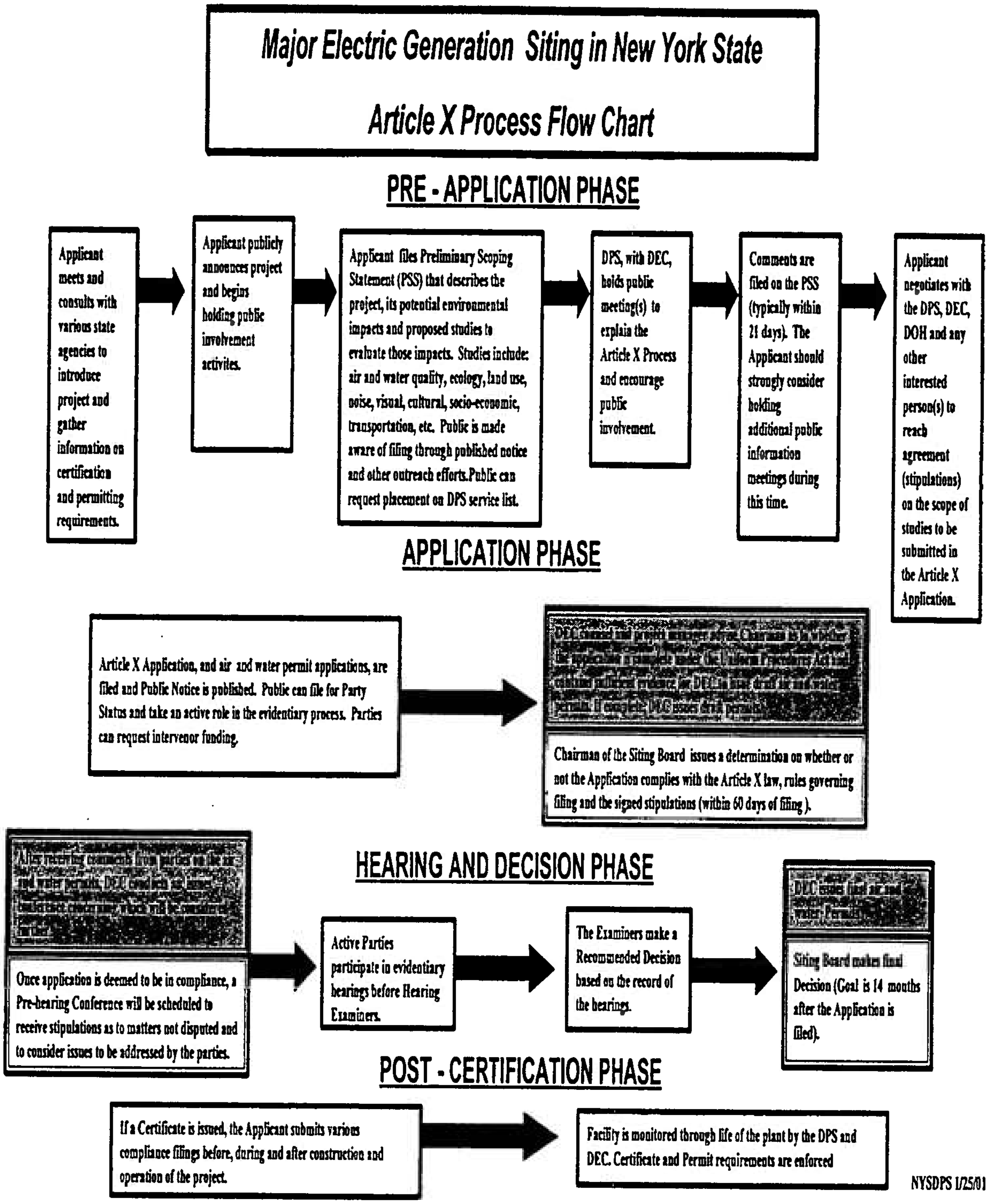
applicable requirements are met); however, an LSE (LSE or CSP in future) with a curtailing End-User will not avoid Energy charges to the extent that the End-User's curtailed Energy is self-supplied. Participating End-Users with diesel generators would need to have separate interval meters on diesels to insure Load curtailment was not self-supplied via diesels.

13) **ICAP Eligibility** - Eligibility for program participants qualifying for ICAP and any associated rules will be determined and developed by the ICAP Working Group. This eligibility will be resolved as part of ICAP Stage 2 or October 1, 2001 whichever is sooner.

14) **Sunset Clause** – To be determined.

15) **Other Issues** - (a) SCUC and Billing and Settlement need to be fully tested; (b) the Market Monitoring Unit needs to develop the necessary measures to ensure protection against gaming and market flaws; and (c) the program needs to be coordinated with the implementation of any Price Circuit Breaker.

Appendix C
New York Article X Siting Process Description



GUIDE TO THE CERTIFICATION REVIEW PROCESS FOR MAJOR ELECTRIC GENERATING FACILITIES UNDER ARTICLE X OF THE NEW YORK STATE PUBLIC SERVICE LAW

Revised November 8, 2000

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INTRODUCTION

Article X of the New York State Public Service Law sets forth a review process in New York State (NYS) for consideration of any application to construct and operate an electric generating facility with a capacity of 80 megawatts or more. An applicant must meet Article X requirements to obtain the Certificate of Environmental Compatibility and Public Need (Certificate) that is needed before construction of such a facility.

Article X was enacted in 1992 to replace Article VIII that expired on January 1, 1989. Article X was amended in November 1999 to clarify the permitting process regarding air and water permits. This guide explains the requirements which apply to Article X applications filed ***after December 1, 1999.***

You may obtain a copy of Article X and its regulations from the New York State Department of Public Service by visiting our website, writing, or calling our toll-free number:

- Internet http://www.dps.state.ny.us/articlex.htm

- Write: New York State Department of Public Service
  Office of Consumer Education and Advocacy
  Three Empire State Plaza
  Albany, NY 12223-1350
- Call Toll Free: 1-877-PSC-ARTX (1-877-772-2789)

THE SITING BOARD

Any application filed under Article X is decided by the New York State Board on Electric Generation Siting and the Environment (Siting Board). As established by state law, the Siting Board is made up of seven members:

- Five permanent Siting Board members or their designees:
  - Chairman of the NYS Public Service Commission,
  - Commissioner of the NYS Department of Environmental Conservation,
  - Commissioner of the NYS Department of Health,
  - Commissioner of the NYS Department of Economic Development, and
  - Chairman of the NYS Energy Research and Development Authority.
- Two public Siting Board members are named in each case by the Governor 30 days after an applicant files its application:
  - A resident from the judicial district in which a facility is proposed, and
  - A resident from the county where a facility is proposed.

The Chairman of the Public Service Commission, who manages the New York State Department of Public Service, serves as Chairman of the Siting Board. The staff of the Department of Public Service acts as staff to the Siting Board.

PRE-APPLICATION PROCEDURE

Early in the planning phase of the project, each prospective Article X applicant is encouraged to consult informally with state agencies, municipalities, environmental organizations, other stakeholder groups, and local residents that may be interested in the proposed facility. Following this period, the applicant files the preliminary scoping statement for the project. This is the first formal document a prospective applicant must file. In it the applicant describes:

- The proposed facility and its environmental setting;
- Potential environmental impacts from the construction and operation of the proposed facility;
- Proposed mitigation of potential environmental impacts;
- Reasonable alternatives to the proposed facility; and
- Other information that may be relevant or required by the Siting Board to supplement the application.

With the filing of the preliminary scoping statement, the pre-application phase begins and a case number is assigned. During the pre-application phase, the Chief Administrative Law Judge of the Department of Public Service may assign a hearing examiner to mediate disagreements on the scope and method of any environmental impact studies or other studies to support the application that are proposed in the preliminary scoping statement or stipulations. Stipulations, as Referred to here, are written agreements among the applicant, various state agencies, and other stakeholders. Stipulations establish the scope of environmental impact studies and other information needed in the application to meet the requirements of Article X and its implementing regulations.

PUBLIC INVOLVEMENT

The Article X process guarantees opportunities for public involvement. Under Article X, an applicant must communicate with the public early in the pre-application process through the use of media coverage, direct mailings, fliers, newsletters, etc. This should be done before any agreements on project stipulations have Been made between the applicant and interested parties.

To facilitate the application process and to enable public participation, an applicant must carry out a meaningful public involvement program. An applicant is expected to hold public meetings, offer presentations to individual groups and organizations, and establish a community presence. Establishing a local office, A toll-free telephone number, Internet website, or a community advisory group a re among the actions an applicant may take to establish its presence in the community. An applicant should disseminate information about its project at meetings, in mass mailings, and through local media.

FILING AND NOTICE REQUIREMENTS

An Article X Applicant is required to:

- Serve copies of its preliminary scoping statement, proposed stipulations, and application on the permanent members of the Siting Board, interested state agencies, members of the State Legislature, municipalities, local libraries, and other interested persons and organizations in areas that may be affected by the proposed project;
- Offer the public a reasonable opportunity to submit comments on the proposed stipulations before they are signed; and
- Publish notice of the filing of its preliminary scoping statement, proposed stipulations, and application as stipulated in the regulations.

APPLICATION

An Article X Application must contain:

- A description of the facility and the site including all applicable environmental characteristics;
- Studies of impacts on air, water, visual resources, land use, noise levels, health, and other matters;
- Proof that the proposed facility will meet state and federal health, safety, and environmental regulations;
- Applications for air and water permits; and
- A complete report of the applicant's public involvement program activities and its efforts to encourage citizen participation.

THE CERTIFICATION PROCESS

The Chairman of the Siting Board has 60 days after an application is filed to determine if it is in compliance with Article X. If an application is found to be lacking required information, the applicant is informed of the deficiencies. The applicant is then required to file supplemental information to bring its application into compliance.

The presiding examiner from the Department of Public Service and an associate examiner from the Department of Environmental Conservation are appointed to conduct hearings, receive public comment, and review evidence. The examiners hold one or more pre-hearing conferences at which intervenor-funding requests are considered and the issues to be addressed by the parties are specified.

After the Chairman determines that the application complies with applicable requirements, public statement and evidentiary hearings are held, and parties investigate the application. The examiners review briefs submitted by the parties and issue recommended decisions to the Siting Board in which each issue required to be addressed is analyzed.

INTERVENOR FUND

When an applicant submits its Article X application, it must also submit a fee of $1,000 per megawatt of capacity, up to $300,000, for an intervenor fund. The intervenor fund is distributed by the presiding examiner assigned to the case.

The examiner awards funds to municipal and other local parties to help defray the expenses of expert witnesses and consultants. At least fifty percent of the fund is designated for the use of municipalities, and up to fifty percent is designated for the use of other local parties in the case.

Prospective intervenors are encouraged to contact Department of Public Service staff during the pre-application phase of a case for additional information regarding the preparation of a funding award application letter. Detailed requests for funds must be submitted in writing to the presiding examiner not later than 15 days after the date on which the notice of the initial pre-hearing conference is issued. The presiding examiner considers such requests at the initial pre-hearing conference. Subsequent requests may also be entertained depending on the extent of the funds remaining. Any intervenor funds remaining at the end of a case will be returned to the applicant. For more specific information regarding an application for intervenor funding, consult **Article X Regulations, 16 NYCRR, Section 1000.9, Fund for Municipalities and Local Parties** which is available on the Department of Public Service Website.

PERMIT PROCESSES ASSOCIATED WITH THE CERTIFICATION PROCEEDING

In conjunction with the Article X process, the Department of Environmental Conservation (DEC) reviews applications for permits for the discharge of water pollutants and the emission of air pollutants submitted as part of an Article X application. The Article X Certification process and the air and water permitting processes are coordinated to the maximum extent practical. DEC advises the Chairman as to whether the Article X application contains enough evidence for draft permits to be issued. After an issues conference, substantive and significant issues regarding air and water permits are specified. The DEC must provide these permits to the Siting Board before the Board decides whether to grant a Certificate to an applicant.

SITING BOARD DECISION

After reviewing the examiners' recommended decision or reports, the Siting Board decides if a Certificate should be granted. The goal is that this decision be made within 14 months after an application is filed. If a substantial change is made to the application, however, the Siting Board may take up to an additional six months to make its decision. The applicant may also agree to allow the Siting Board to take more time.

To grant a certificate, the Siting Board must determine:

1. Either:
   (a) Construction of the facility is reasonably consistent with the most recent State Energy Plan, **or**
   (b) The facility will be constructed and operated as part of the competitive electricity supply market.
2. The nature of the probable environmental impacts, including an evaluation of cumulative air quality impacts;
3. The facility minimizes adverse environmental impacts, given environmental and other pertinent considerations;
4. The facility is compatible with public health and safety;
5. The facility will not discharge or emit any pollutants in violation of existing requirements and standards;
6. The facility will control the disposal of solid and hazardous wastes;
7. The facility is designed to operate in compliance with state and local legal provisions, although the applicant may ask the Siting Board to refuse to apply any local legal provisions the applicant considered unreasonably restrictive; and
8. The construction and operation of the facility is in the public interest

Appendix D
Study Assumptions and Methodology

Basic Study Assumptions

The fundamental goal of this study was to quantify the economic effects of adding new power generation facilities as New York State demand for electric power increases. The inputs and assumptions described below were selected to focus on price differentials that would arise due to capacity expansion.

Installed Generating Capacity and Expansion Plans

Figure 1 shows the generating capability at the beginning of the study period. The GEII-PSEC data for the Northeast are derived from RDI Basecase[1].

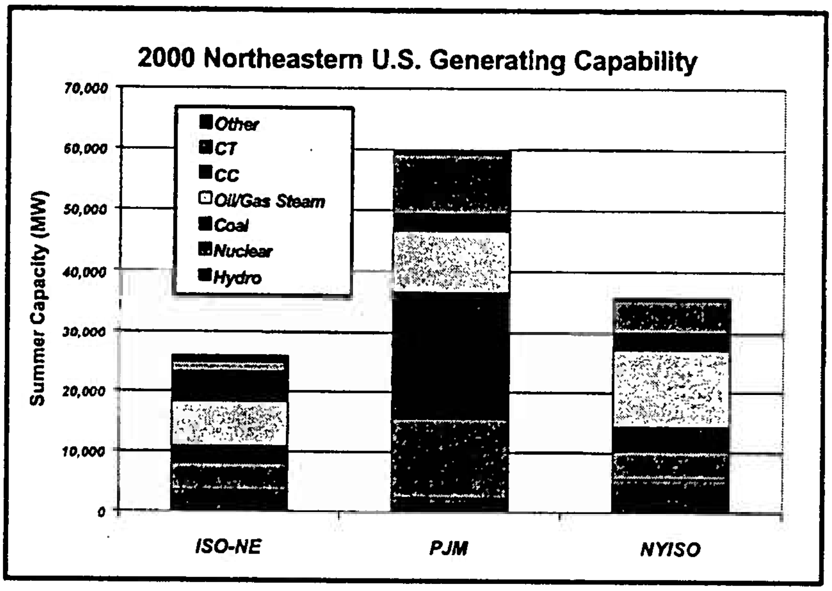

Figure 1: Existing Regional Generating Capability

For expansion planning purposes, the 1,500 MW import from HQ to NEPOOL was modeled as firm capacity and included in the reserve calculations. The other imports were modeled as economic transactions.

Case Definitions

PSEC and NYISO defined two cases and associated inputs designed to focus on price differentials arising from each case. The Base Case, outlined in Table 1, assumes that the current situation continues and no new generating capacity is added within New York by 2005. The Additional Generation case assumes the addition of 8600 MW of new capacity in New York through 2005. The generation additions within New York are distributed among the four pricing regions as indicated. Both cases include the same generation expansion plan for New England and PJM. Additions in New England and PJM are based on current projects that are

[1] RDI Basecase, August 2000 release.

judged likely to be completed based primarily on information compiled by RDI[2] in their NEWGen[3] data service.

	New York					ISO-NE	PJM
	West	East	NYC	Long Island	Total New York		
2001							
CC	0	0	0	0	0	1500	1300
CT	0	0	0	0	0	0	300
Total	0	0	0	0	0	1500	1600
2003							
CC	0	0	0	0	0	9900	1830
CT	0	0	0	0	0	0	450
Total	0	0	0	0	0	9900	2280
2005							
CC	0	0	0	0	0	500	800
CT	0	0	0	0	0	0	0
Total	0	0	0	0	0	500	800

Table 1: Base Case Generation Expansion Summary

	New York					ISO-NE	PJM
	West	East	NYC	Long Island	Total New York		
2001							
CC	0	0	0	0	0	1500	1300
CT	0	0	300	200	500	0	300
Total	0	0	300	200	500	1500	1600
2003							
CC	800	2200	1300	0	4300	9900	1830
CT	0	0	200	300	500	0	450
Total	800	2200	1500	300	4800	9900	2280
2005							
CC	0	1000	1000	1300	3300	500	800
CT	0	0	0	0	0	0	0
Total	0	1000	1000	1300	3300	500	800

Table 2: Additional Generation Case Expansion Summary

Projects modeled in New England and PJM were those identified as being in "Advanced Development" or "Under Construction Auction" by RDI. Projects in Advanced Development have at least two of the following attributes.

1. Turbines purchased
2. Power Purchase Agreement in place
3. Financing Closed

[2] RDI: Resource Data International, Inc., a subsidiary of the Financial Times network.

[3] RDI NEWGen, December 2000 Release.

4. Air permit has been obtained
5. Strong Local Support
6. Repowering old unit and no emissions increase

Some adjustments were made to the RDI project list based on other information about plant status. These adjustments added 130MW in NE and 450MW in PJM beyond the projections in NEWGen. Two NE plants with approximately 1100MW of combined capacity are listed by RDI as being in Advanced Development. These two plants are unlikely to be completed during the study period, and they are not included in the database for this analysis.

The New York Additional Generation case was developed in conjunction with the NYISO as a representative case of potential additions and did not rely on RDI information.

Load and Load Growth

The annual peak hour demand and annual energy demand projections used in MAPS are taken from RDI for PJM and New England. These values are approximately the same as the North America Electric Reliability Council (NERC) load projections as identified in the NERC Electricity Supply & Demand database. Load growth forecasts are based on 1999 published reports, and do not necessarily match the most recent regional forecasts.

NYISO load forecasts for New York were used for study years 2001, 2003, and 2005.

The resulting peak demand and energy demand for New York and the adjoining ISO regions are shown below in Table 3.

Actual NYISO loads for NY were used in development and verification of the model.

	New York					ISO-NE	PJM
	West	East	NYC	LI	TOTAL		
Electricity Demand							
2001							
Annual Energy (GWh)	60,166	30,614	48,310	19,536	158,626	124,836	262,019
Peak Demand (MW)	9,839	5,962	10,470	4,597	30,868	23,697	51,705
2003							
Annual Energy (GWh)	61,861	31,261	49,520	19,970	162,611	128,240	271,363
Peak Demand (MW)	10,204	6,143	10,796	4,694	31,836	24,395	53,419
2005							
Annual Energy (GWh)	63,183	31,979	50,625	20,372	166,159	132,601	280,094
Peak Demand (MW)	10,480	6,319	11,018	4,837	32,654	25,211	55,090

Table 3: Regional Load Growth Forecast

The peak loads and annual energy are applied to load shapes for each of the three ISOs which yields a forecast of hourly loads for 2001 through 2005. Load data from 1997 is used to build the hourly load shapes used in this process.

Fuel Prices

Fuel is the largest single cost contributor for most power generation facilities. As such, fuel prices can strongly influence the cost of power. In order to avoid the potential for fuel price changes to mask the effect of generation additions, a single set of annual average fuel prices[4] were used for all years during this study (i.e. no price changes or escalation factors were applied). As a result, fuel prices used in this study are representative of possible future fuel prices, but are not intended to represent a forecast of actual fuel prices.

Fuel prices tend to show recurring seasonal patterns based on supply and demand conditions. To capture the potential effect of these patterns, the model varies fuel prices monthly based on monthly adjustment factors provided by RDI. Table 4 lists the resulting monthly fuel prices in New York; similar, but slightly different fuel prices were used in New England and PJM.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Coal	$1.39	$1.38	$1.37	$1.36	$1.35	$1.35	$1.36	$1.36	$1.35	$1.34	$1.35	$1.36
Distillate Oil	$5.23	$6.14	$5.71	$5.39	$5.82	$5.27	$5.71	$5.94	$5.04	$5.42	$6.80	$6.41
Residual Oil	$4.58	$3.82	$3.36	$3.45	$3.44	$3.39	$3.50	$3.83	$4.05	$4.23	$4.28	$4.04
Natural Gas	$4.39	$3.86	$3.54	$3.43	$3.50	$3.41	$3.35	$3.28	$3.29	$3.57	$4.18	$4.47

Table 4: New York Fuel Prices ($/MMBTU)

All fuels were assumed to be available in sufficient quantity at the price listed above to satisfy the need of each generating unit.

Each generating unit used only its primary fuel for generation.

Operation and Maintenance (O&M) Costs

O&M costs vary by unit type, size and location. Table 5 shows a summary of the range of values applicable to power generation plants in the Northeast. These data are the results of a PSEC analyses of historical costs.

	Variable Costs ($/MWh)	*Fixed Costs ($/kW/yr)*
Nuclear	0.6	75.0
Gas Turbines	1.5 - 4.0	3.0 - 6.0
Steam Turbines	0.6 - 1.4	10.6 - 23.9
Combined Cycles	1.2 - 1.5	10.0 - 12.0

Table 5: Operation and Maintenance Costs[5]

Outage Rates

Average outage rates are based on a PSEC analysis of historical data.[6]

[4] RDI Basecase, February 2000 Release. Prices were selected to avoid historically abnormal gas prices

[5] O&M costs vary by size of unit and location and are based on analyses of nominal operating costs performed by PSEC in 1997 and 1999.

[6] RDI PowerDat data for 1991 through 1997 and NERC Generator Availability Data System (GADS) data for 1993 through 1997. Nuclear outage rates are based on a 1999 PSEC analysis of nuclear outage data

The average outage rates are used by MAPS to determine the available capacity each hour. MAPS optimizes the scheduled maintenance based on perfect knowledge of the hourly load. Outage rates are assumed to remain constant throughout the study.

Unit Type	Size(MW)	Planned Outage Rate	Forced Outage Rate
Nuclear	All	10.0	6.0
Fossil-Coal	0-99	9.6	4.8
	100-199	10.0	5.7
	200-299	10.6	6.1
	300-399	11.6	8.2
	400-599	11.9	8.0
	600-799	9.8	6.4
	800-999	9.7	5.9
	>=1000	12.0	7.7
Fossil-Oil	0-99	7.6	4.6
	100-199	10.0	5.6
	200-299*	11.0	9.6
	300-399	13.4	6.9
	400-599	13.4	5.4
	600-799	14.4	7.0
	800-999	8.1	5.1
Fossil-Gas	0-99	6.4	4.2
	100-199	10.2	5.3
	200-299	12.4	3.8
	300-399	15.2	6.7
	400-599	13.2	5.4
	600-799	14.2	6.0
	800-999	10.5	6.1
GT	All	6.3	4.3
CC	All	10.5	3.3

Table 6: Generic Outage Rates (Percent)

Emission Rates and Costs

The study is based on the environmental regulations currently in force in New York State, New England and PJM.

Emissions rates for New York generating units are based on actual emission rates reported by each unit where this information was available[7]. The unit specific rates are based on 1998 emissions for the most part, and do not reflect changes that may have been made since that time (e.g. new pollution control equipment or fuel changes). Unit specific heat rates were obtained from publicly available data sources[8]. Default emission rates based on unit type and fuel were used where unit specific information was not available.

[7] Individual plant emission rates for NY were developed using data from the New York Power Pool, July 1, 1999 supplement to the 1999 Load & Capacity Data Report.

[8] Primarily, RDI BaseCase.

Plant emission rates for large coal plants in PJM and New England are derived using 1998 CEMS data. National CEMS data also provide the basis for determining the default emission rate and full load heat rate used in the MAPS database as listed in Table 7.

Recommended Default Emissions & Heat Rates							
	Full Load Heat Rate (MBTU/kWh)				Release Rates (lbs/MBTU)		
	<100 MW	100-250 MW	250-500 MW	>500 MW	SO_2	CO_2	NOx
Coal-Fired Steam Boilers	11,570	10,930	10,800	10,400	1.38	205	0.48
Heavy Oil-Fired Steam Boilers	13,378	11,060	11,990	10,970	0.91	160	0.27
Natural Gas-Fired Steam Boilers	11,880	10,350	9,970	9,340	0.00	119	0.20

Table 7: Default Emissions and Heat Rates[9]

Generation capability between May and September are assumed to be at the summer unit rating. Winter ratings were assumed for the other months. Summer ratings for gas turbine-based generating units were assumed to be 90% of the winter ratings unless plant specific information was available.

New combined-cycle and gas turbine unit heat rates were assumed to be 6800 MBtu/kWh and 10,000 MBtu/kWh respectively. NO_x emission rates for both types of plants were assumed to be 0.0075 lbs/MBtu[10].

The costs associated with allowances for NOx and SO2 are modeled as variable costs. As such, these costs are used to commit and dispatch the units and consequently are reflected in the calculation of the marginal production cost of power.

The NO_X costs in Table 8 reflect the expected increase in allowance values associated with tightened emission restrictions.

	2001	2003	2005
Emission Prices ($/ton)			
NOx	$841	$2,960	$3,170
SOx	$172	$238	$263

Table 8 Emission Allowance Prices[11]

Transmission System

Transmission Line Constraints

In order to simulate security-constrained dispatch of the study system, operating constraints and transmission limitations are entered into the MAPS database. Transmission data called

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9 Data for default values were extracted from RDI Base Case database 2.0.0799 dated July 26, 1999.

10 Older gas turbine-based generation performance is based on unit specific information from RDI.

11 RDI BaseCase.

"flowgates" used as a source of constraints for the eastern NERC regions are taken from the NERC website (http://flows.nerc.com/contents.asp). Regional reports are reviewed to identify additional constraints.

Two basic categories of limits are used in the MAPS data base. The first category is line limits for normal system operating conditions (non-contingency conditions) and are based on thermal limits. MAPS will dispatch generation such that all monitored lines remain within their thermal limits each hour.

The second category is a contingency constraint. MAPS forces the system to operate in a state which can withstand the outage of any single line or transformer without causing any other line or transformer to exceed its thermal limit. Contingency constraints are specified in MAPS by identifying contingencies to simulate, and the lines which could overload for each contingency.

The limits developed for the data set do not reflect transient stability and voltage limits. They also do not address multiple element outages, or distinguish between switching stations with relaying and breakers and tap points.

In addition to normal and contingency transmission constraints for individual transmission lines, interface limits are also specified. For example, in the NYISO such interfaces as the "Central-East Interface" or the "UPNY/SENY Interface" are modeled. MAPS uses interface limits to restrict the total amount of power that may flow through a specified combination of transmission lines.

MAPS Modeling

Unit Commitment and Dispatch

The objective of the commitment and dispatch algorithms in MAPS is to determine the most economic operation of the generating units on the system, subject to the operating characteristics of the individual generating units, the constraints imposed by the transmission system, and other operational considerations such as operating and spinning reserve requirements.

MAPS models the system chronologically on an hourly basis, committing and dispatching the generation to serve the load for all hours of the year. The unit commitment process in MAPS begins by developing a priority list of the available thermal units based on their full-load operating costs. This priority ordering of the thermal units is used for the entire week.

The units are then committed in order of increasing full-load costs, including an allowance for startup costs, to meet the load plus spinning reserve requirements on an hourly basis, recognizing transmission constraints. This preliminary commitment for the entire week is then checked to see if any units need to be kept on-line because of minimum downtime or minimum run-time constraints.

Upon completion of the commitment process for the week, the program begins the dispatch process. All of the committed units are loaded to their minimum power point, and then the program dispatches the remaining unit sections, in order of increasing incremental cost, to meet the hourly bus loads, once again recognizing the constraints imposed by the transmission system and other user-specified operating considerations.

Price Forecasting Model

This study incorporates both fundamental and econometric principles to forecast wholesale electricity prices using the following conceptual model:

$$\ln(P_t) = \ln(P_{(t-1)}) - g\{\ln P_{(t-1)} - \ln m_t\} + s\, dw$$

where:

P_t = spot energy price at time t

m_t = expected spot energy price at time t

s = standard deviation of model error (volatility)

dw = normal distribution factor (-1 to +1)

g = mean reversion "speed"

The above model is a "mean reverting" model. In this model, the price in any given hour depends on three primary factors: (1) the price in the preceding hour, (2) the "expected" price, and (3) a random volatility component.

The price in one hour depends on the price in the preceding hour and the "expected" price. This combined relationship accommodates both market inertia and rapidly changing demand patterns. The "expected" price for an hour is determined by adjusting the forecast marginal cost of production based on historical observed prices. The marginal cost of production is determined using the MAPS[14] system simulation software.

The adjustment factors derived from observed prices are a function of the amount of excess capacity[15] expected to be available at that time. For most hours, the expected adjustment represents a relatively small percentage increase applied to the MAPS prediction of the marginal cost of production. When demand approaches the generation capability, however, prices deviate considerably from a cost-based estimate increase. The price response during periods of tight supply are predicted based on price behavior observed in PJM during 1999 as illustrated in Figure 2. This model uses PJM experience because there have been few occurrences of tight supply conditions in New York since the initiation of the wholesale market under the NYISO.

[14] MAPS (Multi-Area Production Simulation) software is a proprietary product of GE Power Systems Energy Consulting. MAPS performs a economically based chronological commitment and dispatch of the power generation system subject to physical and security limitations imposed by the transmission system.

[15] Excess capacity is defined as the percentage of generating capacity available for operation during an hour in excess of the load for that hour. In cases where exchange with surrounding regions can be neglected, excess capacity is determined using the following equation:

$$\textit{Excess Capacity} = \frac{ICAP - Outage_{planned} - Outage_{forced} - Load}{Load}$$

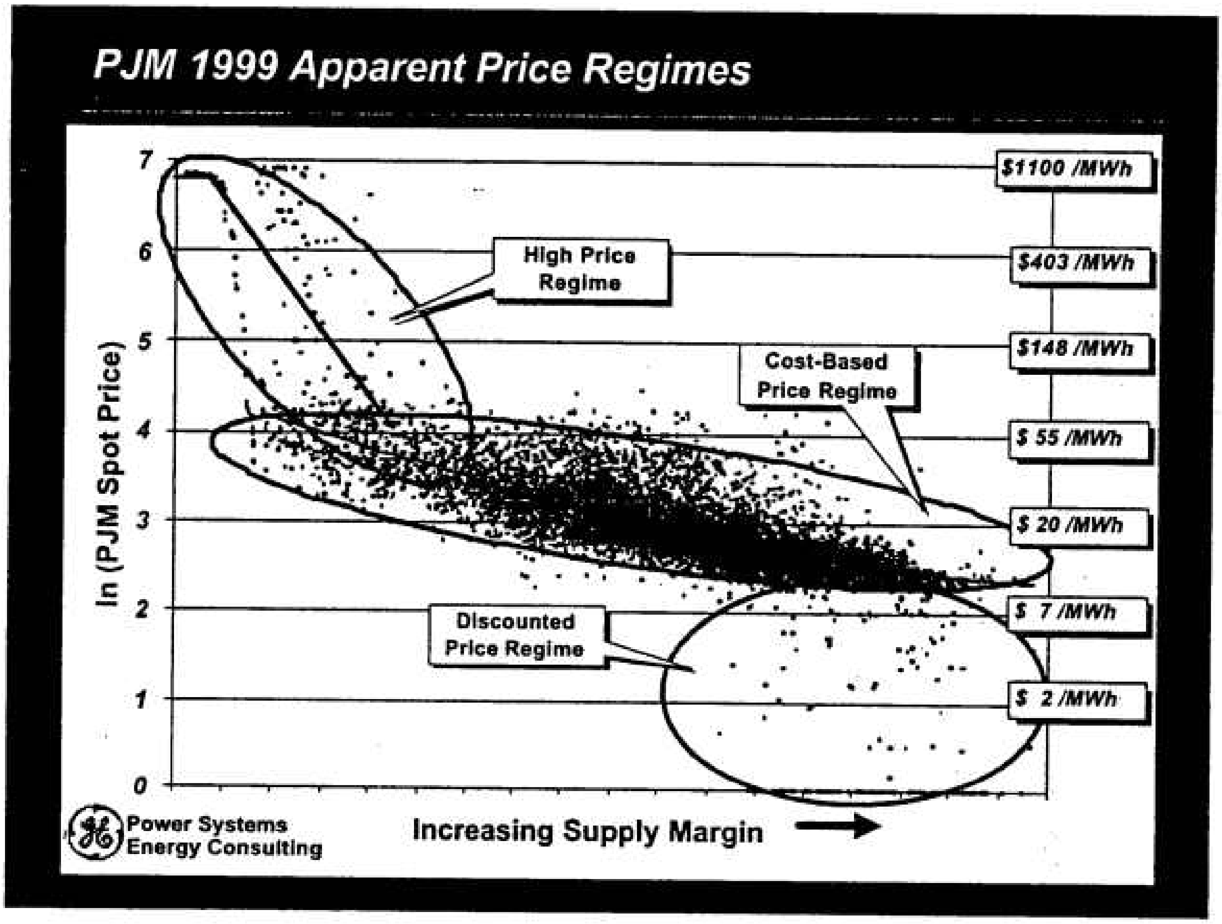


Figure 2: PJM Price Experience

Volatility is based on observed price deviations from predicted prices and is applied as a random factor in forecasting individual hourly prices. Volatility will produce prices that deviate from the "expected" prices. The mean reverting behavior, however, causes prices to tend to return to the "expected" value over time. The force exerted by the mean reversion tendency increases as the deviation from the "expected" value increases.

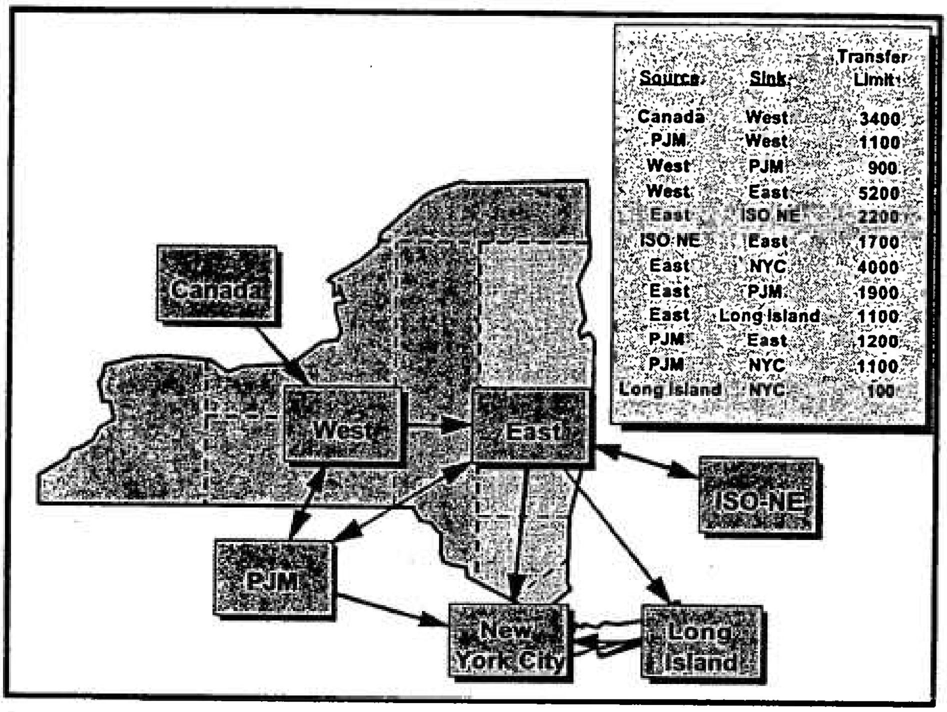
New York Price Regions

The NYISO routinely calculates prices for eleven zones within New York. An examination of historical prices, however, suggests that a reasonable approximation of price differences within New York can be achieved using four regions as illustrated by the colored areas in Figure 3.

While MAPS uses a detailed representation of the transmission system, the market price forecasting model uses simplified regional transfers. In this model, power transfer capability is used to minimize price differentials between regions. The inter-regional transfer capabilities shown in Figure 3 were derived from actual flow performance and interface limits.[16]

[16] NYISO Operations Engineering Publication, "New York Independent System Operator 1999 Transmission Performance Report", July 2000. This report provides actual flow information across important interfaces and lines within New York, including average flow, maximum and minimum levels.

Flow from New England to Long Island of up to 100 megawatts was incorporated into the East to Long Island transfer link.



Source	Sink	Transfer Limit
Canada	West	3400
PJM	West	1100
West	PJM	900
West	East	5200
East	ISO NE	2200
ISO NE	East	1700
East	NYC	4000
East	PJM	1900
East	Long Island	1100
PJM	East	1200
PJM	NYC	1100
Long Island	NYC	100

Figure 3 – Power Transfer Capabilities Assumed in the Price Forecasting Model

Simulation of Price Responsive Loads

The competitive power market offers the promise of providing consumers with the option of alter their power consumption patterns as a means of controlling the costs they incur in purchasing power. The NYISO and other interested parties are currently exploring how to make this promise a reality. Price responsive loads, as used in this context, differ considerably from historically more common "interruptible loads". System operators use interruptible loads as a means of balancing supply and demand for power during periods when supply is short. Consequently, load interruptions occur primarily as a means of assuring overall system reliability. Price responsive loads, on the other hand, are postulated to respond primarily to economic forces. That is, if the price of power exceeds the value of that power to the consumer, then the consumer simply chooses not to purchase the power at that time. Price responsive loads may also reduce peak power demand since peak demands frequently coincide with high prices. This correlation can benefit system reliability, but reliability is not the primary basis for the decision to alter consumption.

To date, little experience exists with regard to the quantity of price responsive loads that may exist, nor to the prices that will lead consumers to change their consumption patterns. Nonetheless, a price response is expected to emerge as market rules are developed to enable their participation, and it is appropriate to include their potential response when forecasting future power prices.

Price responsive load in this model is divided into three equal blocks, each with a unique price point, as illustrated in Figure 4. If the predicted price of power in a region exceeds P_3, demand in that region is decreased by Q MW, and the predicted price is recalculated. If the price exceeds P_2, demand is decreased by 2/3 Q; if the price exceeds P1, demand is decreased by 1/3 Q MW. If the price is less than P_1, load remains unchanged. Different values of Q may be assigned to each price region.

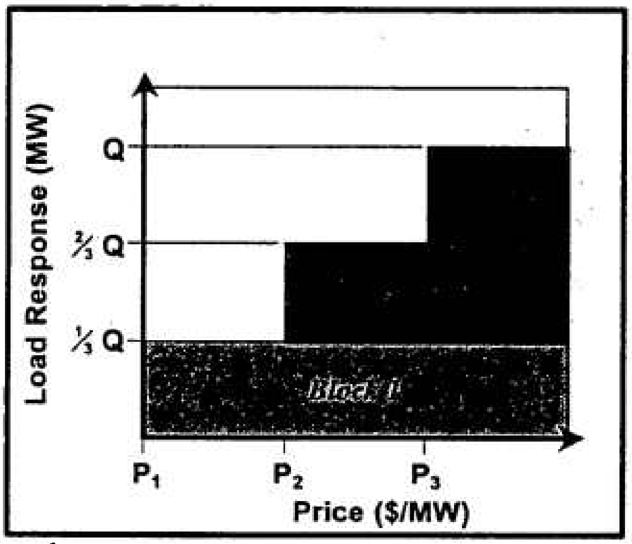


Figure 4: Price Responsive Load Simulation Model

3000 MW of price responsive load in New York State was simulated with the following allocation to each region:

10 percent of the price responsive load is assumed to be in the West region

10 percent of the price responsive load is assumed to be in the East region

40 percent of the price responsive load is assumed to be in New York City

40 percent of the price responsive load is assumed to be Long Island

In addition to a baseline with no price responsive load, two sets of price points and their corresponding quantities were analyzed as shown in Table 10.

	Set 1	Set 2
1/3 Q	$200	$400
2/3 Q	$400	$600
Q	$600	$800

Table 10 – Default Minimum Hydro Capacity Ratings and Capacity Factors

Price Results

Prices resulting from this analysis are locational marginal wholesale energy prices in each region. They do not include ancillary services, transmission and distribution, or the value of installed capacity.

Appendix E
Comparison of New York and Other States

ISO Market Comparison

	New York	California	Mid-Atlantic	New England	Texas
Peak Demand (MW)	**30,311**	**45,570**	**51,700**	**22,500**	**57,796**
Population Served (millions)	19	27	22	13	17
Reserve Capacity (%)	**18**	**9.3**	**15.3**	**16**	**15.5**
Power Imported at Peak Demand (%)	**< 5**	**25**	**<1**	**<6**	**< 1**
Installed Generating Capacity (MW)	34,700	50,300	58,000	25,600	61,700
New Plants Built 1995-2000 (MW)	**1,084**	**672**	**1,900**	**3,745**	**5,700**
Long-term (bi-lateral) Contracts	**Yes**	**No**	**Yes**	**Yes**	**tbd**
Energy Markets - Day-ahead	Yes	Yes	Yes	No	tbd
- Hour-ahead	Yes	Yes	Yes	Yes	tbd
Ancillary Services (Market or cost-based)	Market	Market	Market/Cost	Market	tbd
Installed Capacity Market	Yes	No	Yes	Yes	tbd
Method of Congestion Management	Financial	Physical	Financial	Financial	tbd
Average Energy + A/S Price in 2000 ($/KWh)	**$58.15**	**$117.18**	**$36.57**	**$46.22**	**na**
Market Volume * in 2000 ($)	**$ 5.2 billion**	**$ 28.0 billion**	**$ 1.7 billion**	**$ 0.6 billion**	**na**
(million-MWh)	**160.7**	**238.7**	**262.1**	**124.9**	**na**
Energy Bid Cap ($/MWh)	**$1,000**	**$250**	**$1,000**	**$1,000**	**tbd**
Market Model	LBMP	Zonal	LBMP	LBMP	tbd
Control versus Power Exchange Functions	Combined	Separate	Combined	Combined	tbd

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

Appendix F
NYISO Structure, Powers and Mission

NYISO STRUCTURE, POWERS AND MISSION

The New York Independent System Operator (NYISO) began operations on December 1, 1999. A new entity created jointly by government, electric power utilities and power producers, the NYISO was formed as part of the restructuring of the electric industry of New York State, which was undertaken by the State Public Service Commission (PSC) to introduce competition into New York's electricity markets after many decades of regulated monopolies in electric power. The NYISO's task is to oversee and manage the transition to an era of open markets – while seeking to maintain equity among competitors and reliability of the State's power supply – in order to realize the ultimate objectives of restructuring: more competition and lower energy prices than a regulated industry would produce.

Why Was the NYISO Created?

A fair and efficient wholesale market means that suppliers must have access to the State's electric transmission system, and this access must be provided on an even-handed, impartial basis. In order to assure the non-discriminatory operation of the system under deregulation, an operator was needed who could be independent of the transmission owners, the electricity suppliers and all other segments of the new market. Thus, the NYISO has been given the responsibility of operating the State's transmission system. (Legal ownership of the transmission facilities remains with the investor-owned utility companies, the New York Power Authority and the Long Island Power Authority.)

The NYISO was established under a mandate of the Federal Energy Regulatory Commission ("FERC") under authority granted to the FERC under the Federal Power Act to oversee restructuring efforts by the states, and it is regulated by the FERC. The New York State PSC also played a key role in establishing the NYISO and participates (on a non-voting basis) in NYISO deliberations.

How the NYISO is Structured

The NYISO is a 501c(3) not-for-profit corporation, with headquarters in Guilderland, New York (just outside Albany), at facilities previously operated by the former New York Power Pool (an alliance of investor-owned utilities and the New York Power Authority that was formed after the Great Northeast Blackout of 1965 and later went out of existence). The NYISO is governed by a Board of ten (10) Directors who have no affiliations with any participants in the New York electric power industry (some are former executives for out-of-state power companies, while the others come from a variety of backgrounds in technology, telecommunications, finance, academia and environmental affairs). The initial Board members were selected by participants in the power market (including generators and utilities), government (the PSC and the City of New York), environmental advocates and citizens' groups.

The Board is now self-sustaining and fills its own vacancies. Working with the Board to govern the NYISO are committees of market participants – including wholesale sellers and buyers of electricity, consumer protection organizations, environmental organizations and agencies and authorities of both New York City and New York State.

The NYISO funds its own budget from charges that it levies on market transactions. It has a full-time staff of over 200 professionals, who specialize in directing the NYISO's activities in such areas as finance, information services, market services and – most critically of all – operations and reliability of the New York State power grid.

The NYISO: Its Purposes and Its Powers

The reliable and safe operation of the State's bulk power transmission system;

Establishing and enforcing rules that will provide open access to the transmission system;

Administering and collecting rates and charges for use of the transmission system;

Supervising the operation of free and open markets for wholesale transactions in electric energy and capacity;

Fostering and maintaining, to the maximum extent possible, competitive wholesale markets for electricity;

Coordinating concerns about energy reliability and related commercial issues with neighboring regions in the northeast United States and Canada.

REBUTTAL EXHIBIT MRJ-2

Multi-Area Production Simulation (MAPS) Analysis

Report to:

Ramapo Energy Limited Partnership

for

Ramapo Energy Project

Prepared by:

Sundar Venkataraman
GEII Power Systems Energy Consulting

August 1, 2001

Foreword

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Table of Contents

Executive Summary

Article X of the New York State Public Service Law sets forth a review process in New York State for consideration of any application to construct and operate an electric generating facility with a capacity of 80 megawatts or more. An applicant must meet Article X requirements to obtain the Certificate of Environmental Compatibility and Public Need (Certificate) that is needed before construction of such a facility.

An Article X Application must contain, among other filings, a description of the facility and the site including all applicable environmental characteristics and studies to evaluate the impact of the facility on air, water, visual resources, land use, noise levels, health and other matters.

This report presents the findings of the economic and environmental impact study of the Ramapo Energy Project (REP). The scope of the study is to determine the overall economic and environmental impact of the proposed power plant on New York state generation including change in average LBMP and emissions in the New York City (J) zone.

1. Introduction

An Article X Application must contain, among other filings, a description of the facility and the site including all applicable environmental characteristics and studies to evaluate the impact of the facility on air, water, visual resources, land use, noise levels, health and other matters. This report presents the findings of a study conducted by General Electric's Power System Energy Consulting (PSEC) for Ramapo Energy to determine the overall economic and environmental impact of the Ramapo Energy Project (REP). The results from this study will be filed in support of Ramapo Energy's Article X Application for REP.

The main objective of this study is to determine the overall economic and environmental impact of the proposed power plant on New York state with respect to the change in average LBMP (Location Based Marginal Prices) and power plant emissions in New York State. General Electric's Multi-Area Production Simulation (MAPS) program will be used to study the impact of siting a generating unit in New York State. MAPS is a production simulation program and it is used to accurately model the operation of an interconnected utility power system and determine the production costs. The major objective of multi-area production simulation is to simulate the least cost operation of a power system while insuring the system's security constraints are not violated. Security constraints include the operating limits and capabilities of generation sources, constraints and contingencies imposed by the transmission system and the operational limits such as minimum operating reserve levels.

2. Study Scope

2.1 Study Objective

The general objective of this study is to determine the potential environmental and economic impacts from the operation of the REP combined-cycle units. The specific objectives are as follows:

- Determine the annual energy and capacity factor of the REP Combined-cycle units.
- Determine the change in average Location Based Marginal Prices (LBMPs) due to the addition of REP in the following New York control areas: Hudson Valley-G, Millwood-H, and New York City-J.
- Determine the change in total air emissions (SO_2, NO_x and CO_2) in the study area (New York State and PJM) and NYISO Zone G due to the addition of REP combined-cycle facility.

New York State Public Service Commission's database containing all existing generating facilities in New York was used as the baseline database to which the following changes were made.

- Peak load and energy were updated per New York State Independent System Operator's 2000 Load Capacity Data (Yellow) book for the years under study.
- the following generation development projects were added to this database:

  Ramapo (01 January 2004)
  Astoria SCS (01 January 2003)
  Athens (01 January 2002)
  Heritage (01 January 2003)
  Bowline (01 January 2002)
  East River (01 January 2002)
  Ravenswood (01 January 2003)
  Poletti (01 January 2004), and
  11 other NYPA gas turbines.

MAPS runs were performed without and with the REP unit for the year 2004.

2.2 Project Background

Ramapo Energy Project will consist of four single shaft combined-cycle blocks. Each one of the four combined-cycle blocks will consist of an Alstom GT-24 gas turbine unit and a heat recovery steam generator (HRSG) feeding a steam turbine. The combined summer and winter ratings for REP will be assumed to be 990MW and 1100MW respectively for this study. This unit will also have Dry Low NOx (DLN) control on the gas turbines and Selective Catalytic Reduction (SCR) for emission reduction. The SO_2 and NOx emissions for the combined-cycle block are 0.0022 LB/MMBTU and 0.007123 LB/MMBTU respectively. These emission rates are the average rates taken from Table 4.2 of Ramapo Energy's Application.

For the Article X study, the combined-cycle units (MAPS name - RAMAPOCC) are modeled as a single 1100MW unit (summer rating – 990MW) connected to Ramapo 345KV substation. For the purpose of this study, the REP unit will be assumed to come online by 01 January, 2004.

3. Study Results

The study shows that the addition of REP will lower the average LBMP and emissions in Zones G,H and J (Downstate NY) and the rest of New York State. The study results are discussed below.

3.1 Energy and LBMP Summary

Table 3.1 gives the annual energy output, capacity factor and average spot price for the REP unit for the year 2004

Ramapo Output Summary	
Energy Output	8464 GWh
Capacity Factor	92%
Average Spot Price	27.89 $/Mwh

Table 3.1 REP Annual Energy Summary

Table 3.2 shows the minimum, maximum and average LBMP for three load zones in New York without and with REP unit for the year 2004. As observed, there is a significant reduction in average LBMP for all three zones. The average LBMP is calculated by taking a straight average of the hourly LBMP for all the generators in a zone.

	Without Ramapo CC			With Ramapo CC			Reduction	
NYISO ZONE	Minimum ($/MWh)	Maximum ($/MWh)	Average ($/MWh)	Minimum ($/MWh)	Maximum ($/MWh)	Average ($/MWh)	Average ($/MWh)	Average (%)
G	18.99	77.52	28.82	18.43	78.99	27.81	1.00	3.49
H	18.99	95.62	29.44	18.57	121.57	28.47	0.96	3.28
J	18.74	106.02	29.02	18.43	184.39	28.36	0.66	2.28

Table 3.2: Maximim, minimum and average spot prices without and with REP unit

3.2 Emissions

Table 3.3a shows the total emissions and the reduction in emissions in the study region, i.e., New York and PJM. It can be observed from this table that the total SO2, NOx and CO2 emissions decrease with the addition of REP. These reductions are particularly significant in Zone G due to the Ramapo Energy project displacing the existing, less efficient, more polluting units located in Zone G. Table 3.3b shows the reduction in change in emissions in Zone G due to the addition of Ramapo Energy Project. The increase in CO2 emissions with REP in service is due to the fact that more energy is being produced in Zone G (15,649GWh compared to 8,931 without REP). A better comparison of emissions would the the amount of SO2, Nox and CO2 emissions per GWh of energy produced, with and without REP. The SO2, Nox and CO2 emissions is 1.12, 0.56 and 538.13 tons/GWh respectively for the case without REP. The SO2, Nox and CO2 emissions is 0.32, 0.064 and 431.40 tons/GWh respectively for the case with REP. There is a significant reduction in emissions (in tons/GWh) with the Ramapo Energy Project.

Emissions	Without REP (1000 Tons)	With REP (1000 Tons)	Reduction (1000 Tons)	Reduction (%)
SO2	1,021	995	25	2.47
NOx	329	320	9	2.64
CO2	203,639	201,382	2,257	1.11

Table 3.3a: New York and PJM emissions summary

Emissions	Without REP (1000 Tons)	With REP (1000 Tons)	Reduction (1000 Tons)	Reduction (%)
SO2	10	5	5	45.76
NOx	5	3	2	41.94
CO2	4,806	6,751	-1,945	-40.47

Table 3.3b: Zone G emissions summary

3.3 Production Cost and Average Spot Price

The production cost summary for the two pool system (NYISO and PJM) without and with REP in service is given in Table 3.4. The total production cost is the sum of fuel, start-up and variable costs. The variable cost consists of variable operation and maintenance (O&M) cost and emission trading cost. As shown in the table, there is a reduction of $42,356,000 in production cost with REP in service. This amount represents the potential savings in production cost due to the Ramapo Energy Project.

Cost (Million $)	Without REP	With REP	Reduction
Fuel	6669.024	6646.056	22.968
Start-up	6.783	6.41	0.373
Variable	1495.802	1476.787	19.015
Total	8171.609	8129.253	42.356

Table 3.4: Production Cost Summary

The average spot price for New York State without and with REP in service is $31.84/MWh and $31.32/MWh respectively, leading to a reduction in average spot price of $0.52 /MWh. The average spot price is a load weighted spot price that is calculated from hourly loads and spot prices for all zones in New York State.

4. Conclusions

The results from the MAPS simulation of REP shows that this project has a positive economic, as well as, environmental impact on New York State. The average LBMP in Zone G, H and J are reduced by $1.00, 0.96 and $0.66 respectively during the study period under consideration. The operation of REP unit also leads to lower emissions and production cost in New York State and PJM.