THE IMPACT OF RETIRING INDIAN POINT ON ELECTRIC SYSTEM RELIABILITY

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1. Introduction

Concern has been raised since September 11, 2001 over the potential for a terrorist attack on the nuclear power plants located at Indian Point in Westchester County, New York. Synapse Energy Economics, Inc. ("Synapse") was retained by Riverkeeper, Inc., and the Pace Law School Energy Project to examine whether the permanent retirement of the two operating Indian Point nuclear units would seriously affect the reliability of the electric systems in Westchester County, New York City and New York State.

There are three nuclear power plants at Indian Point. Indian Point Unit 1 was retired in the 1970s. Indian Point Units 2 and 3 are currently operating. Both units are owned by the Entergy Corporation. Indian Point Unit 2 has the capability of providing 953 MW of power during the peak summer season. Indian Point Unit 3 has the capability of providing 982 MW during the peak summer season.[1] Together these two units provide 1,935 MW of summer season capacity.

Our analysis examines expected conditions during the summer of 2002 and the following five years. We believe that these are the most important years to study given the large number of new generating and transmission projects that are expected to be completed starting in the years 2003 and 2004. As our analysis clearly shows, electric system reliability will improve significantly as these new generation and transmission facilities are added to the system.

2. Summary of Findings

Synapse has found that:

1. The permanent retirement of Indian Point Units 2 and 3 would not lead to any reliability problems in New York City. There would still be enough power available from generating units located within New York City and through import over existing transmission lines to serve expected peak loads while providing adequate capacity reserves.

2. The permanent retirement of Indian Point Units 2 and 3 would not lead to any reliability problems in Westchester County. There still would be enough power available in Westchester County without Indian Point Units 2 and 3 to serve expected peak loads and provide needed capacity reserves.

3. There would be adequate generating and transmission capacity in New York State without Indian Point Units 2 and 3 to serve expected peak loads and provide reasonable capacity reserves.

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[1] *2001 Load & Capacity Data*, New York Independent System Operator, at pages 19 and 21.

4. The implementation of aggressive conservation programs in conjunction with the retirement of Indian Point Units 2 and 3 could significantly enhance the reliability of the electric systems in New York City, Westchester County and New York State.

In other words, electric power system reliability would be adequate in New York City, Westchester County and New York State, as a whole, even if both Indian Point units were closed.

3. The New York State Electric System

New York State has an integrated electric power system that includes hundreds of generating facilities and thousands of miles of transmission lines. An important feature of this electric system is the ability to instantaneously meet varying loads of customer demand through the operation of power plants scattered throughout the state and/or by importing power from neighboring systems. The New York State Independent System Operator ("NYISO") monitors and controls the daily operation of the power system and coordinates longer-term system planning

Electric power systems are planned to meet projected peak customer loads while maintaining adequate levels of reserve generating capacity that could be used if needed. In New York State, the peak customer demands generally occur on the hottest weekdays during the summer. However, unexpected events such as transmission line or generating unit outages can stress the system at any time.

The integrated New York State system also is interconnected at a number of locations with neighboring power systems in Ohio, Pennsylvania, New Jersey, Canada, and New England. These interconnections allow neighboring power systems to exchange power under both normal and emergency conditions.

Although there are important limitations, the physical design of the integrated New York State electric system allows the transmission of large amounts of power throughout the state and into the state from neighboring systems. Therefore, power consumed by customers in New York City may have been generated either at in-City facilities or imported from power plants located in upstate New York, New Jersey, Pennsylvania, New England or Canada. For this reason, when evaluating the potential impact of closing Indian Point on electric system reliability, it is important to consider not only how much generating capacity will be left in New York City but also the capability of the transmission system to import power generated at plants outside the City.

4. Reliability Requirements

The NYISO and the New York State Reliability Council have established three requirements to ensure that the integrated New York State electric system has enough

capacity to provide reliable power without experiencing a system interruption more frequently than one day in ten years.[2]

- There must be a statewide 18 percent capacity reserve margin where the reserve margin is calculated as the amount of reserve capacity divided by the projected system peak load.
- There must be enough generating capacity within New York City to serve 80 percent of the projected in-city peak load. (NYISO's "80 percent in-city" requirement)
- There must be enough generating capacity on Long Island to serve 93 percent of the projected peak load on Long Island.

Indian Point is located in Westchester County, outside of both the Long Island and New York City transmission constrained areas. Therefore, the permanent retirement of both Indian Point nuclear units will not affect the amount of generating capacity either in New York City or on Long Island. Consequently, the capability of the electric system to meet both the NYISO's 80 percent in-city requirement and the requirement that there be enough generating capacity on Long Island to serve 93 percent of the expected peak load would not be adversely affected by the closing of both Indian Point units.

5. Data Sources

This analysis is based on data published by the NYISO, the New York Department of Public Service, the New England Power Pool, and the Northeast Power Coordinating Council. In particular, we have relied upon the projections of peak system demands, available generating capacity, transmission system capability and limitations, and new plant in-service dates reported by the New York State Department of Public Service or published in a number of recent NYISO studies: "NYISO 2001 Load & Capacity Data;" "Locational Installed Capacity Requirements Study," Revised March 14, 2002; "Power Alert II, New York's Persisting Energy Crisis," March 2002; and "2001 Area Transmission Review of the New York State Bulk Power Transmission System in the Year 2006," November 2001.

6. Conservative Assumptions in Synapse Analyses

A number of the assumptions that we have used are conservative and tend to reduce what the level of electric system reliability might be without Indian Point Units 2 and 3.

1. The New York State Board on Electric Generation Siting and the Environment ("the Siting Board") has approved the construction of seven new generating facilities in New York State (three of which are within New York City) which together represent 4,430 MW of new capacity. These seven projects are listed in Table 1:

[2] *New York Control Area Installed Capacity Requirement for the Period May 2002-April 2003*, New York State Reliability Council, December 14, 2001, and *Locational Installed Capacity Requirements Study*, New York Independent System Operator, Revised March 14, 2002.

Table 1
Generating Projects Approved
by the New York State Board on Electric
Generation Siting and the Environment

Project	Capacity	Projected In-service Date[3]
Astoria Energy	1,000 MW	3rd Quarter of 2005
Athens Generating Plant	1,080 MW	3rd Quarter of 2003
Bethlehem Energy Center	750 MW total 350 MW of new capacity	3rd Quarter of 2004
Bowline Unit 3	750 MW	2nd Quarter of 2005
East River Repowering	360 MW total 160 MW of new capacity	4th Quarter of 2004
Heritage	800 MW	3rd Quarter of 2005
Ravenswood Cogeneration	250 MW	4th Quarter of 2003

Another nine projects (two of which are within New York City) are currently being reviewed by the Siting Board. As shown in Table 2 these projects would add another 4,857 MW of new capacity.

[3] The projected in-service dates for these projects were published on the Siting Board's website, www.dps.state.ny.us/articlex.htm.

Table 2
Generating Projects Currently Under Review by the New York State Board on Electric Generation Siting and the Environment

Project	Capacity	Projected In-service Date[4]
Brookhaven	580 MW	2004
Empire State Newsprint	505 MW	2005
Glenville Energy Park	520 MW	2005
Kings Park	300 MW	2004
Reliant Energy Astoria Repowering	1,832 MW total 562 MW of new capacity	2006 and 2007
NYPA Astoria	500 MW	2004
Ramapo Energy	1,100 MW	2004
Spagnoli Road Energy Center	250 MW	2004
Wawayanda	540 MW	2004

Finally, Preliminary Scoping Statements for another two projects, representing 1,430 MW of new capacity, have been filed with the Siting Board.

The construction of just those projects that have either received Siting Board approval or that are currently undergoing review would add more than 9,200 MW of new capacity in New York State, 2,500 MW of which would be in New York City. However, to be conservative, we have assumed that only the 4,430 MW of capacity that would be provided by the seven projects that have been approved by the Siting Board will be built by 2007.

Although we recognize that some of the seven specific projects that have been approved by the Siting Board may not be built for financial reasons, some of the projects that are currently under Siting Board review may be constructed in their place. In addition, we believe that the retirement of Indian Point Units 2 and 3 might spur the construction of some new generating facilities that otherwise might not be built. At the same time, proposed facilities may be built sooner than currently projected as a result of improving financial conditions or if plant certificates are sold to companies that have greater funding and interest in building the new facilities.

[4] The projected in-service dates for these projects were published at the Siting Board's website, www.dps.state.ny.us/articlex.htm.

2. Five proposals for new transmission cables that would increase the capability to import power into New York State from Connecticut, New Jersey and Nova Scotia as early as 2002 have been approved by the New York State Department of Public Service or are currently being reviewed by the DPS. These transmission projects are listed in Table 3.

Table 3
New Transmission Facilities
for Importing Power into New York State
That Have Been Approved or Are Undergoing
New York State DPS Review[5]

Project	Capacity	Projected In-service Date	Regulatory Status
Cross Sound cable from Connecticut to Long Island	300 MW	2002	Approved
Cross Hudson Project from New Jersey to NYC	1,100 MW	2003	Under Review
Hudson Energy Project from Nova Scotia, Canada to NYC	800 MW	2004	Under Review
Neptune Phase I from New Jersey to NYC	600 MW	2004-05	Under Review
Neptune Phase I from New Jersey to Long Island	600 MW	2004-05	Under Review

Another five projects that would import an additional 5,400 MW of power into New York State starting in 2005 also have been announced but are not yet undergoing DPS review.[6]

To be conservative, we have not included any of these projects in our analyses. The addition of some or all of these projects will greatly increase the capability to import power into New York City and Long Island and will significantly improve the reliability of the electric systems in New York State.

3. NYISO has said that demand response measures reduced actual system peak loads by approximately 1,500 MW during the summer of 2001.[7] These demand response measures included the implementation of emergency procedures such as curtailing non-essential commercial and industrial loads under applicable tariffs, instituting a manual voltage reduction, asking for voluntary curtailment of large

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5 This information was published on the New York State DPS' website at www.dps.state.ny.us/articlevii.htm.

6 TransEnergie Project (660 MW into NYC); Jupiter Cable (500 MW into NYC); Neptune Phase II (1,200 MW into NYC); Northeast Utilities (660 MW into Long Island); and Pegasus East Coast NYC (2,400 MW into NYC). www.dps.state.ny.us/articlevii.htm.

7 *Power Alert II, New York's Persisting Energy Crisis*, at Appendix page 3.

industrial and commercial customers, and conducting public appeals for energy conservation. These measures also included two new demand side response programs that resulted in 580 MW of peak load reductions.[8] These were an Emergency Demand Response Program and a Day-Ahead Demand Response Program. The Emergency Demand Response Program provides compensation for customers who can reduce their electric demands when requested by the NYISO to do so during emergency conditions. The Day-Ahead Demand Response Program allows customers to specify their willingness to curtail their loads for a specified price. These "demand bids" are treated as a supply resource by NYISO when it does its day-ahead scheduling of generation to meet anticipated loads.

Although it is reasonable to expect that these same programs could lead to similar, or even larger, reductions in summer peak loads in 2002 and subsequent years, it is unclear whether NYISO's peak load forecasts for the years 2002 through 2007 reflect comparable contributions from demand response measures. The results of our analyses are conservative, therefore, because we have not reflected any future summer peak load reductions from these programs.

4. The NYISO peak load forecasts do not appear to reflect the nearly 500 MW of reductions in peak loads that can be expected by the year 2008 from the energy efficiency programs that are funded by NYSERDA through funds collected from systems benefits charges. To be conservative, we have not included these significant peak load savings. Therefore, electric system reliability should be even better than is shown in Figures 1 through 8 of this Report.

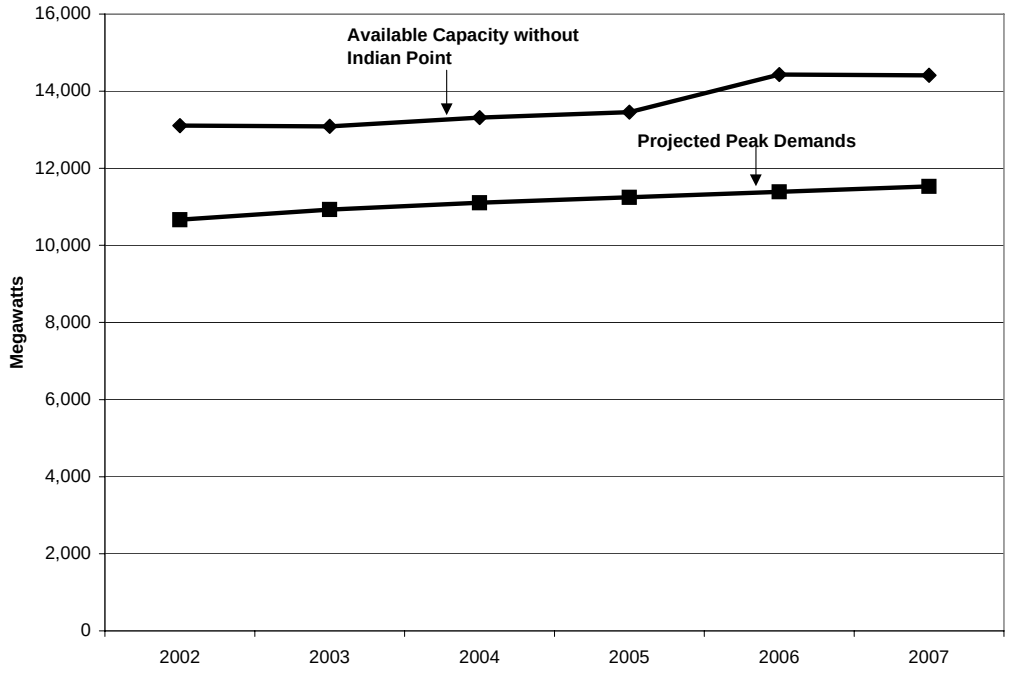
7. Reliability in New York City

Finding No. 1 - The permanent retirement of Indian Point Units 2 and 3 would not lead to any reliability problems in New York City. There would still be enough power available from generating units located within New York City and through import over existing transmission lines to serve expected peak loads while providing adequate capacity reserves.

Figure 1 compares the total amount of capacity that would be available to serve projected customer demand in New York City if Indian Point Units 2 and 3 were closed and NYISO's projected New York City peak loads for the years 2002 to 2007. This comparison demonstrates that there would be more than enough capacity to meet projected loads in New York City in each of these years even if Indian Point Units 2 and 3 were retired before the summer of 2002.

[8] *Power Alert II, New York's Persisting Energy Crisis*, at Appendix page 4.

Figure 1
New York City
Projected Peak Loads and
Capacity Supplies
during the years 2002-2007
without Indian Point Units 2 and 3



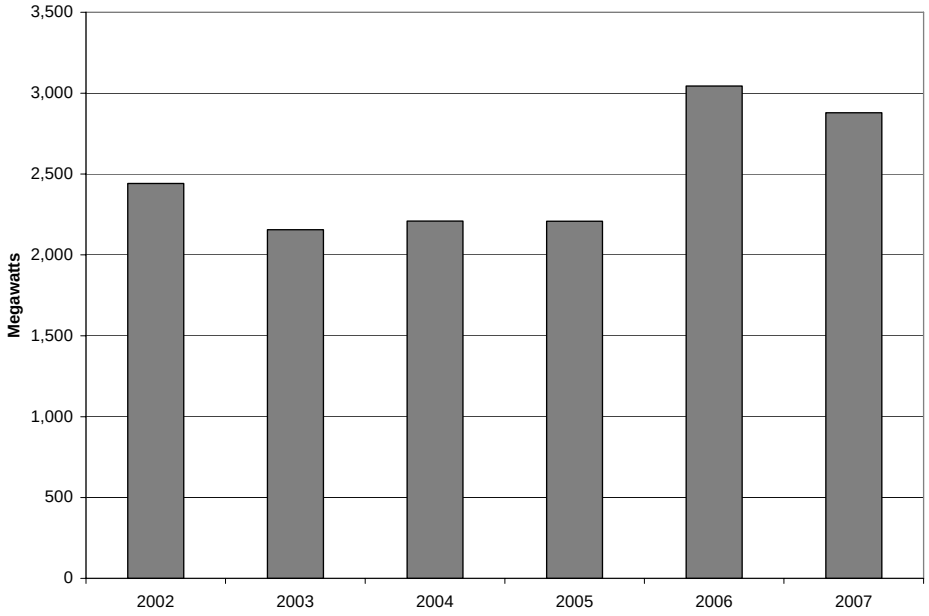
The annual capacity supplies presented in Figure 1 include both the in-City generating capacity in New York City (e.g., approximately 8,500 MW in 2002) and the capacity that could be imported into New York City through the existing transmission links with Westchester County and New Jersey if Indian Point were closed (e.g., approximately 4,400 MW in 2002).

Figure No. 1 also assumes that only the following three generating units will be built in New York City by 2007: the 250 MW Ravenswood Cogeneration Project in late 2003, the 360 MW East River Repowering Project in late 2004, and the 1,000 MW Astoria Energy facility in late 2005. We have not assumed that any of the other in-city generating or transmission projects that are currently undergoing state regulatory review will be completed before the summer of 2007. As we noted earlier, it is possible that some of these other generation and transmission projects may be completed instead of, or in addition to, one or more of the three projects listed above.

Projected annual capacity reserves and system reserve margins in New York City for each of the years 2002 through 2007 are presented in Figures 2 and 3. These capacity

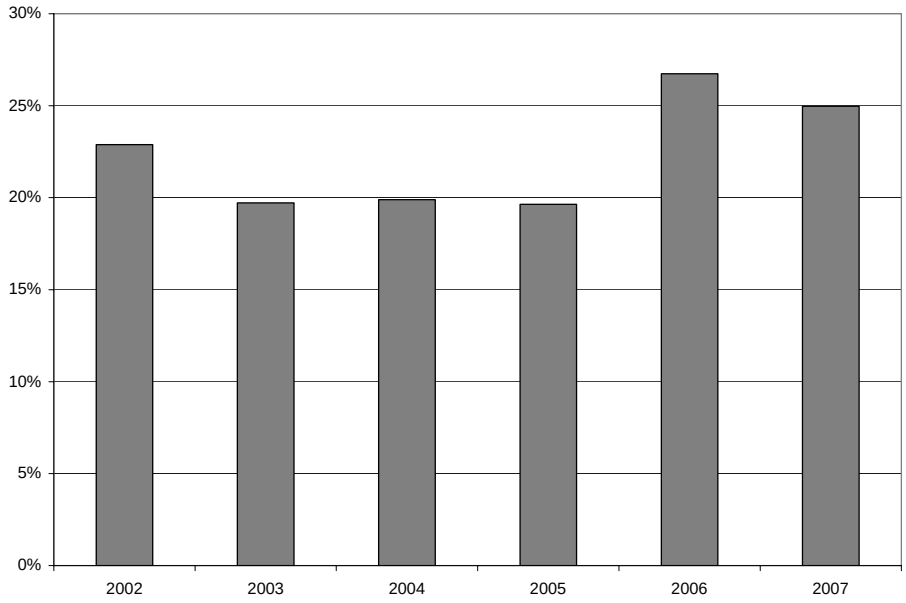
reserves and system reserve margins were developed from the comparisons presented in Figure 1.[9]

Figure 2
New York City
Capacity Reserves
during the years 2002-2007
without Indian Point Units 2 and 3



[9] The capacity reserves (in MW) shown in Figure 2 are simply the difference between the available capacity and peak load figures presented in Figure 1. The reserve margins shown in Figure 3 represent the capacity reserves from Figure 2 expressed as a percentage of the projected peak load.

Figure 3
New York City
System Reserve Margins
during the years 2002-2007
without Indian Point Units 2 and 3



Figures 1, 2 and 3 effectively demonstrate that even if Indian Point Units 2 and 3 were retired there would be enough electric generating and transmission capacity both to serve the projected peak loads in New York City in each year from 2002 to 2007 and to provide for significant amounts of reserve capacity. This reserve capacity could be used in case some electric generating plants or transmission facilities were out of service during the peak system hours or if the summer weather were hotter than expected.

The availability of this reserve capacity in each of the years 2002 through 2007 and the more-than-adequate reserve margins should ensure that there would be adequate electric system reliability in New York City during peak load periods even if Indian Point Units 2 and 3 were permanently retired as early as the summer of 2002.

It also is important to note that Figures 1, 2 and 3 reflect conditions during the peak load hours of the year. Peak electric system loads are generally experienced in New York City on the hottest summer afternoons. System loads during the substantially more numerous "non-peak" hours of the year are significantly lower than the peak loads. Electric system capacity reserves during these non-peak hours would be much higher than during peak hours.

The NYISO requires that there be enough generating capacity within New York City to serve at least 80 percent of expected peak loads. However, Indian Point Units 2 and 3 are not located inside New York City. Consequently, their retirement would not affect the amount of in-city capacity available to meet this requirement.

8. Reliability in Westchester County

Finding No. 2 - The permanent retirement of Indian Point Units 2 and 3 would not lead to any reliability problems in Westchester County. There still would be enough power available in Westchester County without Indian Point Units 2 and 3 to serve expected peak loads in Westchester County and provide needed capacity reserves.

The retirement of both Indian Point units would leave 103 MW of generating capacity in Westchester County. However, the large amount of transmission capacity from further north in the Hudson River Valley will ensure that there is far more capacity available in Westchester County than would be needed to serve the area's peak system loads. In fact, there would be enough generation and transmission import capacity in Westchester County without Indian Point Units 2 and 3 to provide more than 2.5 times the expected summer peak loads. This is a more than adequate system reserve. If needed, additional capacity could be imported into Westchester County over existing transmission links with New York City and Long Island.

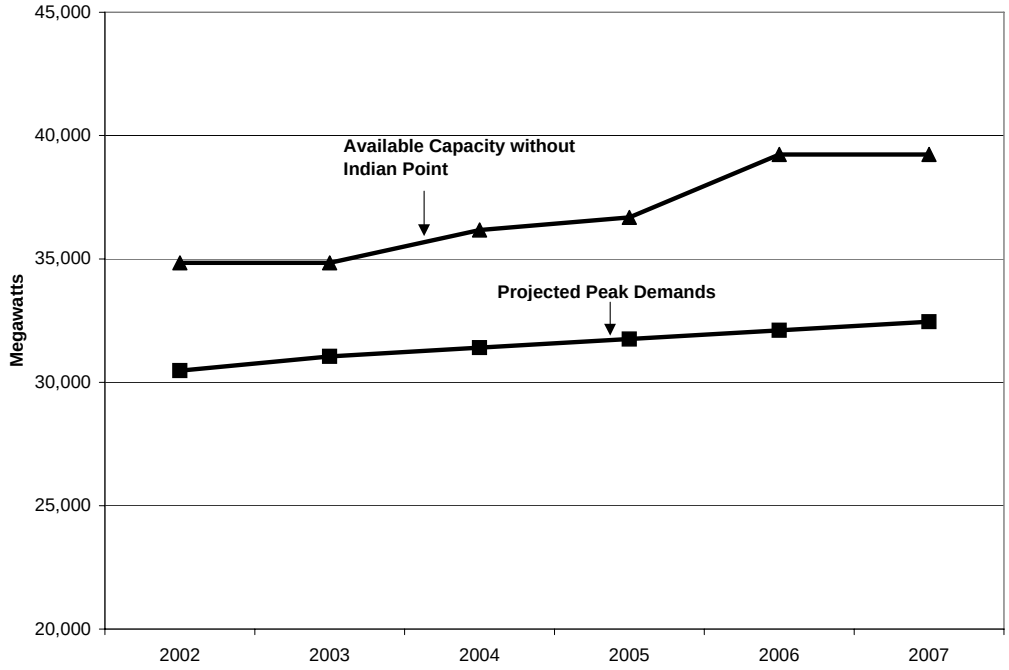
At the same time, new renewable or natural-gas fired capacity may be sited in Westchester County whether or not Indian Point is retired. For example, Entergy already has announced plans to build a 330 MW natural gas-fired generating plant at Indian Point by 2004. The retirement of Indian Point Units 2 and 3 actually might accelerate the siting of other new natural gas-fired plants in the County. The implementation of aggressive demand side management and load response programs also could help to reduce the system loads in Westchester County and, thereby, improve electric system reliability.

9. Reliability in New York State

Finding No. 3 - There would be adequate generating and transmission capacity in New York State without Indian Point Units 2 and 3 to serve expected peak loads and provide reasonable capacity reserves.

Figure 4 compares the total amount of capacity that would be available to serve projected peak loads in New York State if Indian Point Units 2 and 3 were retired and the NYISO's projected statewide peak loads for each of the years 2002 to 2007. This comparison demonstrates that there would be more than enough capacity to meet projected loads in New York State in each of these years even if Indian Point Units 2 and 3 were retired prior to the summer of 2002.

Figure 4
New York State
Peak Loads and Generating Capacity
during the years 2002-2007
without Indian Point Units 2 and 3



Projected annual statewide capacity reserves and system reserve margins for each of the years 2002 through 2007 are presented in Figures 5 and 6. These capacity reserves and system reserve margins were developed from the comparisons presented in Figure 4.[10]

[10] The capacity reserves (in MW) shown in Figure 5 are simply the difference between the available capacity and peak load figures presented in Figure 4. The reserve margins shown in Figure 6 represent the capacity reserves from Figure 5 expressed as a percentage of the projected peak loads.

Figure 5
New York State
Generating Capacity Reserves
during the years 2002-2007
without Indian Point Units 2 and 3

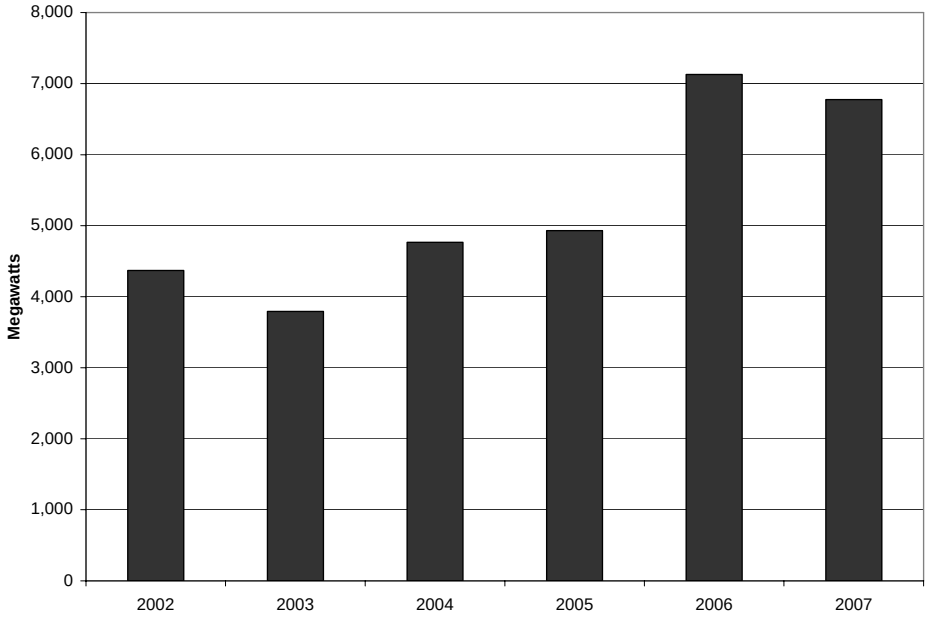
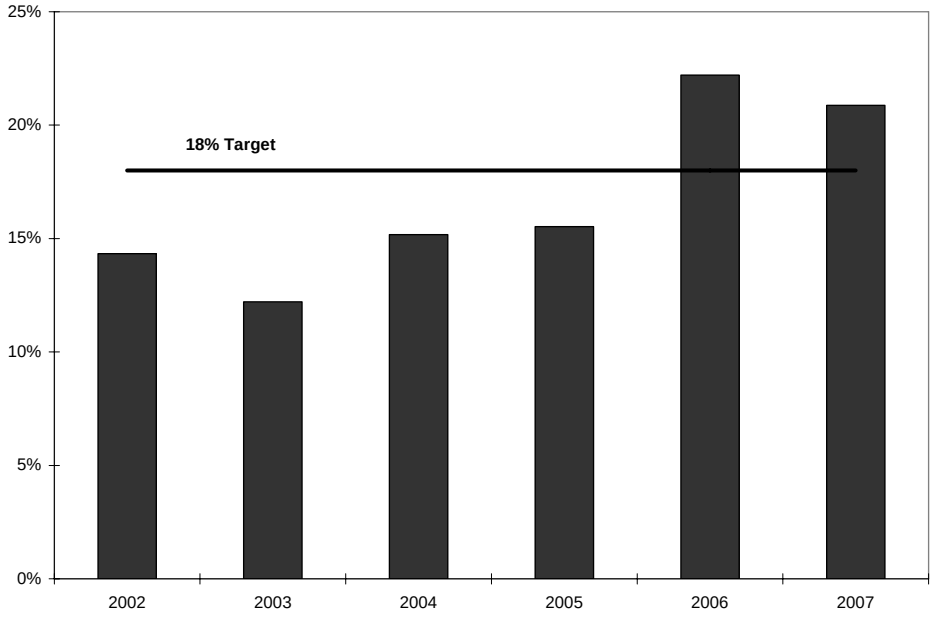


Figure 6
New York State
System Reserve Margins
during the years 2002-2007
without Indian Point Units 2 and 3



Figures 4, 5, and 6 show that even if Indian Point Units 2 and 3 were retired there would be enough electric capacity both to serve projected peak loads in New York State in each year from 2002 to 2007 and to provide significant amounts of reserve capacity. This reserve generating capacity could be used in the event that some electric generating plants or transmission facilities were out of service during the peak system hours or if the summer weather were hotter than expected.

Figure 6 does show, however, that system capacity reserve margins for the years 2002 to 2005 would fall below the NYISO's 18 percent target levels. However, this does not mean that there would be a significant risk of blackouts and brownouts in New York State. In fact, New York has a number of transmission links with Ohio, PJM[11], Canada, and New England through which more than 5,000 MW of generating capacity can be imported under both normal and emergency conditions. Current projections show that there will be significant excess generating capacity in both PJM and New England during the years 2002 through 2007. If needed, this excess capacity could be imported into New York State, even at the time of peak system loads.

For example, the April 1, 2002 "Forecast of Capacity, Energy, Loads and Transmission – 2002-2011" by the New England Power Pool projects that New England will have reserve margins of 30 percent and higher starting in the summer of 2002.[12] PJM forecasts also project reserve margins of 35 percent or higher starting in 2002.[13] These forecasts are evidence that substantial capacity sales could be made to New York State under both normal and emergency conditions without threatening the reliability of the New England or PJM electric systems.

At the same time, as we will discuss in Finding Number 4, any concern about the possible adverse effects of the retirement of Indian Point Units 2 and 3 on statewide electric system reliability could be addressed through the implementation of aggressive conservation programs. Such programs would enhance electric system reliability by reducing system peak loads.

Moreover, it is important to emphasize that Figures 4, 5, and 6 reflect conditions only during the peak periods of the year. Electric system capacity reserves and reserve margins would be significantly higher during the more numerous non-peak hours of the year.

Finally, statewide electric system capacity reserves and capacity reserve margins would be even higher if one or more of the generating facilities that are currently under review by the Siting Board are built before 2007.

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[11] PJM refers to the Pennsylvania-New Jersey-Maryland system.

[12] New York State has the capability to import 1375 MW from New England. NYISO "2001 Load & Capacity Data," at page 120.

[13] New York State has the capability to import 2200 MW from PJM. NYISO "2001 Load & Capacity Data," at page 120.

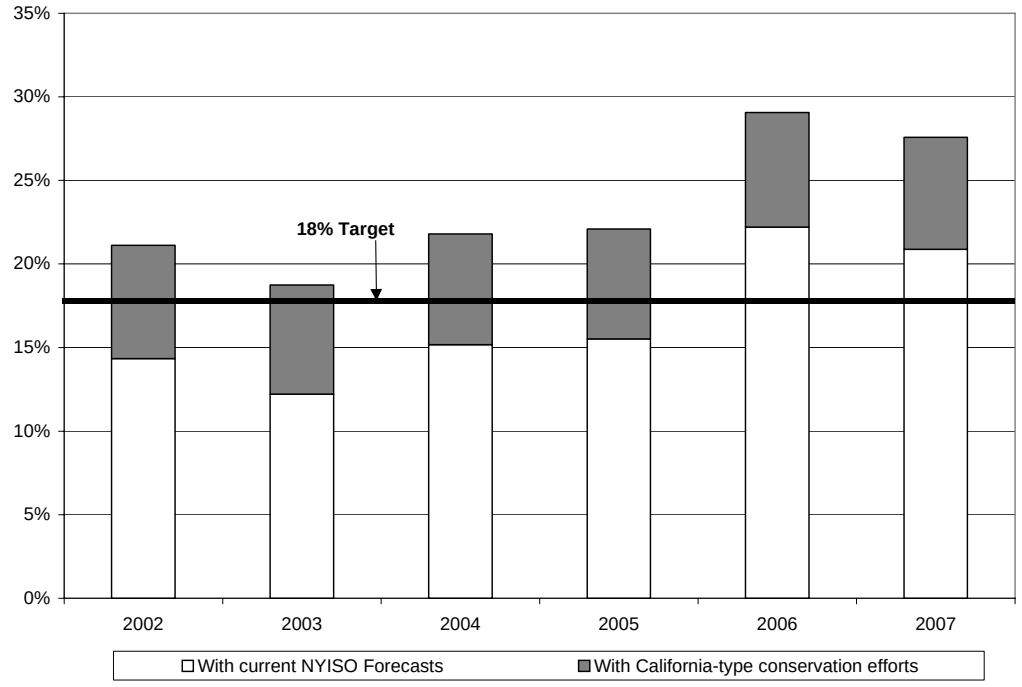
10. Conservation

Finding No. 4 – The implementation of aggressive conservation programs in conjunction with the retirement of Indian Point Units 2 and 3 could significantly enhance the reliability of the electric systems in New York City and New York State.

A study by Komanoff Energy Associates has concluded that the implementation of an aggressive conservation program could reduce individual summer peak loads in Southeastern New York State (including Westchester County, New York City and Long Island) by 5.6 percent to 14.8 percent. Such programs could be implemented if Indian Point is closed to ensure that system reliability does not fall below desired target levels.

Figure 7 shows the significant increases in statewide capacity reserve margins (and consequently statewide electric system reliability) that could be achieved if the peak loads in Southeastern New York State were reduced by 9.7 percent during just the summer months. This 9.7 percent reduction represents the middle of the reasonable range of possible savings calculated by Komanoff.[14]

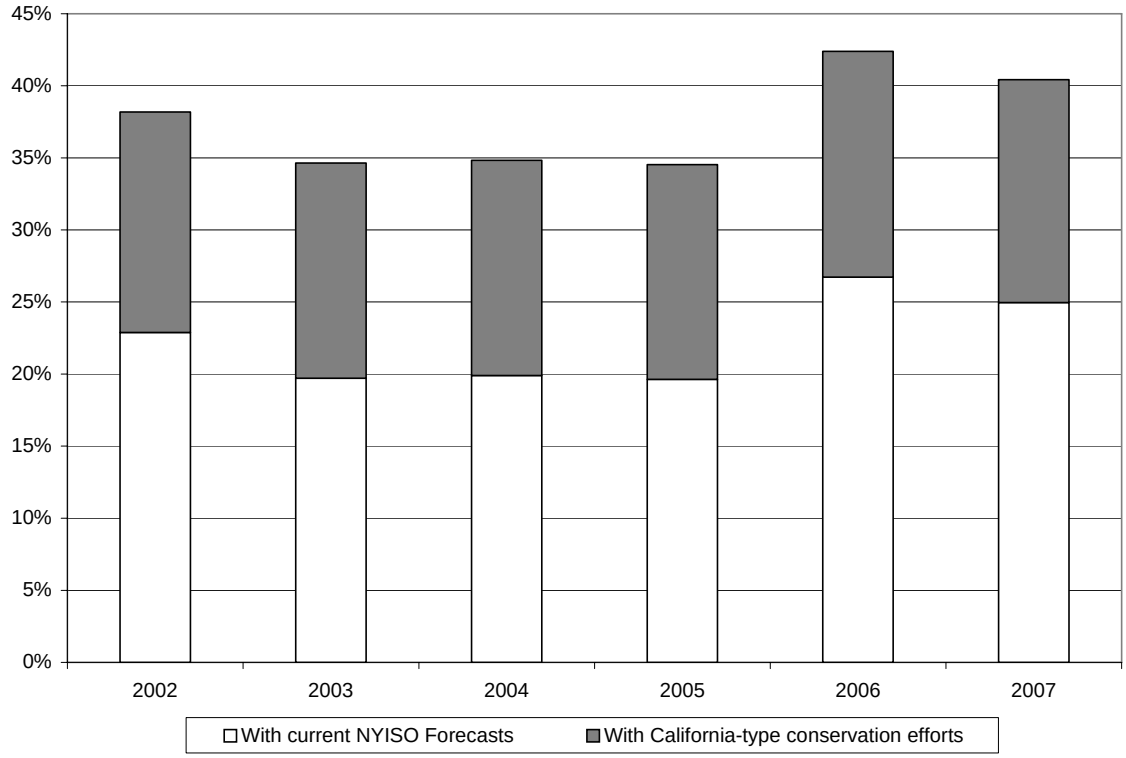
Figure 7
New York State
System Capacity Reserve Margins
without Indian Point Units 2 and 3
Aggressive Conservation Scenario



[14] Statewide peak load savings would be even higher if the aggressive conservation programs were implemented throughout the State rather than being limited to Southeastern New York State.

Figure 8 presents the same comparison for New York City.

Figure 8
New York City
System Capacity Reserve Margins
without Indian Point Units 2 and 3
Aggressive Conservation Scenario



11. Conclusion

Electric power system reliability would be adequate in New York City, Westchester County and New York State, as a whole, even if both Indian Point units were closed. The implementation of California-type conservation efforts could resolve any concerns that the NYISO or others may have about statewide system reserve margins falling below targeted levels in any years.