Synapse
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Report on the Availability of Replacement Capacity and Energy for Indian Point Units 2 & 3

November 28, 2007

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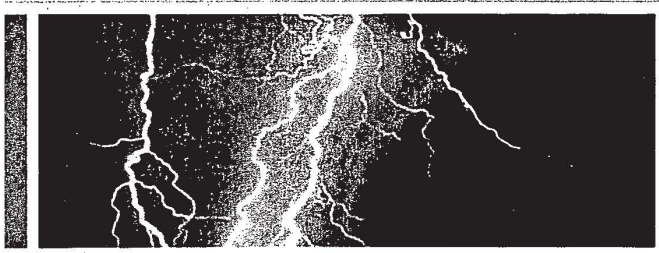

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Entergy Nuclear Operations has applied to the Nuclear Regulatory Commission for a renewal the two operating licenses for Indian Point Unit 2 and Unit 3 for an additional 20 years. This report examines the availability of: (1) renewable energy resources, (2) energy conservation and efficiency measures, (3) repowering of existing power plants, (4) transmission system upgrades and enhancements and (5) new power plants. The report concludes that the capacity and energy provided by Indian Point Units 2 and 3 can be replaced if the Units are not relicensed. In particular, energy efficiency, renewable resources, the repowering of older generating facilities, transmission upgrades and new natural gas-fired generating facilities represent viable alternatives to the relicensing of Indian Point. Substantial reductions in peak demand and energy requirements will be achieved by 2013 under the state's newly announced "15 by 15" Clean Energy Plan. Significant amounts of new renewable resources will be available as a result of the state's renewable energy portfolio standard and other initiatives. In addition, thousands of megawatts ("MW") of new generating capacity can be provided by the repowering (i.e., rebuilding) of older generating facilities both along the Hudson River and in the downstate area of the state in New York City and on Long Island. At the same time, transmission system upgrades also can increase the amounts of power that can provided to the downstate region of the State. Finally, there is the potential for the addition of several thousand megawatts of new generating facilities in the Hudson River Valley and in downstate New York.

This report was prepared by David A. Schlissel. Mr. Schlissel is a Senior Consultant at Synapse Energy Economics. Since 1973, he has served as a consultant, expert witness, and attorney on complex management, engineering, and economic issues, primarily in the fields of energy and the environment. Prior to joining Synapse, Mr. Schlissel was the president of Schlissel Technical Consulting, Inc. and its predecessor, Schlissel Engineering Associates.

Mr. Schlissel has been retained by regulatory commissions, consumer advocates, publicly-owned utilities, non-utility generators, governmental agencies, and private organizations in 23 states to prepare expert analyses on issues related to electric, natural gas, and telephone utilities. He has presented testimony in more than 100 cases before regulatory boards and commissions in 28 states, two federal regulatory agencies, and in state and federal court proceedings.

Recent work has involved the evaluation of electric transmission and distribution system reliability, power plant operations and outages, industry restructuring including quantification of stranded costs, proposed nuclear and fossil power plant sales, and proposed utility mergers. Mr. Schlissel has also examined the impact of nuclear power plant life extension on plant decommissioning costs.

Mr. Schlissel holds BS and MS degrees in Astronautical Engineering from the Massachusetts Institute of Technology (MIT) and Stanford University. He also received a Juris Doctor degree from Stanford University School of Law. He has also studied Nuclear Engineering and Project Management at MIT. He is a member

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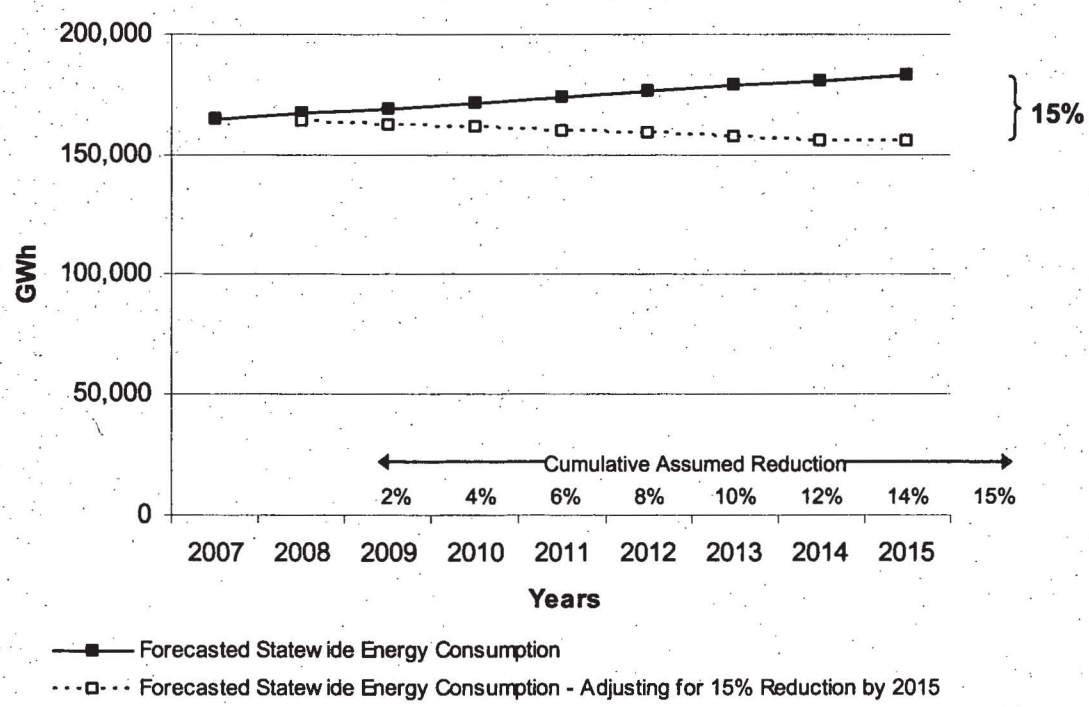
ENERGY EFFICIENCY

New York Governor Eliot Spitzer has announced a "15 by 15" Clean Energy Plan to reduce energy consumption in 2015 by 15 percent to be achieved by energy efficiency alone.[1] The energy efficiency that would be achieved under this Plan would more than replace the capacity and energy provided by both Indian Point Units.

As explained by the Governor, the plan would include taking actions to provide incentives to utilities to conserve energy, strengthening efficiency standards for energy intensive appliances and buildings, and by making the State Government's use of energy more efficient.

The "15 by 15" plan would reduce statewide electricity consumption by approximately 27,000 GWh by 2015. Figure 1 below illustrates the energy savings that would be achieved under the program assuming a linear implementation.

Figure 1 – Impact of New York State's "15 by 15" Policy



The reasonably expected annual generation from both Indian Point Units after 2013 would be approximately 15,600 GWh. This reflects a capacity rating of 979MW for

[1] Remarks by Governor Eliot Spitzer. "15 by 15": A Clean Energy Strategy for New York. 19 Apr 2007. Found at: http://www.state.ny.us/governor/keydocs/0419071_speech.html

Indian Point Unit 2, a 1,000 MW capacity rating for Indian Point Unit 3, and 90 percent average annual capacity factors for both units. The capacity ratings for each unit reflect approximately 4 percent reductions in net plant output due to the potential addition of cooling towers.

To determine the potential of this policy to offset the Indian Point units, we evaluated the potential energy and summer peak capacity savings that can be expected from the "15 by 15" policy using both statewide[2] and zonal[3] forecasts of energy consumption in GWh by the New York Independent System Operator (NY ISO). We used zonal forecasts from Zones H, I, J and K to represent the region that the Indian Point units directly serve. However, it is also relevant to look at the potential for summer peak capacity savings statewide as the region does import power from other regions.

The ramp-in required to achieve the target of 15% energy reduction by 2015 had not been determined. Therefore, we assumed a linear ramp-in of 2% per year starting in 2008 and ending in 2014, with 1% remaining required in 2015 to reach the goal of 15%. We calculated the statewide and regional energy reductions that would be required to achieve this goal by multiplying the total forecasted energy consumption by state and region by the cumulative percentage reduction required for the given year.

We assumed that only 15% reductions would be achieved in the regions of New York State directly served by Indian Points (i.e., Zones H, I, J and K). This is a conservative assumption because it is likely that urban areas such as New York City and Long Island would be able to achieve greater energy reductions than more rural areas which would have fewer energy savings opportunities.

We then converted the energy reductions to summer peak capacity savings in order to assess the ability for these reduction goals to offset the need for the two Indian Point units after 2013. We calculated a ratio between summer peak capacity and energy based on achievable potential estimates from the most recent study of energy efficiency potential in New York State. This study was conducted for NYSERDA in 2003 by Optimal Energy Inc.[4]

Statewide

We used the following methodology to develop ratios to be applied to estimated statewide energy reductions. As zones in the state have a range of avoided costs, I calculated a range of summer peak capacity savings using low and high avoided cost scenarios.

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2 New York Independent System Operator (NY ISO). 2007 Load and Capacity Data. Table I-1. NYISO 2007 Long Term Forecast - 2007 to 2017: Energy (GWh). Pg. 4.

3 New York Independent System Operator (NY ISO). 2007 Load and Capacity Data. Table I-2a. Forecast of Annual Energy by Zone – GWh. Pg. 5.

4 Optimal Energy, Inc. Energy Efficiency and Renewable Energy Resource Development Potential in New York State. Final Report. Volume One: Summary Report. August 2003. Found at: http://www.nyserda.org/sep/EE&ERpotentialVolume1.pdf

Low Avoided Cost Scenario: A ratio between the statewide economic potential summer peak capacity savings and energy reductions in 2007 using low avoided costs (0.196) was applied to energy reductions from 2007-2011. A ratio between the statewide economic potential summer peak capacity savings and energy reductions in 2012 using high avoided costs (0.216) was applied to energy reductions from 2012-2015.[5]

High Avoided Cost Scenario: A ratio between the statewide economic potential summer peak capacity savings and energy reductions in 2007 using high avoided costs (0.212) was applied to energy reductions from 2007-2011. A ratio between the statewide economic potential summer peak capacity savings and energy reductions in 2012 using high avoided costs (0.229) was applied to energy reductions from 2012-2015.[6]

The energy reductions were multiplied by these ratios to arrive at summer peak capacity savings. A summary of the statewide results are shown in Table 1 below.

Table 1 – Statewide Summer Peak Capacity Savings Under "15 by 15"

	Cumulative Energy Reduction (GWh)	Cumulative Summer Peak Capacity Savings – Range from Low to High Avoided Costs (MW)	Indian Point – Cumulative Capacity (MW)
2008	3,349	656 – 710	
2009	6,779	1,328 – 1,436	
2010	10,305	2,019 – 2,183	
2011	13,923	2,728 – 2,950	
2012	17,662	3,817 – 4,049	
2013	21,451	**4,636 – 4,918**	**979**
2014	25,358	5,480 – 5,813	
2015	27,532	**5,950 – 6,311**	
2016			**1,979**

It is clear from this analysis that a statewide 15% energy reduction by 2015 would more than offset the power that would be provided by the two Indian Point units if they were relicensed.

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5 Optimal Energy, Inc. Energy Efficiency and Renewable Energy Resource Development Potential in New York State. Final Report. Volume One: Summary Report. August 2003. Table 1.5 New York Statewide Economic Potential – Low Avoided Costs. Pg. 3-4. Found at: http://www.nyserda.org/sep/EE&ERpotentialVolume1.pdf

6 Optimal Energy, Inc. Energy Efficiency and Renewable Energy Resource Development Potential in New York State. Final Report. Volume One: Summary Report. August 2003. Table 1.6 New York Statewide Economic Potential – High Avoided Costs. Pg. 3-4. Found at: http://www.nyserda.org/sep/EE&ERpotentialVolume1.pdf

The Need for Indian Point in Downstate New York (Zones H, I, J and K)

We used a similar methodology to develop ratios to be applied to estimated regional energy reductions (including Zones H, I, J and K). The only difference was that we used higher avoided costs rather than the range of avoided costs to represent these zones because these zones typically have the highest avoided costs in the state.

Table 2 – Regional Summer Peak Capacity Savings Under "15 by 15"

	Cumulative Energy Reduction (GWh)	Cumulative Summer Peak Capacity Savings – High Avoided Costs (MW)	Indian Point – Cumulative Capacity (MW)
2008	1,748	370	
2009	3,541	750	
2010	5,394	1,143	
2011	7,301	1,547	
2012	9,288	2,129	
2013	11,282	**2,586**	**979**
2014	13,340	3,058	
2015	14,487	**3,321**	
2016			**1,979**

Again, a 15% energy reduction in 2015 statewide would more than offset both the energy and capacity from both Indian Point units and would eliminate any need to extend the license of the two units in 2013 and 2016.

Significantly, the 15 percent reduction in statewide energy consumption anticipated under the "15 by 15" plan would not represent all of the economical potential energy efficiency that has been identified in New York State. A recent presentation by Philip Mosenthal of Optimal Energy, Inc., has projected that there is 61,506 GWh of economically potential energy efficiency in the State.[7]

[7] *Electric & Natural Gas Efficiency Potential in New* York, presentation by Philip Mosenthal, Optimal Energy, Inc., at the New York State Public Service Commission Energy Efficiency Portfolio Standard Overview Forum, July 19, 2007, slide no. 9.

RENEWABLE ENERGY RESOURCES

According to NYSERDA's August 2007 *New York State Renewable Portfolio Standard Performance Report for the Program Period ending March 2007,* new renewable capacity installed since the onset of the Renewable Portfolio Standard (RPS) program could exceed 1,206 MW by the end of 2008, of which 1,184 MW would be located in New York State (p.2). The 1,206 MW of new installed capacity is expected to produce approximately 3.6 million MWh of electricity per year.[8]

This same Performance Report also noted that the September 24, 2004 New York PSC Order set forth annual energy targets representing how much renewable energy should be used by New York ratepayers to satisfy the 2013 goal of having 25% of the power consumed in New York come from renewable energy. The RPS energy targets set by the PSC in its September 24, 2004 Order are shown in Table 3 below.

Table 3 - RPS Energy Targets Set by New York Public Service Commission

	Main Tier Targets	Customer Sited Tier Targets	EO 111 Targets	Voluntary Market Targets	Combined Targets
2006	1,121,247	25,259	282,812	228,584	1,657,902
2007	2,326,171	50,488	314,579	457,167	3,148,405
2008	3,549,026	75,685	346,366	685,751	4,656,828
2009	4,767,994	100,855	378,174	914,335	6,161,358
2010	6,012,179	125,988	410,002	1,142,919	7,691,088
2011	7,297,746	151,081	391,857	1,371,502	9,212,186
2012	8,556,710	176,123	373,712	1,600,086	10,706,631
2013	9,854,038	201,130	355,568	1,828,670	12,239,406

Note: Not shown are energy targets associated with voluntary compliance by the Long Island Power Authority (LIPA) and the New York Power Authority (NYPA)

To meet these targets, New York will require the addition of the following MW of renewable resources:

Table 4 - Estimated Renewable Energy Capacity for NY through 2013

Type	Capacity (MW)
Co-fire biomass	296
Hydro	1,100
LFG	121
Off-shore wind	579
Wind	2,450
Solar	16
Small wind	1
Fuel cell	28
Grand Total	4,590

[8] At page 1.

There are an increasing number of analyses of the potential for renewable resources in New York State. It is reasonable to expect that the retirement of either or both Indian Point units at the end of their current NRC licenses would provide a substantial impetus to the development of additional renewable resources.

Wind Powering America: New York, a website sponsored by the US DOE, estimates that the in-state wind energy potential for New York State is 8,400 MW of capacity after land use and environmental exclusions. (available at http://www.nrel.gov/docs/fy00osti/28090.pdf).

NYISO's September 2007 *Comprehensive Reliability Plan 2007*, noted the following concerning wind capacity:

> The NYISO interconnection queue includes proposals for wind generation that now total in excess of 5,000 MW. Wind generators are intermittent resources and have unique electrical characteristics that pose challenges for planning and operations of the interconnected system. The NYISO has completed a study conducted with GE Energy which evaluated the reliability and operating implications of the large scale integration of wind generation. The study concluded that if state-of-the-art wind technology is utilized, wind generation can reliably interconnect with only minor adjustments to existing planning, operating, and reliability practices.[9]

The study cited in this NYISO report is titled *The Effects of Integrating Wind Power on Transmission System Planning, Reliability, and Operations, Report on Phase 1, Preliminary Overall Reliability* Assessment, prepared for NYSERDA by GE Energy Consulting, 2004. A Phase 2 Report, *System Performance Evaluation,* also was completed in March 2005.

When combined with other energy resources, wind can produce energy in patterns comparable to a baseload generation facility. At the same time, the effects of short term wind variability can be mitigated by building a larger number of wind turbines and by siting the wind turbines in different geographic locations. There is no evidence that any replacement capacity for Indian Point would need to be a fully dispatchable facility. Indeed, the electric grid in New York State will already have a large number of fully dispatchable facilities.

Entergy merely rehashes the same tired old arguments against reliance on wind power. As a detailed 2004 Wind Integration Study – Final Report prepared for Xcel Energy and the Minnesota Department of Commerce has noted:

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9 New York Independent System Operator, *The Comprehensive Reliability Plan 2007, A Long-Term ReliabilityAssessment of New York's Bulk Power System,* Final Report, September 2007, Appendices, at page 75.

> Many of the earlier concerns and issues related to the possible impacts of large wind generation facilities on the transmission grid have been shown to be exaggerated or unfounded by a growing body of research studies and empirical understanding gained from the installation and operation of over 6000 MW of wind generation in the United States.[10]

Contrary to what Entergy has claimed, wind power can reduce the need for the capacity from Indian Point Units 2 and 3 and can provide low cost energy.

An August 2003 study prepared for NYSERDA, *Energy Efficiency and Renewable Energy Resource Development Potential in New York State,* by Optimal Energy, Inc., American Council for an Energy Efficient Economy, the Vermont Energy Investment Corporation and Christine T. Donovan Associates, has provided the following estimates of the potential for renewable resources and energy efficiency in New York State:

Table 5 - New York Statewide Economic Potential – Low Avoided Costs

	2007		2012		2022	
	Annual GWh	Summer Peak MW	Annual GWh	Summer Peak MW	Annual GWh	Summer Peak MW
Energy Efficiency Savings						
Residential	10,124	1,475	12,205	1,981	15,610	2,646
Commercial	27,490	6,173	32,124	8,009	32,994	9,266
Industrial	5,718	840	6,045	896	4,999	752
Total Efficiency	43,332	8,489	50,374	10,886	53,603	12,664
Renewable Supply						
Biomass	5,141	833	5,325	861	6,344	1,022
Fuel Cells	-	-	-	-	-	-
Hydropower	1,512	109	4,336	375	9,123	816
Landfill Gas	-	-	-	-	-	-
Municipal Solid Waste	-	-	682	91	1,421	190
Photovoltaics	-	-	-	-	-	-
Solar Thermal	175	-	181	-	189	-
Windpower	-	-	1,245	100	41,818	3,255
Total Renewable	6,828	942	11,769	1,427	58,894	5,283
Total Efficiency Savings & Renewable Supply	50,159	9,431	62,143	12,313	112,497	17,947

10 *Wind Integration Study-Final Report*, prepared for Xcel Energy and the Minnesota Department of Commerce by EnerNex Corporation and Wind Logics, Inc., dated September 28, 2004, the Project Summary portion of which is included as Exhibit JI-4-A, at page 19.

Table 6 - New York Statewide Economic Potential - High Avoided Costs

	2007		2012		2022	
	Annual GWh	Summer Peak MW	Annual GWh	Summer Peak MW	Annual GWh	Summer Peak MW
Energy Efficiency Savings						
Residential	12,593	2,433	15,982	3,267	19,660	4,480
Commercial	30,273	7,021	35,340	8,988	36,847	10,225
Industrial	5,718	840	6,045	896	4,999	752
Total Efficiency	48,584	10,294	57,367	13,151	61,506	15,457
Renewable Supply						
Biomass	5,141	833	5,325	861	6,344	1,022
Fuel Cells	-	-	-	-	-	-
Hydropower	2,115	257	5,038	555	10,311	1,095
Landfill Gas	439	59	407	54	419	56
Municipal Solid Waste	-	-	682	91	1,421	190
Photovoltaics	-	-	-	-	-	-
Solar Thermal	175	-	181	-	189	-
Windpower	893	70	3,744	293	41,818	3,255
Total Renewable	8,762	1,219	15,376	1,855	60,501	5,618
Total Efficiency Savings & Renewable Supply	57,347	11,513	72,744	15,006	122,007	21,074

Based on the results of this study, renewable resources have the technical and economic potential to provide between 1427 MW and 1855 MW of new capacity in New York State by 2012 and between 5283 MW and 5618 MW of new capacity by 2022. Energy Efficiency and renewable resources together have the technical and economic potential to provide between 12,313 MW and 15,006 MW in 2012 and between 17947 MW and 21074 MW in 2022. Clearly, this is far more than would be required to replace the approximately 2000 MW of capacity from Indian Point Units 2 and 3.[11]

The same conclusion is true for the energy that would be supplied by Indian Point Units 2 and 3 if their licenses are renewed. The same tables presented above show that renewable resources, alone have the potential to provide between 11769 and 15376 GWh of energy in 2012 and between 58894 and 60501 GWh of energy in 2022. Similarly, energy efficiency and renewable resources combined could provide between 62,143 GWh and 72,744 GWh in 2012 and between 112,497 GWh and 122,007 GWh in 2022.[12]

The 2003 study for NYSERDA also showed that a significant portion of the energy that could be provided by energy efficiency and renewable resources would be in downstate New York.[13] For example, the study found that by 2012, energy efficiency and renewable resources have a technical and economic potential of

11 At Volume One, page 3-4.

12 Id.

13 Id, Figure 1.8, at page 3-7.

approximately 30,000 GWh just in Zones J and K, which represent New York City and Long Island. It similarly found that by 2022, energy efficiency and renewable resources have a technical and economic potential of more than 50,000 GWh just in these same areas of the state. Again, this would easily replace the energy that would be provided by Indian Point Units 2 and 3.

The May 2007 study, *New York's Solar Roadmap, A Plan for Energy Reliability, Security, Environmental Responsibility and Economic Development in New York State*[14], has noted that a private-sector initiative launched in 2007 R&D, manufacturing, and industry leaders in New York State, has developed the strategic goal of increasing solar power deployment in the State from the current level of about 12 MW of grid-connected electricity as of January 2007 to over 2,000 MW by 2017.[15] This would provide about 5 percent of the peak electric capacity of the state.[16]

An October 2002 study by NYSERDA on *Combined Heat and Power, Market Potential for New York State*, has concluded that by 2012 there could be between 763.6 MW and 2,169.1 MW of combined heat and power in the state.[17] Between 525.4 MW and 1,319.7 MW of this combined heat and power could be in the Downstate area of the State.[18]

The new administration in New York State already is taking significant actions to increase the amount of energy efficiency and renewable resources:

New York State has announced the following major initiatives as part of their Clean Energy Agenda:

- **Reduce energy consumption.** Governor Spitzer has announced that New York will reduce energy consumption by 15 percent below the forecasted level in 2015 – this is the most aggressive target in the country. New York businesses can raise their profits and New York's families can reduce their utility bills by conserving energy. At the state level, government will lead by example and cut its own use of energy.

- **Invest in and develop renewable energy such as wind, solar, hydropower, and fuel cells**. The Spitzer-Paterson administration will ensure New York will meet the current goal of obtaining 25 percent of our energy from renewable resources by 2013, and the Task Force will evaluate whether to expand this goal. In addition,

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14 This study is available at http://www.neny.org/download.cfm/NENY_Membership_Application.pdf?AssetID=225

15 Executive Summary, at page 1.

16 Id, at page 2.

17 *Combined Heat and Power, Market Potential for New York State*, NYSERDA, Final Report 02-12, October 2002, Table ES-4, at page ES-9.

18 Id.

we must continue to support research and development in this area, and encourage renewable energy businesses to locate in New York.

- **Clean Energy Siting Bill.** Streamlining the state approval process for renewable and clean energy sources is an essential part of our effort. Governor Spitzer proposed a new power plant siting law ("Article X") that would provide a streamlined and expedited review process for wind projects and other clean energy sources. [19]

The State also has convened a Renewable Energy Task Force to evaluate, among other issues, whether the state's Renewable Portfolio Standard should be increased to 30 percent as a result of the Governor's announced "15 by 15" energy efficiency program.

POWER PLANT REPOWERING

Entergy did not consider the potential repowering of older existing power plants as an alternative to the relicensing of Indian Point Units 2 and 3.

Repowering a generation facility means replacing a plant's old, inefficient and polluting equipment with newer, more efficient equipment. Today, virtually all repowering projects replace old equipment with combined-cycle combustion turbines (CCCTs). CCCTs generate electricity in two stages. In the first stage, fuel is burned to operate a gas turbine generator, and in the second stage, excess heat from the gas turbine is used to drive a steam turbine and generate additional electricity. This two-stage process can turn 50 percent or more of the fuel energy into electricity. Repowering has become commonplace in the electric industry since the early 1990s. One repowering project in the Hudson River Valley was PSEG's Bethlehem Energy Center outside Albany. Completed in 2005, this project now consists of 793 MW of combined-cycle generating capacity, which includes a net increase of 400 MW relative to the old Albany Steam Plant that was replaced.

In practice, repowering can be done in at least two ways, either by rebuilding and replacing part or all of an existing plant or by closing down an existing power plant, building a new unit next to it and reusing the existing transmission and fuel facilities.

Repowering older power plants provides a number of important environmental and electric system reliability benefits: improved plant availability, lower plant operating and maintenance costs; increased plant capacity and generation; reduced facility heat rates which lead to significantly more efficient fuel use; reuse of industrial sites; up to 99 percent reductions in water intake and related fish impacts; and large reductions in air emissions, both overall and in terms of emissions per MWh of electricity.

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19 Available from http://www.ny.gov/governor/press/lt_conservation.html.

A recent study on repowering KeySpan's generating facilities on Long Island by the Center for Management Analysis at Long Island University concluded that repowering these facilities would provide cost effective generating capacity to carry Long Island at least into the next 20 to 40 years and beyond, and would provide "compelling" environmental benefits:

> Improvements in efficiency from about 35 percent to close to 60 percent in the conversion of fuel to electricity can be achieved. The resulting reduction in fuel burned for a given amount of generation will be significantly less nitrogen oxides and carbon monoxide emitted. Modern combined cycle units have state of the art emission control systems in contrast to the older steam electric units with no such controls. The re-powered units achieve emission reductions immediately since they replace higher emitting, older units that would likely continue to operate in an expansion program of new greenfield projects.[20]

The study by the Center for Management Analysis concluded that converting the major plants on the KeySpan system to combined cycle could increase Long Island's electric supply by about 2,000 MW.[21] Clearly, the repowering of these existing power plants on Long Island could replace the approximate 2,000 MW of capacity provided by Indian Point Units 2 and 3.

Reliant Energy also received an Article X certificate to repower its aging Astoria Generating facility. This repowering would add another 1,816 MW of combined cycle capacity to the electric system in New York City. This would represent an increase of approximately 650 MW over the capacity of the existing Astoria facility. The retirement of Indian Point Units 2 and 3 would create an incentive for the completion of this repowering project.

Detailed engineering and economic analyses must be performed to determine the optimum size of the repowered unit and the extent to which existing facilities can be refurbished and reused. The types of existing facilities that can be refurbished and reused include boilers, turbine generators, condensers, transmission switchyards, and other auxiliary plant equipment. The reuse of this equipment can lower the cost of building the repowered facility as compared to the cost of constructing a new unit at a new site.

There are a number of older fossil-fueled power plants situated on the river between Albany and New York City: Bowline Point, Roseton, and Danskammer. As noted earlier, one older plant along the river, the old Albany Station, has been replaced with modern power generation equipment. However, the units at the Bowline, Roseton and Danskammer fossil-fueled plants utilize older power generating technology, which is less efficient and has far greater environmental impacts than new generating systems. Most of the boilers and generating units in these four plants are over 25 years old – three of them are over 45 years old – and none of them has been retrofitted with post-combustion emission controls or modern

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20 *The Feasibility of Re-Powering KeySpan's Long Island Electric Generating Plants to Meet Future Energy Needs*, Long Island University, Center for Management Analysis, August 6, 2002, at page 8.

21 Id, at page 78.

cooling systems that minimize water use from the river. Repowering these plants with new combined cycle technology could add additional generating capacity to replace Indian Point at the same time that it would provide significant economic and environmental benefits.

TRANSMISSION SYSTEM ENHANCEMENTS AND UPGRADES

Entergy has failed to adequately consider transmission system enhancements and upgrades as part of the portfolio of options for replacing the capacity and energy from Indian Point Units 2 and 3. Such enhancements and upgrades could increase the capability to import power into the Hudson River Valley and Downstate New York from New England, PJM[22] or upstate New York.

For example, at least two new transmission links between New York and New Jersey have been proposed. Both of these are in the interconnection queue at the New York ISO. One of these is the Hudson Transmission Project that would provide a new controllable line into New York City rated at 600 MW.[23] A second project, the 550 MW Harbor Cable Project and Generating Portfolio, would provide a full controllable transmission pathway from generating sources in New Jersey to New York City.[24]

At the same time, the 2005 Levitan & Associates study identified three possible transmission alternatives to the retirement of Indian Point Units 2 and 3. The first would include retirement with the construction of two physically separate 500 kV circuits between the Capitol District around Albany to the downstate grid in New York City. Each of the circuits would be controllable and would be able to transmission 1,000 MW of power for a total of 2,000 MW.[25] A third proposed project would be the 300 MW Linden Variable Frequency Transformers that would be physically located adjacent to the Linden Cogen plant in northern New Jersey. It would result in a variable 300 MW tie between PJM and New York City.[26]

The second transmission alternative identified by Levitan & Associates would be to upgrade the existing 345 kV New Scotland-Leeds circuit and the 345 kV Leeds-Pleasant Valley circuit, and construct a new 345 kV line from New Scotland to Pleasant Valley. This would increase the UPNY-SENY interface transfer capability by approximately 600 MW.[27]

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22 PJM is the interconnected regional electric system in 13 states and the District of Columbia. New Jersey and Pennsylvania are two of the state's within PJM.

23 New York Independent System Operator, *The Comprehensive Reliability Plan 2007, A Long-Term ReliabilityAssessment of New York's Bulk Power System,* Final Report, September 2007, at page 27.

24 Id.

25 *Indian Point Retirement Options, Replacement Generation, Decommissioning/Spent Fuel Issues, and Local Economic/Rate Impacts*, prepared for the County of Westchester and the County of Westchester Public Utility Service Agency, by Levitan & Associates, Inc., June 9, 2005, at pages 35 and 36.

26 Id.

27 Id, at pages 36 and 37.

Finally, the third transmission alternative would be to convert the existing 345 kV Marcy-New Scotland circuit to a double circuit and to rebuild the New Scotland station to a breaker-and-a-half design. This would increase the Central-East transfer capability by approximately 650 MW and increase the transmission capability into New York City by approximately 450 MW.[28]

Levitan & Associates also identified a fourth transmission alternative that would upgrade the interconnections between New York and the PJM system by re-conductoring the existing transmission paths from Ramapo to Buchanan and/or constructing a new dedicated (overhead or underground) transmission line from Ramapo to Buchanan. However, Levitan & Associates were unsure of the amount by which this alternative would increase the Total East transfer capability into New York State.

NEW GENERATING FACILITIES

A number of proposed power plant projects received certificates under New York's now-expired Article X statutes. However, some of these projects have not been built because they were unable to secure the needed financing. The Governor of New York has proposed requiring utilities to enter into long-term contracts with prospective suppliers. This would enable plant developers to limit risks, gain the confidence of investors and obtain the financing to build their projects.

The following is list of the approved projects in the Hudson River Valley and downstate New York that have not been built:

- Besicorp – Empire State Newsprint Project – 505 MW – Rensselaer County
- Bowline Unit 3 – 750 MW – Rockland County
- Reliant Energy Astoria Repowering Project – 1816 MW total (net addition 652 MW) – Queens County
- Spagnoli Road Energy Center – 250 MW – Suffolk County

The addition of these units would add over 2,100 MW of new generating capacity.

Other new generating facilities, totaling 1400 MW of new capacity, have been proposed for downstate New York including:

- A second Astoria Repowering Project, submitted by NRG Power Marketing, would add 500 MW (375 MW net) of new combustion turbine power in Queens by 2011.[29]
- A 600 MW combined cycle unit at Arthur Kill on Long Island by 2012.[30]

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28 Id. at page 37.

29 New York Independent System Operator, *The Comprehensive Reliability Plan 2007, A Long-Term Reliability Assessment of New York's Bulk Power System*, Final Report, September 2007, at page 27.

30 Id.

- A 300 MW Peaking Facility at Indian Point, proposed by Entergy Nuclear Power Marketing. This project would be in service by mid-2011.

As explained in the 2005 *Indian Point Options* study by Levitan & Associates, it is reasonable to expect that the retirement of Indian Point would encourage developers to complete the approved but not yet built projects:

> Project developers are keenly tuned to market dynamics in New York. They would realize that retiring IP would cause market energy and capacity values to increase across the downstate region. These price signals would be important, given IP's size and location, to encourage the development of new generation and/or transmission projects that would replace the lost capacity. These new generation projects could include decentralized and renewable resource options. If the retirement of IP were announced in advance, developers would be able to calculate the economic feasibility of their projects and pursue those that make financial sense in time to maintain the state's reliability requirement. In addition, utilities in the downstate regions might offer long-term PPAs for new replacement generation. PPAs offer generators market certainty and reduce price risk, improving the opportunity for owners to obtain debt and equity financing in today's skittish financial markets.
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> The developers' ability to respond to market price signals and the utilities' interest in contracting for new generation are central to our analysis. We believe that developers would require a minimum of three-to-four years to plan, permit, and construct a gas-fired combined cycle project. Perhaps six months to a year could be shaved off the time for a simple cycle project. The early project development work can often be accomplished at minimal cost, even if a formal retirement plan was not announced, in order for the developer to get a "head start" on competitors. Such tasks encompass conceptual design, site control, preliminary fuel supply and power offtake arrangements, and initial permit applications. The remaining project development and construction time would be approximately three years for a combined cycle plant and less for simply cycle. Thus we would recommend that any voluntary retirement be announced at least three-to-four years in advance, to give the market enough time to develop replacement capacity....
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> The existing NRC license expiration dates of 2013/15 define our Base Case scenario against which we evaluate other options. If Entergy announced an agreement to retire IP2&3 on those dates at least three, and preferably four years in advance, there would be

more than enough time for project developers and downstate utilities to respond.[31]

It is important to realize that gas supply will not be a critical factor in closing Indian Point. According to the 2006 National Academy of Sciences study, " *Committee on Alternatives to Indian Point for Meeting Energy Needs*, at page 5, replacing both Indian Point units would ultimately require an additional 1300-1400 MW of new gas-fired generating capacity. Conservatively assuming a heat rate of 8000 btu/KWh, under peak conditions providing 1400 MW would require a gas supply of 0.26 bcf per day, or about 16% of the combined capacity of the new LNG facilities being developed in Eastern Canada and Massachusetts. There will be more than enough slack in the system to supply the gas needed for additional generating facilities to replace Indian Point from existing and new sources outside New York State.

New gas supplies will be available in the northeastern United States and eastern Canada from new LNG facilities that are expected to be on-line within the next few years. (The Canaport LNG terminal is expected to begin receiving deliveries and transporting gas to the northeast United States through the upgraded Maritimes and Northeast pipeline as soon as 2008) The combined capacity of these LNG terminals would be approximately 1.73 billion cubic feet (bcf) per day, of which 0.73 bcf would be delivered from the Canaport facility (Nova Scotia) and 1.0 bcf from two offshore facilities in Massachusetts. These facilities are well advanced in the permitting process (Canaport is under construction), and they rely on known and proven LNG transfer and regassification technologies.

Note that the two proposed LNG import terminals, located in Massachusetts, to serve the northeast market have been approved by the Governor of Massachusetts.[32] In addition, the Repsol Energy North America Corporation, developer of the Canaport LNG facility in Saint John, New Brunswick, has filed a notice with FERC clarifying that they intend and expect to deliver 0.73 bcf of gas into the northeastern United States.[33]

The addition of these new LNG facilities in the northeastern United States and eastern Canada will free-up additional pipeline capacity into the New York area from the south so that more gas could be delivered to the Westchester Area. Today, New England gets much of its gas supply from the Algonquin Pipeline which passes through Connecticut from the southeast corner of the state to the northwest corner. This transport—through function accounts for about 90% of the activity on Algonquin in this region. Once additional LNG-based supplies are available in New England, much of that existing pipeline capacity would be available for delivering gas supplies from domestic sources (i.e., the Gulf of Mexico) to the New York area. In addition, decreased competition for this pipeline capacity means that

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31 *Indian Point Retirement Options, Replacement Generation, Decommissioning/Spent Fuel Issues, and Local Economic/Rate Impacts*, prepared for the County of Westchester and the County of Westchester Public Utility Service Agency, by Levitan & Associates, Inc., June 9, 2005, at pages 30 and 31.

32 http://www.boston.com/news/local/articles/2006/12/20/governor_approves_2_lng_ports/

33 http://elibrary.FERC.gov/idmws/file_list.asp?accession_num=20070111-0066

transportation costs to the New York area are likely to decrease. Thus the availability of new LNG terminals in New England and eastern Canada will provide a benefit to New York and Connecticut in terms of availability of supply, and likely in terms of price, even if the physical molecules of gas are not delivered to the region from those new LNG facilities.

In conclusion, the LNG terminals in Canada and Massachusetts will all add to the available gas supplies for New York and Connecticut. They can do this either directly, by transporting gas to the region through the interstate pipeline system, or indirectly, by releasing pipeline capacity that would otherwise be reserved for moving supplies through the region and northward.[34]

CONCLUSION

In conclusion, the capacity and energy provided by Indian Point Units 2 and 3 can be replaced if the Units are not relicensed. In particular, energy efficiency, renewable resources, the repowering of older generating facilities, transmission upgrades and new natural gas-fired generating facilities represent viable alternatives to the relicensing of Indian Point. Substantial reductions in peak demand and energy requirements will be achieved by 2013 under the state's newly announced "15 by 15" Clean Energy Plan. Significant amounts of new renewable resources will be available as a result of the state's renewable energy portfolio standard and other initiatives. In addition, thousands of megawatts ("MW") of new generating capacity can be provided by the repowering (i.e., rebuilding) of older generating facilities both along the Hudson River and in the downstate area of the state in New York City and on Long Island. At the same time, transmission system upgrades also can increase the amounts of power that can provided to the downstate region of the State. Finally, there is the potential for the addition of several thousand megawatts of new generating capacity in the Hudson River Valley and in downstate New York.

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34 See *The Proposed Broadwater LNG Import Terminal: An Analysis and Assessment of* Alternatives, March 2006 and *The Proposed Broadwater LNG Import Terminal Update of Synapse Analysis*, January 19, 2007, both are available at www.synapse-energy.com.