2010 Reliability Needs Assessment

New York Independent System Operator

FINAL REPORT

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Caution and Disclaimer

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Executive Summary

The 2010 Reliability Needs Assessment (RNA) commences the fifth cycle of the NYISO's reliability planning processes provided for in its Comprehensive System Planning Process (CSPP). The NYISO's CSPP encompasses the existing reliability planning processes with the new economic planning process called the Congestion Analysis and Resource Integration Study (CARIS). The RNA provides a long-range reliability assessment of both resource adequacy and transmission security of the New York bulk power system conducted over a 10-year planning horizon. This 2010 RNA builds upon the results and analyses contained in the NYISO's prior Comprehensive Reliability Plans (CRP) in 2005, 2007, 2008 and 2009 respectively. The first three CRPs responded to the Reliability Needs identified by their respective RNAs. The 2009 RNA, with the reduced forecast associated with energy efficiency peak load reductions, increased generation and increased demand response, identified no Reliability Needs. The fourth CRP indicated that the system was reliable and no solutions were necessary in response to the 2009 RNA.

The 2010 RNA identified no Reliability Need, assuming that all modeled transmission and generation facilities, including Indian Point, remain in service during the next 10 years from 2011 through 2020. The study of the Base Case indicates that the baseline system meets all applicable Reliability Criteria. However pending regulatory initiatives may affect Base Case facilities and could result in unanticipated retirement of capacity in New York. The NYISO will continue to monitor these developments and will conduct appropriate reliability studies as necessary.

There are three primary reasons this year's RNA continues to find no Reliability Needs for the next 10 years:

1. **Generation additions –** Two new proposed generating plants totaling 1060 MW located in Zone J are included in the 2010 RNA Base Case, but were not included in the previous RNAs.

2. **Lower Energy Forecast –** two factors contributed to this outcome:

   The 2009 Recession – The effect of the 2009 recession was to reduce the peak demand forecast for 2011 by 1400 MW, before any energy efficiency adjustments. This also reduced the projections of peak load in subsequent years.

   Statewide Energy Efficiency Programs (15 x 15) – This refers to the Governor's initiative to lower energy consumption on the electric system by 15% of the 2007 forecasted levels in 2015. Based on seven factors set forth in the 2010 RNA, the projected impact of these energy efficiency programs has increased from the 2009 RNA. The 2009 RNA included cumulative energy savings of 10,235 GWh by 2018. In the 2010 RNA, this value increased to 13,040 GWh by the year 2018 and to 13,684 GWh by the year 2020.

The 2010 RNA Base Case forecast reflects larger energy efficiency usage reductions than the preceding 2009 RNA Base Case forecast. Each of those base case forecasts was created by subtracting a projected energy efficiency impact from the respective current econometric forecast. For example, in the case of the 2009 RNA Base Case energy forecast for 2015, a projected 8086 GWh in energy savings were subtracted from the econometric forecast to reach the base case forecast. In the 2010 RNA, for the year 2015, a projected 9914 GWh were subtracted from the current econometric forecast.

3. **Increased registration in Special Case Resource (SCR) –** The NYISO continues to experience increases in the registration of the SCR programs that supply capacity resources to the system through the NYISO market. The NYISO has projected registrations of 2251 MW of SCRs, an increase of 167 MW of resources over the SCR levels included in the 2009 RNA Report.

The NYISO has conducted scenario analyses in order to test the robustness of the needs assessment studies and to bind the conditions under which resource adequacy or transmission security needs may arise. In some scenarios, violations of Reliability Criteria were identified; however, a scenario will not identify or propose additional Reliability Needs. Scenarios are variations on key assumptions in the RNA Base Case to assess the impact of possible changes in circumstances that could impact the RNA. The findings under the scenario conditions are:

1. The Econometric Forecast Scenario reveals that reliability violations would occur in 2019 and 2020 at the higher peak load levels which do not account for the projected energy efficiency reductions included in the Base Case.

2. The 45 x 15 Scenario (full 15 x 15 energy efficiency coupled with 30% renewables) demonstrates that LOLE levels, already low and well below 0.1 in the Base Case, would drop to essentially zero. This scenario used the same energy forecast used for the 2009 RNA 15 x 15 scenario for the year 2015 and beyond. This forecast did not reflect the impact of the current recession. The inclusion of the recession impact would have further reduced the LOLE.

3. Reliability violations would occur if the Indian Point Plant were to be retired at the latter of the two units' current license expiration dates using the Base Case load forecast assumptions. In addition to the LOLE violations, transmission analysis demonstrated thermal violations per applicable Reliability Criteria. Under stress conditions, the voltage performance on the system without Indian Point would be degraded. To relieve the transmission security violations, load relief measures will be required for Zones G through K. Further, utilizing the econometric forecast scenario, but if the Indian Point Energy Center units were to be retired, significantly higher LOLEs would result.

4. The Zonal Capacity at Risk Scenario looked only at potential LOLE violations to determine how much capacity could be removed from downstate zones J and K, lower-Hudson zones G-H-I, and upstate zones A through F while maintaining the LOLE requirement. The results generally showed that it may be possible to remove approximately 1000 MW from Zone J, or from Zone K, or from the combined zones of G-H-I, without an LOLE violation for 2020, but not from all these zones. For Zones A-F the removal of capacity and its impact on the reliability of the transmission system and the transmission system's transfer capability are highly location dependent. The study did not attempt to assess a comprehensive set of potential scenarios that might arise from specific unit retirements. In all zones, transmission security analyses would need to be performed to determine the precise reliability impact and to test the impact of removing any specific generator to the transmission system operations. This can be particularly important around congested interfaces.

5. The NYSEG import scenario, which assumes NYSEG exercising its option to import 1080 MW from PJM using Existing Transmission Capacity for Native Load (ETCNL) rights, showed no effect on LOLE.

6. The Scenario testing a "Wheel-Through" of 300 MW through New York from HQ to New England showed a minimal increase in LOLE, hence no material impact as the LOLE in 2020 stayed well below 0.01.

7. The NYISO also performed an evaluation of the potential impacts of major environmental program initiatives on New York generators. This was done by placing each of those generators into categories of impact and presenting the results by groups of zones. A comparison of those affected capacities against the numbers resulting from the Zonal Capacity at Risk results showed that, except for the NOx RACT program taken alone, the cumulative effect of the air program initiatives could result in retirements that exceed the amount of capacity that can be lost as reflected in the Zonal Capacity at Risk limits, and thus, may result in resource adequacy violations. Similar impacts could result from the BTA Policy taken alone.

In summary, based upon the combined effect of lower energy forecasts, generator additions, and additional SCR program participation, under the Base Case assumptions the NYISO has determined there are no Reliability Needs, assuming that all modeled transmission and generation facilities, including Indian Point, remain in service in New York from 2011 through 2020. Therefore, a request for Reliability Need solutions will not be issued this year. Nevertheless, the NYISO, in accordance with Attachment Y of the OATT will issue a 2010 CRP to update the 2009 CRP and to serve as the starting point for the next NYISO economic planning study (CARIS).

The NYISO will continue monitoring and evaluating the progress of previous CRP market-based solutions, State energy efficiency program implementations, SCR program registration, potential reliability impact of new and proposed environmental regulations, local transmission owners' plans as listed in Table 3-4 and other planned projects on the bulk power system as shown in Table 2–1 to determine that these projects remain on schedule. This monitoring is essential and key to the NYISO's continued determination during the balance of the current planning cycle that there are no Reliability Needs. Should the NYISO determine that conditions have changed during the planning cycle, it will determine whether market-based solutions that are currently progressing are sufficient to meet the resource adequacy and system security needs of the New York power grid. If not, the NYISO will address any newly identified Reliability Need in the subsequent RNA or, if necessary, issue a request for a Gap solution.

Many challenges drive the need for vigilance in monitoring the conditions on the bulk power system until the NYISO conducts its next RNA. On the one hand, there are new capacity resources that are under development, which, if they become operational, may further improve and help maintain the reliability of the bulk power system. On the other hand, other system changes (e.g., retirements not included in the Base Case) depending on timing and location could result in future Reliability Criteria violations and could generate future Reliability Needs, if such events were to become likely.

1. Introduction

The Reliability Needs Assessment (RNA) is developed by the NYISO in conjunction with Market Participants and all interested parties as the first step in the Comprehensive System Planning Process (CSPP). The RNA and CRP are performed to maintain electric system reliability over the next ten year period. If the RNA identifies Reliability Needs in the 10-year Study Period, the NYISO will designate one or more Responsible Transmission Owners who are responsible for the development of a regulated backstop solution to address each identified need. In addition, after approval of the RNA, the NYISO will request market-based and alternative regulated responses from all interested parties to address the identified Reliability Needs. This document reports the RNA findings for the Study Period 2011-2020.

Solutions must satisfy Reliability Criteria, including resource adequacy. Nevertheless, the solutions submitted to the NYISO do not have to be in the same amounts or locations used in the RNA to quantify the Reliability Needs. There are various combinations of resources and transmission upgrades that could meet the needs identified in RNA. The reconfiguration of transmission facilities and/or modifications to operating protocols identified in the solution phase could result in changes and/or modifications of the needs identified in the RNA.

Continued reliability of the bulk power system during the Study Period depends on a combination of additional resources, provided by independent developers in response to market forces and by the electric utility companies who are obligated to provide reliable and adequate service to their customers. To maintain the system's long-term reliability, those resources must be readily available or in development to meet future needs. Just as important as the electric system plan is the process of planning itself. Electric system planning is an ongoing process of evaluating, monitoring and updating as conditions warrant. Along with addressing reliability, the CSPP is also designed to provide information that is both informative and of value to the New York wholesale electricity marketplace.

This report begins with an overview of the CSPP. The 2009 Comprehensive Reliability Plan (CRP) and prior reliability plans are then summarized. The report continues with a summary of the 2010 RNA Base Case assumptions and methodology. Detailed analyses, data and results underlying the modeling assumptions are contained in the Appendices.

In addition to assessing the Base Case conditions, the RNA analyzes certain scenarios to test the robustness of the system and the conditions under which needs would arise. Attention is given to risks that may give rise to Reliability Needs, including unusually high peak loads, unexpected plant retirements, and delay in achievement of the State's energy efficiency goal. Most importantly, the NYISO will continue to monitor the progress of the market-based solutions submitted in earlier CRPs, State energy efficiency program implementation, the ongoing developments in State and Federal environmental regulatory programs, plant re-licensing efforts, transmission owner projects identified in the Local Transmission Plans (LTPs) and other planned projects on the bulk power system to determine that these projects progress as expected and that any delays will not adversely impact system reliability.

Finally, the NYISO will issue a 2010 CRP based upon this RNA report. This RNA report also provides the latest information available regarding the past five years of congestion via a link to the NYISO's website. This historic congestion information is provided to the marketplace for informational purposes. The NYISO completed its first forward-looking economic planning assessment of future congestion in the CARIS process in January 2010, which was based upon the 2009 CRP. The 2010 CRP will be the foundation for the next CARIS report.

2. Summary of Prior CRPs

This is the fifth RNA since the NYISO's planning process was approved by FERC in December 2004. The 2005 CRP, which was approved by the NYISO Board of Directors in August 2006, identified 3,105 MW of resource additions needed through the 10-year Study Period ending in 2015. Market solutions totaled 1200 MW, with the balance provided by updated Transmission Owners' (TOs) plans. The 2007 CRP, which was approved by the NYISO Board of Directors in September 2007, identified 1800 MW of resource additions needed over the 10-year Study Period ending in 2016. Proposed market solutions totaled 3007 MW, in addition to updated Transmission Owners' (TOs) plans. The 2008 CRP, which was approved by the NYISO Board of Directors in July 2008, identified 2350 MW of resource additions needed through the 10-year Study period ending in 2017. Market solutions totaling 3,380 MW were submitted to meet these needs. The NYISO did not trigger any regulated backstop solutions to meet Reliability Needs.

The 2009 CRP, which was approved by the NYISO Board of Directors in January 2009, identified that there were no resource addition needs through the 10-year Study period ending in 2018. Therefore, market solutions were not requested. Although the 2009 CRP did not identify any needs, as a risk mitigation measure, the NYISO has continued to monitor the market based solutions submitted for the 2008 CRP throughout 2009 and 2010. The primary drivers causing there to be no needs identified in the 2009 RNA as compared to the 2008 RNA were 1) an increase in generation and transmission facilities, 2) a decrease in the energy forecast due to the Energy Efficiency Portfolio Standard Order (EEPS), and 3) an increase in Special Case Resources (SCRs).[1]

Table 2-1 presents the market solutions and TOs' plans that were submitted in response to previous requests for solutions and were included in the 2008 CRP. The table also indicates that 2115 MW of solutions are either in-service or are still being reported to the NYISO as moving forward with the development of their projects.

It should be noted that there are a number of other projects in the NYISO queue that are also moving forward with the interconnection process, but that have not been offered as market solutions in this process. Some of these additional resources are listed in Table 2-2. These projects have either accepted their cost allocation as part of the Class Year Facilities Study process or are currently included in the 2009 or 2010 Class Year Facilities Studies. Both Tables 2-1 and 2-2 note the projects that meet the RNA Base Case inclusion rules.

[1] Similar trends in these drivers resulted in identifying no needs in this 2010 RNA report.

Table 2-1: Current Status of Tracked Market-Based Solutions & TOs' Plans in the 2008 CRP

Project Type	NYISO Queue #	Submitted	MW	Zone	Original In-Service Date	Current Status[1]	Included in 2010 RNA Base Case?
Resource Proposals							
Gas Turbine NRG Astoria Re-powering[2]	**201 and 224**	CRP 2005, CRP 2007, CRP 2008	520 MW	J	Jan - 2011	New Target June 2012	No
Simple Cycle GT Indian Point		CRP 2007, CRP 2008	300	H	May - 2011	Withdrawn	No
Empire Generation Project	**69**	CRP 2008	635	F	Q1 2010	New Target July 2010 Under Construction	Yes
Transmission Proposals							
Controllable AC Transmission Linden VFT	**125**	CRP 2007, CRP 2008	300 (No specific capacity identified)	PJM - J	Q4 2009 PJM Queue G22	Placed In-Service November, 2009	Yes
Back-to-Back HVDC, AC Line HTP	**206**	CRP 2007, CRP 2008 and was an alternative regulated proposal in CRP 2005	660 (500 MW specific capacity identified)	PJM - J	Q2/2011 PJM Queue O66	New Target Q2 2012 Article VII Pending	No
Cross Hudson	**255**	CRP 2008	550	J	Jun - 2010	Withdrawn as Solution Replaced with queue # 295	No
Cross Hudson II	**295**	CRP 2008	800	J	Jun - 2010	Project No Longer Considered Viable as Solution	No
TOs' Plans							
ConEd M29 Project	**153**	CRP 2005	N/A	J	May - 2011	On Target Under Construction	Yes
Caithness	**107**	CRP 2005	310	K	Jan - 2009	Placed In-Service August, 2009	Yes
Millwood Cap Bank	**N/A**	CRP 2007	240 MVAr	H	Q1 2009	Placed In-Service May, 2009	Yes

[1] Status as provided by Market Participant as of March 31, 2010

[2] NRG sumbitted three proposals, one of them was withdrawn. For the purposes of the Market-Based solutions' evaluation NYISO assumed the lowest MW proposal. There is a retirement of 112 MWs at this location reflected in the base case.

Table 2-2: Proposed Resources per 2010 Gold Book

Queue	Developer	Project Name	POI	CTO	Zone	Rating (MW)	UNIT TYPE	Completed Class Year	Included in 2010 RNA Base Case?
		Completed Class Year Facilities Study							
19	NYC Energy LLC	NYC Energy LLC	Kent Ave 138kV	ConEd	J	79.9	Combustion Turbine(s)	2002	No
69	Empire Generating Company, LLC	Empire Generating	Reynolds Road 345kV	NM-NG	F	635.0	Combined Cycle	2003-05	Yes
119	ECOGEN, LLC	Prattsburgh Wind Farm	Eelpot Rd-Flat St. 115kV	NYSEG	C	78.2	Wind Turbines	2003-05	No
127A	Airtricity Munnsville Wind Farm, LLC	Munnsville	OriskanyTap-MorrisvilleTap 46kV	NYSEG	E	6 Incr.	Wind Turbines	2006	Yes
147	NY Windpower, LLC	West Hill Windfarm	Oneida-Fenner 115kV	NM-NG	C	31.5	Wind Turbines	2006	No
156	PPM Energy/Atlantic Renewable	Fairfield Wind Project	Valley-Inghams 115kV	NM-NG	E	74.0	Wind Turbines	2006	No
161	Marble River, LLC	Marble River Wind Farm	Willis-Plattsburgh WP-1 230kV	NYPA	D	84.0	Wind Turbines	2006	No
166	AES-Acciona Energy NY, LLC	St. Lawrence Wind Farm	Lyme Substation 115kV	NM-NG	E	79.5	Wind Turbines	2007	No
171	Marble River, LLC	Marble River II Wind Farm	Willis-Plattsburgh WP-2 230kV	NYPA	D	132.3	Wind Turbines	2006	No
182	Howard Wind, LLC	Howard Wind	Bennett-Bath 115kV	NYSEG	C	62.5	Wind Turbines	2007	No
185	New York Power Authority	Blenheim Gilboa Storage	Gilboa 345 kV	NYPA	F	incr 120	Pump storage	2006	Yes
186	Jordanville Wind, LLC	Jordanville Wind	Porter-Rotterdam 230kV	NM-NG	E	80.0	Wind Turbines	2006	No
197	PPM Roaring Brook, LLC/PPM	Tug Hill	Boonville-Lowville 115kV	NM-NG	E	78.0	Wind Turbines	2008	No
206	Hudson Transmission Partners	Hudson Transmission	West 49th Street 345kV	ConEd	J	660.0	DC/AC	2008	No
207	BP Alternative Energy NA, Inc.	Cape Vincent	Rockledge Substation 115kV	NM-NG	E	210.0	Wind Turbines	2008	No
213	Noble Environmental Power, LLC	Ellenburg II Windfield	Willis-Plattsburgh WP-2 230kV	NYPA	D	21.0	Wind Turbines	2007	No
216	Nine Mile Point Nuclear, LLC	Nine Mile Point Uprate	Scriba Station 345kV	NM-NG	C	incr 168	Nuclear Uprate	2008	Yes
231	Seneca Energy II, LLC (1)	Seneca	Goulds Substation 34.5kV	NYSEG	C	incr 6.4 (total 24 MW)	Methane	2008	No
234	Steel Winds, LLC	Steel Winds II	Substation 11A 115kV	NM-NG	A	15.0	Wind Turbines	2008	Yes

Note: Jordanville Wind Queue #186 – NYISO received an Interconnection Agreement suspension notification from the developer on July 2, 2010.

Table 2-3: Class Year 2009 and 2010 Projects [5]

Class Year 2009 Projects

142	EC&R Northeast, LLC (2)	Steuben Wind	Bennett-Palmiter 115kV	NYSEG	C	50.0	Wind Turbines	CY09 in progress	No
222	Noble Environmental Power, LLC	Ball Hill	Dunkirk-Gardenville 230kV	NM-NG	A	90.0	Wind Turbines	CY09 in progress	No
232	Bayonne Energy Center, LLC	Bayonne Energy Center	Gowanus 345kV	ConEd	J	512.0	Dual Fuel	CY09 in progress	Yes
245	Innovative Energy Systems Inc.	Fulton County Landfill	Ephratah – Amsterdam 69kV	NM-NG	F	3.2	Methane	CY09 in progress	No
251	CPV Valley, LLC	CPV Valley	Coopers – Rock Tavern 345kV	NYPA	G	630.0	Combined Cycle	CY09 in progress	No

Class Year 2010 Projects

237	Allegany Wind, LLC	Allegany Wind	Homer Hill – Dugan Rd. 115kV	NM-NG	A	72.5	Wind Turbines	CY10 in progress	No
254	Ripley-Westfield Wind, LLC	Ripley-Westfield Wind	Ripley - Dunkirk 230kV	NM-NG	A	124.8	Wind Turbines	CY10 in progress	No
260	Beacon Power Corporation	Stephentown	Greenbush - Stephentown 115kV	NYSEG	F	20.0	Flywheel	CY10 in progress	Yes
261	Astoria Generating Company	South Pier Improvement	Gowanus 138 kV Switchyard	ConEd	J	95.5	Combustion Turbine(s)	CY10 in progress	No
263	Stony Creek Wind Farm, LLC (3)	Stony Creek Wind Farm	Stolle Rd - Meyer 230kV	NYSEG	C	88.5	Wind Turbines	CY10 in progress	No
266	NRG Energy, Inc.	Berrians GT III	Astoria (Poletti) 345kV	NYPA	J	789.0	Combustion Turbine(s)	CY10 in progress	No
308	Astoria Energy II, LLC	Astoria Energy II	Astoria (Poletti) 345kV	NYPA	J	550.0	Combined Cycle	CY10 in progress	Yes
330	BP Solar	Upton Solar Farms	Brookhaven 8ER 69kV Substation	LIPA	K	32.0	Solar	CY10 in progress	No

Other Non-Class Year Generators

180A	Riverbay Corporation (4)	Co-op City			J	40.0	Gas Turbine	N/A	Yes
204A	Green Power	Cody Road	Fenner - Cortland 115kV	NM-NG	C	10.0	Wind Turbines	N/A	No
250	Duer's Patent Project, LLC	Beekmantown Windfarm	Kent Falls-Sciota 115kV	NYSEG	D	19.5	Wind Turbines	N/A	No
	Seneca Energy II, LLC	Ontario	Haley Rd. - Hall 34.5kV	NYSEG	B	6.4	Methane	N/A	No

Notes:

(1) Seneca Energy II- Seneca was added back to the Class Year 2008

(2) Steuben Wind gave notice May 6, 2010 to withdraw from queue

(3) Stony Creek Wind revised their capacity from 142.5 MW to 88.5 MW.

(4) Since Riverbay will be serving its own load, only 24 MW is available as capacity

(5) Subsequent to publication of the 2010 Gold Book, NYISO standardized the way in which Class Year (CY) ratings are set. Gold Books will continue to be consistent with CY ratings at time of publication.

3. RNA Base Case Assumptions, Drivers and Methodology

The NYISO has established procedures and a schedule for the collection and submission of data and for the preparation of the models used in the RNA. The NYISO's procedures are designed to allow its planning activities associated with the CSPP to be aligned and coordinated with the related activities of the NERC, NPCC, and NYSRC and to be performed in an open and transparent manner. The assumptions underlying the RNA were reviewed at the Transmission Planning Advisory Subcommittee (TPAS) and the Electric System Planning Working Group (ESPWG). The Study Period analyzed in the 2010 RNA is the 10-year period from 2011 through 2020 for both the Base Case and Scenarios.

The RNA Base Case consists of the first Five Year Base Case and the system representations for the second five years of the Study Period as required by Attachment Y of the tariff. All studies and analyses in the RNA Base Case reference a common energy forecast, which is the Baseline Forecast from the 2010 Load and Capacity Data Report, also known as the "Gold Book". The Baseline Forecast is an econometric forecast with an adjustment for statewide energy efficiency programs. This forecast is the 2010 RNA Base Case forecast.

The Five Year Base Case was developed based on:

- The most recent Annual Transmission Reliability Assessment (ATRA) base case
- Input from Market Participants and
- The procedures set forth in the applicable planning manual.

Projections for the installation and retirement of resources and transmission facilities are developed in conjunction with Market Participants and Transmission Owners and included in the Base Case. Resources that may choose to participate in markets outside of New York are modeled as contracts thus removing their available capacity for meeting resource adequacy requirements in New York.

The NYISO developed the system representation for the second five years of the Study Period by starting with the first Five Year Base Case plus:

- The most recent Load and Capacity Data Report published by the NYISO on its Web site
- The most recent versions of NYISO reliability analyses and assessments provided for or published by NERC, NPCC, NYSRC, and neighboring control areas
- Information reported by neighboring control areas such as power flow data, forecasted energy, significant new or modified generation and transmission facilities, and anticipated system conditions that the NYISO determines may impact the bulk power transmission facilities (BPTF)

- Market Participant input and
- Procedures set forth in the applicable planning manual.

Based on this continuing process, the network model for the second five-year period incorporates LTPs and neighboring system plans in addition to those incorporated in the first Five Year Base Cases. The changes in the MW and MVAr components of the load model were made to maintain a constant power factor.

The 2010 RNA Base Case model of the New York bulk power system includes the following new and proposed facilities and forecasts in the Gold Book:

- TO projects on non-bulk power facilities included in the FERC 715 Cases
- LTPs identified in the 2010 Gold Book as firm plans
- Facilities that have accepted their Attachment S cost allocations and are in service or under construction as of April 1, 2010
- Facilities that have obtained a NYS PSC Certificate (or other regulatory approvals and SEQRA review) and an approved System Reliability Impact Study ("SRIS") and an executed contract with a credit-worthy entity
- Transmission upgrades related to any projects and facilities that are included in the RNA Base Case, as defined above
- Facility reratings and uprates
- Scheduled retirements
- Special Case Resources (SCR) and the impacts of the state's energy efficiency programs, as developed and reviewed at the Electric System Planning Working Group (ESPWG) in accordance with the procedures established for the RNA
- External System Modeling.

The RNA Base Case does not include all projects currently listed on the NYISO's interconnection queue or those shown in the 2010 Gold Book. Table 3-3 includes only those projects which meet the screening requirements for inclusion.

Pursuant to Section 5.5 of Attachment Y of the OATT, the NYISO also develops reliability scenarios for the first five years and second five years of the Study Period considering, among other things, energy forecast uncertainty, new resources, retirements, and environmental programs that are currently pending or under consideration. The NYISO also conducts sensitivity analyses pursuant to Section 5.6 of OATT Attachment Y to test the robustness of the needs assessment studies and identify conditions under which Reliability Criteria may not be met.

3.1. Impact of Energy Efficiency Programs on the Forecast

The 2010 Gold Book contains two of the three forecasts used in the 2010 RNA. The first forecast produced is an econometric forecast[2] of annual energy and peak demand that does not include the impacts of the statewide 15x15 energy efficiency programs. The second forecast, which is used for the 2010 RNA Base Case, includes a reduction to the econometric forecast for a portion of the full impact of the statewide 15 x 15 energy efficiency initiative. The second forecast reflects an achievement of 51% of the statewide goal by the end of the forecast horizon in 2020. The third forecast was prepared for the 45 x 15 scenario and reflects 100% of the 15 x 15 energy goal by 2015.

As part of the EEPS Proceeding, the NYS PSC directed a series of working groups composed of all interested parties to the Proceeding to obtain information needed to further elaborate its goal. The NYS PSC issued an Order on June 23, 2008, setting short-term goals for programs to be implemented in the 2008-2011 period to begin the process of satisfying the NYS PSC's goal as applied to the entities over which it has jurisdiction. The NYS PSC anticipated that LIPA, NYPA and other state agencies would implement their own programs, including energy efficiency, improvements in building codes and new appliance standards.

The NYISO has been a party to the EEPS proceeding from its inception and is a member of the Evaluation Advisory Group, responsible for advising the NYDPS on the methods to be used to track program participation and measure the program costs, benefits, and impacts on electric energy usage. In conjunction with the consensus view of market participants in the Electric System Planning Working Group, the NYISO developed energy forecasts for the potential impact of the EEPS over the 10-year planning period. The following factors were considered in developing the 2010 RNA Base Case forecast:

- NYS PSC-approved spending levels for the programs under its jurisdiction, including the Systems Benefit Charge and utility-specific programs
- Expectation of increased spending levels after 2011
- Expected realization rates, participation rates and timing of planned energy efficiency programs
- Degree to which energy efficiency is already included in the NYISO's econometric energy forecast
- Impacts of new appliance efficiency standards, and building codes and standards

[2] See Appendix C

- Specific energy efficiency plans proposed by LIPA, NYPA and Consolidated Edison Company of New York, Inc. (Con Edison)
- The actual rates of implementation of EEPS, based on data received from Department of Public Service staff.

Table 3-1(a) below summarizes the 2010 RNA econometric forecast, the 2010 RNA Base Case forecast and the 2010 RNA 15 x 15 forecast. Table 3-1(b) shows a comparison of the Base Case forecasts and energy efficiency program impacts contained in the 2009 RNA and the 2010 RNA.[3]

The 2010 RNA 15x15 forecast was derived from the 15 x 15 forecast from the 2009 RNA, which was 157,380 GWh in the year 2015 based on the required 15% reduction for 2015. In this 2010 RNA, the 2015 Base Case forecast has been reduced by 10,800 GWh due to the 2009 recession and subsequent lower economic growth projections, as compared to the 2009 RNA Base Case forecast. Therefore, the 2015 energy forecast taken from the 2009 RNA's 15 x 15 scenario was used to conduct the 45x15 scenario used in the 2010 RNA.[4]

The peak demand savings in the 2010 RNA are the same or slightly lower in some years than those in the 2009 RNA, even though the energy impacts are larger. This is attributed to the fact that many of the residential sector programs (and residential lighting in particular) will have much less impact on peak day summer afternoons than during evening hours. The current share of EEPS program impacts is dominated by residential lighting[5]. The peak demand impacts in the 2010 RNA are only expected to exceed those projected in the 2009 RNA in the later years of the forecast.

While the 2010 RNA Base Case projects that savings from statewide energy efficiency programs will accrue more slowly in 2010 than projected in the 2009 RNA Base Case, the programs are expected (based on NYS PSC spending projections) to ramp up thereafter and achieve a higher level of cumulative energy savings by 2015 in the 2010 Base Case than previously projected in the 2009 Base Case.

The 2010 projection of these program impacts was discussed with all market participants during multiple meetings of the Electric System Planning Working Group. The ESPWG accepted the projection of impacts used in the 2010 RNA Base Case forecast in accordance with procedures established for the RNA.

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[3] These numbers are not the same as the PSC's goals as identified in Order 07-M-0548 which have remained unchanged.

[4] The energy usage level for 2015 in the 15x15 forecasts for 2009 and 2010 are identical as shown in Fig 3-1(b). While the PSC's goals have not changed, the forecast of energy usage without energy efficiency has been reduced

[5] The EEPS Status Report for the First Quarter of 2010 reports 100 GWh savings for the NYSERDA CFL Expansion Program, out of 159 GWh savings in total.

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Table 3-1 (a): 2010 RNA Forecast

2010 RNA Annual Energy Forecasts

Annual GWh	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
2010 Econometric Forecast	161,334	163,305	166,616	170,360	172,969	175,286	177,827	179,844	182,172	184,540	187,015
2010 RNA Base Case Forecast	160,358	160,446	161,618	163,594	164,556	165,372	166,472	167,517	169,132	171,161	173,332
2010 RNA 15x15 Forecast	159,914	159,402	158,892	158,384	157,877	157,380	159,660	161,469	163,558	165,682	167,902

2010 RNA Peak Forecasts

Annual MW	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
2010 Econometric Forecast	33,199	33,651	34,192	34,844	35,285	35,696	36,147	36,565	36,983	37,401	37,843
2010 RNA Base Case Forecast	33,025	33,160	33,367	33,737	33,897	34,021	34,193	34,414	34,672	34,986	35,334
2010 RNA 15x15 Forecast	32,934	32,945	32,805	32,662	32,521	32,377	32,794	33,172	33,529	33,866	34,227

Statewide Energy Efficiency Impacts, Measured from 2010 Econometric Forecast (GWh)

Cumulative GWh	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
2010 RNA Base Case	976	2,860	4,997	6,765	8,413	9,914	11,355	12,327	13,040	13,379	13,684
2010 RNA 15x15 Forecast	1,420	3,903	7,723	11,976	15,092	17,906	18,167	18,375	18,615	18,858	19,113

Statewide Energy Efficiency Impacts, Measured from 2010 Econometric Forecast (MW)

Cumulative MW	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
2010 RNA Base Case	174	491	825	1,107	1,388	1,675	1,954	2,151	2,311	2,415	2,510
2010 RNA 15x15 Forecast	266	706	1,387	2,181	2,764	3,320	3,353	3,393	3,453	3,535	3,616

Table 3-1(b): Comparison of 2009 & 2010 RNA Base Case Forecasts

Comparison of Base Case Energy Forecasts - 2009 & 2010 RNA (GWh)

Annual GWh	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
2009 RNA Base Case	166,677	168,127	169,747	170,953	171,926	173,158	174,799	176,176	178,250	179,283	180,427		
2010 RNA Base Case			160,358	160,446	161,618	163,594	164,556	165,372	166,472	167,517	169,132	171,161	173,332
Change from 2009 RNA			-9,389	-10,508	-10,308	-9,564	-10,243	-10,804	-11,778	-11,766	-11,295	NA	NA

Comparison of Base Case Peak Forecasts - 2009 & 2010 RNA (MW)

Annual MW	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
2009 RNA Base Case	33,792	34,059	34,269	34,462	34,586	34,725	34,905	35,029	35,258	35,430	35,658		
2010 RNA Base Case			33,025	33,160	33,367	33,737	33,897	34,021	34,193	34,414	34,672	34,986	35,334
Change from 2009 RNA			-1,244	-1,302	-1,218	-988	-1,008	-1,008	-1,065	-1,016	-986	NA	NA

Comparison of Energy Impacts from Statewide Energy Efficiency Programs - 2009 RNA & 2010 RNA (GWh)

Cumulative GWh	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
2009 RNA Base Case	172	913	1,828	2,835	4,165	5,511	6,798	8,086	8,802	9,519	10,235		
2010 RNA Base Case			976	2,860	4,997	6,765	8,413	9,914	11,355	12,327	13,040	13,379	13,684
Change from 2009 RNA			-852	25	833	1,255	1,615	1,828	2,553	2,808	2,805	NA	NA

Comparison of Peak Impacts from Statewide Energy Efficiency - 2009 RNA & 2010 RNA (MW)

Cumulative MW	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
2009 RNA Base Case	35	188	379	590	867	1,145	1,412	1,678	1,828	1,977	2,126		
2010 RNA Base Case			174	491	825	1,107	1,388	1,675	1,954	2,151	2,311	2,415	2,510
Change from 2009 RNA			-205	-100	-42	-39	-24	-3	126	174	184	NA	NA

Note: The energy usage level for 2015 in the 15x15 forecasts for 2009 and 2010 are identical as shown in Fig 3-1(b). While the NYS PSC goals have not changed, the forecast of energy usage without energy efficiency has been reduced

Figure 3-1: 2010 Base Case Forecast and Scenarios

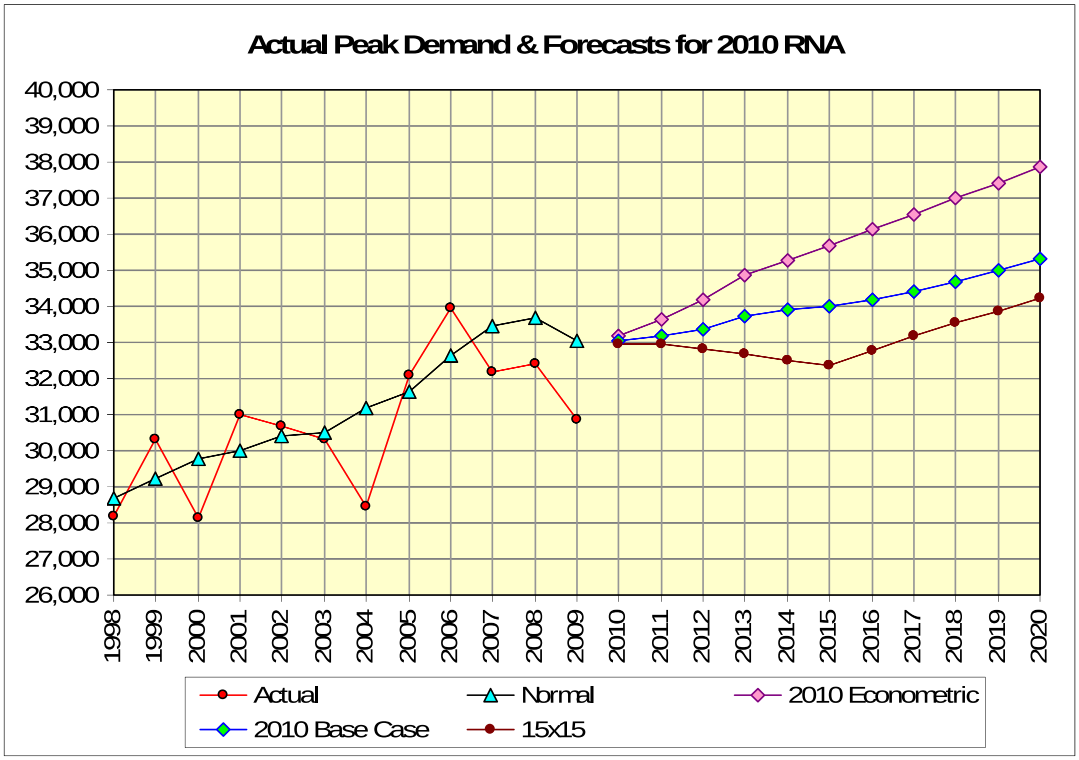
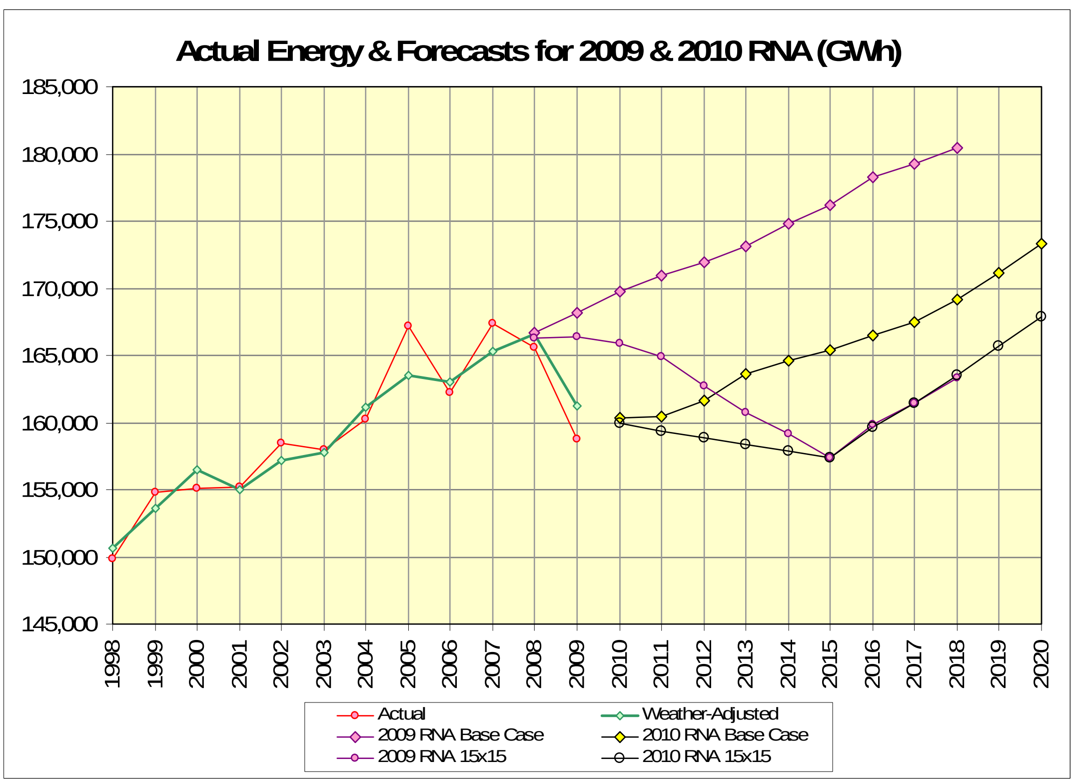


Figure 3-1(b): Comparison of 2009 & 2010 RNA Energy Forecasts



The reporting standard for energy efficiency programs requires a brief explanation. Energy savings measures and processes are installed throughout the course of an entire year. The energy savings achieved by a measure installed in January will be higher than the same measure installed in June or December, all else equal. But even though it will take a full twelve months from the date of installation to achieve the annual energy savings for a given measure, its 'annualized savings' are counted as if the measure was installed on January 1 of the given year. This simplifies the task of reporting summary results. Program databases contain the dates of the measure installations in the event a more accurate month-by-month accounting of impacts is required.

Based on this framework, NY DPS staff recently issued a report[6] indicating that 159 GWh in annualized impacts (about 10% of the 2010 EEPS annual goal of 1640 GWh) were in place by the end of the first quarter, based on initial data provided to DPS by EEPS program administrators, which are the state's investor owned utilities and NYSERDA. The NYISO, together with all statewide energy efficiency program administrators, continues to monitor and evaluate the progress of the EEPS and other energy efficiency programs. The NYISO makes periodic reports to the ESPWG. The NYISO also requested information from the other major program administrators (NYPA & LIPA) regarding their program activities.

The estimated energy reductions achieved by all major program administrators is shown in Table 3-2. The estimated impacts due to building codes and appliance efficiency standards are not included. The energy reductions are preliminary estimates since measurement and verification studies have not yet been performed. NYSERDA is listed twice because its programs administered under the NYS PSC's Systems Benefit Charge were in existence prior to the statewide 15x15 initiative. An additional set of NYSERDA programs are also administered under the EEPS.

Table 3-2: Statewide Energy Efficiency Program Achievements - 2008 to 2010 Q1

Annualized Energy Reductions - GWh

Program Administrator	2008	2009	2010 Q1	Cumulative Reductions
NYSERDA SBC Programs	160	600	230	990
LIPA Programs	142	129	71	342
NYPA Programs	54	51	34	139
EEPS (NYSERDA & IOUs)	0	80	79	159
TOTAL	356	860	914	1630

6 "Program administrators report that electric energy efficiency measures installed to date will reduce average annual consumption by 158,591 MWhs...", Energy Efficiency Portfolio Standard Program Implementation Status Through the First Quarter 2010, Office of Energy Efficiency and Environment, New York Department of Public Service, May 4, 2010.

3.2. Forecast of Special Case Resources

The SCR forecast for the 2010 RNA Base Case was based on the 2010 Gold Book value of 2251 MW. As was done in the 2009 RNA, this projected value of SCRs was assumed to be constant for the 10-Year Study Period and therefore 2251 MW of SCRs was assumed to be present in the horizon year. MARS was then used to calculate the SCR values for each hour in each year of the Study Period based upon the ratio of the hourly load to the peak load in the Study Period. Therefore, the SCR value for each hour modeled in the 2010 RNA is derived, but will also vary slightly, from the Gold Book value, which is also assumed to be the peak SCR value during the Study Period. The 2009 RNA projected a peak SCR value of 2084 MW. The 2010 RNA peak SCR value for 2018 shows an increase of 126 MW over the 2084 MW projected in the 2009 RNA for year 2018. The MW level for SCRs at the time of annual projected peak load is shown in table 3-5

3.3. Resource Additions

Table 3-3 presents the unit additions, which were represented in the RNA Base Case.

3.4. Local Transmission Plans

As part of the LTPP, Transmission Owners completed the LTPs and presented them to the NYISO and Stakeholders. The NYISO reviewed the plans and they are included in the 2010 Gold Book. Table 3-4 presents all of the firm transmission plans from the LTPs that were included in the 2010 Gold Book and also were included in the RNA Base Case. Subsequent to RNA Base Case assumptions being finalized, National Grid informed NYISO that changes in the area peak loads have caused them to withdraw the Paradise Project from their LPT. Future NYISO studies will adjust the peak loads and transmission configuration.

Table 3-3: Unit Additions

	Queue	Project Name [4]	2010	2011	2012	2013	Total MW
New Thermal Units							
	69	Empire Generating (July 2010) [3]	635				635
	232	Bayonne Energy (June 2011)		513			513
	308	Astoria Energy II (June 2011)		550			550
	237A	Chautauqua Landfill (Feb 2010)	6				6
	N/A[1]	Riverbay (June 2010) [3]	24				24
		New Thermal Units Sub-Total	**665**	**1063**	**0**	**0**	**1728**
New Wind							
	234	Steel Winds II (Nov 2010)* [3]	15				15
		New Wind Sub-Total	**15**	**0**	**0**	**0**	**15**
Unit Uprates							
	185	Blenheim-Gilboa Unit 4 uprate (June 2010) [3]	30				30
	216	Nine Mile Point II (June 2012) [3]			168		168
	127A	Munnsville Wind Power (Dec 2013) [3]				6	6
		Unit Uprates Sub-Total	**30**	**0**	**168**	**6**	**204**
Other							
	260	Stephentown 20 MW Flywheel (Sept. 2010)[2]					
Retired Units							
		Retired Units	**0**	**0**	**0**	**0**	**0**
		Grand Total	**710**	**1063**	**168**	**6**	**1947**

Notes:

(1) Riverbay did not go through the NYISO Interconnection study process since it is connected to a non-FERC jurisdictional line. Only the available capacity is shown.

(2) Stephentown is modeled as a regulation resource.

(3) Included in 2009 RNA.

(4) Subsequent to publication of the 2010 Gold Book, NYISO standardized the way in which Class Year (CY) ratings are set. Gold Books will continue to be consistent with CY ratings at time of publication.

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Table 3-4: Firm Transmission Plans (2010 Gold Book)

Queue Pos.	Transmission Owner	Terminals		Line Length miles (1)	Expected Service Date/Yr Prior to (2)	Year	Nominal Voltage in kV Operating	Design	# of ckts	Thermal Rating[11] Summer	Winter	Project Description (10) / Conductor Size	Class Year / Type of Construction
	Merchant												
206	Hudson Transmission Partners	Bergen 230 kV (New Jersey)	West 49th Street 345kV			2011	345	345		660 MW	660 MW	back- to- back AC/DC/AC converter, 345 kV AC cable	2008
	Firm Plans (included in 2010 RNA)												
	CHGE	E. Fishkill	E. Fishkill	xfmr #2	S	2010	345/115	345/115	1	440MVA	560MVA	Transformer #2 (Standby)	
	CHGE	Hurley Ave	Saugerties	11.11	W	2018	115	115	1	1114	1359	1-795 ACSR	OH
	CHGE	Saugerties	North Catskill	12.25	W	2018	115	115	1	1114	1359	1-795 ACSR	OH
	CHGE	Hurley Ave	North Catskill	23.36	S	2020	115	115	1	1114	1359	1-795 ACSR	OH
	CHGE (4)	Pleasant Valley	Todd Hill	5.60	S	2015	115	115	1	1280	1563	1-795 ACSR	OH
	CHGE (4)	Todd Hill	Fishkill Plains	5.23	S	2015	115	115	1	1280	1563	1-795 ACSR	OH
	ConEd	Sprain Brook	Sherman Creek	10.00	S	2011	345	345	1	872	1010	2000 CU	UG
	ConEd	Vernon	Vernon	Phase Shifter	S	2012	138	138	1	300MVA	300MVA	Phase Shifter	-
	ConEd	Farragut	East 13th Street	1.98	S	2010	345	345	1	1350	n/a	Refrigeration Cooling	UG
	ConEd	Farragut	East 13th Street	1.98	S	2010	345	345	1	1395	n/a	Refrigeration Cooling	UG
	LIPA	Riverhead	Canal	16.40	S	2012	138	138	1	846	973	2368 KCMIL (1200 mm²) Copper XLPE	UG
	NYPA (5)	Willis 1	Duley	-24.38	S	2011	230	230	1	996	1200	1-795 ACSR	OH
	NYPA (5)	Willis 1	Patnode	9.10	S	2011	230	230	1	996	1200	1-795 ACSR	OH
	NYPA (5)	Patnode	Duley	15.27	S	2011	230	230	1	996	1200	1-795 ACSR	OH
	NYSEG (6)	Wood Street	Carmel	1.34	S	2012	115	115	1	775	945	477 ACSR	OH
	NYSEG (6)	Wood Street	Katonah	11.70	S	2012	115	115	1	775	945	477 ACSR	OH
	NYSEG (4)	Etna	Clarks Corners	14.95	W	2010	115	115	1	1410	1725	1277 KCM ACAR	OH
	NYSEG	Etna	Clarks Corners	14.95	W	2010	115	115	1	1410	1725	1277 KCM ACAR	OH
	NYSEG	Clarks Corners	Clarks Corners	xfmr	W	2010	345/115	345/115	1	200MVA	220MVA	Transformer	
	NYSEG	Clarks Corners	Clarks Corners	xfmr	W	2010	345/115	345/115	1	200MVA	220MVA	Transformer	
	NYSEG	Avoca	Stony Ridge	20.10	S	2011	230	230	1	1200	1200	1033.5 ACSR	OH
	NYSEG	Stony Ridge	Hillside	26.70	S	2011	230	230	1	1200	1200	1033.5 ACSR	OH
	NYSEG	Stony Ridge	Stony Ridge	xfmr	S	2011	230/115	230/115	1	225MVA	270MVA	Transformer	OH
	NYSEG	Stony Ridge	Sullivan Park	6.20	S	2011	115	115	1	1255	1531	1033.5 ACSR	OH
	NYSEG	Sullivan Park	West Erie	3.20	S	2011	115	115	1	1255	1531	1033.5 ACSR	OH
	NYSEG	Meyer	Meyer	Cap Bank	S	2011	115	115	1	15MVAr	15MVAr	Capacitor Bank Installation	-
	NGRID	Paradise Ln 115 kV	Paradise Ln 115 kV	-	S	2012	-	-	-	-	-	115 kV Switchyard	-
	NGRID	Spier	Rotterdam	7.80	S	2010	115	115	1	1114	1359	Replace 7.8 miles of 795kcmil ACSR (Brook-Balstn Tps)	OH
	NGRID	Spier	Luther Forest (New Station)	33.50	W	2010	115	115	1	TBD	TBD	Spier-Rotterdam Loop (2.8 miles new)	OH+UG
	NGRID	Luther Forest (New Station)	Rotterdam	19.90	W	2010	115	115	1	TBD	TBD	Spier-Rotterdam Loop (2.8 miles new)	OH+UG
	NGRID	Mohican	Luther Forest (New Station)	39.00	W	2010	115	115	1	TBD	TBD	Mohican-North Troy #3 Loop w/Mulb Tap (5.9 miles new)	OH
	NGRID	Luther Forest (New Station)	North Troy	17.90	W	2010	115	115	1	TBD	TBD	Mohican-North Troy #3 Loop w/Mulb Tap (5.9 miles new)	OH
	NGRID	Gardenville	Homer Hill	21.00	S	2011	115	115	2	TBD	TBD	115 kV line Replacement	-
	O & R	Ramapo	Sugarloaf	16.00	W	2010	138	138	1	1089	1298	2-1590 ACSR	OH
	O & R	Hillburn	Sloatsburg	3.00	W	2010	69	69	1	1982	2364	2- 795 ACSR	OH
	RGE	Station 135	Station 424	4.98	W	2010	115	115	1	1225	1495	1-1033.5 ACSR	OH
	RGE	Station 13A	Station 135	3.17	W	2010	115	115	1	1225	1495	1-1033.5 ACSR	OH
	RGE	Station 180	Station 180	Cap Bank	S	2011	115	115	1	10MVAr	10MVAr	Capacitor Bank Installation	-
	RGE	Station 128	Station 128	Cap Bank	S	2011	115	115	1	20MVAr	20MVAr	Capacitor Bank Installation	-
	RGE	Station 124	Station 124	Phase Shifter	S	2013	115	115	2	250MVA	250MVA	Phase Shifter	
	RGE	Station 124	Station 124	SVC	S	2013	115	115	1	200MVAr	200MVAr	SVC	

(1) Line Length Miles - negative values indicate removal of Existing Circuit being tapped
(2) S = Summer Peak Period W = Winter Peak Period
(3) Class 2009 - in progress
(4) Reconductoring of Existing Line
(5) Segmentation of Existing Circuit
(6) 115 kv operation as opposed to previous 46 kV operation
(7) Upgrade of existing 69 kV to 138 kV operation
(8) Partial NNC upgrade done in 2008 and full NNC upgrade will be done in 2016 with NNC 450 MW Operation (including Northport-Pilgrim Upgrade)
(9) Rerate of the (3 cables) that were replaced in 2008 from 301 MVA, LIPA owns 50% of the NNC cable
(10) Some of these proposed facilities reflect reconfiguration of the existing facilities
(11) Thermal Ratings in Amperes, except where labeled otherwise.

Note: The Paradise project was withdrawn by National Grid in May 2010

3.5. Resource Retirements

Table 3-5 below presents the unit retirements which were represented in the 2010 RNA Base Case:

Table 3-5: Scheduled Unit Retirements *

Unit/ Year	2009	2010	
Poletti**		891	
Greenidge 3	52		
Westover 7	40		
Total MW	**92**	**891**	**983**

* The retirement of the Energy Systems North East, LLC unit connected to Zone A (88 MW) was not included since its notification of retirement was received after the publication of the 2010 Gold Book.

** Unit retirements included in 2009 RNA

3.6. Base Case Peak Load and Resource Margins

The unit retirements and additions, when combined with the existing generation as of April 1, 2010 in the 2010 Gold Book and other adjustments, resulted in the 2010 RNA Base Case Peak Load and Resource Margins found in Table 3-6 below:

Table 3-6: NYCA Peak Load and Resource Margins 2011 through 2020

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Peak Load										
NYCA	**33,160**	**33,367**	**33,737**	**33,897**	**34,021**	**34,193**	**34,414**	**34,672**	**34,986**	**35,334**
Zone J	11,775	11,815	11,925	11,995	12,065	12,120	12,218	12,298	12,404	12,510
Zone K	5384	5432	5455	5470	5489	5554	5586	5631	5685	5771
Resources										
NYCA										
Capacity (1)	40,447	40,647	41,338	41,239	41,239	41,239	41,239	41,239	41,239	41,239
SCR (2)	2065	2091	2151	2165	2171	2180	2193	2210	2230	2251
Total	**42,512**	**42,738**	**43,489**	**43,404**	**43,410**	**43,419**	**43,432**	**43,449**	**43,469**	**43,490**
Res./Load Ratio	128.2%	128.1%	128.9%	128.0%	127.6%	127.0%	126.2%	125.3%	124.2%	123.1%
Zone J										
Capacity	10,332	10,332	10,332	10,332	10,332	10,332	10,332	10,332	10,332	10,332
SCR	569	571	576	580	583	586	591	594	600	605
Total	**10,901**	**10,903**	**10,908**	**10,912**	**10,915**	**10,918**	**10,923**	**10,926**	**10,932**	**10,937**
Res./Load Ratio	92.6%	92.3%	91.5%	91.0%	90.5%	90.1%	89.4%	88.8%	88.1%	87.4%
Zone K										
Capacity	6311	6311	6311	6311	6311	6311	6311	6311	6311	6311
SCR	188	189	190	191	191	193	195	196	198	201
Total	**6499**	**6500**	**6501**	**6502**	**6502**	**6504**	**6506**	**6507**	**6509**	**6512**
Res./Load Ratio	120.7%	119.7%	119.2%	118.9%	118.5%	117.1%	116.5%	115.6%	114.5%	112.8%

(1) "Capacity" values include resources electrically internal to NY, Additions, Reratings, Retirements, Purchases and Sales, and UDRs with firm capacity. Generation resources are based on Summer Capability and not Nameplate.

(2) SCR values reflect the Year 2020 value as stated in the 2010 Gold Book.

Table 3-7 below presents the comparison between the 2009 RNA and 2010 RNA in Peak Load forecast, unit additions, unit retirements, and SCRs. The 2010 RNA Peak Load forecast decreased by 986 MW, while the overall NYCA capacity increased by 787 MW and SCRs increased by 126 MW for Year 2018.

Table 3-7: 2009 RNA - 2010 RNA Load and Capacity Comparison

	2009 RNA Horizon Year 2018	2010 RNA Year 2018	Year 2018 Delta MW	2010 RNA Horizon Year 2020
NYCA Load	35,658	34,672	-986	35,334
SCR	2084	2210	126	2251
Capacity without SCRs	40,452	41,239	787	41,239
Unit Retirements	1272	983	-289	983

3.7. Methodology for the Determination of Needs

Reliability Needs are defined by the OATT in terms of total deficiencies relative to Reliability Criteria determined from the assessments of the BPTFs performed for this RNA. There are two different steps to analyzing the reliability of the BPTFs. The first is to evaluate the security of the transmission system; the second is to evaluate the adequacy of the system, subject to the security constraints. The NYISO's existing planning procedures include both security and adequacy assessments. The NYISO conducts transmission adequacy and resource adequacy assessment jointly.

Security is the ability of the power system to withstand sudden disturbances and/or the unanticipated loss of system elements and continue to supply and deliver electricity. Compliance with security criteria is assessed deterministically. Security is a deterministic concept, with potential disturbances being treated with equal likelihood in the assessment. These disturbances (single contingency and multiple contingencies) are explicitly defined in the reliability rules as design criteria contingencies. The impact of applying these design criteria contingencies is assessed to ensure no thermal loading, voltage or stability violations exist. These design criteria contingencies are sometimes referred to as N-1 or N-1-1. In addition, the NYISO performs a short circuit analysis to determine that the system can clear faulted facilities reliably under short circuit conditions. The NYISO "Guideline for Fault Current Assessment" is used in this study.

Resource adequacy is the ability of the electric systems to supply and deliver the total quantity of electricity demanded at any given time taking into account scheduled and unscheduled outages of system elements. Resource adequacy considers the transmission systems, generation resources and other capacity resources, such as demand response. Resource adequacy assessments are performed on a probabilistic basis to capture the randomness of system element outages. A system is adequate if the probability of having sufficient transmission and generation to meet expected demand is equal to or less than the system's standard, which is expressed as a LOLE. The New York State bulk power system is planned to meet a LOLE that, at any given point in time, is less than or equal to an involuntary load disconnection that is not more frequent than once in every 10 years, or 0.1 events per year[7]. This requirement forms the basis of New York's ICAP requirement.

If Reliability Needs are identified, compensatory MW for the New York Control Area (NYCA) are developed where appropriate by adding generic 250 MW generating units to zones to address the zone-specific needs. The compensatory MW amounts and locations are based on a review of binding transmission constraints and zonal LOLE in an iterative process to determine when Reliability Criteria are satisfied. These additions are used to estimate the amount of resources generally needed to satisfy Reliability Needs. The compensatory MW additions are not intended to represent specific proposed solutions. Resource needs could potentially be met by other combinations of resources in other areas including generation, transmission and demand response measures. Due to the differing natures of supply and demand-side resources and transmission constraints, the amounts and locations of resources necessary to match the level of compensatory MW needs identified will vary. Resource needs could be met in part by transmission system reconfigurations that increase transfer limits, or by changes in operating protocols. Operating protocols could include such actions as using dynamic ratings for certain facilities, operating exceptions, or special protection systems.

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7 RNA Study results are rounded to two decimal places. A result of exactly 0.01, for example, would correspond to one event in one hundred years.

4. Reliability Needs Assessment

4.1. Overview

Reliability is defined and measured through the use of the concepts of security and adequacy. The NYISO first performs analysis of Transmission Security criteria violations. Then the NYISO assesses Transmission Adequacy and Resource Adequacy jointly with the use of General Electric's Multi Area Reliability Simulation (MARS) software package. This is done through the development of interface transfer limits and a Monte Carlo base simulation of the probabilistic outages of capacity and transmission outages.

4.2. Reliability Needs for Base Case

Below are the principal findings of the RNA for the 2011-2020 Study Period. The needs assessment evaluated scenarios which are described in Section 4.4 below.

4.2.1. Transmission Security Assessment

Identifying Reliability Needs requires analysis and assessment of the transmission security of the BPTFs. The NYISO performed AC contingency analysis of the BPTFs to test for thermal and voltage violations under pre- and post- contingency conditions (per NERC Standards TPL-001, -002, and -003) using Siemens PTI PSS®MUST program utilizing the AC Contingency Analysis activity. More detailed analysis was performed for critical contingency evaluation and transfer limit evaluation using the power-voltage (P-V) curve approach as described in NYISO Transmission Planning Guideline #2-0 and Operating Engineering Voltage Guideline (dated April 11, 2006) using the Siemens PTI PSS®E (Rev. 30) software package. The impact of the status of critical generators on transfer limits was also quantified. Throughout the study period (2011 – 2020) security for the BPTFs is and will be maintained by limiting power transfers. To assist in its assessment, the NYISO also reviewed many previously completed transmission security assessments.

The NYISO performed the transmission system performance testing required for the RNA Base Case. The results of the AC contingency analysis demonstrated that the BPTFs were within the facilities' thermal and voltage limits. The testing included the ability of the BPTF to withstand the loss of any single facility as specified in the NYSRC Rules. NYISO is in the process of conducting a more thorough N-1-1 transmission security analysis as part of the upcoming

Comprehensive Annual Transmission Review (ATR) for the 2010 review.[8]

Transmission security analysis has revealed that a BPTF double circuit tower contingency outage in Rockland County produced local transmission system line loadings in excess of equipment ratings; however, no violation of Reliability Criteria occurred on the bulk power system. While it is likely that there will be local line loadings elsewhere in the upstate NYCA system in excess of equipment ratings attributed to contingencies within the BPTF, these loadings will be addressed in the applicable LTP. The local TOs have operating procedures and plans in place to address the local area non-bulk power system issues.

4.2.2. Short Circuit Assessment

Another important element of performing a transmission security assessment is the calculation of short circuit current to ascertain whether the circuit breakers present in the system would be subject to fault levels in excess of their rated interrupting capability. The analysis was performed for the year 2015 reflecting the study conditions outlined in Sections 3.4, 3.5 and 3.6. The calculated fault levels would be constant over the second five years because the methodology for fault duty calculation is not sensitive to load growth. The detailed analysis is presented in Appendix D of this report.

The overdutied circuit breakers at Farragut occur with the addition of two new projects, Bayonne Energy Center (Class Year 2009) and Astoria Energy II (Class Year 2010), connected to the Con Edison and NYPA systems, respectively. Pursuant to Attachment S of the NYISO OATT, the NYISO will identify necessary mitigation solutions for the overdutied breakers and perform cost allocation of any identified upgrades during the applicable Class Year studies.

National Grid's circuit breaker ratings and ratings methodology are currently under review. If breaker duties are found to exceed the ratings

[8] "N-1-1" means that the applicable reliability criteria apply after any critical element such as a generator, transmission circuit, transformer, series or shunt compensating device, or high voltage direct current (HVDC) pole has already been lost and after generation and power flows have been adjusted between outages by the use of ten-minute operating reserve and, where available, phase angle regulator control and HVDC control.

based on NYISO's fault current assessment, the local TOs will work with the NYISO to develop mitigation plans.

4.2.3. Resource and Transmission Adequacy

The 2010 RNA Base Case Peak Load forecast, which includes reductions for the EEPS program impact, was utilized in the analysis to determine transmission system transfer limits. Tables 4-1, 4-2 and 4-3 below provide the thermal and voltage transfer limits for the major NYCA interfaces.

Table 4-1: Transmission System Thermal Transfer Limits for Key Interfaces in MW

Interface	2010 RNA						2009 RNA study		
	2011	2012	2013	2014	2015	2020	2011	2012	2013
Dysinger East	2725	3125	3200	3175	3175	3125	3050	2925	3075
West Central	1475	1875	1850	1900	1900	1750	1825	1800	1825
Central East less PV-20 plus Fraser-Gilboa	3250	3525	3475	3475	3400	3525	3075	3075	3075
F to G	3500	3475	3475	3475	3525	3500	3450	3450	3450
UPNY-SENY less Ramapo 500kV tie	5250	5400	5400	5400	5475	5500	5150	5150	5150
I to J	4350	4350	4350	4350	4400	4400	4400	4400	4400
I to K	1290	1290	1290	1290	1290	1290	1290	1290	1290

The thermal limits on the Dysinger East and West Central interfaces for year 2011 were more than 300 MW lower when comparing the 2010 RNA analysis to the limits from the 2009 RNA analysis. This is due to a significantly higher base loading of the limiting facility Wethersfield – Meyer 230 kV. Despite this reduction in the thermal limits, the limits used in the MARS analysis for Dysinger East and West Central were higher in the 2010 RNA analysis, since the voltage limits were more constraining, as shown in Table 4-3.

Table 4-2: Transmission System Voltage Transfer Limits for Key Interfaces in MW

Interface	2010 RNA study						2009 RNA study		
	2011	2012	2013	2014	2015	2020	2011	2012	2013
Dysinger East	2725	2725	2725	2725	2875	2900	2600	2600	2550
West Central	1525	1475	1475	1475	1575	1475	1700	1650	1425
Central East less PV-20 plus Fraser-Gilboa	3250	3350	3375	3350	3350	3350	3050	3050	3050
UPNY-ConEd	5475	5475	5475	5475	5605	5400	5500	5500	5500
I to J & K	5290	5290	5290	5290	5470	5130	5365	5365	5365

Note: The I to J and I to K interfaces are each thermally limited but are combined into one interface grouping since the simultaneous voltage based limit can be less than the sum of the two individual thermal limits.

Table 4-3: Transmission System Base Case Transfer Limits for Key Interfaces in MW

Interface	2010 RNA study						2009 RNA study		
	2011	**2012**	**2013**	**2014**	**2015**	**2020**	**2011**	**2012**	**2013**
Dysinger East	2725 V	2725 V	2725 V	2725 V	2875 V	2900 V	2550 V	2550 V	2550 V
West Central	1475 T	1475 V	1475 V	1475 V	1575 V	1475 V	1425 V	1425 V	1425 V
Central East less PV-20 plus Fraser-Gilboa	3250 V	3350 V	3375 V	3350 V	3350 V	3350 V	3050 V	3050 V	3050 V
F to G	3500 T	3475 T	3475 T	3475 T	3525 T	3500 T	3450 T	3450 T	3450 T
UPNY-SENY less Ramapo 500kV tie	5250 T	5400 T	5400 T	5400 T	5475 T	5500 T	5150 T	5150 T	5150 T
I to J	4350 T	4350 T	4350 T	4350 T	4400 T	4400 T	4400 T	4400 T	4400 T
I to K	1290 T	1290 T	1290 T	1290 T	1290 T	1290 T	1290 T	1290 T	1290 T
I to J & K	5290 C	5290 C	5290 C	5290 C	5470 C	5130 C	5365 C	5365 C	5365 C

Note: T = Thermal; V = Voltage; C = Combined

The transfer limits above are derived from transfer cases that reflect critical system conditions. When comparing the transfer limits calculated for the 2010 RNA to the transfer limits calculated for the 2009 RNA, increases in the Dysinger East, West Central and UPNY-SENY interfaces are evident. Local transmission system upgrades and the addition of a Static VAr Compensator (SVC) in Zone B contributed to the increases in the Dysinger East and West Central transfer limits. Changes to the 345 kV transmission system and base system conditions in ISO-NE contributed to the increase in the UPNY-SENY transfer limit by impacting the distribution of base flow on the UPNY-SENY circuits. When comparing the transfer limit in 2015 to the limit in 2020 calculated for the 2010 RNA, the I to J & K transfer limit decreased. The change is due to increased loading on the overall transmission system between study year 2015 and 2020.

Nomograms for the West Central and Central East transmission interfaces to reflect the variation in voltage transfer limits due to load or generation dispatches were developed for the 2010 RNA. For the West Central interface, the limit is a function of load. If the load in Area A is greater than 2529MW and Area B is greater than 1785 MW, then the West Central limit would be 1475 MW. If the load in Area A is greater than 2669 MW and Area B is greater than 1884MW then the West Central limit would be 1350 MW. For the Central East (plus Fraser-Gilboa and minus Plattsburgh-Sandbar transmission lines) transmission interface, the transfer limit is a function of the number of generating units available in the Oswego

Complex. The following table illustrates the changes in transfer limits as a function of the number of units available in the Oswego Complex:

No. Units In Oswego Complex	Central East Limit (MW)
1	2261
2	2586
3	2693
4	2715
5	2819
6	2976
7	2989
8	3250

Resource and transmission adequacy is evaluated for the entire 10-year Study Period. The RNA Base Case transfer limits under emergency conditions were employed as a critical system condition to determine resource adequacy needs in terms of LOLE.

The transfer limits were calculated for each year of the first five years and for the tenth year of the study period (the end of the second five years). If the transfer limits for the tenth year are significantly lower than the fifth year of the study period such that the load flow case cannot solve, and there are Reliability Needs identified in the first five years, NYISO assumes that solutions resulting in the first five years will restore those limits and counter the continued degradation of the transfer limits in the second five years. Therefore, the NYISO holds the transfer limit values in the second five years constant at the fifth year values. The impact on the transfer limits is determined in the evaluation of solutions to validate this assumption. If the assumption is not validated, additional solutions will be developed. For this RNA, under the Base Case assumptions and assuming that all modeled transmission and generation facilities, including Indian Point, remain in service, no Reliability Needs were identified in the first five years. Therefore, NYISO did not assume solutions would develop and so actual transfer limits were calculated for year ten and a linear approximation for the annual reduction in limits was assumed between year five and year ten.

The results of the 2010 RNA Base Case studies show that the LOLE for the NYCA does not exceed 0.10 days per year in any year through 2020. The LOLE[9] results for the entire 10-year RNA Base Case are summarized in Table 4-4.

[9] It should be noted that the LOLE results presented for each load zone are determined based on two key assumptions: the first is that load in a particular load Zone is first served by the capacity in that load Zone unless modeled as contractually obligated to load in another load Zone or area, and second, excess capacity is prorated among deficient zones simultaneously within a pool first.

Table 4-4: NYCA LOLE for the 2010 RNA Study Base Case*

Area/Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AREA_A										
AREA_B										
AREA_C										
AREA_D										
AREA_E										
AREA_F										
AREA_G									<.01	<.01
AREA_H										
AREA_I									0.01	0.01
AREA_J									0.01	0.01
AREA_K										
NYCA	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**	**0.01**

*Note: Blanks represent an LOLE less than 0.001. An LOLE value of 0.00 represents a rounded value, not a zero probability of loss of load.

In order to avoid over-dependence on emergency assistance from external areas, the external areas' emergency operating procedures are not modeled. Capacity of the external systems is further adjusted so that the interconnected LOLE value of the Areas (Ontario, New England, Hydro Quebec, and PJM) is not less than 0.10 and not greater than 0.15. The External Area LOLE values for the Base Case are illustrated in Table 4-5. The MOD-MW capacity modifications required to establish these LOLE values can be found in Appendix D.

Table 4-5: External Area LOLE for the 2010 RNA Study Base Case

Area/Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
NE	0.12	0.11	0.10	0.10	0.11	0.11	0.11	0.11	0.11	0.11
ONT	0.12	0.13	0.11	0.12	0.14	0.12	0.12	0.11	0.10	0.12
HQ	0.14	0.12	0.13	0.11	0.15	0.10	0.10	0.11	0.10	0.12
PJM	0.10	0.10	0.11	0.14	0.12	0.12	0.12	0.12	0.12	0.12

These results were similar to the results obtained in the 2009 RNA Study. The following Table 4-6 illustrates the NYCA LOLEs from the 2009 RNA Study.

Table 4-6: LOLE for the 2009 RNA Study Base Case

Area/Year	2011	2012	2013	2014	2015	2016	2017	2018
NYCA	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.02

4.2.4. Reliability Needs Summary

Given that the Base Case analysis produced LOLE results that were below 0.1 days per year, for all years in the Study Period, there were no identified transmission security violations for the 10-year Study Period. No additional resources are forecasted to be required to maintain reliability at this time. Accordingly, the NYISO did not apply the compensatory MW methodology that is used to quantify Reliability Needs.

4.3. Scenarios

Scenarios are variations on the RNA Base Case to assess the impact of possible changes in key study assumptions which, if they occurred, could change whether there could be Reliability Criteria violations on the NYCA system during the study period. The following scenarios were evaluated as part of the RNA.

- Forecast Scenarios
    - 2010 Econometric Forecast (from 2010 Gold Book)
    - 45 x 15 Scenario
- Indian Point 2 and 3 Nuclear Unit Retirements
- Zonal Capacity At Risk
- NYSEG ETCNL
- Wheel Throughs

4.3.1. Forecast Scenarios

4.3.1.1. Econometric Forecast Scenario

The RNA Base Case forecast includes projected additional energy reduction impacts associated with statewide energy efficiency programs. The Econometric Forecast Scenario excludes these energy efficiency program impacts from the peak forecast and is shown in Table 3-1. It projects a higher peak load in 2020 than the Base Case forecast by 2510 MW. Since the peak load in the econometric forecast is higher than the Base Case, the probability of violating the LOLE criterion increases.

The econometric forecast scenario results in Table 4-7 show that LOLE violations would occur in the years 2019 and 2020. The LOLE increased in 2020 from 0.01 in the RNA Base Case to 0.25. This result indicates the substantial impact of the energy efficiency programs on the Base Case forecast and the resulting determination of the LOLE

Table 4-7: RNA Base Case LOLE Econometric Forecast Scenario

Area/Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AREA_A										
AREA_B										
AREA_C										
AREA_D										
AREA_E										
AREA_F										
AREA_G				0.00	0.00	0.01	0.02	0.03	0.05	0.09
AREA_H										
AREA_I				0.00	0.01	0.03	0.05	0.08	0.13	0.21
AREA_J				0.01	0.01	0.03	0.05	0.08	0.13	0.22
AREA_K						0.01	0.01	0.02	0.04	0.11
NYCA	**0.00**	**0.00**	**0.00**	**0.01**	**0.02**	**0.03**	**0.05**	**0.09**	**0.15**	**0.25**

4.3.1.2. 45 x 15 Scenario

The 45 x 15 scenario models the State's clean energy policy goal to serve 30% of the State's energy needs with renewable resources and reduce energy usage in the year 2015 by 15%. Only renewable projects that have been installed since Jan 1, 2003 are included towards meeting this goal. Renewable projects include hydro, wind, landfill gas, biomass, refuse and solar. As shown in Table 4-8, 1320 MW of renewable projects have been installed since Jan. 1, 2003 and are included in the 2010 RNA Base Case. An additional 1368 MW of renewable wind and solar projects are proposed to be built before 2015. Table 4-9 lists the proposed renewable projects that have completed a Facilities Study Class Year and accepted their cost allocation or are currently included in a Facilities Study Class Year. The total of 2688 MW of renewable projects represents approximately 5,830 GWh (59%) of the State's RPS target of 9870 GWh by 2015.

The forecast for this scenario is the 2010 RNA 15 x 15 forecast, as shown in Table 3-1(a). It projects 3320 MW of peak demand reductions from the 2010 RNA Base Case by the year

2015, should the 15 x 15 goal be achieved. By 2020, the peak demand reduction is 3616 MW.

Even though the full RPS goal is not modeled, the additional capacity combined with achievement of the full 15 x 15 energy efficiency goal is sufficient to reduce the LOLE to 0.0.

Table 4-8 Renewable Projects in 2010 RNA Base Case that Contribute to the RPS Goal

Owner, Operator, and / or Billing Organization	Station/Unit	In-Service Date	Current Proposed In-Service Date	Nameplate Rating (MW)
Hydro Units				
Erie Blvd. Hydro - Oswegatchie	Upper Newton Falls 4	07-01-2002		0.5
Erie Blvd. Hydro - Oswegatchie	Upper Newton Falls 2	07-01-2002		0.5
Erie Blvd. Hydro - Oswegatchie	Lower Newton Falls 1	07-01-2002		0.5
Erie Blvd. Hydro - Oswegatchie	Upper Newton Falls 3	07-01-2002		0.5
Niagara Mohawk Power Corp.	Mechanicville	03-01-2005		2.0
Erie Blvd. Hydro - Seneca Oswego	Oswego Falls W 6	01-01-2007		0.9
Erie Blvd. Hydro - Seneca Oswego	Oswego Falls W 7	01-01-2007		0.9
Erie Blvd. Hydro - Upper Hudson	Sherman Island 1	03-01-2009		8.0
Erie Blvd. Hydro - Upper Hudson	Sherman Island 6	02-02-2009		1.0
Niagara Mohawk Power Corp.	Moutainaire Massage Spa	11-01-2009		0.0
Niagara Mohawk Power Corp.	Oakvale Construction	11-01-2009		0.0
Niagara Mohawk Power Corp.	Edison Hydro Electric	11-01-2009		0.0
Niagara Mohawk Power Corp.	Finch Paper LLC - Glens Falls	11-01-2009		0.0
Total Hydro				**14.9**
Wind Units				
Flat Rock Windpower, LLC	Maple Ridge Wind 1	01-01-2006		231.0
Commerce Energy, Inc.	Steel Winds	01-23-2007		20.0
Shell Energy North America (US), L.P.	Munnsville Wind Power	08-20-2007		34.5
Flat Rock Windpower, LLC	Maple Ridge Wind 2	12-01-2007		90.7
Noble Bliss Windpark, LLC	Bliss Wind Power	03-20-2008		100.5
Noble Ellenburg Windpark, LLC	Ellenburg Wind Power	03-31-2008		81.0
Noble Clinton Windpark 1, LLC	Clinton Wind Power	04-09-2008		100.5
Noble Altona Windpark, LLC	Altona Wind Power	09-23-2008		97.5
Noble Chateaugay Windpark, LLC	Chateaugay Wind Power	10-07-2008		106.5
Canandaigua Power Partners, LLC	Canandaigua Wind Power	12-05-2008		125.0
Noble Wethersfield Windpark, LLC	Wethersfield Wind Power	12-11-2008		126.0
Sheldon Energy LLC	High Sheldon Wind Farm	02-01-2009		112.5
Steel Winds, LLC	Steel Winds II		2010/11	15.0
Airtricity Munnsville Wind Farm, LLC	Munnsville		2013/12	5.5
Total Wind				**1,246.2**
Landfill Gas Units				
Seneca Energy II, LLC	Ontario LFGE	12-01-2003		5.6
Modern Innovative Energy, LLC	Modern LF	02-01-2006		6.4
Innovative Energy Systems, Inc.	Colonie LFGTE	03-01-2006		4.8
Constellation Energy Commodities Group, Inc.	Mill Seat	07-20-2007		6.4
Constellation Energy Commodities Group, Inc.	Chaffee	08-09-2007		6.4
New York State Elec. & Gas Corp.	Broome LFGE	09-01-2007		2.1
Constellation Energy Commodities Group, Inc.	High Acres 2	02-28-2008		6.4
Innovative Energy Systems, Inc.	DANC LFGE	09-08-2008		4.8
Innovative Energy Systems, Inc.	Hyland LFGE	09-08-2008		4.8
Innovative Energy Systems, Inc.	Clinton LFGE	10-01-2008		4.8
Innovative Energy Systems, Inc.	Chautauqua LFGE	02-12-2010		6.4
Total Landfill Gas				**58.9**
Total Renewable Base Case Projects Contributing to RPS Goal				**1,320.0**

Table 4-9: Additional Proposed Renewable Projects

Queue	Developer	Project Name	POI	CTO	Zone	Rating (MW)	CRIS (MW) (1)	UNIT TYPE	Completed Class	Proposed In-Service
		Completed Class Year Facilities Study								
119	ECOGEN, LLC	Prattsburgh Wind Farm	Eelpot Rd-Flat St. 115kV	NYSEG	C	78.2	78.2	Wind Turbines	2003-05	2010/Q3
147	NY Windpower, LLC	West Hill Windfarm	Oneida-Fenner 115kV	NM-NG	C	31.5	31.5	Wind Turbines	2006	N/A
156	PPM Energy/Atlantic Renewable	Fairfield Wind Project	Valley-Inghams 115kV	NM-NG	E	74.0	74.0	Wind Turbines	2006	2011/01
161	Marble River, LLC	Marble River Wind Farm	Willis-Plattsburgh WP-1 230kV	NYPA	D	84.0	84.0	Wind Turbines	2006	2011/10
166	AES-Acciona Energy NY, LLC	St. Lawrence Wind Farm	Lyme Substation 115kV	NM-NG	E	79.5	79.5	Wind Turbines	2007	2012/09
171	Marble River, LLC	Marble River II Wind Farm	Willis-Plattsburgh WP-2 230kV	NYPA	D	132.3	132.3	Wind Turbines	2006	2011/10
182	Howard Wind, LLC	Howard Wind	Bennett-Bath 115kV	NYSEG	C	62.5	62.5	Wind Turbines	2007	2010/12
186	Jordanville Wind, LLC	Jordanville Wind	Porter-Rotterdam 230kV	NM-NG	E	80.0	80.0	Wind Turbines	2006	2011/12
197	PPM Roaring Brook, LLC/PPM	Tug Hill	Boonville-Lowville 115kV	NM-NG	E	78.0	0.0	Wind Turbines	2008	2011/09
207	BP Alternative Energy NA, Inc.	Cape Vincent	Rockledge Substation 115kV	NM-NG	E	210.0	0.0	Wind Turbines	2008	2012/12
213	Noble Environmental Power, LLC	Ellenburg II Windfield	Willis-Plattsburgh WP-2 230kV	NYPA	D	21.0	21.0	Wind Turbines	2007	2011/10
		Class 2009 Projects								
222	Noble Environmental Power, LLC	Ball Hill	Dunkirk-Gardenville 230kV	NM-NG	A	90.0	TBD	Wind Turbines	CY09 in progress	2011/12
		Class 2010 Projects								
237	Allegany Wind, LLC	Allegany Wind	Homer Hill – Dugan Rd. 115kV	NM-NG	A	72.5	TBD	Wind Turbines	CY10 in progress	2011/10
254	Ripley-Westfield Wind, LLC	Ripley-Westfield Wind	Ripley - Dunkirk 230kV	NM-NG	A	124.8	TBD	Wind Turbines	CY10 in progress	2011/12
263	Stony Creek Wind Farm, LLC	Stony Creek Wind Farm	Stolle Rd - Meyer 230kV	NYSEG	C	88.5	TBD	Wind Turbines	CY10 in progress	2010/12
330	BP Solar	Upton Solar Farms	Brookhaven 8ER 69kV Substation	LIPA	K	32.0	TBD	Solar	CY10 in progress	2010/09-2011/09
		Other Non-Class Generators								
180A	Green Power	Cody Road	Fenner - Cortland 115kV	NM-NG	C	10.0	10.0	Wind Turbines	N/A	2010/10
204A	Duer's Patent Project, LLC	Beekmantown Windfarm	Kent Falls-Sciota 115kV	NYSEG	D	19.5	19.5	Wind Turbines	N/A	N/A
	Overall Total					**1368.3**				

4.3.2. Indian Point Plant Retirement Scenario

Reliability violations of the NYS Reliability Council and NPCC resource adequacy criteria would occur if the Indian Point Plant were to be retired at the latter of the current license expiration dates using the Base Case load forecast assumptions. In this 2016 scenario, LOLE was 0.14 days/year, a violation of the 0.1 days/year criterion, which is an unacceptable probability of a load shedding occurrence. Beyond 2016, due to annual load growth, the LOLE continues to escalate for the remainder of the Study Period reaching an LOLE of 0.38 days/year in 2020. In addition to the LOLE violations, a transmission analysis was performed and demonstrated thermal violations per applicable Reliability Criteria. Furthermore, under stress conditions, the voltage performance on the system without the Indian Point Plant would be degraded. In all cases, power flows replacing the Indian Point generation cause increased reactive power losses in addition to the loss of the reactive output from the plant. It would be necessary to take emergency operations measures, including load relief,[10] to eliminate the transmission security violations in Southeastern New York.

The Indian Point Plant has two base-load units (2060 MW) located in Zone H in Southeastern New York, an area of the State that is subject to transmission constraints that limit transfers in that area. As indicated in the Base Case analysis, there are no reliability violations if the two units remain in operation. Southeastern New York, however, with the Indian Point Plant in service, currently relies on transfers to augment existing capacity, and loads in this area, and across the state, are forecasted to continue to grow.

Transfer limit analysis was performed with both Indian Point units out-of–service (i.e. beginning 2016), and it was assumed all other generation capacity in Zones G through I would be fully dispatched, supporting Southeastern New York load. The analysis shows that, under typical load conditions, the ability to transfer power to Zone J and Zone K would be limited by the upstream UPNY-SENY interface, before reaching the UPNY-ConEd interface limits. Even with all of the remaining generating capacity in Zones G, H, and I fully dispatched, the UPNY-ConEd and I to J and K interface facilities would not be loaded to either their voltage or thermal limits. The difference in interface loading would be approximately 2000 MW if the Indian Point Plant were to be retired.

As shown in Table 4-10 below with both units out of service in 2016, the reliability criterion for resource adequacy is violated with an LOLE of 0.14 days/year. Thereafter, the LOLE continues to escalate for the remainder of the Study Period reaching an LOLE of 0.38 days/year in 2020 which substantially exceeds the reliability criterion of 0.1 days/year.

[10] According to the NYISO Emergency Operations Manual, Load Relief Capability is described as including measures such as: voltage reduction, load shedding, and other curtailment measures such as interruptible customers and public appeals.

Table 4-10: Indian Point Plant Nuclear Retirement Scenario

Area/Year	2016	2017	2018	2019	2020
AREA_A					
AREA_B					
AREA_C					
AREA_D					
AREA_E					
AREA_F					
AREA_G	0.05	0.06	0.08	0.13	0.17
AREA_H	0.12	0.15	0.20	0.29	0.38
AREA_I	0.12	0.17	0.23	0.33	0.41
AREA_J	0.10	0.14	0.19	0.28	0.38
AREA_K	0.01	0.00	0.00	0.00	0.01
NYCA	**0.14**	**0.19**	**0.26**	**0.36**	**0.38**

The 2009 RNA reported an LOLE of 2.41 for the year 2016 as noted in Table 4-12 compared to 0.14 noted above in Table 4-10. This significant difference is primarily due to the combination of the lower load and the generation additions included in the 2010 RNA as compared to the 2009 RNA as shown in Table 4-11.

Table 4-11: Comparison of Year 2016 Peak Load and Capacity

Year	2009 RNA Year 2016	2010 RNA Year 2016	Delta
Peak Load			
NYCA	**35,258**	**34,193**	**-1065**
Zone J	12,787	12,120	-667
Zone K	5374	5554	180
Resources			
NYCA			
Capacity	40,452	41,239	787
SCR	2084	2180	96
Total	**42,536**	**43,419**	**883**
Res./Load Ratio	120.6%	127.0%	6.3%
Zone J			
Capacity	9206	10,332	1126
SCR	622	586	-36
Total	**9828**	**10918**	**1091**
Res./Load Ratio	76.9%	90.1%	13.2%
Zone K			
Capacity	6368	6311	-57
SCR	216	193	-23
Total	**6584**	**6504**	**-80**
Res./Load Ratio	122.5%	117.1%	-5.4%

To further illustrate the impact that the peak load and capacity differences have on this scenario results, additional sensitivity analyses on year 2016 were performed as described below and shown in Table 4-12 below:

1. Utilizing the 2009 RNA database with the peak load data and capacity data from the 2010 RNA database results in the NYCA LOLE being reduced from 2.41 (as reported in the 2009 RNA) to 0.11 for 2016.

2. Utilizing the 2010 RNA database with the peak load data from the 2009 RNA results in the NYCA LOLE increasing from 0.14 to 0.60 for 2016.

3. Utilizing the 2010 RNA database with the capacity additions of Astoria Energy II (550MW) and Bayonne Energy (513MW) units removed, results in the NYCA LOLE increasing from 0.14 to 0.94 for 2016.

4. Utilizing the 2010 RNA database with both the peak load data from the 2009 RNA and with the Astoria Energy II (550MW) and Bayonne Energy (513MW) units removed results in the NYCA LOLE increasing from 0.14 to 3.11 for 2016.

Table 4-12: Effects on LOLE for 2016 without Indian Point Units 2 and 3

RNA Year	RNA Base Case Results	with 2010 Load and Capacity	with 2009 Load and Capacity	without Astoria II and Bayonne	without Astoria II and Bayonne and with 2009 Load projections
2009	2.41	0.11	2.41	2.41	2.41
2010	0.14	0.14	0.6	0.94	3.11

This illustrates that when the peak load and capacity values are aligned, the results between the two RNA models are more consistent. This also illustrates that it is the combination of both the lower energy forecast and the capacity additions in Zone J in the 2010 RNA that leads to changes in results from the 2009 RNA.

Utilizing the econometric forecast with the Indian Point units retired results in a NYCA LOLE of 0.98 in 2016 and 3.34 in 2020.

4.3.3. Zonal Capacity at Risk

Given that the LOLE of the Base Case conditions did not exceed 0.10 for the 10-year study period, additional analysis was performed to determine the reduction in capacity which would cause the LOLE to exceed 0.10. The eleven zones, A through K comprising the NYCA were aggregated A-F, G-I, J, and K. The overall capacity in these zonal aggregates was derated in increments of 250 MW until the NYCA LOLE exceeded 0.10. The NYISO did not model the potential impacts within zones or superzones. Therefore no internal transmission problems were evaluated. The results do not indicate whether or not the transmission system could support some or all of the capacity derates nor does it indicate whether even a single generating unit can be removed without violating transmission system security. Transmission security analyses would need to be performed for any contemplated unit shutdown to avoid transmission security violations.

In separate studies, the levels of capacity removed in those zones for 2020 without violating NYCA LOLE are: Zone J at 1000 MW, or Zone K at 1000 MW, or Zones G-I at 1000 MW total. These capacities cannot be removed simultaneously. For Zones A-F, the individual zone reductions ranged from 250 – 2500 MW, indicating that the amount of capacity that could be removed without an LOLE violation would have to be specifically modeled and studied.

Actual levels of capacity that can be removed may be lower as a result of transmission security violations due to specific capacity losses at specific locations. For example the NYISO conducted a limited local transmission security analysis which removed a number of existing units within Zones A-F to test whether LOLE results alone were sufficient to adequately assess the shutdown of selected generating units. The transmission security analysis showed that with the unavailability of just a few units, certain 115 kV facilities in those zones would experience thermal and voltage violations and that therefore LOLE results for all of superzone A-F would be meaningless and misleading. Any potential transmission problems would be subject to further transmission owners' verification and mitigation.

While from the zones at risk analysis a maximum level of capacity that can be removed in 2020 without LOLE violations could be 1000 MW for Zones J, or K, or G-I, in reality lower amounts of capacity removal are likely to result in reliability issues at specific transmission locations although, a mid-year 2015 analysis showed that from an LOLE standpoint alone, the maximum capacity removal amount could be 1750 MW in G-I, or 1500 MW in Zone J, or 1250 MW in Zone K.

For Zones A-F the removal of capacity and its impact on the reliability of the transmission system and the transmission system's transfer capability are highly location dependent. The study did not attempt to assess a comprehensive set of potential scenarios that might arise from specific unit retirements. Therefore, such calculated 250-2500 MW[11] capacity removal from one of these zones should be further studied and verified according to the specific capacity locations in the transmission network.

The results presented in the zones at risk scenario represent the maximum level of capacity that can be removed without an LOLE

[11] In the analysis the impact of the removal of upstate capacity was mitigated by both surplus downstate capacity and significant emergency assistance from our neighboring control areas. The ability of Zones A-F to absorb this level of import has not been determined with the absence of the Zone A-F generation that supports the transmission system. Consequently the analysis for Zones A-F is inconclusive. Any potential retirement in Zones A-F must be evaluated in detail to address potential impacts on the bulk power systems transfer capability as well as potential local transmission and distribution concerns.

violation. Additional transmission security analysis such as N-1-1 analysis would need to be performed for any contemplated plant retirement in any zone.

4.3.4. Existing Transmission Capacity for Native Load

NYSEG has the grandfathered Deliverability rights to import up to 1080 MW of capacity from PJM. This scenario does not imply that NYSEG should or needs to modify their current agreement. Modeling the 1080 MW as a firm contract on the PJM western NY ties had no impact on the NYCA LOLE.

4.3.5. Wheel Throughs

To determine the impact of capacity wheel throughs, a 300 MW contract through New York from HQ to New England was modeled as a firm contract delivering 300 MW from Hydro Quebec to Western Massachusetts in New England; and applicable internal and external interfaces were reduced accordingly. The transfer limits of the Hydro Quebec-Area_D, Moses South, and Central East interfaces were modified by 300 MW in both directions by choice of MARS program options. The first parallel path from Area_F-W MA and the second parallel path Area_F-Area_G, Area_G-CT and CT-W MA interfaces were modified by 150 MW in both directions by choice of MARS program options. The reserve margins of all Areas were not modified from the Base Case.

The results indicated a negligible increase in the NYCA LOLE from 0.008 to 0.009 in year 2020.

5. Impacts of Environmental Program Initiatives & Additional Wind Resources

5.1. Environmental Regulations

New York has a long history in the active development of environmental policies and regulations that govern the permitting, construction and operation of power generation and transmission facilities. Two noteworthy policy initiatives where New York has preceded national environmental programs include the regulation of power plant emissions to curb acid rain, and the more recently promulgated regional program to limit power plant emissions of carbon dioxide and other greenhouse gases. Currently New York's standards for permitting new generating facilities are among the most stringent in the nation. The combination of tighter environmental standards coupled with competitive markets administered by the NYISO since 1999 has resulted in the retirement of older plants equaling approximately 3000 MW of capacity and the addition of over 7000 MW of new efficient generating capacity. In turn, these changes have led to marked reduction of power plant emissions and a significant improvement in the efficiency of the generation fleet.

Notwithstanding the remarkable progress towards achieving New York's clean energy and environmental goals, more remains to be accomplished. The 2009 New York State Energy Plan[12] provides a long range vision and framework for New York's energy usage. The State's Department of Environmental Conservation (NYS DEC) annual publication of its regulatory agenda[13] describes the new environmental initiatives that it will focus on during the coming year. The U.S. Environmental Protection Agency also publishes a similar report on its regulatory agenda.[14]

The environmental initiatives that may affect generation resources may be driven by either or both the State or Federal programs.

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[12] (http://www.nysenergyplan.com/stateenergyplan.html)

[13] http://www.dos.state.ny.us/info/register/2010/jan6/pdfs/regagenda.pdf.

[14] http://www.reginfo.gov/public/do/eAgendaMain;jsessionid=9f8e890430d77ed37246b4ab417e9961cfca348ec55b.e34ObxiKbN0Sci0RbxaSc3qRc3n0n6jAmljGr5XDqQLvpAe?operation=OPERATION_GET_AGENCY_RULE_LIST&currentPub=true&agencyCd=2000&Image58.x=36&Image58.y=15

One of the purposes of the RNA is to identify possible future outcomes that could lead to insufficient resources in the NYS Power System to satisfy applicable Reliability Criteria. For example, such a situation may result from energy growth rates exceeding the NYISO's Base Case forecast, the failure of new resources to successfully achieve commercial operation as planned, or the unplanned retirement of a significant amount of capacity provided by existing resources. The purpose of the development of this "Environmental Scenario" is to gain insight into the population of resources that are likely to be faced with major capital investment decisions in order to achieve compliance with several evolving environmental program initiatives. The premise of this analysis is that the risk of unplanned retirements is directly related to the capital investment decisions resource owners need to make in order to achieve compliance with the new regulatory program requirements. The goal of this scenario analysis is to identify when and where these risks occur on the New York Power System.

This analysis identifies, on a zonal or super-zonal basis, the levels of cost impact that will result in an identified risk of unplanned retirements. The identification and timing of these potential risks will help to inform the NYISO and State policy makers of the potential impacts to system reliability caused by the newly adopted and/or provide proposed environmental regulations. Of equal importance, the results will also provide useful information about future opportunities to developers of new clean efficient generation resources or aggregators of special case resources.

5.1.1. Selection of Major Environmental Program Initiatives

The environmental initiatives reviewed for this study are described below.

5.1.1.1. Reasonably Available Control Technology for Oxides of Nitrogen (NOx RACT)

NYS DEC has recently finalized new regulations for the control of emissions of nitrogen oxides (NOx) from fossil fueled power plants. The regulations establish presumptive emission limits for each type of fossil fueled generator and fuel used as an electric generator in New York. NYS DEC is seeking to reduce emissions from the affected generators by 50%, from 58,000 Tons per Year (TPY) to 29,000 TPY. Compliance options include averaging emissions with lower emitting units, fuel switching, and installing emission reduction equipment such as low NOx burners or combustors, or selective catalytic reduction units.

The NYISO retained GE to conduct a detailed study about the types and costs of control technology necessary to comply with the proposed regulation. The study found that "A total of 72 units or 9515

MW of capacity was identified as needing some type of control mechanism of equipment modification to comply with the proposed standard." The study concluded that the costs to comply with the NOx RACT regulation would reduce operating margin for affected generators, but taken alone would generally not lead to situations where those margins would become negative. In addition, the study concluded that the proposed compliance deadline should be extended to July 2014 in order to accommodate the outage schedules necessary to install the required emissions control equipment retrofits. In its final regulation, the NYS DEC adopted the study's July 2014 recommendation.

5.1.1.2. Best Available Retrofit Technology (BART)

NYS DEC recently promulgated a new regulation Part 249, Requirements for the Applicability, Analysis, and Installation of Best Available Retrofit Technology (BART) Controls. The regulation applies to fossil fueled electric generating units built between August 7, 1962 and August 7, 1977 and is necessary for State to comply with provisions of the federal Clean Air Act that are designed to improve visibility in National Parks. The regulation requires an analysis to determine the impact of an affected unit's emissions on visibility in national parks. If the impacts are greater than a prescribed minimum, then emission reductions must be made at the affected unit. Emissions control of sulfur dioxide (SO2), nitrogen oxides (NOx) and particulate matter (PM) may be necessary. The compliance deadline has been set as January 2014.

5.1.1.3. Maximum Achievable Control Technology (MACT)

The USEPA is required by the federal Clean Air Act to develop rules to limit emissions of certain substances classified as hazardous air pollutants (HAPs). USEPA is scheduled to release a proposed rule March 2011. The rule will establish limits for HAPs such as Hydrogen Chloride (HCl), Hydrogen Fluoride (HF), Mercury (Hg), Dioxin and Furans, as well as for parameters such as Carbon Monoxide (CO), and Particulate Matter. These limits will apply to coal fired generators and may apply to electric generators that are fueled by heavy oil. The anticipated compliance date is November 2014.

In addition, NYS DEC has promulgated Part 246: Mercury Reduction Program for Coal-Fired Electric Utility Steam Generating Units, which establishes emission limitations that are currently in effect in New York to reduce mercury emissions. Phase II of this regulation requires additional reductions from coal fired boilers in 2015. The Phase II emission limitations may be equivalent to the limits USEPA will establish next year.

The USEPA has proposed limitations on mercury emissions from oil fired boilers that supply generators less than 25 MW. Similar limitations for large oil fired boilers are likely.

5.1.1.4. Best Technology Available (BTA)

NYS DEC is currently seeking comment on its policy document "Best Technology Available (BTA) for Cooling Water Intake Structures". The proposed policy will apply to plants with design intake capacity greater than 20 million gallons/day and prescribes reductions in fish mortality. The proposed policy establishes performance goals for new and existing cooling water intake structures. The performance goals call for the use of wet, closed-cycle cooling systems at existing generating facilities. The policy does provide some limited relief for plants with historical capacity factors less than 15%.

Once the NYS DEC has made a determination of what constitutes BTA for a facility, the Department will consider the cost of the technology to determine if the costs are "wholly disproportionate" to the environmental benefits to be gained with BTA.

5.1.2. Reliability Impact Assessment Methodology

Several of the evolving environmental initiatives described above have sufficient definition of potential requirements, are generally widespread in effect, and are expected to require compliance actions in the earlier portion of the planning period some of which either individually or taken together could require substantial additional capital investment. Therefore, they could lead to premature retirements. The programs are estimated to impact 23,957 MW of capacity in the NYCA or 64% of the installed generating capacity NYISO currently relies on to meet the electricity needs of New York consumers.

Each of the four programs has been examined to determine the category of capital cost potentially required of affected units to comply with each program. Three category levels are used to qualify the expected impacts of each program on the existing generation fleet. Category 1 applies for the affected generator that is already in compliance with the proposed requirements, or that could be expected to achieve compliance with changes in operating procedures and/or through the use of fuel switching. Thus the capital cost to achieve compliance for Category 1 generators is relatively small. Category 2 applies where the required capital expenditures are of a magnitude that is consistent with other capital expenditure that is necessary to maintain a generator over the planning horizon, e.g., a five year major overhaul of the steam turbine or less than $25/kw. Category 3 applies where the capital expenditures required to comply with the new regulation are above the average level of routinely expected capital expenditures.

While the total population of affected units is represented by the summation of the three impact categories, in each of these analyses the primary concern is with the capital investment decisions represented by Category 2 and 3. With the results of these analyses, the level of impact for each unit is summed across the four programs for Category 2 and 3. Units with the highest cumulative totals of impact are considered to be potentially at risk for premature retirement. The level of impact for each zone will be compared to the zones at risk analysis to identify the zones where the environmental initiatives may result in a NYCA LOLE violation.

5.1.2.1. NOx RACT Impact Assessment

The NYISO retained GE to conduct a detailed study about the types and costs of control technology necessary to comply with the proposed regulation. The study found that "[a] total of 72 units or 9515 MW of capacity was identified as needing some type of control mechanism or equipment modification to comply with the proposed standard." Capital costs of compliance were estimated to be approximately in the range of $100-300 million. The study concluded that the costs to comply with this regulation would reduce operating margin for affected generators but taken alone would not generally lead to situations where those margins would become negative. In addition the study recommended that the proposed compliance deadline should be extended to July 2014 in order to accommodate the outage schedules necessary to retrofit the required emissions control equipment. As a result, in its final regulation the NYS DEC adopted the study recommendation.

5.1.2.2. BART Impact Assessment

The impact assessment of the BART program is less certain than the assessment for the NOx RACT program. The results of the visibility analysis are used to determine the emission reductions that may be necessary for SO2, NOx, and PM. For the purposes of this impact assessment, it is assumed that all affected units in New York will need to reduce emissions of these pollutants that cause visibility impairments. Based on this assumption, 8940 MW of capacity is affected. Appendix E contains a detailed listing of affected units, the majority of which are located in SENY. The majority of these units are large oil fired units that have gas as an alternate fuel. Many of these units do not have state of the art emission control systems. Units that have natural gas capabilities were assigned Category 1. Generators that were designated to fuel switch in the NOx RACT study were assigned Category 2. Facilities that are predominantly coal fired were assumed to need upgraded particulate collection, SCR, and Flue Gas Desulfurization (FGD), and were assigned Category 3.

The NOx control measures for BART generally were consistent with the results of the NOx RACT study. NYS DEC has established a reasonableness test of $5000/ton reduced. This NYS DEC estimate is based on the NYS DEC definition of "Potential to Emit". Capital expenditures for this program would be of the same order of magnitude as the NOx RACT program.

5.1.2.3. MACT Impact Assessment

USEPA's proposal for MACT for fossil fired electric generators is planned to be released next Spring. In the interim we can gain some insight about the scope and the possible limits by reviewing the recently released MACT regulations for units less than 25 MW. The regulations apply to coal and oil fueled electric generators. The proposed emission limits for coal are comparable to the NYS DEC Part 246 Phase 2 regulations. The USEPA proposal for small boilers goes beyond the current version of Part 246 by specifying emission limits that are comparable to those for coal, thus for the purpose of this assessment, we have assumed that units burning heavy oil will need to retrofit mercury sorbent materials and capture them in upgraded particulate collection equipment.

Facilities that are in compliance with the 2015 emission limit are assigned Category 1. Generators that need to add sorbent injection systems are assigned Category 2. Facilities that need to add sorbent injection and improved particulate collection are assigned Category 3.

The 2008 USEPA Toxic Release Inventory reports that approximately 1250 pounds of mercury were released from electric generators. Assuming that the MACT regulation will require a 90% reduction in mercury emissions similar to the NYS DEC Part 246 requirement, then an estimated emission reduction of 1125 pounds/yr. would be required. The US Energy Information Agency (USEIA) has estimated the cost of removal to be approximately $20,000/pound. The estimated annual cost for the carrying and operating costs of mercury removal systems would be $ 22.5 million per year.

5.1.2.4. BTA Impact Assessment

NYS DEC's BTA policy will require the use of closed cycle cooling systems at plants that currently have open cycle cooling systems with some limited relief for sites that cannot physically accommodate cooling towers, generators with current historical capacity factors below 15%, and where the expense of a closed cooling water system is "wholly disproportionate" compared to the environmental benefits to be gained. Several sites have gained limited relief and are assigned Impact Category 1. Sites that may gain approval to use fish protection systems based on specific equipment and past studies are assigned Impact Category 2. A majority of the sites evaluated in this scenario may need to retrofit closed cycle cooling systems and are assigned to Impact Category 3.

NYS DEC has estimated the capital and operating costs of using closed cycle cooling at electric generators in NY at $8.5 billion without consideration for cases where limited relief is granted. NYS DEC has made twelve BTA determinations of which two determinations required the use of closed cycle cooling systems. Although the number of impacted MWs is unknown, for study purposes the NYISO shows a range from 4410 MW to 7376 MW. This program will require capital investments that are one to two orders of magnitude greater than the cumulative costs for the other environmental initiatives examined. Consequently, the BTA program has the greatest potential to lead to unplanned retirements.

5.1.2.5. Summary of Impact Assessment

The risk of premature retirement of an individual unit of capacity is represented in this study by the summation of the assigned risk categories. The representation does not imply that the risk associated with each program Category 1, 2, or 3 is equivalent, rather is meant to collect the number of risk events that specific MW of capability are exposed to. The higher the sum of these risk events the greater the likelihood of premature retirement.

Figures 5-1 through 5-4 show the amounts of capacity and number of units that are affected by multiple programs. Venn diagrams are presented for the four environmental initiatives analyzed in this scenario. The total number of generating units, and the corresponding capacity, affected by each environmental initiative is identified at the top of each diagram. A subset of the units affected by the identified environmental program may also be affected by the other initiatives. These subsets can be divided into four categories: (1) units affected by the initiative and one other, (2) units affected by the initiative and two others, (3) units affected by all four initiatives and, (4) units affected by only the identified program. The Venn diagrams are made up of three characteristic types: (1) areas with no overlap, (2) areas where two circles overlap, and (3) the area where all three circles overlap. Each of these areas represents a different subset. Where there is no overlap the data contained are the units which fall under the identified initiative and one other program, where two areas overlap are the data for three initiatives, and the region where all the circles exist represents the units affected by all four initiatives studied. Using the NOx RACT program as an example, we find that there are 74 affected units with 9450 MW of capacity of which 28 units with 5263 MW capacity are in Category 2 and 3 and therefore represent some risk of a premature retirement. Some of these units are also affected by the other environmental programs studied in this scenario. The Venn diagram for the NOx RACT program shows that the Category 2 and 3 units belong to one of the following subsets.

- Four units with 2152 MW of capacity are also subject to BART, MACT, and BTA.
- Thirteen units 2107 MW of capacity are also subject to MACT and BTA.
- One unit with 250 MW of capacity is also subject to BTA.
- One unit with 20 MW of capacity is also subject to BART and MACT.
- One unit with 22 MW of capacity is also subject to MACT.
- Seven units with 712 MW of capacity are only subject to NOx RACT alone.

The sums for the multiple programs are presented in Table 5-5 below. Additional tables that also include Category 1 MWs are included in Appendix E.

Figure 5-1 NOx RACT Affected Units also Affected by Other Programs

NOx RACT -

	NOx RACT Impact by Category			
	1	2	3	Total
MW (# of Units)	4,188 (46)	3,896 (16)	1,367 (12)	9,450 (74)

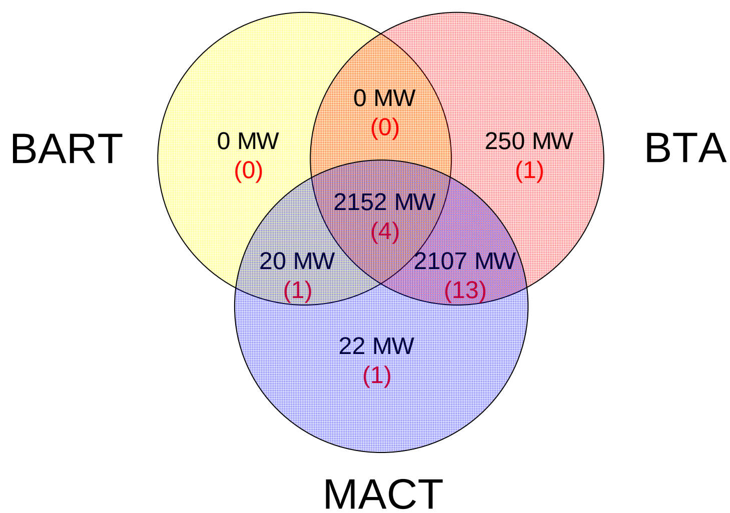


Figure 5-2 BART Affected Units also Affected by Other Programs

BART -

	BART Impact by Category			
	1	2	3	Total
MW	3,360	4,559	325	8,243
(# of Units)	(8)	(9)	(4)	(21)

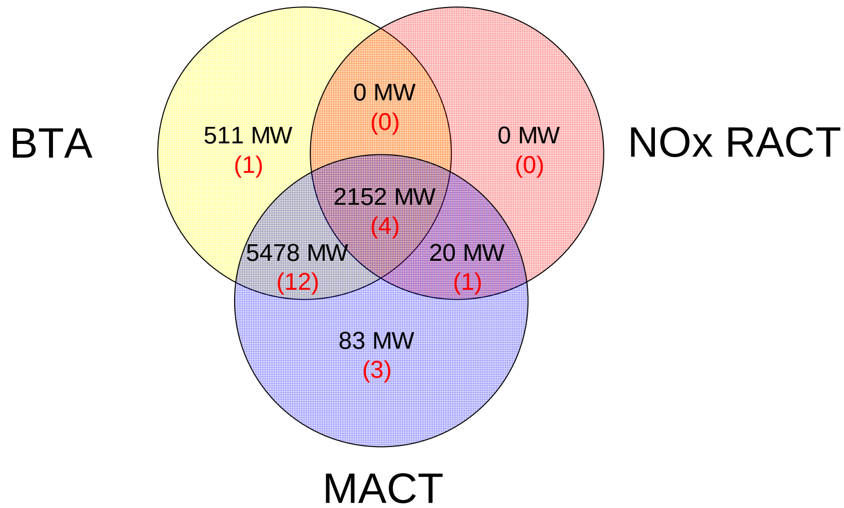


Figure 5-3 MACT Affected Units also Affected by Other Programs

MACT -

	MACT Impact by Category			
	1	2	3	Total
MW	1,177	4,242	6,849	12,268
(# of Units)	(7)	(21)	(19)	(47)

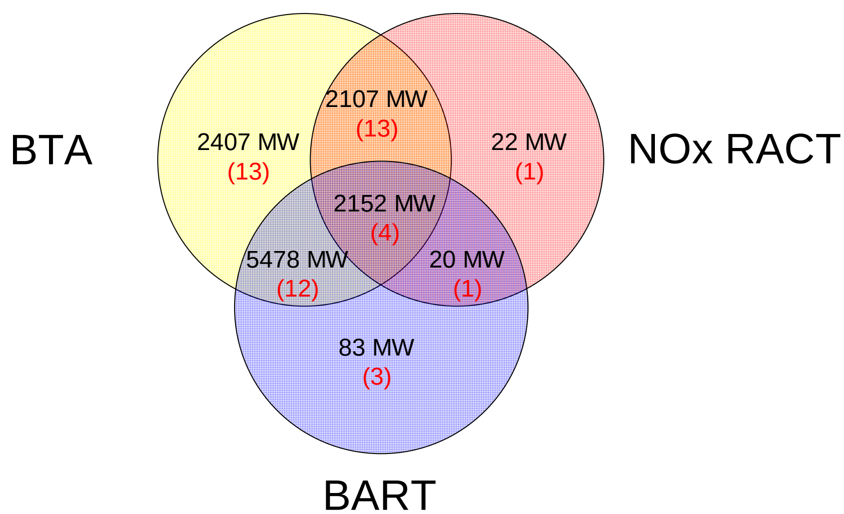
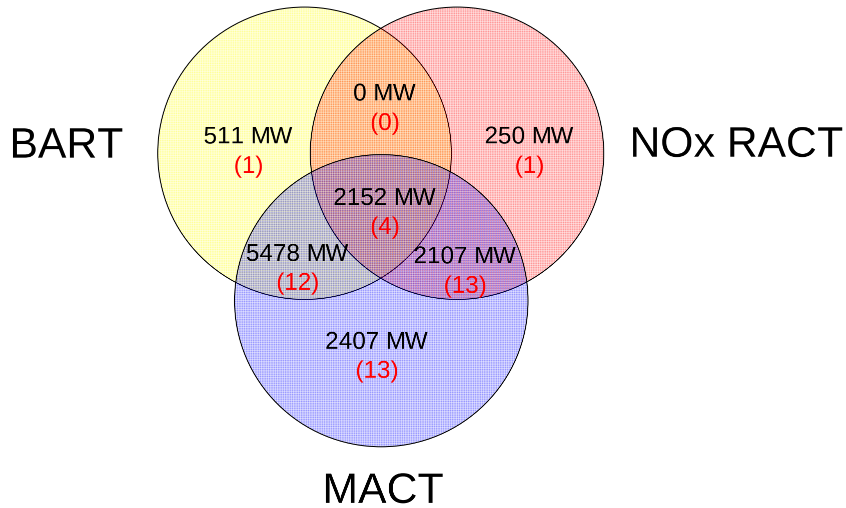


Figure 5-4 BTA Affected Units also Affected by Other Programs

BTA -

	BTA Impact by Category			
	1	2	3	Total
MW	6,305	5,243	7,376	18,923
(# of Units)	(13)	(18)	(23)	(54)



5.1.3. Environmental Initiative Impact Assessment with Zones at Risk Analysis

In the Zones at Risk analysis, the RNA examines levels of capacity that can be removed while continuing to satisfy the Reliability Criteria of LOLE < 0.1. The analysis considers the reliability implication of the environmental initiatives described above by matching the quantities of capacity identified in the zones at risk analysis If the capacity that can be removed from that zone is more than the capacity represented by the total amount of capacity in Category 2 and 3 for that zone, the reliability impact caused by retirements resulting from these regulations would need a specific transmission security analysis to determine what upgrades would be necessary on the local transmission system along with an associated timeline for completion of these upgrades.

If the capacity that can be removed from that zone is less than the capacity represented by the total amount of capacity in Category 2 & 3 for that zone, then reliability would be at risk. Transmission security analyses would then need to be conducted to define the extent and magnitude of the problem caused by premature retirements. Solutions to reduce that risk could include: flexibility in the design of the environmental initiative, or regulatory flexibility during the transition period while new generation and/or transmission resources are developed and placed in-service to reduce the reliability risk to acceptable levels.

Tables 5-1 through 5-6 below identify the quantity of capacity that is in Category 2 or Category 3 for each of the environmental programs and therefore are indicative of the relative amount of capacity at risk for premature retirement as a result of these programs. The following are the "LOLE Threshold Note" as referenced in these tables:

1. Varies depending on the specific location. More detailed intra-zonal analysis would need to be performed to calculate the LOLE threshold.
2. 1000 MW in year 2020.
3. 1000 MW in Zone J and 1000 MW in Zone K. These values are not cumulative.

For the NOx RACT program, Zones A-F have the most capacity affected which could exceed a reliability threshold and would require site specific transmission security analyses. There is 1312 MW of capacity at risk in Zones G-H-I which exceeds the threshold for the amount of capacity that can be removed while maintaining LOLE Reliability Criteria. The amount of capacity in Category 2 & 3 for Zones J and K is less than the identified threshold amount of capacity that can be removed; however, the complexity of the transmission system in those Zones would require that site specific analyses be conducted there.

Table 5-1 NOx RACT Program Affected Capacity by Assigned Impact Category

NOx RACT Impact by Category				
Super Zones	**2**	**3**	**Total**	**LOLE Threshold Note**
A-B-C-D-E-F	2672	419	3091	1
G-H-I	551	761	1312	2
J-K	673	187	860	3
Total	**3896**	**1367**	**5263**	

For the MACT program, Zones A-F has 2760 MW of capacity affected which could exceed a reliability threshold and would require site specific transmission security analyses. There is 2794 MW of capacity at risk in Zones G-H-I which exceeds the threshold for the amount of capacity that can be removed while maintaining LOLE Reliability Criteria. There is 5537 MW of capacity affected in Zones J and K which also exceeds the threshold for the amount of capacity that can be removed while maintaining LOLE Reliability Criteria.

Table 5-2 MACT Program Affected Capacity by Assigned Impact Category

MACT Impact by Category				
Super Zones	**2**	**3**	**Total**	**LOLE Threshold Note**
A-B-C-D-E-F	1921	840	2760	1
G-H-I	368	2426	2794	2
J-K	1953	3583	5537	3
Total	**4242**	**6849**	**11,091**	

For the BART program, Zones A-F have 1778 MW of capacity affected which could exceed a reliability threshold and would require site specific transmission security analyses. There is 1453 MW of capacity at risk in Zones G-H-I which exceeds the threshold for the amount of capacity that can be removed while maintaining LOLE Reliability Criteria. There is 1652 MW of capacity affected in Zones J and K which also exceeds the threshold for the amount of capacity that can be removed while maintaining LOLE Reliability Criteria.

Table 5-3 BART Program Affected Capacity by Assigned Impact Category

BART Impact by Category				
Super Zones	**2**	**3**	**Total**	**LOLE Threshold Note**
A-B-C-D-E-F	1686	92	1778	1
G-H-I	1221	233	1453	2
J-K	1652	0	1652	3
Total	**4559**	**325**	**4883**	

The BTA program affects the greatest amount of capacity and has the highest potential capital expenditures, and therefore is likely to create the greatest risk for premature retirements and for unacceptable reliability risks. For the BTA program Zones A-F have 4203 MW of capacity affected which could exceed a reliability threshold and would require site specific transmission security analyses. There are 2063 MW of Indian Point Plant capacity at risk in Zones G-H-I which exceeds threshold for the amount of capacity that can be removed while maintaining LOLE Reliability Criteria. There is 6353 MW of capacity affected in Zones J-K which also exceeds the threshold for the amount of capacity that can be removed while maintaining LOLE Reliability Criteria.

Table 5-4 BTA Program Affected Capacity by Assigned Impact Category

BTA Impact by Category				
Super Zones	**2**	**3**	**Total**	**LOLE Threshold Note**
A-B-C-D-E-F	1211	2992	4203	1
G-H-I	0	2063	2063	2
J-K	4032	2321	6353	3
Total	**5243**	**7376**	**12,619**	

Table 5-5 Combined Program Affected Capacity by Assigned Impact Category

Air Programs (NOx RACT, BART, MACT) Combined Affected Capacity (MW) by Assigned Impact Excluding Category 1									
Super Zones	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**	**LOLE Threshold Note**
A-B-C-D-E-F	1611	324	1410	148	0	840	20	4352	1
G-H-I	136	126	0	1772	529	0	233	2794	2
J-K	2501	1619	0	1778	187	0	0	6084	3
Total	**4247**	**2068**	**1410**	**3698**	**716**	**840**	**252**	**13,230**	

Table 5-6 Summarized Zonal Distribution of Capacity Impact Assessment

Air and BTA Programs Combined Affected Capacity (MW) by Assigned Impact Excluding Category 1									
Super Zones	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**	**LOLE Threshold Note**
A-B-C-D-E-F	1647	2203	999	591	561	1030	73	7102	1
G-H-I	136	2189	0	1772	529	0	233	4857	2
J-K	862	0	382	2942	499	1778	187	6649	3
Total	**2645**	**4391**	**1380**	**5304**	**1589**	**2807**	**492**	**18,609**	

5.1.4. Summary:

All programs will require significant capital investments from some portion of the affected population of units. Except for the very few units affected by NOx RACT alone, LOLE violations are likely to occur for each of the environmental initiatives if plant retirements occur as summarized in Categories 2 & 3, with the possible exceptions of superzone A-F where more focused zonal and specific transmission security analysis would be required.

Previous studies have indicated that the NOx RACT program by itself may be accommodated while maintaining positive net revenues, however in combination with the requirements of the other programs the hurdle to reinvestment is raised along with the potential for premature retirement. MACT, BART, and BTA programs will affect a large portion of the fleet in their respective zones that is significantly greater than the amount of capacity that can be removed as determined by the zones at risk analysis.

5.2. Wind Impact

The NYISO conducted a study[15] of the reliability impacts of up to 8 GW of installed nameplate wind for selected years through 2018. The primary finding of the study is that wind generation can be reliably integrated to supply renewable energy with significant reductions in "greenhouse" gases such as CO_2 and other emissions such as NOx and $SO_{2.}$ However, because of their intermittent and variable nature, wind plants provide more of a challenge to power system operation than conventional power plants. This study concluded that the NYISO's systems and procedures (which includes the security constrained economic dispatch and the practices that have been adopted to accommodate wind resources) will allow for the integration of up to 8 GW of installed wind plants without any adverse BPTF reliability impacts. However, local transmission security issues may need to be addressed.

This conclusion is predicated on the assumption that a sufficient thermal resource base is maintained to support the wind. As wind resources increase as an overall percentage of the resource mix, the installed reserve margin will increase due to the variability and the lower overall availability of these resources, all else

[15] http://www.nyiso.com/public/committees/documents.jsp?com=bic_miwg&directory=2010-06-18

being equal. (Capacity factors for determining a wind unit's capacity value over the last three years have ranged from14.1% to 22.9% in the summer months and from 24.2% to 30.4% in winter months.)

The intermittent nature of wind generation results in an increase in overall system variability as measured by the net load (load minus wind). In response to these increased operational challenges the NYISO has implemented changes to its operational practices such as being the first ISO to incorporate intermittent resources into security constrained economic dispatch (SCED) and to implement a centralized forecasting process for wind resources. The study concluded that at higher levels of installed wind generation the system will experience higher magnitude ramping events and will require additional regulation resources to respond to increased variability during the five minute dispatch cycle. The analysis determined that the average regulation requirement will need to increases by approximately 9% for every 1,000 MW increase in wind generation between 4250 MW and 8000 MW. In order to accomplish this increased regulation requirement, non-wind resources will be required.

6. Observations and Recommendations

6.1. Base Case

This 2010 RNA, like the preceding 2009 RNA, indicates that the forecasted system does not violate the LOLE resource adequacy criterion for the following ten years. There are three primary reasons why this year's RNA continues to identify no Reliability Need, assuming that all modeled transmission and generation facilities, including Indian Point, remain in service over the Study Period:

1. The Base Case includes two major additions of generation in Zone J totaling approximately 1,060MW which were not included in the 2009 RNA.

2. The 2010 RNA projects peak loads about 1000 MW lower than the same years in the 2009 RNA resulting from the impacts of the 2009 recession and forecasts of larger energy efficiency impacts than the preceding 2009 RNA Base Case energy forecast.

3. The NYISO has experienced a continued increase in registration for its SCR program which supplies capacity resources to the system through the NYISO market. The NYISO has projected registrations of 2251 MW of SCRs, an increase of 167 MW over the SCR levels included in the 2009 RNA.

In summary, the NYISO has performed studies that demonstrate that at this time there are no Reliability Needs in the New York bulk power system as modeled from 2011 through 2020. Therefore, there is no reason to request solutions to Reliability Needs this year. Nevertheless, the NYISO will perform and issue a 2010 CRP to update the 2009 CRP and to serve as the starting point for the next biennial economic planning process, which is known as CARIS.

The NYISO will continue to monitor the progress of market-based solutions, State energy efficiency program implementation, the accuracy of the forecasts, environmental program initiatives, transmission owner projects and other planned projects on the bulk power system to determine that these projects remain on schedule. This monitoring is key to the NYISO's determination that there are no Reliability Needs at this time. Should the NYISO determine that conditions have changed, it will determine whether market-based solutions that are currently progressing are sufficient to meet the resource adequacy and system security needs of the New York power grid. If not, the NYISO will address any newly identified Reliability Need in the subsequent RNA or, if necessary, issue a request for a Gap solution.

6.2. Scenarios

The NYISO conducted analyses of scenarios to determine whether, and under what conditions, shifts in resources, peak load levels or public policy programs would give rise to Reliability Needs. Under certain scenarios there were Reliability Criteria violations identified which would need to be addressed if those scenarios materialized.

6.2.1. Econometric Forecast.

The NYISO evaluated resource adequacy needs against the 2010 econometric load forecast in the Gold Book, which does not include the projected effect of the statewide energy efficiency programs. Because the peak load would be approximately 2,510 MW higher in 2020 than in the RNA Base Case forecast, there would be a need for additional resources in 2019 and 2020 in the absence of the statewide energy efficiency programs.

6.2.2. 45 x 15 Scenario

The 45 x 15 Scenario models the State's clean energy policy goal to serve 30% of the state's energy needs with new renewable resources and to reduce energy usage in 2015 by 15%. While the full 15 x 15 energy reduction goal was modeled, the total of renewable generation built since 2003 plus renewable generation that is completed or is currently part of the NYISO Class Year Facilities Study, only added up to 59% of the renewable resource goal. Nevertheless, in combination with the energy efficiency programs, this was sufficient to demonstrate an LOLE of 0.0 for this scenario.

6.2.3. Indian Point Plant Retirement Scenario

Reliability violations would occur if the Indian Point Plant were to be retired at the latter of the current license expiration dates using the Base Case load forecast assumptions. In addition to the LOLE violations, transmission analysis demonstrated thermal violations per applicable Reliability Criteria. Under stress conditions, the voltage performance on the system without Indian Point would be degraded. To relieve the transmission security violations, load relief measures will be required for Zones G through K. Because these results appear to be different from the higher LOLE results from the 2009 RNA for this scenario, this report showed the effect of the lower peak loads and additional generating capacity as applied to the 2009 RNA Base Case. The results showed that the 2009 and 2010 results are very similar once adjustments are made to more closely align for the assumptions for the peak load forecast and generation.

6.2.4. Zonal Capacity at Risk

Given that the LOLE of the Base Case conditions did not exceed 0.10 for the 10-year study period, additional analysis was performed to determine the reduction in capacity which would cause the LOLE to exceed 0.10. The eleven zones, A through K comprising the NYCA were aggregated A-F, G-I, J, and K. The results do not indicate whether or not the transmission system could support some or all of the capacity derates nor does it indicate whether even a single generating unit can be removed without violating transmission system security.

The levels of capacity removed in those zones for 2020 without violating NYCA LOLE are: Zone J at 1000 MW, Zone K at 1000 MW, Zones G-I at 1000 MW. For Zones A-F the removal of capacity and its impact on the reliability of the transmission system and the transmission system transfer capability are highly location dependent. The study did not attempt to assess a comprehensive set of potential scenarios that might arise from specific unit retirements.

The results presented in the zones at risk scenario represent the maximum level of capacity that can be removed without an LOLE violation. Additional transmission security analysis would need to be performed for any contemplated plant retirement in any zone.

6.2.5. Existing Transmission Capacity for Native Load

This scenario modeled the exercise of NYSEG's Existing Transmission Capacity for Native Load (ETCNL) at a full 1080 MW import level. There was no noticeable deterioration of the LOLE results.

6.2.6. Wheel Throughs

This scenario considered the wheel of 300 MW through New York from HQ to New England. The LOLE was essentially unchanged at 0.01.

6.2.7. Environmental Program Initiatives

All programs will require significant capital investments from some portion of the affected population of generating units. The NOx RACT program by itself may be accommodated while maintaining positive net revenues, however in combination with the requirements of the other programs the hurdle to reinvestment is raised along with the potential for premature retirement. MACT, BART, and BTA programs will affect a large portion of the fleet in their respective zones and LOLE or transmission violations are likely to occur if plant retirements materialize as summarized in Categories 2 & 3. The BTA program affects the greatest amount of capacity and has the highest potential capital expenditures, and therefore is likely to create the greatest risk for premature retirements.

6.2.8. Wind Generation

This study concluded that the NYISO's systems and procedures (which include the security constrained economic dispatch and the practices that have been adopted to accommodate wind resources) will allow for the integration of up to 8 GW of installed wind plants without any adverse reliability impacts, subject to transmission constraints.

7. Historic Congestion

Appendix A of Attachment Y of the NYISO OATT states: "As part of its Comprehensive System Planning Process, the NYISO will prepare summaries and detailed analysis of historic congestion across the New York Transmission System. This will include analysis to identify the significant causes of historic congestion in an effort to help Market Participants and other stakeholders distinguish persistent and addressable congestion from congestion that results from onetime events or transient adjustments in operating procedures that may or may not recur. This information will assist Market Participants and other stakeholders to make appropriately informed decisions." The detailed analysis of historic congestion can be found on the NYISO Web site.[16]

[16] http://www.nyiso.com/public/markets_operations/services/planning/documents/index.jspdocs=nyiso-historic-congestion-costs/congested-elements-reports

Appendices

Appendix A - Reliability Needs Assessment Glossary

Term	Definition
10-year Study Period:	10-year period starting with the year after the study is dated and projecting forward 10 years. For example, the 2010 RNA covers the 10-year Study Period of 2011 through 2020.
Adequacy:	Encompassing both generation and transmission, adequacy refers to the ability of the bulk power system to supply the aggregate requirements of consumers at all times, accounting for scheduled and unscheduled outages of system components.
Alternative Regulated Responses:	Regulated solutions submitted by a TO or other developer in response to a solicitation by the NYISO, if the NYISO determines that it has not received adequate market based solutions to satisfy the Reliability Need.
Annual Transmission Reliability Assessment (ATRA):	An assessment, conducted by the NYISO staff in cooperation with Market Participants, to determine the System Upgrade Facilities required for each generation and merchant transmission project included in the Assessment to interconnect to the New York State Transmission System in compliance with Applicable Reliability Requirements and the NYISO Minimum Interconnection Standard.
Annual Transmission Review (ATR)	The NYISO, in its role as Planning Coordinator is responsible for providing an annual report to the NPCC Compliance Committee in regard to its Area Transmission Review in accordance with the NPCC Reliability Compliance and Enforcement Program and in conformance with the NPCC Design and Operation of the Bulk Power System (Directory #1).
Best Available Retrofit Technology (BART)	NYS DEC regulation, required for compliance with the federal Clean Air Act, applying to fossil fueled electric generating units built between August 7, 1962 and August 7, 1977. Emissions control of SO2, NOx and PM may be necessary for compliance. Compliance deadline is January 2014.
Best Technology Available (BTA)	Proposed NYS DEC policy establishing performance goals for new and existing electricity generating plants for Cooling Water Intake Structures. The policy would apply to plants with design intake capacity greater than 20 million gallons/day and prescribes reductions in fish mortality. The performance goals call for the use of wet, closed-cycle cooling systems at existing generating plants.

Term	Definition
Bulk Power Transmission Facility (BPTF):	Transmission facilities that are system elements of the bulk power system which is the interconnected electrical system within northeastern North America comprised of system elements on which faults or disturbances can have a significant adverse impact outside of the local area.
Capability Period:	The Summer Capability Period lasts six months, from May 1 through October 31. The Winter Capability Period runs from November 1 through April 30 of the following year.
Capacity:	The capability to generate or transmit electrical power, or the ability to reduce demand at the direction of the NYISO.
Class Year	The group of generation and merchant transmission projects included in any particular Annual Transmission Reliability Assessment [ATRA], in accordance with the criteria specified for including such projects in the assessment.
Clean Air Interstate Rule (CAIR):	Rule proposed by the U.S. EPA to reduce Interstate Transport of Fine Particulate Matter (PM) and Ozone. CAIR provides a federal framework to limit the emission of SO_2 and CO_2.
Comprehensive Reliability Plan (CRP):	An annual study undertaken by the NYISO that evaluates projects offered to meet New York's future electric power needs, as identified in the Reliability Needs Assessment (RNA). The CRP may trigger electric utilities to pursue regulated solutions to meet Reliability Needs if market-based solutions will not be available by that point. It is the second step in the Comprehensive System Planning Process (CSPP).
Comprehensive Reliability Planning Process (CRPP):	The annual process that evaluates resource adequacy and transmission system security of the state's bulk electricity grid over a 10-year period and evaluates solutions to meet those needs. The CRPP consists of two studies: the RNA, which identifies potential problems, and the CRP, which evaluates specific solutions to those problems.
Comprehensive System Planning Process (CSPP):	A transmission system planning process that is comprised of three components: 1) Local transmission planning; 2) Compilation of local plans into the Comprehensive Reliability Planning Process (CRPP), which includes developing a Comprehensive Reliability Plan (CRP); 3) Channeling the CRP data into the Congestion Assessment and Resource Integration Study (CARIS)

Term	Definition
Congestion Assessment and Resource Integration Study (CARIS):	The third component of the Comprehensive System Planning Process (CSPP). The CARIS is based on the Comprehensive Reliability Plan (CRP).
Congestion:	Transmission paths that are constrained, which may limit power transactions because of insufficient capability.
Contingencies:	Contingencies are electrical system events (including disturbances and equipment failures) that are likely to happen.
Day-Ahead Market (DAM):	A NYISO-administered wholesale electricity market in which capacity, electricity, and/or Ancillary Services are auctioned and scheduled one day prior to use. The DAM sets prices as of 11 a.m. the day before the day these products are bought and sold, based on generation and energy transaction bids offered in advance to the NYISO. More than 90% of energy transactions occur in the DAM.
Dependable Maximum Net Capability (DMNC):	The sustained maximum net output of a generator, as demonstrated by the performance of a test or through actual operation, averaged over a continuous time period as defined in the ISO Procedures. The DMNC test determines the amount of Installed Capacity used to calculate the Unforced Capacity that the Resource is permitted to supply to the NYCA.
Electric Reliability Organization (ERO):	Under the Energy Policy Act of 2005, the Federal Energy Regulatory Commission (FERC) is required to identify an ERO to establish, implement and enforce mandatory electric reliability standards that apply to bulk electricity grid operators, generators and TOs in North America. In July 2006, the FERC certified the North American Electric Reliability Corporation (NERC) as America's ERO.
Electric System Planning Work Group (ESPWG):	A NYISO governance working group for Market Participants designated to fulfill the planning functions assigned to it. The ESPWG is a working group that provides a forum for stakeholders and Market Participants to provide input into the NYISO's Comprehensive System Planning Process (CSPP), the NYISO's response to FERC reliability-related Orders and other directives, other system planning activities, policies regarding cost allocation and recovery for regulated reliability and/or economic projects, and related matters.

Term	Definition
Energy Efficiency Portfolio Standard (EEPS):	A statewide program ordered by the NYSPSC in response to the Governor's call to reduce New Yorkers' electricity usage by 15% of 2007 forecast levels by the year 2015, with comparable results in natural gas conservation.
Federal Energy Regulatory Commission (FERC):	The federal energy regulatory agency within the U.S. Department of Energy that approves the NYISO's tariffs and regulates its operation of the bulk electricity grid, wholesale power markets, and planning and interconnection processes.
FERC 715	Annual report that is required by transmitting utilities operating grid facilities that are rated at or above 100 kilovolts. The report consists of transmission systems maps, a detailed description of transmission planning Reliability Criteria, detailed descriptions of transmission planning assessment practices, and detailed evaluation of anticipated system performance as measured against Reliability Criteria.
Five Year Base Case:	The model representing the New York State power system over the first five years of the Study Period.
Forced Outage:	An unanticipated loss of capacity, due to the breakdown of a power plant or transmission line. It can also mean the intentional shutdown of a generating unit or transmission line for emergency reasons.
Gap Solution:	A solution to a Reliability Need that is designed to be temporary and to strive to be compatible with permanent market-based proposals. A permanent regulated solution, if appropriate, may proceed in parallel with a Gap Solution.
Gold Book:	Annual NYISO publication of its Load and Capacity Data Report.
Independent Market Advisor:	Person, persons or consulting firm retained by the NYISO Board pursuant to Article 4 of the ISO's Market Monitoring Plan.
Installed Capacity (ICAP):	A generator or load facility that complies with the requirements in the Reliability Rules and is capable of supplying and/or reducing the demand for energy in the NYCA for the purpose of ensuring that sufficient energy and capacity are available to meet the Reliability Rules.

Term	Definition
Installed Reserve Margin (IRM):	The amount of installed electric generation capacity above 100% of the forecasted peak electric consumption that is required to meet New York State Reliability Council (NYSRC) resource adequacy criteria. Most studies in recent years have indicated a need for a 15-20% reserve margin for adequate reliability in New York.
Interconnection Queue:	A queue of transmission and generation projects (greater than 20 MW) that have submitted an Interconnection Request to the NYISO to be interconnected to the state's bulk electricity grid. All projects must undergo three studies – a Feasibility Study (unless parties agree to forgo it), a System Reliability Impact Study (SRIS) and a Facilities Study – before interconnecting to the grid.
Load Pocket:	Areas that have a limited ability to import generation resources from outside their areas in order to meet reliability requirements.
Local Transmission Plan (LTP)	The Local Transmission Owner Plan resulting from the LTPP.
Local Transmission Owner Planning Process (LTPP):	The first step in the Comprehensive System Planning Process (CSPP), under which transmission owners in New York's electricity markets participate in local transmission planning for its own Transmission District.
Loss of load expectation (LOLE):	LOLE establishes the amount of generation and demand-side resources needed - subject to the level of the availability of those resources, load uncertainty, available transmission system transfer capability and emergency operating procedures - to minimize the probability of an involuntary loss of firm electric load on the bulk electricity grid. The state's bulk electricity grid is designed to meet an LOLE that is not greater than one occurrence of an involuntary load disconnection in 10 years, expressed mathematically as 0.1 days per year.
Lower Hudson Valley:	The southeastern section of New York, comprising New York Control Area Load Zones G (lower portion), H and I. Greene, Ulster, Orange, Dutchess, Putnam, Rockland and Westchester counties are located in those Load Zones.
Market-Based Solutions:	Investor-proposed projects that are driven by market needs to meet future reliability requirements of the bulk electricity grid as outlined in the RNA. Those solutions can include generation, transmission and Demand Response Programs.
Market Participant:	An entity, excluding the NYISO, that produces, transmits sells, and/or purchases for resale capacity, energy and ancillary services in the wholesale market. Market Participants include: customers under the NYISO's tariffs, power exchanges, TOs,

Term	Definition
	primary holders, load serving entities, generating companies and other suppliers, and entities buying or selling transmission congestion contracts.
Maximum Achievable Control Technology (MACT)	USEPA rule, scheduled for release in March 2011, which will propose to establish limits for Particulate Matter (PM), Hydrogen Chloride (HCl), Mercury (Hg), Carbon Monoxide (CO), and Dioxin and Furans.
National Ambient Air Quality Standards (NAAQS):	Limits, set by the EPA, on pollutants considered harmful to public health and the environment.
New York Control Area (NYCA):	The area under the electrical control of the NYISO. It includes the entire state of New York, and is divided into 11 zones.
New York State Department of Environmental Conservation (NYSDEC):	The agency that implements New York State environmental conservation law, with some programs also governed by federal law.
New York Independent System Operator (NYISO):	Formed in 1997 and commencing operations in 1999, the NYISO is a not-for-profit organization that manages New York's bulk electricity grid – a 10,877-mile network of high voltage lines that carry electricity throughout the state. The NYISO also oversees the state's wholesale electricity markets. The organization is governed by an independent Board of Directors and a governance structure made up of committees with Market Participants and stakeholders as members.
New York State Department of Public Service (DPS):	The New York State Department of Public Service, as defined in the New York Public Service Law, which serves as the staff for the New York State Public Service Commission.
New York State Energy Research and Development Authority (NYSERDA):	A corporation created under the New York State Public Authorities law and funded by the System Benefits Charge (SBC). Among other responsibilities, NYSERDA is charged with conducting a multifaceted energy and environmental research and development program to meet New York State's diverse economic needs.
New York State Public Service Commission (NYSPSC):	The New York State Public Service Commission, as defined in the New York Public Service Law.

Term	Definition
New York State Reliability Council (NYSRC)	A not-for-profit entity that develops, maintains, and, from time-to-time, updates the Reliability Rules which shall be complied with by the New York Independent System Operator ("NYISO") and all entities engaging in electric transmission, ancillary services, energy and power transactions on the New York State Power System.
North American Electric Reliability Corporation (NERC)	A not-for-profit organization that develops and enforces reliability standards; assesses reliability annually via 10-year and seasonal forecasts; monitors the bulk power system; and educates, trains, and certifies industry personnel. NERC is a self-regulatory organization, subject to oversight by the FERC and governmental authorities in Canada.
Northeast Power Coordinating Council (NPCC)	A not-for-profit corporation responsible for promoting and improving the reliability of the international, interconnected bulk power system in Northeastern North America.
Open Access Transmission Tariff (OATT):	Document of Rates, Terms and Conditions, regulated by the FERC, under which the NYISO provides transmission service. The OATT is a dynamic document to which revisions are made on a collaborative basis by the NYISO, New York’s Electricity Market Stakeholders, and the FERC.
Order 890:	Adopted by FERC in February 2007, Order 890 is a change to FERC’s 1996 open access regulations (established in Orders 888 and 889). Order 890 is intended to provide for more effective competition, transparency and planning in wholesale electricity markets and transmission grid operations, as well as to strengthen the Open Access Transmission Tariff (OATT) with regard to non-discriminatory transmission service. Order 890 requires Transmission Providers – including the NYISO – have a formal planning process that provides for a coordinated transmission planning process, including reliability and economic planning studies.
Outage:	Removal of generating capacity or transmission line from service either forced or scheduled.
Peak Demand:	The maximum instantaneous power demand averaged over any designated interval of time, which is measured in megawatt hours (MWh). Peak demand, also known as peak load, is usually measured hourly.
Reasonably Available Control Technology for Oxides of Nitrogen (NOx RACT)	Revised regulations recently promulgated by NYSDEC for the control of emissions of nitrogen oxides (NOx) from fossil fueled power plants. The regulations establish presumptive emission limits for each type of fossil fueled generator and fuel used as an electric generator in NY. The NOx RACT limits are part of the State Implementation Plan for achieving compliance with the National Ambient Air Quality Standard (NAAQS) for ozone.

Term	Definition
Reactive Power Resources:	Facilities such as generators, high voltage transmission lines, synchronous condensers, capacitor banks, and static VAr compensators that provide reactive power. Reactive power is the portion of electric power that establishes and sustains the electric and magnetic fields of alternating-current equipment. Reactive power is usually expressed as kilovolt-amperes reactive (kVAr) or megavolt-ampere reactive (MVAr).
Regional Greenhouse Gas Initiative (RGGI):	A cooperative effort by ten Northeast and Mid-Atlantic states to limit greenhouse gas emissions using a market-based cap-and-trade approach.
Regulated Backstop Solutions:	Proposals required of certain TOs to meet Reliability Needs as outlined in the RNA. Those solutions can include generation, transmission or Demand Response. Non-Transmission Owner developers may also submit regulated solutions. The NYISO may call for a Gap solution if neither market-based nor regulated backstop solutions meet Reliability Needs in a timely manner. To the extent possible, the Gap solution should be temporary and strive to ensure that market-based solutions will not be economically harmed. The NYISO is responsible for evaluating all solutions to determine if they will meet identified Reliability Needs in a timely manner.
Reliability Criteria:	The electric power system planning and operating policies, standards, criteria, guidelines, procedures, and rules promulgated by the North American Electric Reliability Council (NERC), Northeast Power Coordinating Council (NPCC), and the New York State Reliability Council (NYSRC), as they may be amended from time to time.
Reliability Need:	A condition identified by the NYISO in the RNA as a violation or potential violation of Reliability Criteria.
Reliability Needs Assessment (RNA):	A bi-annual report that evaluates resource adequacy and transmission system security over a 10-year planning horizon, and identifies future needs of the New York electric grid. It is the first step in the NYISO's CSPP.
Renewable Portfolio Standard (RPS):	Proceeding commenced by order of the NYSPSC in 2004 which established goal to increase renewable energy used in New York State 25% (or approximately 3,700 MW) by 2013.
Responsible Transmission Owner (Responsible TO):	The Transmission Owner(s) or TOs designated by the NYISO, pursuant to the NYISO CSPP, to prepare a proposal for a regulated solution to a Reliability Need or to proceed with a regulated solution to a Reliability Need. The Responsible TO will normally be the Transmission Owner in whose Transmission District the NYISO identifies a Reliability Need.

Term	Definition
Security:	The ability of the power system to withstand the loss of one or more elements without involuntarily disconnecting firm load.
Southeastern New York (SENY):	The portion of the NYCA comprised of the transmission districts of Con Edison and LIPA (Zones H, I, J and K).
Special Case Resources (SCR):	A NYISO Demand Response program designed to reduce power usage by businesses and large power users qualified to participate in the NYISO's ICAP market. Companies that sign up as SCRs are paid in advance for agreeing to cut power upon NYISO request.
State Environmental Quality Review Act (SEQRA)	NYS law requiring the sponsoring or approving governmental body to identify and mitigate the significant environmental impacts of the activity/project it is proposing or permitting.
State Implementation Plan (SIP):	A plan, submitted by each State to the EPA, for meeting specific requirements of the Clean Air Act, including the requirement to attain and maintain the National Ambient Air Quality Standards (NAAQS).
Study Period:	The 10-year time period evaluated in the RNA.
System Reliability Impact Study ("SRIS")	A study, conducted in by the NYISO in accordance with Applicable Reliability Standards, to evaluate the impact of the proposed interconnection on the reliability of the New York State Transmission System.
System Benefits Charge (SBC):	An amount of money, charged to ratepayers on their electric bills, which is administered and allocated by NYSERDA towards energy-efficiency programs, research and development initiatives, low-income energy programs, and environmental disclosure activities.
Transfer Capability:	The amount of electricity that can flow on a transmission line at any given instant, respecting facility rating and reliability rules.
Transmission Constraints:	Limitations on the ability of a transmission facility to transfer electricity during normal or emergency system conditions.
Transmission Owner (TO):	A public utility or authority that owns transmission facilities and provides Transmission Service under the Tariff
Transmission Planning Advisory Subcommittee (TPAS):	An identified group of Market Participants that advises the NYISO Operating Committee and provides support to the NYISO Staff in regard to transmission planning matters including transmission system reliability, expansion, and interconnection.
Unforced Capacity Delivery Rights	Unforced capacity delivery rights are rights that may be granted to controllable lines to deliver generating capacity from locations

Term	Definition
(UDR):	outside the NYCA to localities within NYCA.
Upstate New York (UPNY):	The NYCA north of Con Edison's transmission district.
Weather Normalized:	Adjustments made to neutralize the impact of weather when making energy and peak demand forecasts. Using historical weather data, energy analysts can account for the influence of extreme weather conditions and adjust actual energy use and peak demand to estimate what would have happened if the hottest day or the coldest day had been the typical, or “normal,” weather conditions. Normal is usually calculated by taking the average of the previous 30 years of weather data.
Zone:	One of the eleven regions in the NYCA connected to each other by identified transmission interfaces. Designated as Load Zones A-K.

Appendix B - The CSPP's Reliability Planning Process

This section presents an overview of the CSPP' Reliability Planning Processes followed by a summary of the 2005, 2007, 2008 and 2009 CRPs and their current status[17]. A detailed discussion of the Reliability Planning Process, including applicable Reliability Criteria, is contained in NYISO Manual 26 entitled: "Comprehensive Reliability Planning Process Manual,"[18] which is posted on the NYISO's website.

Each biennial cycle begins with the Local Transmission Planning Process (LTPP). As part of the LTPP, local Transmission Owners perform transmission studies for their BPTFs in their transmission are according to all applicable criteria. The LTPP provides inputs for the NYISO's Reliability Planning Process. The NYISO then conducts the Reliability Needs Assessment (RNA). The RNA evaluates the adequacy and security of the bulk power system over a 10-year Study Period. In identifying resource adequacy needs, the NYISO identifies the amount of resources in megawatts (known as "compensatory megawatts") and the locations in which they are needed to meet those needs. After the RNA is complete, the NYISO requests and evaluates first market-based solutions, then regulated backstop solutions and alternative regulated responses that address the identified Reliability Needs. This step results in the development of the NYISO's Comprehensive Reliability Plan (CRP) for the 10-year Study Period. The next step of the CSPP is the completion of the Congestion Assessment and Resource Integration Study (CARIS) for economic planning. CARIS Phase 1 examines congestion on the New York bulk power system and the costs and benefits of alternatives to alleviate that congestion. During CARIS Phase 2, the NYISO will evaluate specific transmission project proposals for regulated cost recovery.

The NYISO's Reliability Planning Process is a long-range assessment of both resource adequacy and transmission reliability of the New York bulk power system conducted over five-year and 10-year planning horizons. As an integral part of the CSPP, the Local Transmission Owner Planning Process (LTPP) provides opportunities for stakeholders to have input into each Transmission Owner's system specific plans, which,

[17] The first CRP was entitled the "2005 Comprehensive Reliability Plan," while the second CRP, released the following year, was entitled the "2007 Comprehensive Reliability Plan." A year was skipped in the naming convention because the title of the first CRP, which covered the Study Period 2006-2015, designated the year the study assumptions were derived, or 2005, but for the second CRP a different year designation convention was adopted, which identified the first year of the Study Period. The latter naming convention continues to be applied to for the 2008 and 2009 CRP documents. However, the original naming convention is used for the 2010 CRP and subsequent CRP documents.

[18] http://www.nyiso.com/public/webdocs/documents/manuals/planning/CRPPManual120707.pdf.

in turn, are input used in the RNA. Links to the Transmission Owner's LTPs can be found on the NYISO's website.[19]

There are two different aspects to analyzing the bulk power system's reliability in the RNA: adequacy and security. Adequacy is a planning and probabilistic concept. A system is adequate if the probability of having sufficient transmission and generation to meet expected demand is equal to or less than the system's standard, which is expressed as a loss of load expectation (LOLE). The New York State bulk power system is planned to meet an LOLE that, at any given point in time, is less than or equal to an involuntary load disconnection that is not more frequent than once in every 10 years, or 0.1 days per year. This requirement forms the basis of New York's installed capacity (ICAP), or resource adequacy requirement.

Security is an operating and deterministic concept. This means that possible events are identified as having significant adverse reliability consequences, and the system is planned and operated so that the system can continue to serve load even if these events occur. Security requirements are sometimes referred to as N-1 or N-1-1. N is the number of system components; an N-1 requirement means that the system can withstand single disturbance events (e.g., generator, bus section, transmission circuit, breaker failure, double-circuit tower) without violating thermal, voltage and stability limits or before affecting service to consumers. An N-1-1 requirement means that the Reliability Criteria apply after any critical element such as a generator, a transmission circuit, a transformer, series or shunt compensating device, or a high voltage direct current (HVDC) pole has already been lost. Generation and power flows can be adjusted by the use of 10-minute operating reserve, phase angle regulator control and HVDC control and a second single disturbance is analyzed.

The CSPP is anchored in the market-based philosophy of the NYISO and its Market Participants, which posits that market solutions should be the preferred choice to meet the identified Reliability Needs reported in the RNA. In the CRP, the reliability of the bulk power system is assessed and solutions to Reliability Needs evaluated in accordance with existing Reliability Criteria of the North American Electric Reliability Corporation (NERC), the Northeast Power Coordinating Council, Inc. (NPCC), and the New York State Reliability Council (NYSRC) as they may change from time to time. These criteria and a description of the nature of long-term bulk power system planning are described in detail in the applicable planning manual, and are briefly summarized below. In the event that market-based solutions do not materialize to meet a Reliability Need in a timely manner, the NYISO designates the Responsible TO or Responsible TOs to proceed with a regulated backstop solution in order to maintain system reliability. Market Participants

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[19] http://www.nyiso.com/public/markets_operations/services/planning/process/ltpp/index.jsp

can offer and promote alternative regulated responses which, if determined by NYISO to help satisfy the identified Reliability Needs and by regulators to be more desirable, may displace some or all of the Responsible TOs regulated backstop solutions[20]. Under the CSPP, the NYISO also has an affirmative obligation to report historic congestion across the transmission system. In addition, the draft RNA is provided to the Independent Market Advisor for review and consideration of whether market rules changes are necessary to address an identified failure, if any, in one of the NYISO's competitive markets. If market failure is identified as the reason for the lack of market-based solutions, the NYISO will explore appropriate changes in its market rules with its stakeholders and Independent Market Advisor. The CSPP does not substitute for the planning that each TO conducts to maintain the reliability of its own bulk and non-bulk power systems.

The NYISO does not have the authority to license or construct projects to respond to identified Reliability Needs reported in the RNA. The ultimate approval of those projects lies with regulatory agencies such as the FERC, the NYS PSC, environmental permitting agencies, and local governments. The NYISO monitors the progress and continued viability of proposed market and regulated projects to meet identified needs, and reports its findings in annual plans. Figure B-1 below summarizes the reliability planning process and Figure B-2 summarizes the economic planning process which collectively comprises the CSPP process.

The 2010 CRP will form the basis for the next cycle of the NYISO's economic planning process. That process will examine congestion on the New York bulk power system and the costs and benefits of alternatives to alleviate that congestion.

[20] The procedures for reviewing alternative regulated solutions for a reliability need are currently being discussed in NYPSC Case 07-E-1507.

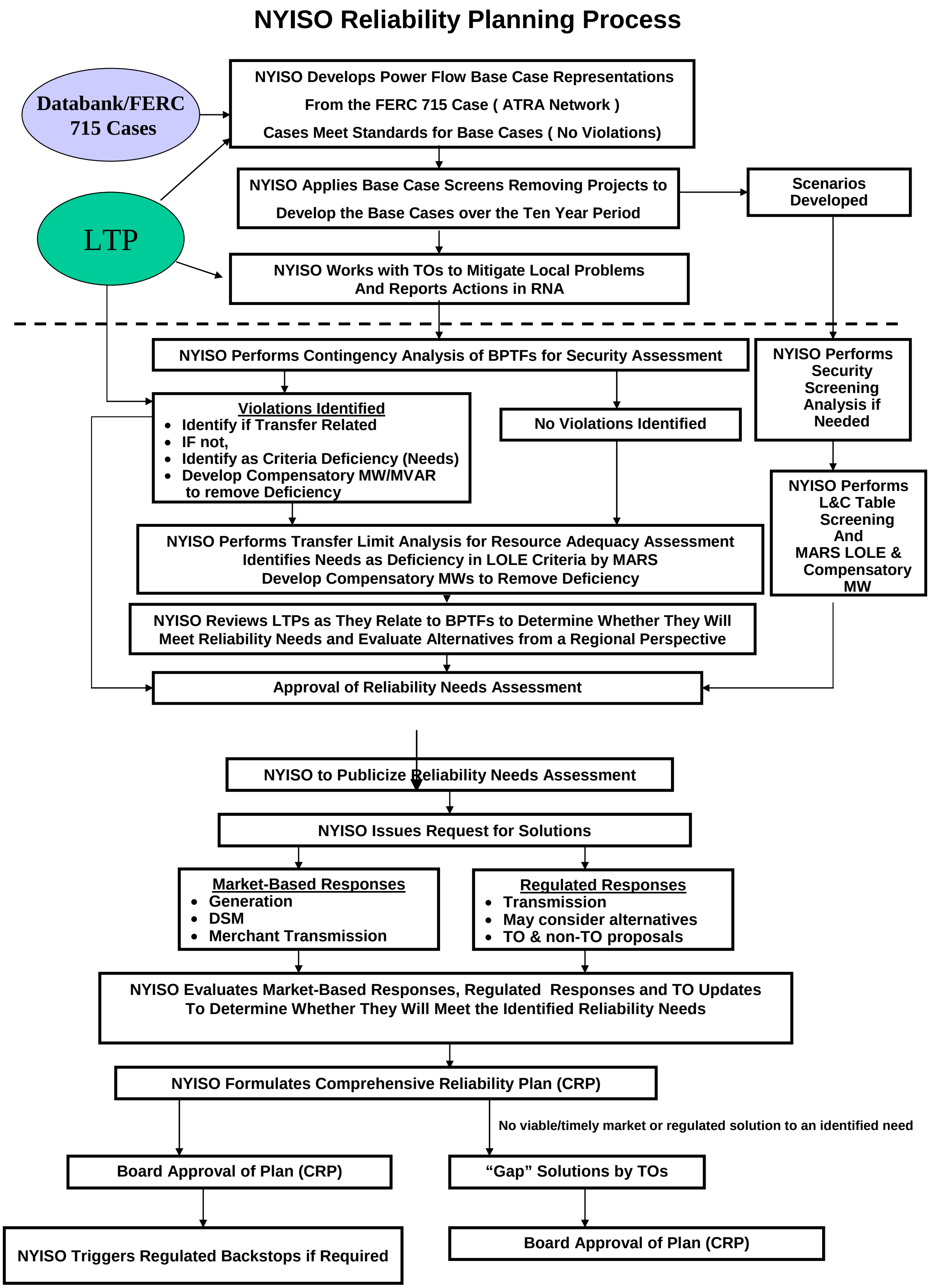


Figure B-1: NYISO Reliability Planning Process

NYISO Comprehensive System Planning Process (CSPP) Economic Planning Process (CARIS)

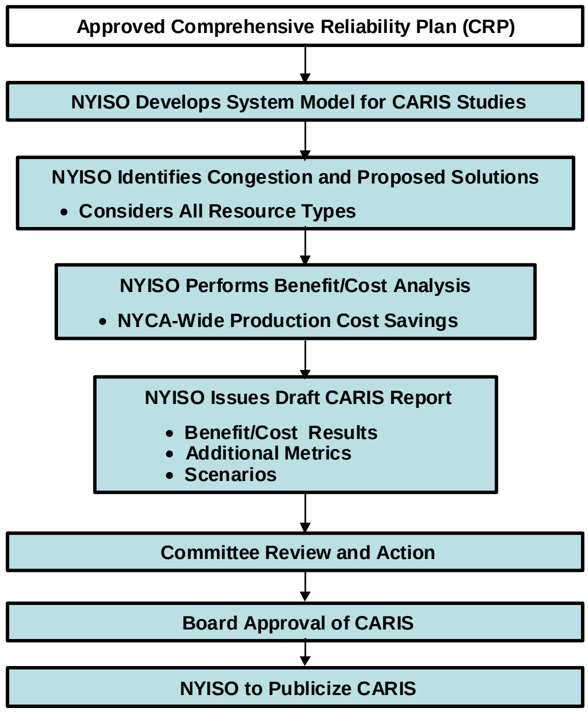


Figure B-2: Economic Planning Process

Appendix C - Load and Energy Forecast 2010-2020

C-1. Historical Overview

C-1.1. NYCA System

Table C-2 shows the New York Control Area's (NYCA) historic peak and energy growth since 2000. The table provides both actual results and weather-normalized results, together with annual average growth rates for each table entry. The growth rates are averaged over the period 2000 to 2009.

Table C-1: Historic Energy and Seasonal Peak Demand - Actual and Weather-Normalized

With Annual Average Growth Rates

	Annual Energy - GWh		Summer Peak - MW		Peak Winter - MW		
Year	**Actual**	**Weather Normalized**	**Actual**	**Weather Normalized**	**Years**	**Actual**	**Weather Normalized**
2000	156,631	157,502	28,138	29,774	2000-01	23,773	24,218
2001	156,801	156,206	30,982	29,994	2001-02	22,798	24,256
2002	158,752	156,604	30,664	30,408	2002-03	24,454	24,294
2003	158,012	157,731	30,333	30,519	2003-04	25,262	24,849
2004	160,211	160,618	28,433	31,179	2004-05	25,541	25,006
2005	167,208	164,111	32,075	31,630	2005-06	24,947	24,770
2006	162,237	162,709	33,939	32,644	2006-07	25,057	25,030
2007	167,341	165,809	32,169	33,444	2007-08	25,021	25,490
2008	165,613	166,371	32,432	33,670	2008-09	24,673	25,016
2009	158,780	161,160	30,844	33,065	2009-10	24,074	24,537
	0.15%	0.26%	1.03%	1.17%		0.14%	0.15%

NYCA is a summer peaking system and its summer peak has grown faster than annual energy and winter peak over this period. Both summer and winter peaks show considerable year-to-year variability due to the influence of extreme weather conditions on the seasonal peaks. Annual energy is influenced by weather conditions over an entire year, which is much less variable.

C-1.2. Executive Summary

The NYISO performs the Comprehensive System Planning Process to assess the adequacy of New York's electricity infrastructure for meeting reliability and market needs over the 2011 – 2020 horizon. As part of this assessment, a ten year forecast of summer and winter peak demands and annual energy requirements was produced.

The electricity forecast is based on projections of New York's economy performed by Moody's Analytics in January 2010. The forecast includes detailed projections of employment, output, income and other factors for twenty three regions in New York State. A summary of the electricity forecast and the key economic variables that drive it follows.

In June 2008, the Public Service Commission of New York issued its Order regarding the Energy Efficiency Portfolio Standard. This proceeding set forth a statewide goal of a cumulative energy reduction of about 26,900 GWh. The NYISO estimates the peak demand impacts to be about 5500 MW. This goal is expected to be achieved by contributions from a number of state agencies, power authorities and utilities, as well as from federal codes and building standards. The NYISO included fifty percent of the goal by the year 2020 in the 2010 RNA Base Case.

Table C-2: Summary of Econometric Forecasts

	Average Annual Growth			
Economic Indicators	**1999-2004**	**2004-2009**	**2010-2015**	**2015-2020**
Total Employment	-0.11%	0.18%	-0.08%	1.65%
Gross State Product	2.31%	2.16%	0.37%	3.17%
Population	0.42%	0.28%	0.06%	0.16%
Total Real Income	1.58%	1.29%	0.51%	3.27%
Summer Peak (actual data through 2009)	-1.27%	1.64%	0.60%	0.76%
Annual Energy (actual data through 2009)	0.53%	-0.18%	0.62%	0.94%

	Shares of Total Employment			
Employment Trends	**2004**	**2010**	**2015**	**2020**
Business, Services & Retail	38.34%	37.75%	37.83%	37.82%
Health, Education, Government, Agriculture	46.70%	49.27%	50.27%	50.82%
Manufacturing	14.97%	12.98%	11.91%	11.36%

C-2. Historical Overview

C-2.1. NYCA System

Table C-3 shows the New York Control Area's (NYCA) historic peak and energy growth since 2000.

Table C-3: Historic Peak and Energy Data with Growth Rates

			Summer Capability Period		Winter Capability Period		
Year	Annual GWh	Percent Growth	Summer MW	Percent Growth	Year	Winter MW	Percent Growth
2000	156,631		28,138		2000-01	23,774	
2001	156,801	0.11%	30,982	10.11%	2001-02	23,713	-0.26%
2002	158,752	1.24%	30,664	-1.03%	2002-03	24,454	3.12%
2003	158,012	-0.47%	30,333	-1.08%	2003-04	25,262	3.30%
2004	160,211	1.39%	28,433	-6.26%	2004-05	25,541	1.10%
2005	167,208	4.37%	32,075	12.81%	2005-06	25,060	-1.88%
2006	162,237	-2.97%	33,939	5.81%	2006-07	25,057	-0.01%
2007	167,341	3.15%	32,169	-5.21%	2007-08	25,021	-0.14%
2008	165,613	-1.03%	32,432	0.82%	2008-09	24,673	-1.39%
2009	158,780	-4.13%	30,844	-4.90%	2009-10	24,074	-2.43%
Annual Avg Growth:		0.15%		1.03%			0.14%

NYCA is a summer peaking system and its summer peak has grown faster than annual energy and winter peak over this period. Both summer and winter peaks show considerable year-to-year variability due to the influence of extreme weather conditions on the seasonal peaks. Annual energy is influenced by weather conditions over an entire year, which is much less variable.

C-2.2. Regional Energy and Seasonal Peaks

Table C-4 shows historic and forecast growth rates of annual energy for the different regions in New York. The Upstate region includes Zones A – I. The NYCA's most critical load centers are Zones J (New York City) and K (Long Island) are shown individually.

Table C-4: Actual and Forecast Annual Energy- GWh

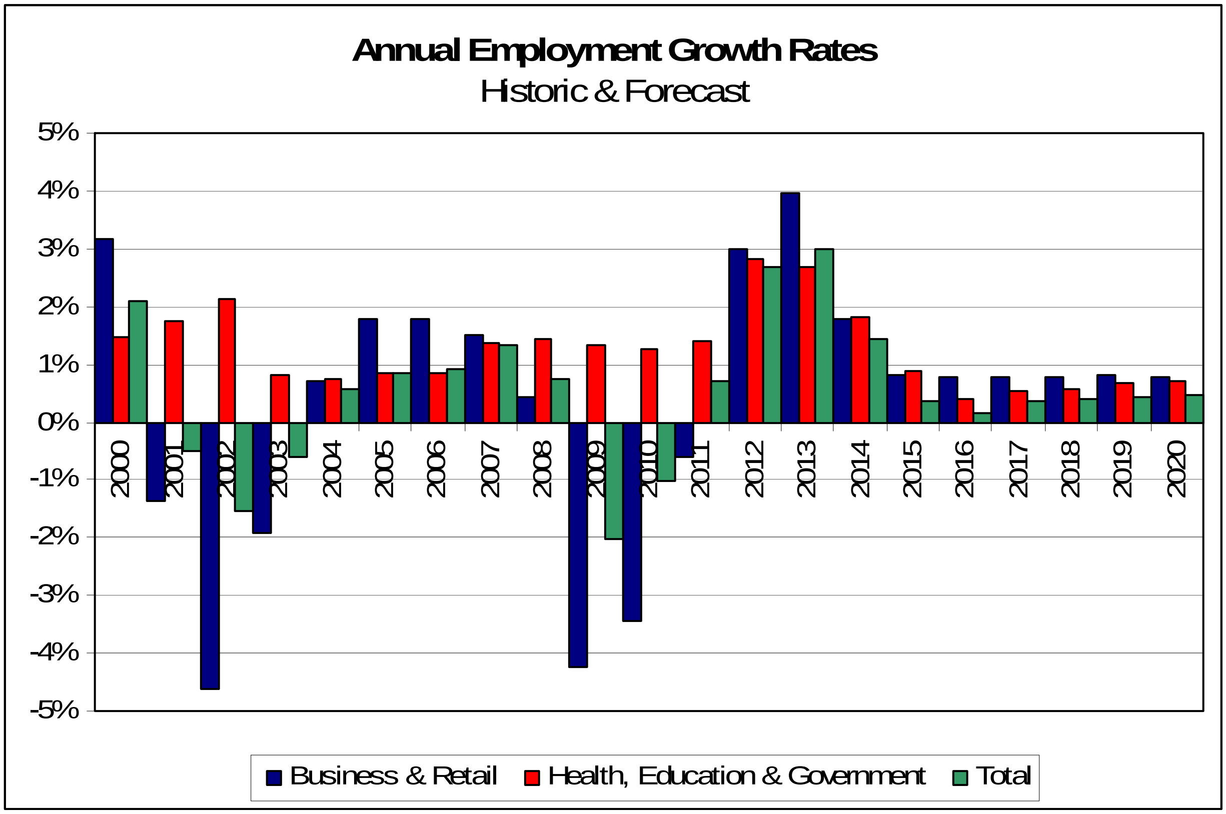
Year	Upstate Region	New York City	Long Island	NYCA
2000	87,376	49,183	20,072	156,631
2001	85,851	50,227	20,723	156,801
2002	85,852	51,356	21,544	158,752
2003	85,223	50,829	21,960	158,012
2004	85,935	52,073	22,203	160,211
2005	90,253	54,007	22,948	167,208
2006	86,956	53,096	22,185	162,237
2007	89,843	54,750	22,748	167,341
2008	88,316	54,835	22,461	165,613
2009	83,788	53,100	21,892	158,780
2010	85,334	52,838	22,187	160,358
2011	85,458	52,697	22,290	160,446
2012	86,131	53,026	22,461	161,618
2013	87,614	53,437	22,544	163,594
2014	87,967	53,966	22,623	164,556
2015	88,139	54,466	22,767	165,372
2016	88,412	54,939	23,122	166,472
2017	88,872	55,305	23,340	167,517
2018	89,600	55,886	23,646	169,132
2019	90,501	56,630	24,031	171,161
2020	91,412	57,385	24,535	173,332
2000-09	-0.5%	0.9%	1.0%	0.2%
2010-20	0.7%	0.8%	1.0%	0.8%
2000-04	-0.4%	1.4%	2.6%	0.6%
2004-09	-0.5%	0.4%	-0.3%	-0.2%
2010-15	0.6%	0.6%	0.5%	0.6%
2015-20	0.7%	1.0%	1.5%	0.9%

C-3. Trends Affecting Electricity in New York

C-3.1. *2010 Employment Forecast*

The 2010 economic outlook for employment shows a slow recovery from the 2009 recession. Total employment growth does not become positive until 2011. It reaches a rate of 3% by 2013, and then slows to a rate of 0.5% thereafter.

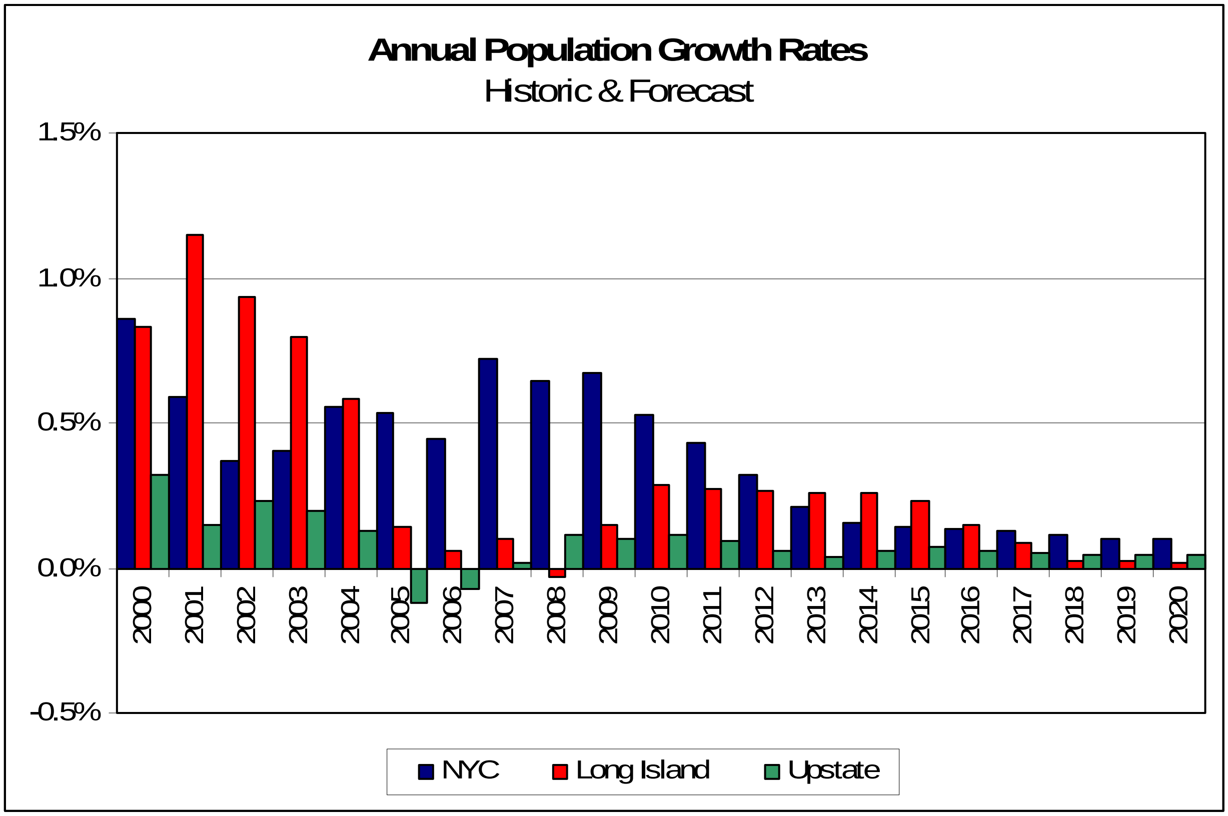
Figure C-1: Annual Employment Growth Rates



C-3.2. *2010 Population Forecast*

The 2010 population forecast projects slower population growth in every region of the state. While all growth rates remain positive, we see rates that grow more and more slowly. The largest change in growth is in New York City, where future growth is less than 50% of recent historic growth.

Figure C-2: Annual Change in Population by Region

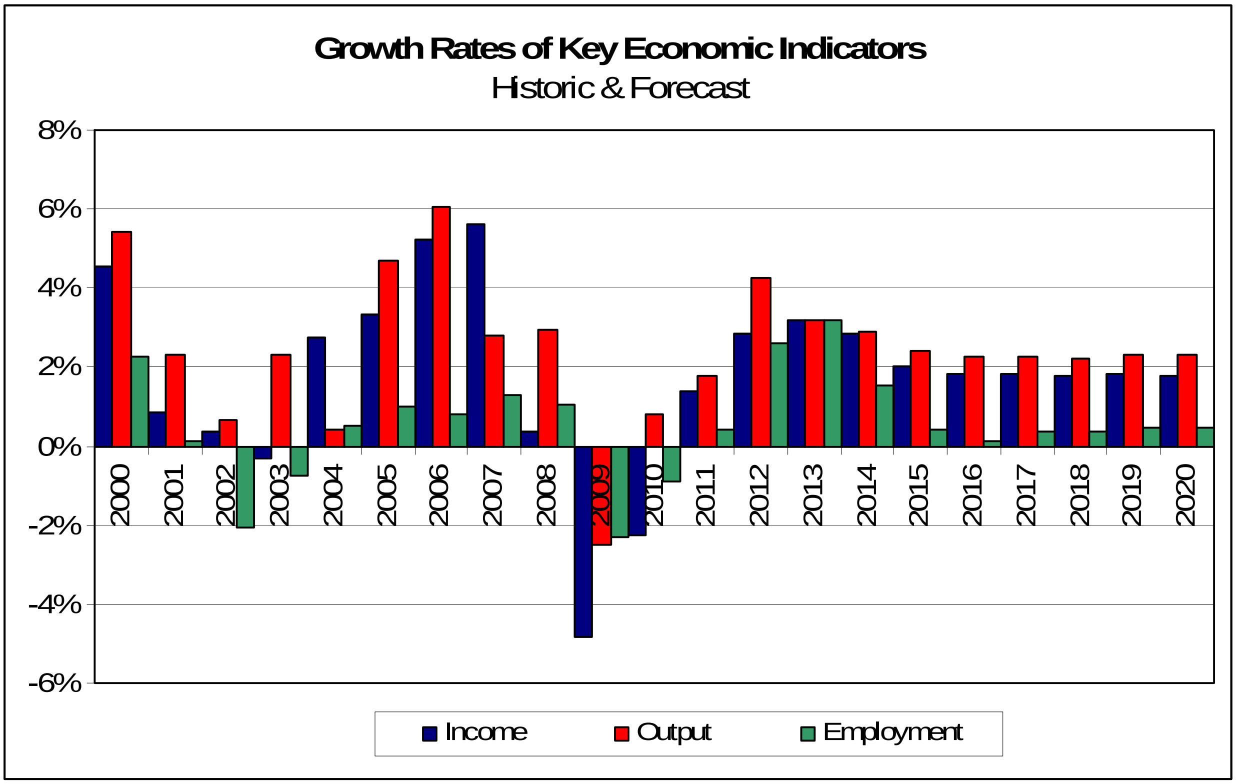


C-3.3. *2010 Forecasts of Real Output, Real Income, Employment*

Three key economic trends in the state are measured by real gross output, total income, and employment. Real gross output measures the prosperity of business, while real income and employment are indicative of the prosperity of households. The period from 2004 to 2007 showed significant growth in all these metrics. The recession caused them to decline substantially until 2011.

The 2010 forecast projects real economic output growth in the range of 2% through 2020. Real income growth has a similar pattern to output. Employment turns positive but is only growing at a rate of about 0.5%. All indices are characterized by faster growth in the near term followed by slower growth in the long term.

Figure C-3: Annual Growth Rates in Real Output and Income



C-3.4. Regional Economic Trends

Compared to previous years, there is a greater similarity in economic and electric energy growth throughout the state. The Upstate region (Zones A to I) has slower economic growth and slower energy growth.

Table C-5: Regional Economic Growth Rates of Key Economic Indicators

New York State

	Average Annual Growth	
Economic Indicators	**1999-2009**	**2010-2020**
Total Employment	0.2%	1.0%
Gross Product	2.5%	2.6%
Population	0.3%	0.1%
Total Income	1.6%	2.1%

New York City

	Average Annual Growth	
Economic Indicators	**1999-2009**	**2010-2020**
Total Employment	0.3%	1.1%
Gross Product	3.1%	3.1%
Population	0.6%	0.2%
Total Income	1.9%	3.2%

Upstate Regions

	Average Annual Growth	
Economic Indicators	**1999-2009**	**2010-2020**
Total Employment	0.1%	0.9%
Gross Product	1.7%	2.5%
Population	0.1%	0.1%
Total Income	1.2%	2.4%

Long Island

	Average Annual Growth	
Economic Indicators	**1999-2009**	**2010-2020**
Total Employment	0.3%	1.0%
Gross Product	1.9%	2.1%
Population	0.5%	0.2%
Total Income	1.7%	2.1%

C-4. Forecast Methodology

The NYISO methodology for producing the long term forecasts for the Reliability Needs Assessment consists of the following steps.

Econometric forecasts were developed for zonal energy using quarterly data from 1993 through 2009. For each zone, the NYISO estimated an ensemble of econometric models using population, households, economic output, employment, cooling degree days and heating degree days. Each member of the ensemble was evaluated and compared to historic data. The zonal model chosen for the forecast was the one which best represented recent history and the regional growth for that zone. The NYISO also received and evaluated forecasts from Con Edison and LIPA, which were used in combination with the forecasts we developed for Zones H, I, J and K.

The summer & winter non-coincident and coincident peak forecasts for Zones H, I, J and K were derived from the forecasts submitted to the NYISO by Con Edison and LIPA. For the remaining zones, the NYISO derived the summer and winter coincident peak demands from the zonal energy forecasts by using average zonal weather-normalized load factors from 2001 through 2009. The 2010 summer peak forecast was matched to coincide with the 2010 ICAP forecast.

C-5. Energy Conservation

The Energy Efficiency Portfolio Standard (EEPS) is an initiative of the Governor of New York and implemented by the state's Public Service Commission. The goal of the initiative is to reduce electric energy usage by 15 percent from forecasted energy usage levels in the year 2015 (the 15x15 initiative), which translates into a goal of 26,880 GWh by 2015.

The NYS PSC directed a series of working groups composed of all interested parties to the proceeding to obtain information needed to further elaborate the goal. The NYS PSC issued an Order in June 2008, directing NYSERDA and the state's investor owned utilities to develop conservation plans in accordance with the EEPS goal. The NYS PSC also identified goals that it expected would be implemented by LIPA and NYPA.

The NYISO has been a party to the EEPS proceeding from its inception. As part of the development of the 2010 RNA forecast, the NYISO developed an adjustment to the 2010 econometric model that incorporated a portion of the EEPS goal. This was based upon discussion with market participants in the Electric System Planning Working Group. The NYISO considered the following factors in developing the 2010 RNA Base Case:

- the approved spending levels of NYPA, LIPA and the NYS PSC,
- the expectation of increased spending levels after 2011,
- the expected realization rates of planned conservation,
- the degree to which energy conservation is already included in the econometric forecast,
- the impacts of new appliance efficiency standards and building codes and standards
- specific conservation plans proposed by LIPA, NYPA and Consolidated - Edison.
- the actual rates of implementation, based on data received from Department of Public Service staff.

The resulting adjusted econometric forecast included approximately 50% of the entire EEPS goal by the year 2020. Once the statewide energy and demand impacts were developed, zonal level forecasts were produced for the econometric forecast and for the Base Case.

Figure C-5: Zonal Energy Forecast Growth Rates - 2008 to 2018

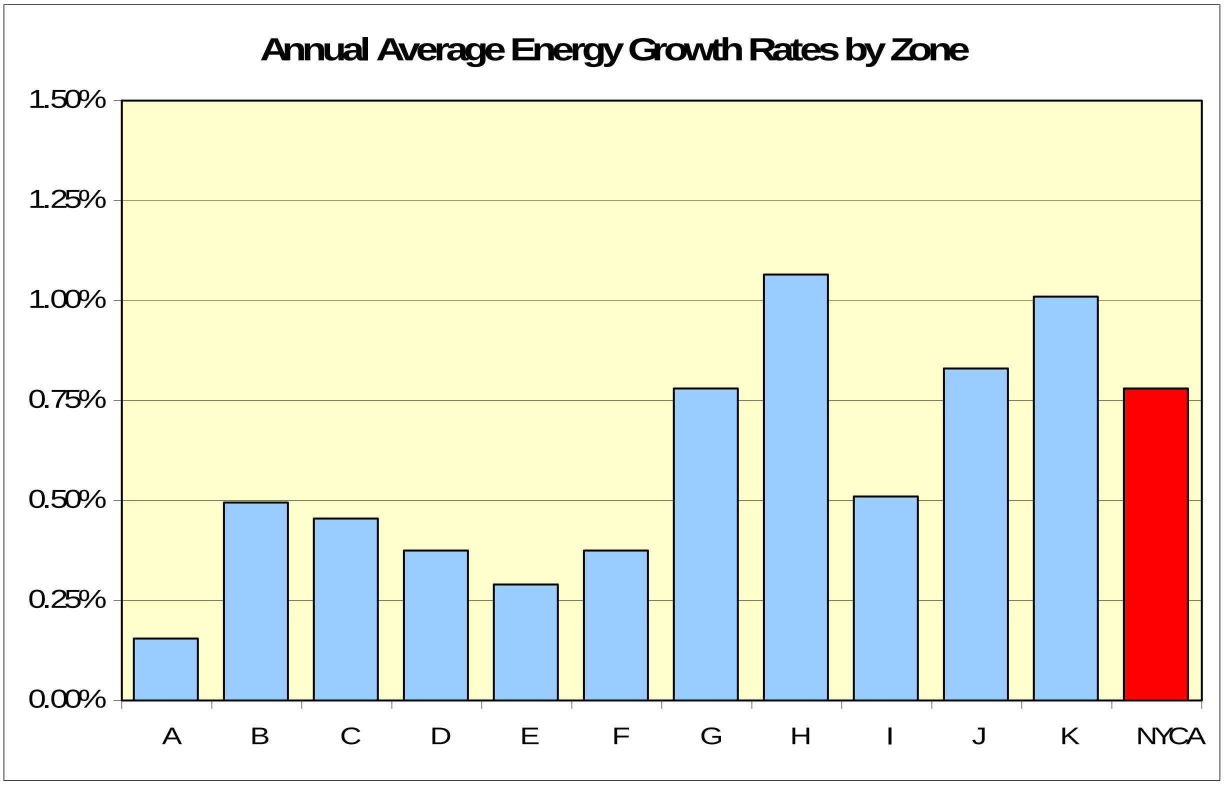


Figure C-6: Zonal Summer Peak Demand Forecast Growth Rates - 2007 to 2017

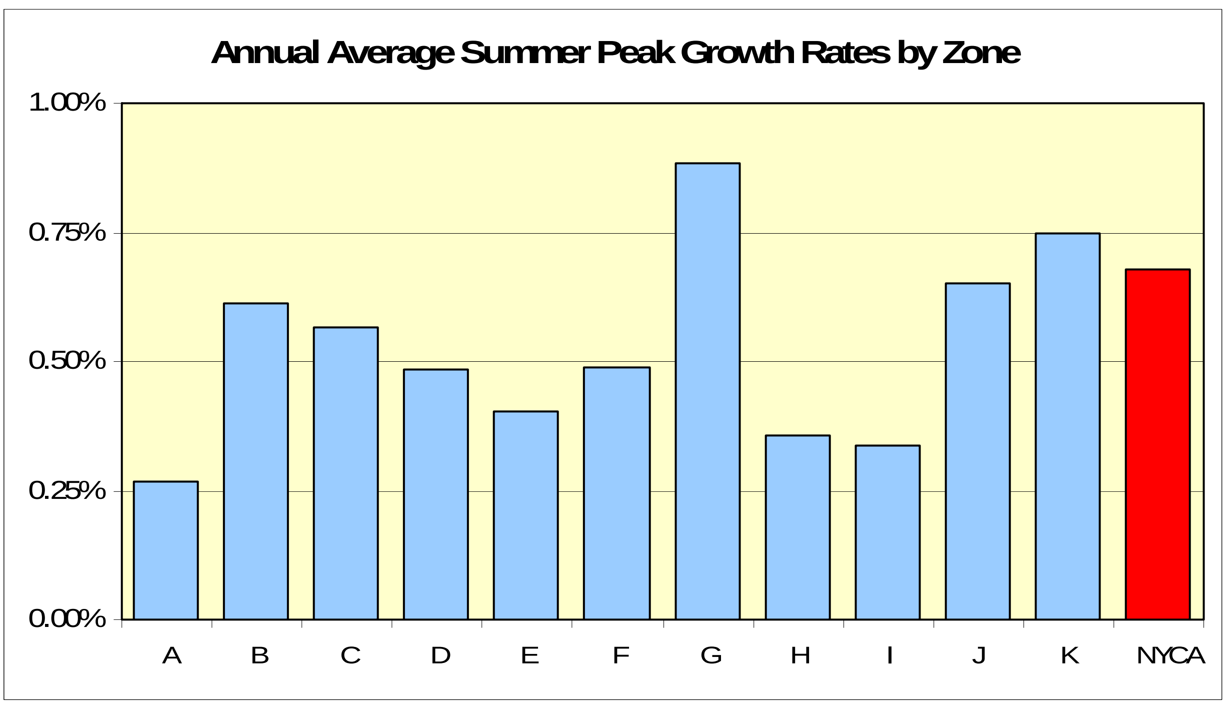


Table C-6: Actual and Forecast Annual Energy by Zone - GWh

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2000	16,785	9635	16,182	6527	8182	11,398	10,795	1942	5929	49,183	20,072	156,631
2001	16,209	9661	16,034	6374	7403	11,429	10,957	2003	5782	50,227	20,723	156,801
2002	16,355	9935	16,356	6450	7116	11,302	10,215	2162	5962	51,356	21,544	158,752
2003	15,942	9719	16,794	5912	6950	11,115	10,451	2219	6121	50,829	21,960	158,012
2004	16,102	9888	16,825	5758	7101	11,161	10,696	2188	6216	52,073	22,203	160,211
2005	16,498	10,227	17,568	6593	7594	11,789	10,924	2625	6435	54,007	22,948	167,208
2006	15,998	10,003	16,839	6289	7339	11,337	10,417	2461	6274	53,096	22,185	162,237
2007	16,258	10,207	17,028	6641	7837	11,917	10,909	2702	6344	54,750	22,748	167,341
2008	15,835	10,089	16,721	6734	7856	11,595	10,607	2935	5944	54,835	22,461	165,613
2009	15,149	9860	15,949	5140	7893	10,991	10,189	2917	5700	53,100	21,892	158,780
2010	15,364	9990	16,245	4236	8011	11,383	10,448	2997	6658	52,838	22,187	160,358
2011	15,301	9967	16,297	4365	8012	11,422	10,469	3010	6614	52,697	22,290	160,446
2012	15,211	9972	16,343	4920	7989	11,436	10,554	2992	6714	53,026	22,461	161,618
2013	15,150	10,013	16,403	6230	7977	11,437	10,634	2991	6778	53,437	22,544	163,594
2014	15,194	10,058	16,429	6358	7959	11,439	10,669	3037	6823	53,966	22,623	164,556
2015	15,189	10,068	16,462	6385	7945	11,443	10,707	3083	6856	54,466	22,767	165,372
2016	15,202	10,103	16,494	6397	7970	11,464	10,754	3131	6896	54,939	23,122	166,472
2017	15,263	10,174	16,578	6431	8021	11,522	10,830	3165	6890	55,305	23,340	167,517
2018	15,352	10,262	16,692	6489	8084	11,601	10,952	3216	6952	55,886	23,646	169,132
2019	15,476	10,377	16,846	6559	8167	11,708	11,119	3271	6978	56,630	24,031	171,161
2020	15,602	10,494	17,001	6625	8249	11,815	11,289	3332	7004	57,385	24,535	173,332

Table C-7: Actual and Forecast Summer Coincident Peak Demand - MW

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2000	2462	1644	2459	757	1185	1872	2176	417	1265	9771	4130	28,138
2001	2519	1889	2719	780	1260	2068	2361	537	1347	10,602	4900	30,982
2002	2631	1842	2787	777	1252	2073	2076	498	1335	10,321	5072	30,664
2003	2510	1782	2727	671	1208	2163	2146	498	1395	10,240	4993	30,333
2004	2493	1743	2585	644	1057	1953	2041	475	1280	9742	4420	28,433
2005	2726	1923	2897	768	1314	2164	2236	592	1409	10,810	5236	32,075
2006	2735	2110	3128	767	1435	2380	2436	596	1467	11,300	5585	33,939
2007	2592	1860	2786	795	1257	2185	2316	595	1438	10,970	5375	32,169
2008	2611	2001	2939	801	1268	2270	2277	657	1399	10,979	5231	32,432
2009	2595	1939	2780	536	1350	2181	2159	596	1279	10,366	5063	30,844
2010	2609	1969	2829	520	1423	2260	2288	623	1494	11,725	5286	33,025
2011	2605	1970	2844	537	1426	2274	2297	624	1494	11,775	5314	33,160
2012	2595	1975	2858	607	1425	2282	2321	627	1503	11,815	5360	33,367
2013	2591	1988	2875	768	1427	2287	2344	633	1515	11,925	5383	33,737
2014	2603	2001	2885	786	1426	2292	2356	635	1519	11,995	5398	33,897
2015	2604	2005	2894	790	1425	2294	2367	636	1524	12,065	5417	34,021
2016	2609	2013	2902	792	1431	2301	2379	638	1528	12,120	5481	34,193
2017	2621	2028	2918	796	1440	2313	2397	640	1531	12,218	5513	34,414
2018	2637	2046	2939	804	1452	2331	2425	644	1540	12,298	5557	34,672
2019	2658	2069	2966	813	1466	2351	2461	645	1543	12,404	5611	34,986
2020	2680	2093	2993	821	1481	2372	2498	646	1546	12,510	5695	35,334

Table C-8: Actual and Forecast Winter Coincident Peak Demand

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2000-01	2489	1510	2506	880	1263	1798	1690	366	877	7206	3188	23,773
2001-02	2248	1455	2340	843	1129	1742	1626	344	860	7013	3198	22,798
2002-03	2418	1507	2679	925	1223	1903	1590	437	927	7373	3472	24,454
2003-04	2433	1576	2755	857	1344	1944	1720	478	981	7527	3647	25,262
2004-05	2446	1609	2747	918	1281	1937	1766	474	939	7695	3729	25,541
2005-06	2450	1544	2700	890	1266	1886	1663	515	955	7497	3581	24,947
2006-07	2382	1566	2755	921	1274	1888	1638	504	944	7680	3505	25,057
2007-08	2336	1536	2621	936	1312	1886	1727	524	904	7643	3596	25,021
2008-09	2274	1567	2533	930	1289	1771	1634	529	884	7692	3570	24,673
2009-10	2330	1555	2558	648	1289	1788	1527	561	813	7562	3443	24,074
2010-11	2234	1521	2523	590	1345	1792	1638	580	956	7587	3523	24,289
2011-12	2225	1517	2531	608	1345	1799	1642	582	950	7567	3539	24,304
2012-13	2212	1518	2538	685	1341	1801	1655	579	964	7614	3566	24,473
2013-14	2203	1524	2548	867	1339	1801	1668	579	973	7673	3579	24,754
2014-15	2210	1531	2552	885	1336	1801	1673	588	980	7749	3592	24,896
2015-16	2209	1532	2557	889	1334	1802	1679	597	984	7821	3615	25,018
2016-17	2211	1538	2562	891	1338	1805	1686	606	990	7889	3671	25,186
2017-18	2220	1549	2575	895	1346	1814	1698	612	989	7941	3706	25,346
2018-19	2232	1562	2593	903	1357	1827	1717	622	998	8025	3754	25,591
2019-20	2251	1579	2616	913	1371	1843	1744	633	1002	8132	3815	25,899
2020-21	2269	1597	2640	922	1385	1860	1770	645	1006	8240	3895	26,230

Appendix D - Transmission System Assessment

A key element underlying the determination of Reliability Needs is an assessment to determine if the transmission system meets Reliability Criteria, and to establish the transfer limits to be used in the Multi-Area Reliability Simulation (MARS) model. This assessment is conducted through a series of power flow, stability and short circuit studies.

In general, the RNA analyses indicated that the bulk power transmission system can be secured, but that transfer limits for certain key interfaces must be reduced in order to respect voltage collapse criteria. However, a reduction in transfer limits or a limiting interface can result in higher LOLE findings and/or needs occurring earlier than they otherwise would. As a result, LOLE analysis was conducted for the RNA Base Case, a case with thermal limits, and finally a case with no internal NYCA transmission limits. These cases were conducted to demonstrate the impact that transmission limits have on the LOLE results.

D-1 Development of RNA Base Case System Cases

The NYISO developed the system representation for the second five years of the Study Period starting with the NPCC CP-8 2010 Summer Assessment Base Case and using: 1) the most recent Load and Capacity Data Report published by the NYISO on its Web site; 2) the most recent versions of NYISO reliability analyses and assessments provided for or published by NERC, NPCC, NYSRC, and neighboring control areas; 3) information reported by neighboring control areas such as power flow data, forecasted peak load, significant new or modified generation and transmission facilities, and anticipated system conditions that the NYISO determines may impact the bulk power transmission facilities (BPTF); 4) Market Participant input; and 5) procedures set forth in the applicable planning manual. Based on this process, the network model for the second five-year period incorporates TO and neighboring system plans in addition to those incorporated in the Five Year Base Cases. The changes in the MW and MVAr components of the load model were made to maintain a constant power factor.

The 2010 RNA Base Case model of the New York bulk power system includes the following new and proposed facilities and forecasts in the Gold Book:

- TO projects on non-bulk power facilities included in the FERC 715 Cases
- Facilities that have accepted their Attachment S cost allocations and are in service or under construction as of April 1, 2010
- Facilities that have obtained a NYS PSC Certificate (or other regulatory approvals and SEQRA review) and an approved System Reliability Impact Study (“SRIS”) and an executed contract with a credit-worthy entity.
- Transmission upgrades related to any projects and facilities that are included in the RNA Base Case, as defined above
- TO plans identified in the 2010 Gold Book as firm plans

- Facility reratings and uprates
- Scheduled retirements
- Special Case Resources (SCR) and the impacts of the NYS PSC EEPS Order, as developed and reviewed at the ESPWG
- External System Modeling.

The RNA Base Case does not include all projects currently listed on the NYISO's interconnection queue or those shown in the 2010 Gold Book. It includes only those which meet the screening requirements for inclusion.

The RNA Base Case was developed from the NPCC CP-8 2010 summer assessment system representation for Ontario, New England, and Hydro Quebec. The PJM representation was based upon the NPCC CP-8 2009 summer assessment data. These data bases included energy forecasts for each of the Areas 2010 through 2013 and a New England energy forecast from 2014 to 2019. The PJM energy forecast for 2014 to 2019 was developed by applying the growth rate (ratio of peak load for each year between 2014-2019) indicated in the PJM 2010 Load Forecast Report Data. The Ontario and Hydro Quebec load for 2014-2019 was derived from the most recent NPCC Load, Capacity, Energy, Fuel, and Transmission Report.

In order to avoid overdependence from emergency assistance from Outside World Areas, the Outside World Area's emergency operating procedure data was removed. Capacity of the Outside World areas was further modified so that the LOLE value of the Areas (Ontario, New England, Hydro Quebec, and PJM) was between 0.10 and 0.15. Table D-1 illustrates the MOD-MW data.

Table D-1: MOD-MW Data to Avoid Overdependence from Emergency Assistance

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Boston	(1125)	(875)	(500)	(250)	(125)	250	375	500	750	750
CMA	0	(250)	(125)	(125)	0	0	125	125	250	250
Norwalk	(500)	(250)	(250)	(125)	0	0	125	125	250	250
SW Ct	0	0	0	0	0	0	0	0	0	125
NE	(1625)	(1375)	(875)	(500)	(125)	250	625	750	1250	1375
Ontario	(5500)	(6500)	(7375)	(8125)	(8500)	(5000)	(4750)	(4875)	(5125)	(4750)
HydroQueb	(1500)	(875)	(500)	0	0	(375)	500	500	750	750
PJM_West	(125)	0	0	0	250	250	375	500	500	750
PJM_Cent	(625)	0	0	0	875	1000	1375	1875	2125	2500
PJM_East	(750)	0	0	0	1125	1250	1875	2250	2750	3250
PJM_MA	(1500)	0	0	0	2250	2500	3625	4625	5375	6500

D-2 Emergency Thermal Transfer Limit Analysis

The NYISO performed an analysis of RNA Base Case emergency thermal transfer limits for the key interfaces used in the MARS Resource Adequacy analysis. Table D-2 illustrates the emergency thermal transfer limits for the RNA base system conditions:

Table D-2: Emergency Thermal Transfer Limits

	2011		**2012**		**2013**		**2014**		**2015**	
Dysinger East	1	2725	1	3125		3200	1	3175	1	3175
West Central	1	1475	1	1875		1850	1	1900	1	1900
Moses South	2	2475	3	2650	3	2650	3	2650	3	2650
Volney East	4	5675	4	5700	4	5800	4	5775	4	5750
Total East	5	5929	6	6066	6	6009	6	5977	6	5880
Central East less PV-20 plus Fraser-Gilboa	5	3250	5	3525	5	3475	5	3475	5	3400
F to G	7	3500	7	3475	7	3475	7	3475	7	3525
UPNY-SENY less Ramapo 500kV tie	7	5250	7	5400	7	5400	7	5400	7	5475
I to J	8	4350	8	4350	8	4350	8	4350	8	4400
I to K	9	1290	9	1290	9	1290	9	1290	9	1290

	Limiting Facility	Limiting Rating	Contingency
1	Wethersfield-Meyer 230 kV	430	Pre-disturbance
2	Browns Falls-Taylorville 115 kV	134	Chateaguay-Massena and Massena-Marcy 765 kV
3	Marcy 765/345 T2 transformer	1971	Marcy 765/345 T1 transformer
4	Oakdale-Fraser 345kV	1380	Edic-Fraser 345kV
5	New Scotland-Leeds 345kV	1724	New Scotland-Leeds 345kV
6	Fraser-Coopers Corners 345 kV	1207	Pre-disturbance
7	Leeds-Pleasant Valley 345 kV	1725	Athens-Pleasant Valley 345 kV
8	Mott Haven-Rainey 345 kV	1196	Mott Haven-Rainey 345 kV
9	Dunwoodie-Shore Rd 345 kV	653	Pre-disturbance

The variations in through-time transfer limits are due to the differences in generation dispatch and other factors.

D-3 Development of the MARS Topology

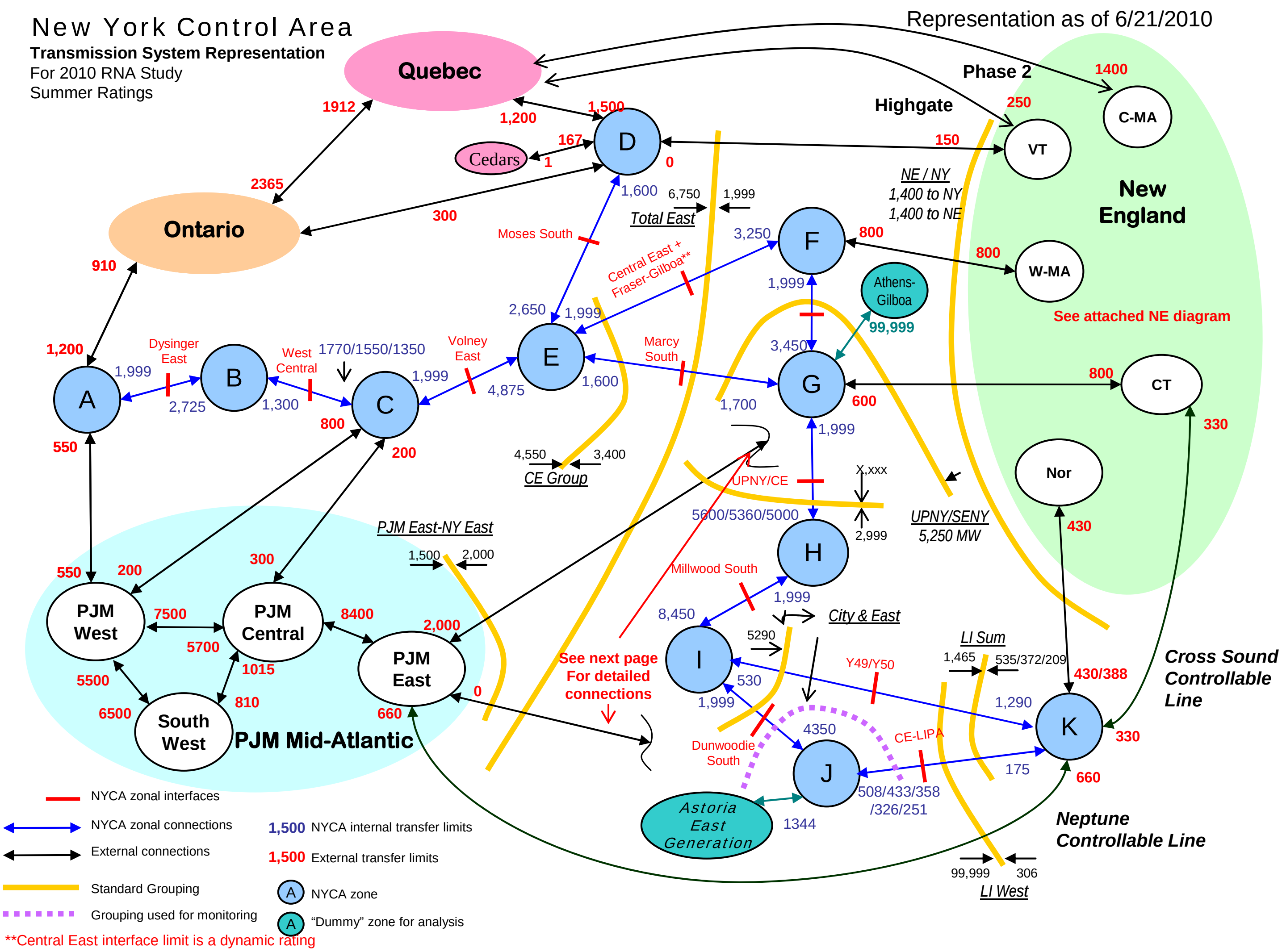


Figure D-1: Development of the MARS Topology

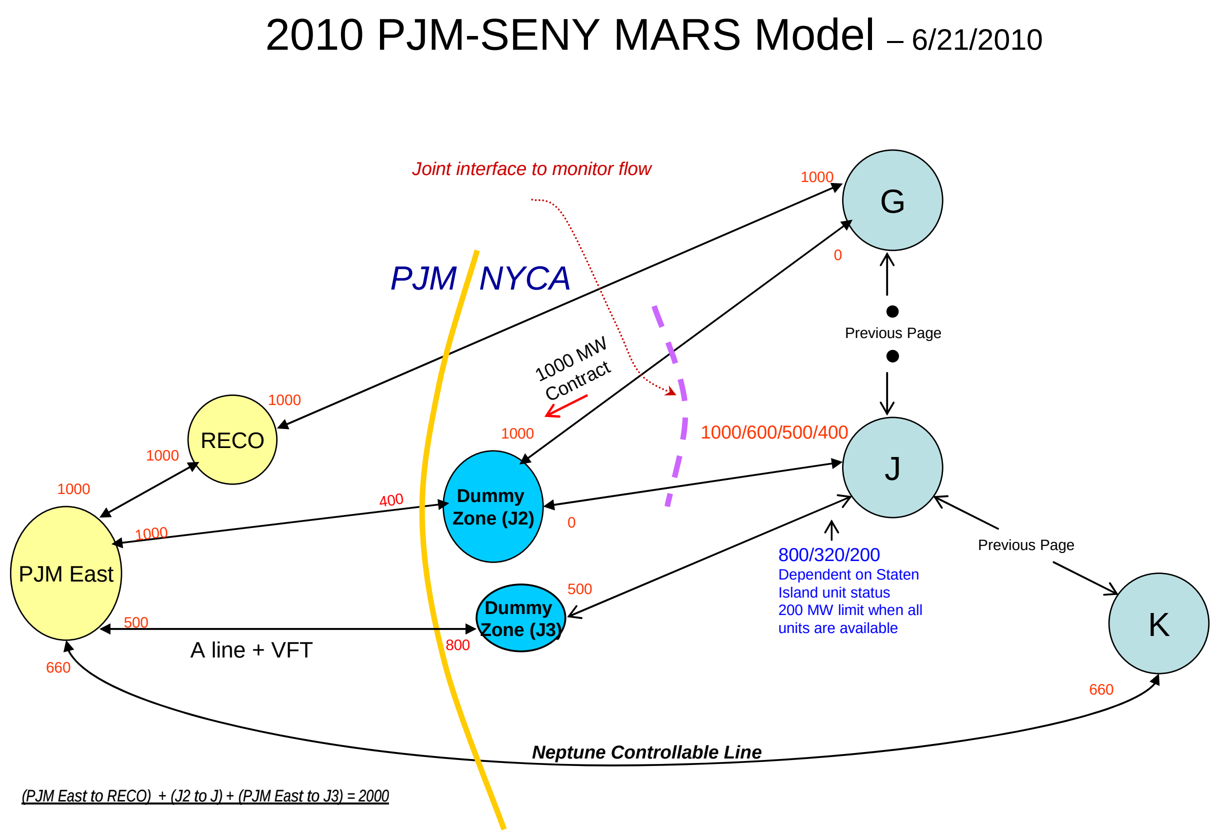


Figure D-2: 2010 PJM-SENY MARS Model

NEPOOL System (Assumed Ratings - MW)

From 2008 New England Comprehensive Review of Resource Adequacy

Excepted as Noted Below:

* Values updated per 2009 NE Interim Report ^ Values revised for RNA study

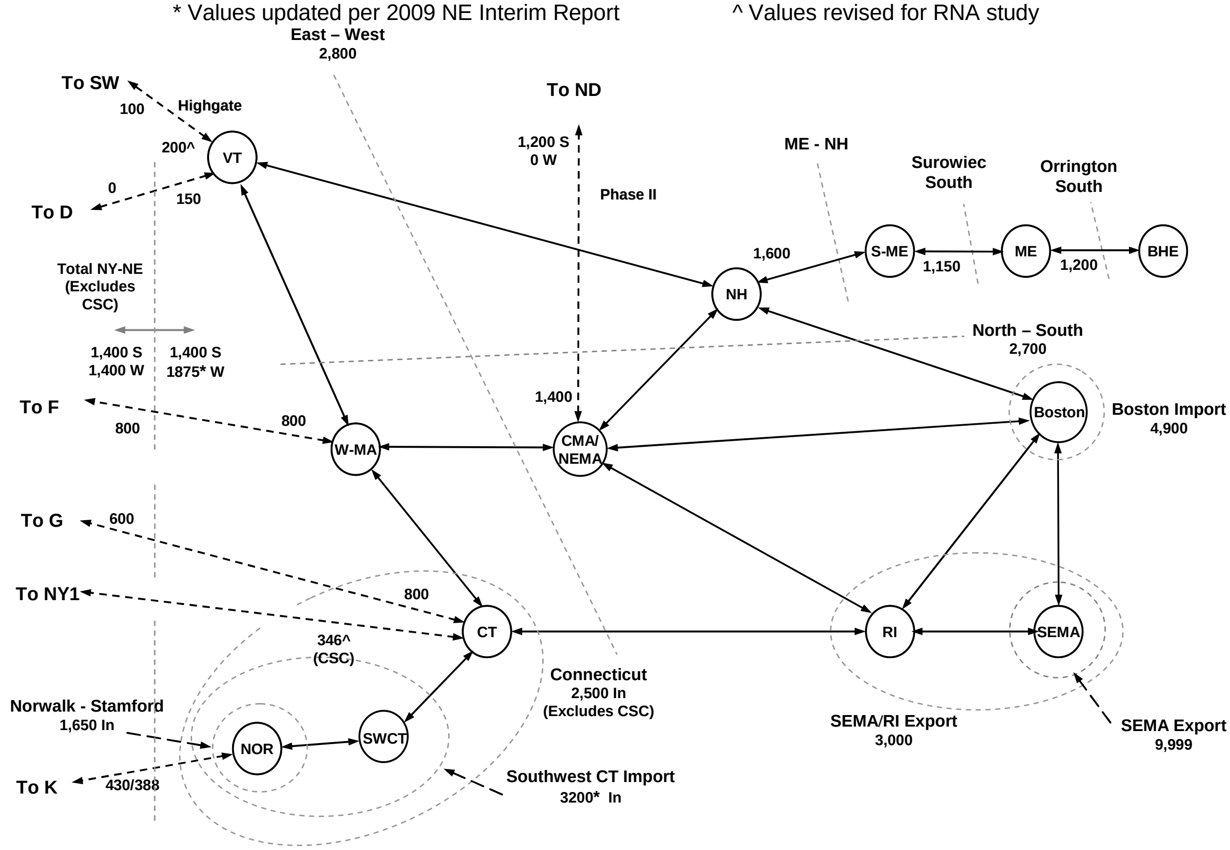


Figure D-3: NEPOOL System

D-4 Short Circuit Assessment

Table D-3 provides the results of NYISO's short circuit screening test. Individual breaker assessment (IBA) is required for any breakers whose rating is exceeded by the maximum fault current. Either NYISO or the Transmission Owner may complete the IBA.

Table D-3: 2010 RNA Fault Current Analysis Summary Table

BUS	KV	Maximum Phase Current	Lowest Rated CB	IBA Needed Y/N
MARCY 765	765	9.7	63	N
MASSENA 765	765	7.9	63	N
RAMAPO	500	15.1	none	n/a
AES SOMERSET	345	17.9	32	N
ALPS	345	17.8	40	N
ATHENS	345	34	50	N
BOWLINE 2	345	27.1	40	N
BOWLINE1	345	27.1	40	N
BUCHAN N	345	29.5	63	N
BUCHAN S	345	39.3	40	N
CLAY	345	34	50	N
COOPERS CRN	345	15.4	32	N
DEWITT	345	19.3	40	N
DUNWOODIE	345	52	63	N
E FISHKILL	345	39.7	63	N
E15ST 45	345	58.2	none	n/a
EDIC	345	32.5	40	N
EGC PAR	345	25.8	63	N
ELBRIDGE	345	16.4	40	N
EV 56-2	345	35	none	n/a
FARRAGUT	345	64.9	63	Y
FITZPATRICK	345	42.9	37	Y
FR KILLS	345	41.7	63	N
FRASER	345	17.5	29.6	N
GILBOA 345	345	25.4	40	N
GOETHL N	345	47.1	63	N
GOETHL S	345	47.1	63	N
GOW N	345	53.2	63	N
GOW S	345	52.3	63	N
HURLEY	345	17.3	40	N
INDEPENDENCE	345	39.6	50	N
LADENTOWN	345	39.5	63	N
LAFAYETTE	345	18.3	40	N
LEEDS	345	34.6	40	N

		Maximum	Lowest	IBA Needed
BUS	KV	Phase Current	Rated CB	Y/N
MARCY 345	345	31.7	63	N
MIDDLETN TAP	345	16	63	N
MILLWOOD	345	45.6	63	N
MOTT HAVEN	345	52.6	63	N
NIAGARA 345	345	33.7	63	N
NMP#1	345	45.3	50	N
NSCOT 99B	345	31.6	32	N
OAKDALE 345	345	12.7	29.6	N
OSWEGO	345	32.7	50	N
PLEASANT VAL	345	41.3	63	N
POLETTI	345	48.6	63	N
PVILLE-1	345	22	63	N
RAINEY	345	60	63	N
RAMAPO	345	43.7	63	N
REYNOLDS	345	14.8	none	n/a
ROCK TAVERN	345	26.3	38	N
Roseton	345	34.9	38	N
S.MAH-A	345	34.2	40	N
S.MAH-B	345	33.9	40	N
S080 345kV	345	17.1	32	N
S122	345	17	32	N
SCRIBA	345	48.9	50	N
SHORE RD	345	28.3	63	N
SPRN BRK	345	53.4	63	N
STOLLE ROAD	345	4	32	N
TREMONT	345	33.5	none	n/a
VOLNEY	345	37.4	40	N
W 49 ST	345	54.6	63	N
W.HAV345	345	28.5	none	n/a
WATERCURE345	345	7.9	29.6	N
WOOD ST A	345	22.1	none	n/a
WOOD ST B	345	25.4	none	n/a
ADIRONDACK	230	9.7	25	N
DUNKIRK	230	15.5	26	N
GARDENVILLE1	230	23.4	30	N
HILLSIDE 230	230	11.8	28.6	N
HUNTLEY	230	27.1	27	Y
MEYER	230	6.6	28.6	N
NIAGRA E 230	230	56.9	63	N
OAKDALE	230	6.4	none	n/a
PACKARD	230	43.7	50	N
PORTER	230	19.6	25	N
ROBINSON RD.	230	14.5	34.4	N
ROTTERDAM66H	230	12.6	20	N
S RIPLEY	230	9.1	40	N
ST LAWRN 230	230	33.6	37	N

BUS	KV	Maximum Phase Current	Lowest Rated CB	IBA Needed Y/N
STOLLE ROAD	230	14	28.6	N
WATERCURE230	230	11.7	26.4	N
WILLIS 230	230	11.8	37	N
AST-EAST-E	138	57.2	63	N
AST-WEST-N	138	46.7	45	Y
BARRETT1	138	49.3	59.2	N
BRKHAVEN	138	26.6	35.4	N
BUCHANAN	138	15.9	40	N
CORONA N.	138	55.3	63	N
DUN NO	138	34.2	40	N
DUN SO	138	30.9	40	N
E 13 ST	138	48.6	63	N
E 179 ST	138	49.4	63	N
EASTVIEW	138	37.2	63	N
EGC-1	138	72.8	80	N
FOXHLS 1	138	34.5	63	N
FOXHLS 2	138	34.9	40	N
FR KILLS	138	38	40	N
FREEPORT	138	36.3	63	N
GLENWOOD	138	51.5	63	N
HOLBROOK	138	47.9	52.2	N
JAMAICA	138	48.4	45	Y
LKE SCSS1	138	39.7	57.8	N
MILLWOOD	138	19.5	20	N
NEWBRID	138	73.7	80	N
NRTHPRT1	138	60.4	56.2	Y
NRTHPRT2	138	60.4	56.2	Y
PILGRIM	138	59.9	63	N
PT JEFF	138	32.2	63	N
QUEENSBG	138	44.8	63	N
RIVERHD	138	18.7	63	N
RULND RD	138	46	63	N
SHM CRK	138	46.1	63	N
SHORE RD1	138	49.5	57.8	N
SHOREHAM1	138	25.2	52.2	N
TREMNT11	138	43.3	63	N
VERNON E	138	43.1	40	Y
VERNON W	138	34.8	40	N
VLY STRM2	138	53.5	57.8	N
CLAY	115	38	60	N
PORTER	115	41.5	43	N

Tables D-4 provides the results of NYISO's IBA for Farragut 345kV, Fitzpatrick 345kV, Astoria West 138kV, Jamaica 138kV and Northport 138 kV.

Table D-4: NYISO IBA for 2010 RNA Study

FARRAGUT 345 KV

Breaker ID	Rating (kA)	1LG (kA)	2LG (kA)	3LG (kA)	Overduty
1E	63	63.885	64.917	60.567	Y
2E	63	63.885	64.917	60.567	Y
3E	63	63.540	64.595	60.261	Y
4E	63	63.467	64.612	60.289	Y
5E	63	63.885	64.917	60.567	Y
6E	63	63.885	64.917	60.567	Y
7E	63	63.195	64.561	60.283	Y
8E	63	63.195	64.561	60.283	Y
9E	63	63.885	64.917	60.567	Y
10E	63	63.885	64.917	60.567	Y
11E	63	53.281	55.841	52.622	N
1W	63	63.885	64.917	60.567	Y
2W	63	63.885	64.917	60.567	Y
3W	63	63.885	64.917	60.567	Y
4W	63	63.885	64.917	60.567	Y
5W	63	62.803	64.196	60.009	Y
6W	63	63.143	64.152	59.818	Y
7W	63	63.143	64.153	59.818	Y
8W	63	63.491	64.612	60.293	Y
9W	63	63.885	64.917	60.567	Y
10W	63	63.885	64.917	60.567	Y
11W	63	54.482	56.462	51.378	N

FITZPATRICK 345 KV

Breaker ID	Rating (kA)	1LG (kA)	2LG (kA)	3LG (kA)	Overduty
10042	37	35.663	36.923	33.423	N

Huntley 230 kV

Breaker ID	Rating (kA)	1LG (kA)	2LG (kA)	3LG (kA)	Overduty
R1202	27	23.098	24.602	25.182	N
R1302	27	21.295	22.012	22.138	N
R1402	27	23.608	24.891	25.29	N
R1502	27	21.293	22.012	22.141	N
R1312	27	16.661	17.582	17.863	N

AST-WEST
138kV

Breaker ID	Rating (kA)	1LG (kA)	2LG (kA)	3LG (kA)	Overduty
G1N	45	44.156	42.406	38.984	N
G2N	45	44.156	42.406	38.984	N

JAMAICA 138 KV

Breaker ID	Rating (kA)	1LG (kA)	2LG (kA)	3LG (kA)	Overduty
1	45	36.614	40.301	39.05	N

NORTHPORT 138 KV

Breaker ID	Rating (kA)	1LG (kA)	2LG (kA)	3LG (kA)	Overduty
1310	56.2	50.247	51.733	52.232	N
1320	56.2	50.22	51.772	52.249	N
1450	56.2	51.339	50.469	49.14	N
1460	56.2	27.255	29.617	31.112	N
1470	56.2	32.206	32.637	32.822	N

Appendix E – Environmental Scenarios

E-1 Background

E-1.1 New York has a long history in the active development of environmental policies and regulations that govern the permitting, construction and operation of power generation and transmission facilities. Two noteworthy policy initiatives where New York has preceded national environmental programs include the regulation of power plant emissions to curb acid rain, and the more recently promulgated regional program to limit power plant emissions of carbon dioxide and other greenhouse gases. Such initiatives along with other environmental regulatory programs have led to significant investments in emission control equipment for many generating plants in New York, while other older less efficient and higher emitting facilities have been retired. Currently New York's standards for permitting new generating facilities are among the most stringent in the nation.

E-1.2 The combined result of these strict environmental standards and competitive markets administered by the NYISO since 1999 has been retirement of older plants representing 3000 MW of capacity and the addition of over 7000 MW of new efficient generating capacity. This has resulted in a marked reduction of power plant emissions and a significant improvement in the efficiency of the generation fleet as shown in Figures E-1 through E-3 below.

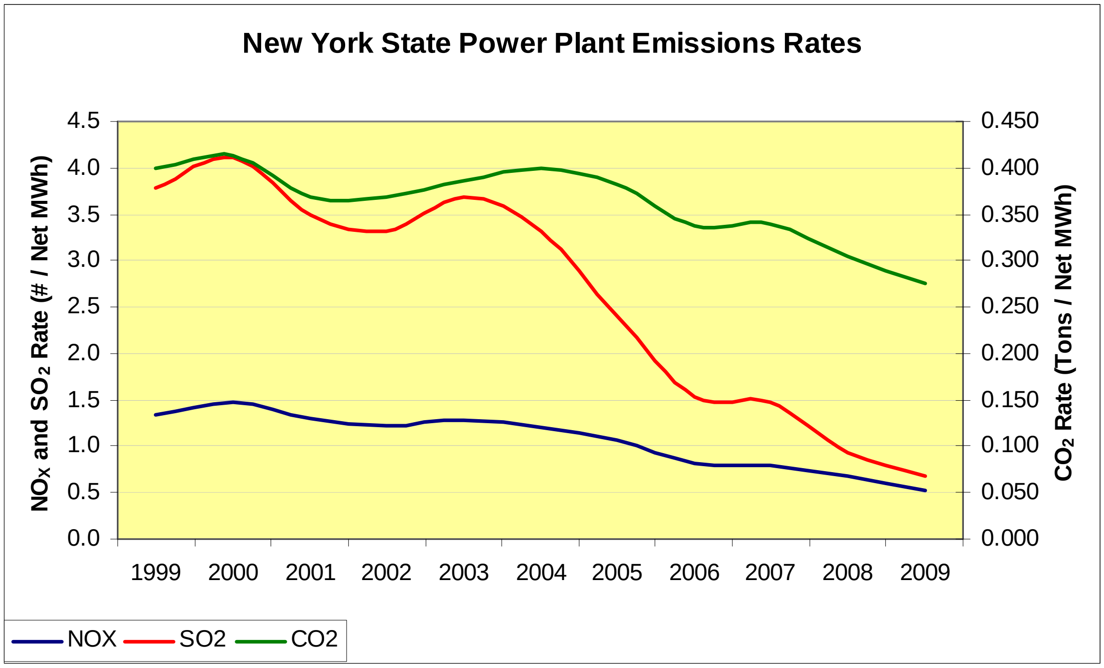


Figure E-1: New York State Power Plant Emissions Rates

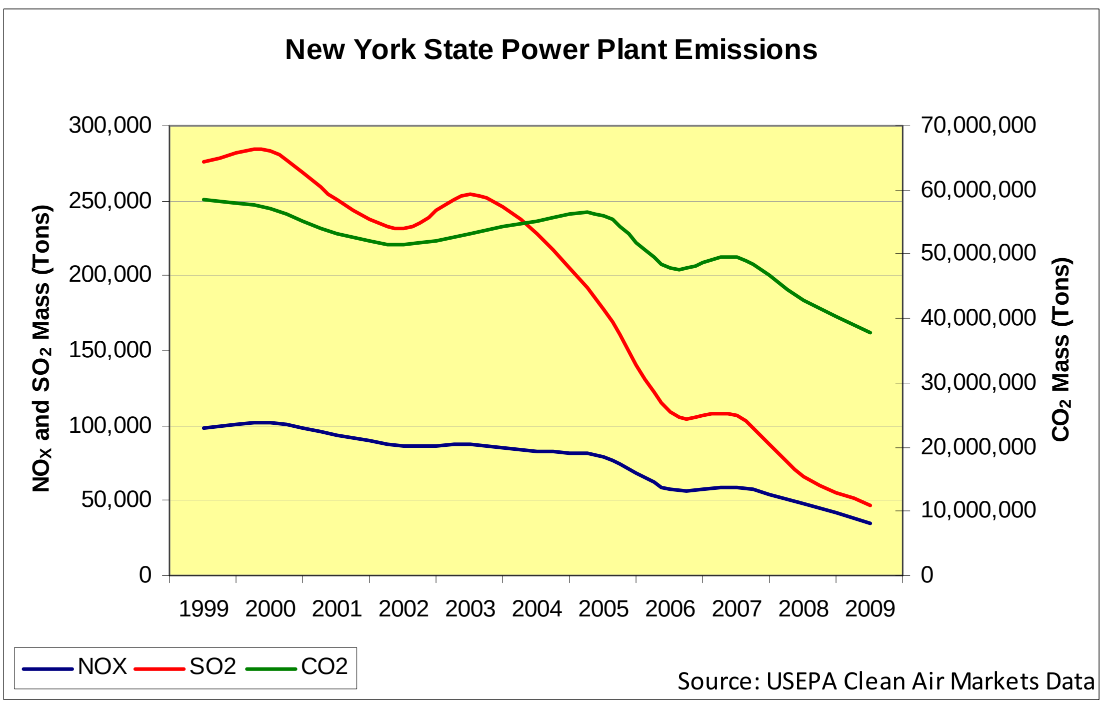


Figure E-2: New York State Power Plant Emissions

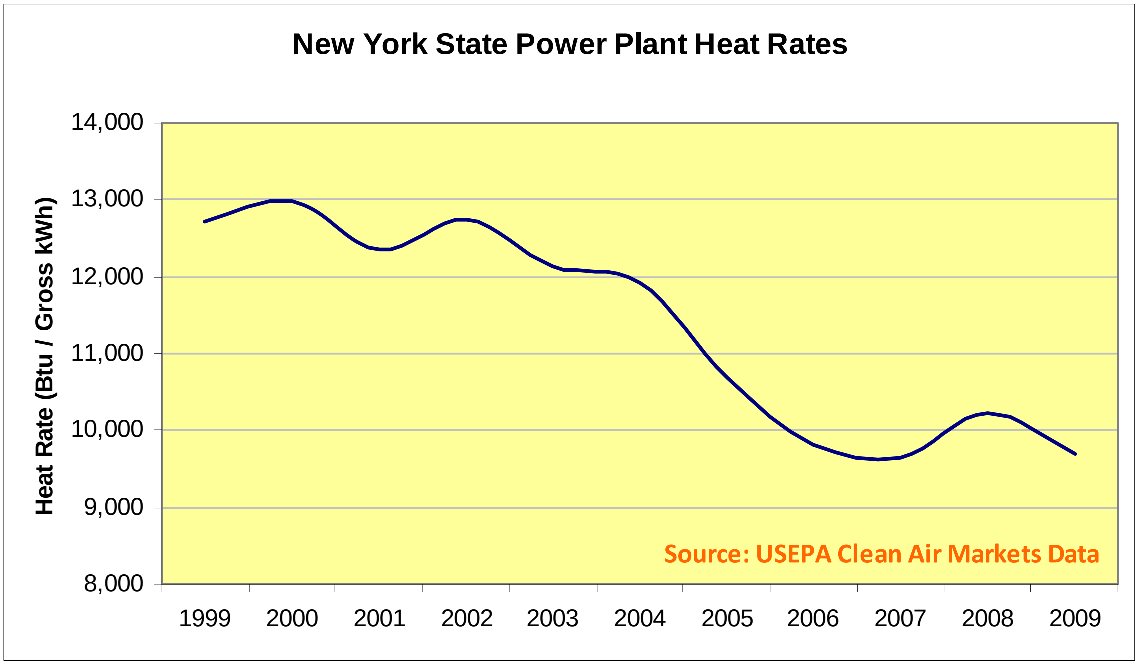


Figure E-3: New York State Power Plant Heat Rates

E-1.3 Notwithstanding the remarkable progress towards achieving New York's clean energy and environmental goals, more remains to be accomplished. While the 2009 New York State Energy Plan[21] provides a long range vision and framework for New York's clean energy economy and provides guidelines for New York State policymakers, much of the immediate environmental objectives and regulatory developments that are impacting New York's energy markets now and in the near-term are mapped out by the State's Department of Environmental Conservation (NYS DEC) in the annual publication of its regulatory agenda. This 2010 agenda[22] describes the new environmental initiatives that it will focus in the coming year. The U.S. Environmental Protection

[21] http://www.nysenergyplan.com/stateenergyplan.html
[22] http://www.dos.state.ny.us/info/register/2010/jan6/pdfs/regagenda.pdf

Agency also publishes a similar report on its regulatory agenda[23] The environmental initiatives that may affect generation resources may be driven by either or both the State or federal programs.

E-1.4 One of the purposes of the RNA is to identify possible future outcomes that could lead to insufficient resources in the NYS Power System to satisfy applicable Reliability Criteria. For example, such a situation may result from peak load growth rates exceeding the NYISO's Base Case forecast, the failure of new resources to successfully achieve commercial operation as planned, or the unplanned retirement of a significant amount of capacity provided by existing resources. The purpose of the development of this "Environmental Scenario" is to gain insight into population of resources that are likely to be faced with major capital investment decisions in order to achieve compliance with several evolving environmental program initiatives. The premise of this analysis is that the risk of unplanned retirements is directly related to the capital investment decisions resources need to make in order to achieve compliance with the new regulatory program requirements. The goal of this scenario analysis is to identify when and where these risks occur on the New York Power System.

E-1.5 The objectives of this study include:

E-1.5.1 Selection of major environmental program initiatives that may require significant capital investments to achieve compliance with the new environmental regulations within the 10 year planning horizon.

E-1.5.2 Identification of the set of existing generation resources that will be subject to each of the regulations studied.

E-1.5.3 Assessment of current environmental control technologies that are in place and related environmental performance for the potentially affected units of each regulatory program.

E-1.5.4 Identification of the possible control technologies that may be required for each regulatory program selected.

[23] http://www.reginfo.gov/public/do/eAgendaMain;jsessionid=9f8e890430d77ed37246b4ab417e9961cfca348ec55b.e34ObxiKbN0Sci0RbxaSc3qRc3n0n6jAmljGr5XDqQLvpAe?operation=OPERATION_GET_AGENCY_RULE_LIST&currentPub=true&agencyCd=2000&Image58.x=36&Image58.y=15

E-1.5.5 Risk characterization resulting from the level of retrofit cost impact for each regulatory program selected.

E-1.5.6 Identification of the timeframe for investment decisions required for affected units to achieve compliance.

E-1.5.7 Summation of the cost impact categories that each affected unit could be expected to be exposed to in the planning horizon

E-1.5.8 Comparison of the cumulative cost impacts for the effected resources on a zonal basis to the standard zones at risk analysis.

This analysis identifies, on a zonal or super zonal basis, the levels of cost impact that will result in an identified risk of unplanned retirements. The identification and timing of these potential risks will inform the NYISO and State policy makers of the potential impacts to potential LOLE violations caused by the newly adopted and proposed environmental regulations. Of equal importance, the results will also provide useful information about future opportunities to developers of new clean efficient generation resources or aggregators of special case resources.

E-2 Selection of Major Environmental Program Initiatives

The environmental initiatives reviewed for this study are described below.

E-2.1 Reasonably Available Control (NOx RACT)

E-2.1.1 NYS DEC has adopted revised regulations for the control of emissions of nitrogen oxides (NOx) from fossil fueled power plants. The regulations establish presumptive emission limits for each type of fossil fueled generator and fuel used as an electric generator in NY. The NOx RACT limits are part of the State Implementation Plan for achieving compliance with the National Ambient Air Quality Standard (NAAQS) for ozone. NOx in the presence of hydrocarbons and sunlight forms ozone. Reducing NOx emissions usually but not always leads to reductions in the ambient concentrations of ozone. Hydrocarbon emissions are largely controlled through automotive tailpipe standards. Fossil fueled power plants are the fourth largest source of NOx emissions in NY. NYS DEC is seeking to reduce emissions from the affected generators by 50%, from 58,000 TPY to 29,000 TPY. Compliance options include averaging emissions with lower emitting units, fuel switching, and installing emission reduction equipment such as low NOx burners or combustors, or selective catalytic reduction units.

E-2.1.2 The NYISO retained GE to conduct a detailed study about the types and costs of control technology necessary to comply with the proposed regulation. The study found that "A total of 72 units or 9515 MW of capacity was identified as needing some type of control mechanism of equipment modification to comply with the proposed standard." The study concluded that the costs to comply with the NOx RACT regulation would reduce operating margin for affected generators, but would generally not lead to situations where those margins would become negative. In addition the study concluded that the proposed compliance deadline should be extended to July 2014 in order to accommodate the outage schedules necessary to install the required emissions control equipment retrofits. The NYS DEC incorporated that recommendation into the revised rule.

E-2.2 Best Available Retrofit Technology (BART)

NYS DEC recently promulgated a new regulation Part 249, Requirements for the Applicability, Analysis, and Installation of Best Available Retrofit Technology (BART) Controls. The regulation applies to fossil fueled electric generating units built between August 7, 1962 and August 7, 1977 and is necessary for State to comply with provisions of the federal Clean Air Act that are designed to improve visibility in National Parks. The regulation requires an analysis to determine the impact of an affected unit's emissions on visibility in region national parks. If the impacts are greater than a prescribed minimum, then emission reductions must be made at the effect unit. Emissions of sulfur dioxide (SO2), nitrogen oxides (NOx) and particulate matter (PM) may be necessary. The compliance deadline has been set as January 2014.

The plants identified in Table E-1, have been identified by NYS DEC as affected facilities.

Table E-1: Facilities Affected by BART

Facility	Owner [EGU]	Unit(s)
EF Barrett Power Station	Keyspan/NG	Unit 2
Northport Power Station	Keyspan/NG	Units 1, 2, 3, 4
Arthur Kill Generating Station	NRG	Boiler 30
Ravenswood Generating Station	TransCanada	Units 10, 20, 30; Steam Plant Unit 3
Bowline Point Generating Station	Mirant	Boilers 1, 2
Danskammer Generating Station	Dynegy	Unit 4
Roseton Generating Station	Dynegy	Units 1, 2
Oswego Harbor Power	NRG	Units 5, 6
Trigen Energy Syracuse	GDF Suez	Boiler 1
Samuel A Carlson Generating Station	JBPU	Boiler 12

E-2.3 Maximum Achievable Control Technology (MACT)

The USEPA is required by the federal Clean Air Act to develop rules to limit emissions of certain substances classified as toxic. USEPA is scheduled to release a proposed rule March 2011. The rule will establish limits for Particulate Matter (PM), Hydrogen Chloride (HCl), Mercury (Hg), Carbon Monoxide (CO), and Dioxin and Furans. These limits will apply to coal fired generators and may apply to electric generators that are fueled by heavy oil. The emission limits are being determined through emissions testing of generators that are representative of the existing fleet of affected units. The limit will be established at the average emission rate of the best performing 12% of the test fleet. This implies that approximately 94% of generators will be determined to be in need of additional emission reductions. The anticipated compliance date is November 2014.

In addition, NYS DEC has promulgated Part 246: Mercury Reduction Program for Coal-Fired Electric Utility Steam Generating Units, which establishes emission limitations that are currently in effect in New York to reduce mercury emissions. Phase II of this regulation requires additional reductions from coal fired boilers in 2015. The Phase II emission limitations may be equivalent to the limits USEPA will establish next year.

The USEPA has proposed limitations on mercury emissions from oil fired boilers that supply generators less than 25 MW. Similar limitations for large oil fired boilers are likely.

E-2.4 Best Available Technology (BTA)

NYS DEC is currently seeking comment on it policy documents "Best Technology Available (BTA) for Cooling Water Intake Structures. The proposed policy will apply to plants with design intake capacity greater than 20 million gallons/day and prescribes reductions in fish mortality. The proposed policy establishes performance goals for new and existing cooling water intake structures. The performance goals call for the use of wet, closed-cycle cooling systems at existing generating facilities.

The policy does provide some limited relief of plants with historical capacity factors less than 15%.

For existing facilities, the proposed BTA requirements will typically be implemented when the existing facilities SPDES permit is renewed (every five years). As such, the NYS DEC will be required to make a determination of BTA for the particular facility intake structures before granting a renewed SPDES permit. Once the NYS DEC has made a determination of what constitutes BTA for a facility, the Department will consider the cost of the technology to determine if the costs are "wholly disproportionate" to the environmental benefits to be gained with BTA.

E-2.5 Clean Air Interstate Rule (CAIR)

On July 6, 2010, the USEPA proposed the Transport Rule that would require significant reductions of 71% in SO2 emissions and 51% in NOx emissions compared to 2005 emission levels from power plants in 31 eastern states and the DC. The rule is intended to replace the prior Clean Air Interstate Rule (CAIR) that was previously struck down by the court. The complex proposal covers over 1300 pages. A detailed analysis of the reliability impacts of this proposal cannot be accomplished within the schedule of the RNA.

E-2.6 Ozone National Ambient Air Quality Standard (Ozone NAAQS)

In January of this year, USEPA proposed lowering the primary 8-hour NAAQS for ground-level ozone to the range of 60 to 70 ppb from the current effective standard of 84 ppb. The final standard determinations are expected to be issued by August 31, 2010. NYS DEC has provided Figure E-4 that identifies counties that may exceed the primary 8-hour standard based on currently available monitoring data if the final standard falls below 65 ppb.

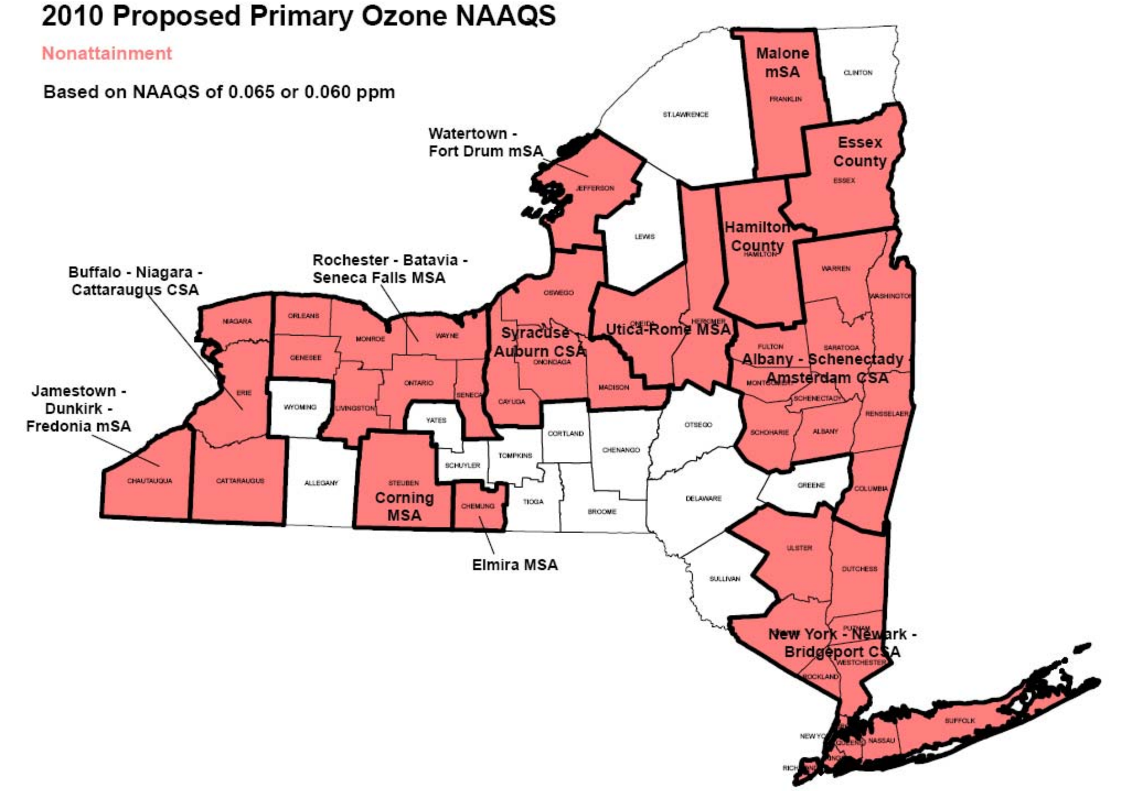


Figure E-4: 2010 Proposed Primary Ozone NAAQS

NYS DEC will have a one year monitoring period to prepare a recommended determination of attainment/non-attainment status for the revised 8-hour standard, and a three year period to develop a State Implementation Plan that will bring the State into compliance with the NAAQS. Actions required to reduce emissions from existing fossil fuel generating plants are anticipated to be necessary by 2017 for identified non-attainment areas.

E-2.7 Distributed Generation (DG Rule)

NYS DEC is preparing a rule to limit emissions from small diesel generators that participate in the NYISO's Installed Capacity/Special Case Resource programs (ICAP/SCR) or Emergency Demand Response Program (EDRP). Some of the older generators that participate in these programs may emit pollutants at rates that are two to three orders of magnitude greater than new gas-fired turbines that have recently interconnected to the bulk power system. There are approximately 218 MW of generating capacity in the ICAP/SCR program and approximately 87 MW of generating capacity in the EDRP program that would be affected by this regulation. Diesel generators built since 2000, however, are generally expected to comply with the new emission limits expected to be proposed by NYS DEC.

E-2.8 USEPA Regulation of Coal Combustion Byproducts

The USEPA has proposed to create a new regulatory program under the Resource Conservation and Recovery Act (RCRA) for the management of coal combustion byproducts. A final rule is expected to be issued by the USEPA this year. If the decision is to regulate coal combustion byproducts under Subtitle D of RCRA, the approach will be somewhat analogous to existing NYS DEC's regulations under Part 360 which have been in effect for a number of years. If the final rule seeks to regulate the material under Subtitle C of RCRA, the additional resources required for doing so are significant and could lead to the premature retirement of some or all of the coal fired generation in New York. New York currently has 2700 MW of coal fired generation.

E-2.9 NYS DEC Part 225: Fuel Composition and Use

NYS DEC has recently proposed amendments to this part to reduce the allowable fuel sulfur content of oil used in the production of electricity. While these amendments will likely result in some increases in fuel costs, they are not expected to result in result in premature retirement of oil fired steam boiler units.

E-2.10 NYS DEC Part 251: Performance Standards for the Emission of CO2

NYS DEC is in the process of drafting new regulations to limit the emissions of CO_2 and other Green House Gases from new and repowered electric generating units. While the specific details of this proposal are not yet available, the process creates regulatory uncertainty. Further if the new emission limits were to be established too low, then the regulation would act as a disincentive to developers.

E-2.11 Federal CO2 Legislation or Regulation

Currently the USEPA is in the process of developing regulation for Best Available Control Technology limits for new and rebuilt electric generators. In addition there is a continuing legislative process working toward some type of limitation on the emission of CO_2 from electric generators. The outcome of the process remains too uncertain to serve as the basis for detailed analysis in this RNA.

E-3 Reliability Impact Assessment Methodology

Several of the evolving environmental initiatives described above have sufficient definition of potential requirements, are generally widespread in effect, and are expected to require compliance actions in the earlier portion of the planning period, and therefore could lead to premature retirements. This study will focus on NOx RACT, BART, MACT, and BTA. The programs are estimated to impact 23,957 MW of capacity in the NYCA or 64% of the installed generating capacity NYISO currently relies on.

Each of the four programs has been examined to determine the category of capital cost potentially required of affected units to comply with each program. Three category levels are used to qualify the expected impacts

of each program on the existing generation fleet. Category 1 applies for the affected generator that is already in compliance with the proposed requirements, or could be expected to achieve compliance with changes in operating procedures and/or through the use of fuel switching. Thus the capital cost to achieve compliance for Category 1 generators is relatively small. Category 2 applies where the required capital expenditures are of a magnitude that is consistent with other capital expenditures that are necessary to maintain a generator over the planning horizon, e.g. a five year major overhaul of the steam turbine. Category 3 applies where the level of capital expenditure required to comply with the new regulation is above the average level of Cap EX and of a magnitude that is not routine.
While the total population of affected units is represented by the summation of the three impact categories, in each of these analyses the primary concern is with the capital investment decisions represented by Category 2 and 3. With the results of these analyses, the level of impact for each unit is summed across the four programs for Category 2 and 3. Units with the highest cumulative totals of impact are considered to be potentially at risk for premature retirement. The level of impact for each zone will be compared to the zones at risk analysis to identify where and when a reliability risk could arrive on the system.

E-3.1 NOx RACT Impact Assessment

The NYISO retained GE to conduct a detailed study about the types and costs of control technology necessary to comply with the proposed regulation. The study found that "[a] total of 72 units or 9515 MW of capacity was identified as needing some type of control mechanism of equipment modification to comply with the proposed standard." Capital costs of compliance were estimated to be approximately in the range of $100-300 million. The study concluded that the costs to comply with this regulation would reduce operating margin for effected generators but would not generally lead to a situations where those margins would become negative. In addition the study concluded that the proposed compliance deadline should be extended to July 2014 in order to accommodate the outage schedules necessary to retrofit the required emissions control equipment.

Generators that already achieve the presumptive limits, or would likely do so with combustion tuning or fuel switching were assigned Category 1, Facilities that needed to install low NOx combustors, Selective Non Catalytic Reduction systems, or expand existing Selective Catalytic Reduction Systems were assigned Category 2. Generators that needed to install complete SCR systems were assigned Category 3. Table E-1 reports the amount of capacity impacted by superzone.

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Table E-1: Zonal Distribution of Capacity Affected by NOx RACT

NOx RACT Impact By Category				
Super Zones	**1**	**2**	**3**	**Total**
A-B-C-D-E-F	1922	2672	419	5013
G-H-I	39	551	761	1351
J-K	2227	673	187	3087
Total	4188	3896	1367	9451

E-3.2 BART Impact Assessment

The impact assessment of the BART program is less certain than the assessment for the NOx RACT program. This uncertainty is found in the need to conduct visibility impairment analysis. This is a relatively new analysis method for the owners of existing generation in the New York. The results of this analysis are used to determine the emission reductions that may be necessary for SO2, NOx, and PM. For the purposes of this impact assessment, it is assumed that all affected units in New York will need to reduce emissions of these pollutants that cause visibility impairments. Based on this assumption, 8,243 MW of capacity is affected. The majority of these units are large oil fired units that have gas as an alternate fuel. Many of these units do not have state of the art emission control systems. Units that have natural gas capabilities were assigned Category 1. Generators that were designated to fuel switch in the NOx RACT study were assigned Category 2. Facilities that are predominantly coal fired were assumed to need upgraded particulate collection, SCR, and FGD and were assigned Category 3.

The NOx control measures for BART generally were consistent with the results of the NOx RACT study.

NYS DEC has established a reasonableness test of $5,000/ton reduced. This NYSDEC estimate is based on the NYSDEC definition of “Potential to Emit”. Capital expenditures for this program would be of the same order of magnitude as the NOx RACT program.

Table E-2: Zonal Distribution of Capacity Affected by BART

BART Impact By Category				
Super Zones	**1**	**2**	**3**	**Total**
A-B-C-D-E-F	0	1686	92	1778
G-H-I	1080	1221	233	2534
J-K	2280	1652	0	3932
Total	3360	4559	325	8244

E-3.3 MACT Impact Assessment

USEPA's proposal for MACT for fossil fired electric generators is planned to be released next Spring. In the interim we can gain some insight about the scope and the possible limits by reviewing the recently released MACT regulations for units less 25 MW. The regulations apply to coal and oil fueled electric generators. The proposed emission limits for coal are comparable to the NYS DEC Part 246 Phase 2 regulations. The USEPA proposal for small boilers goes beyond the current version of Part 246 by specifying emission limits that are comparable to those for coal, thus for the purpose of this assessment, we have assumed that units burning heavy oil will need to retrofit mercury sorbent materials injection systems and capture them in upgraded particulate collection equipment.

Facilities that are in compliance with the 2015 emission limit are assigned Category 1. Generators that need to add sorbent injection systems are assigned Category 2. Facilities that need to add sorbent injection and improved particulate collection are assigned Category 3.

The 2008 USEPA Toxic Release Inventory reports that approximately 1250 pounds of mercury were released from electric generators. Assuming that the MACT regulation will require a 90% reduction in mercury emissions similar to the NYS DEC Part 246 requirement, then an estimated emission reduction of 1,125 pounds/yr. would be required. The USEIA has estimated the cost of removal to be approximately $20,000/pound. The estimated annual cost for the carrying and operating costs of mercury removal systems would be $ 22.5 Mil/yr.

Table E-3: Zonal Distribution of Capacity Affected by MACT

MACT Impact By Category				
Super Zones	**1**	**2**	**3**	**Total**
A-B-C-D-E-F	1177	1921	840	3938
G-H-I	0	368	2426	2794
J-K	0	1953	3583	5536
Total	1177	4242	6849	12268

Table E-4: Combined Zonal Distribution of Capacity Affected by Air Programs

Air Programs (NOx RACT, BART, MACT) Combined Affected Capacity (MW) by Assigned Impact Excluding Category 1									
Super Zones	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**	**LOLE Threshold Note**
A-B-C-D-E-F	1611	324	1410	148	0	840	20	4352	1
G-H-I	136	126	0	1772	529	0	233	2794	2
J-K	2501	1619	0	1778	187	0	0	6084	3
Total	4247	2068	1410	3698	716	840	252	13,230	

E-3.4 BTA Impact Assessment

NYS DEC's BTA policy will require the use of closed cycle cooling systems at plants that currently have open cycle cooling systems with some limited relief for; sites that cannot physically accommodate cooling towers, generators with current historical capacity factors below 15%, and where the expense of a closed cooling water system is "wholly disproportionate" compared to the environmental benefits to be gained. Several sites have gained limited relief and are assigned Impact Category 1. Sites that may gain approval to use fish protection systems based on specific equipment and past studies are assigned Impact Category 2. The majority of the sites may well need to retrofit closed cycle cooling systems and are to Impact Category 3.

NYS DEC has estimated the capital and operating costs of using closed cycle cooling at electric generators in NY at $8.5 billion without consideration for cases where limited relief is granted. This program will require capital investments that are one to two orders of magnitude greater than the costs for any of the other environmental initiatives examined.

Consequently, the BTA program has the greatest potential to lead to unplanned retirements.

Table E-5: Zonal Distribution of Capacity Affected by BTA

BTA Impact By Category				
Super Zones	**1**	**2**	**3**	**Total**
A-B-C-D-E-F	2819	1211	2992	7022
G-H-I	2794	0	2063	4857
J-K	692	4032	2321	7045
Total	6305	5243	7376	18924

The risk of premature retirement of an individual unit of capacity is represented in this study by the summation of the assigned risk categories. The representation does not imply that the risk associated with each program Category, 1, 2, or 3 is equivalent, rather is meant to collect the number of risk events that specific MW of capability is exposed to. The higher the sum of these risk events the greater the likelihood of premature retirement. These sums are presented in Table E-6 below.

Table E-6: Summarized Zonal Distribution of Capacity Impact Assessment

Air and BTA Programs Combined Affected Capacity (MW) by Assigned Impact Including Category 1											
Super Zones	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Total**	**LOLE Threshold Note**
A-B-C-D-E-F	2381	962	2203	847	1121	680	377	913	0	9484	1
G-H-I	39	0	2199	126	0	1221	551	529	233	4896	2
J-K	2408	1373	0	382	1370	1873	1975	187	0	9568	3
Total	4827	2336	4401	1354	2491	3774	2903	1628	233	23,947	