2010 Reliability Needs Assessment

Comprehensive System Planning Process

DRAFT 2 REPORT

Rev. 5
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Caution and Disclaimer

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Executive Summary

1. Introduction

The Reliability Needs Assessment (RNA), as part of the Comprehensive System Planning Process (CSPP), reports on the NYISO's assessement of the bulk electric system to identify any Reliability Needs.

This document reports the RNA findings for the Study Period 2011-2020. If the RNA identifies a reliability need in the 10-year Study Period, the NYISO will designate one or more Responsible Transmission Owners (Responsible TOs) who are responsible for the development of a regulated backstop solution to address each identified Reliability Need. In addition, the NYISO will request from any interested party market-based and alternative regulated solutions after the RNA is approved to address the identified need. 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 the 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 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 loads, unexpected plant retirements, and delay in implementation of state-sponsored energy efficiency programs. 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 market place 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 1,200 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 1,800 MW of resource additions needed over the 10-year Study Period ending in 2016. Proposed market solutions totaled 3,007 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 2,350 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 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. The NYISO has not had to trigger any regulated backstop solutions to meet Reliability Needs.

Table 2-1 presents the market solutions and TOs' plans that were submitted in response to requests for solutions and were included in the 2008 CRP. The table also indicates that 2,115 MW of solutions are either in-service or are still being reported to the NYISO as moving forward with the development of their projects. 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 are 1) an increase in generation and transmission facilities, 2) a decrease in the load forecast due to Energy Efficiency Portfolio Standard Order (EEPS) and 3) an increase Special Case Resources (SCRs).

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.

Table 2-1: Current Status of Tracked Market – Based Solutions and TOs' Plans Included 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
(updated to reflect most current information as noted)

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

Class 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 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 Generators

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

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 RNA Base Case consists of the Five Year Base Case and the second five years of the Study Period. The Study Period analyzed in the 2010 RNA is the 10-year period from 2011 through 2020. The load models developed for the RNA Base Case are based on the baseline load forecast from the 2010 Load and Capacity Data report, also known as the "Gold Book". The Five Year Base Case was developed based on: 1) the most recent Annual Transmission Reliability Assessment (ATRA) Base Case, 2) input from Market Participants, and (3) the procedures set forth in the CRPP Manual.

Forecasts for peak load and energy as well as the impacts of programs such as EEPS and SCRs were developed for the 10-year Study Period. 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 starting with the First Five Year 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 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 CRPP manual. Based on this process, the network model for the second five-year period incorporates LTPs 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 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
- LTPs identified in the 2010 Gold Book as firm plans
- Facility reratings and uprates
- Scheduled retirements
- Special Case Resources (SCR) and the impacts of the NYSPSC 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 per Table 3-3.

3.1. Impact of Energy Efficiency Programs on the Load Forecast

The 2010 Gold Book contains two forecasts. The first is an econometric forecast of annual energy and peak demand that does not include the impacts of the State's EEPS programs. The second forecast includes an adjustment for the statewide energy efficiency programs described below and is the base case forecast for the 2010 RNA. The energy efficiency impacts reflect an achievement of 51% of the entire EEPS goal by the end of the forecast horizon in 2020.

As part of the EEPS Proceeding, the NYSPSC directed a series of working groups composed of all interested parties to the Proceeding to obtain information needed to further elaborate the goal. The NYSPSC 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 NYSPSC's goal as applied to the entities over which it has jurisdiction. The NYSPSC anticipated that LIPA and 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 DPS 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 market participants in the Electric System Planning Working Group, the NYISO developed load 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:

- NYSPSC-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 load forecast
- Impacts of new appliance efficiency standards, and building codes and standards
- 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 below summarizes the 2010 Gold Book econometric forecast, the 2010 RNA Base Case forecast and a 2009 RNA 15x15 forecast. The 2009 RNA15x15 energy forecast for 2015 is 157,380 GWH and represents a 15% reduction from the 2015 econometric forecast expected at that time. Since then, the 2015 forecast has been reduced by almost 9,000 GWh due to the 2009 recession and subsequent lower economic growth projections, as compared to the 2009 RNA.

Table 3-1 - RNA Forecast Scenarios

Annual GWh	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
2010 High Load Scenario	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	160,358	160,446	161,618	163,594	164,556	165,372	166,472	167,517	169,132	171,161	173,332
15x15 Scenario	159,914	159,402	158,892	158,384	157,877	157,380	159,660	161,469	163,558	165,682	167,902

EEPS Energy Impacts

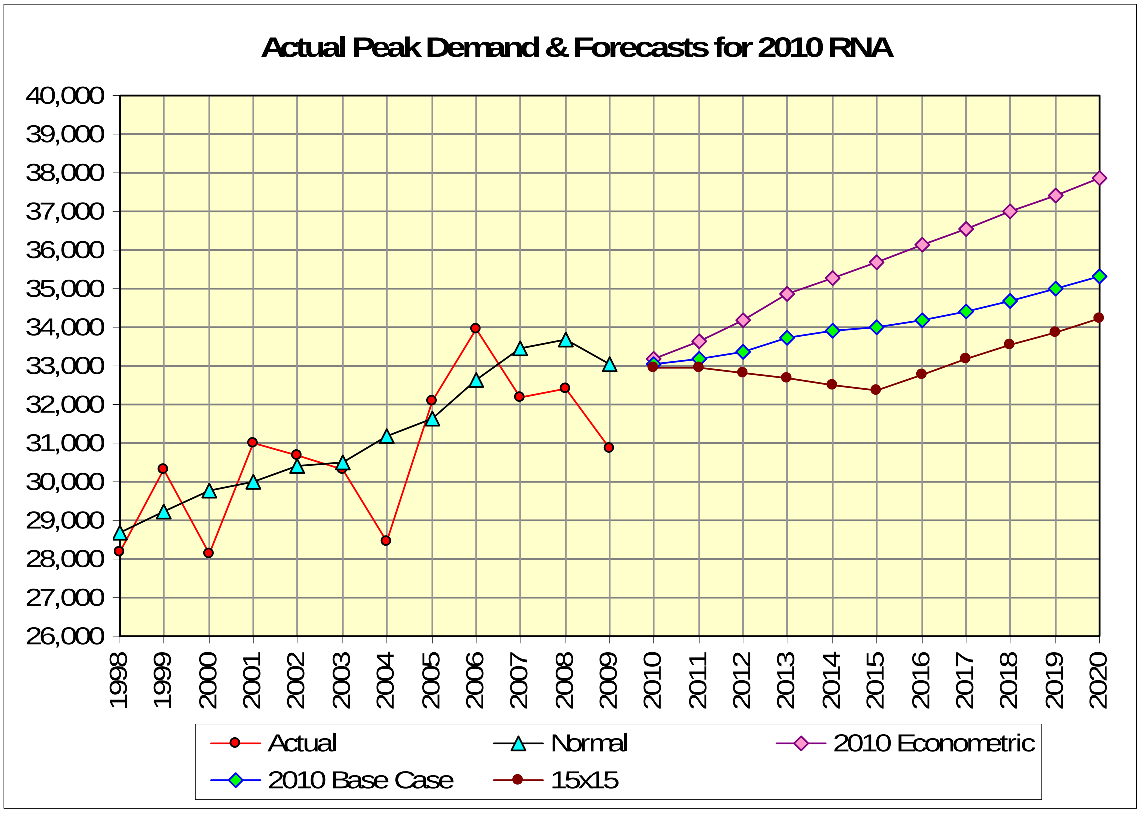
Cumulative GWh	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
2010 RNA Base Case	976	2,860	4,997	6,765	8,413	9,914	11,355	12,327	13,040	13,379	13,684
15x15 Scenario	1,420	3,903	7,723	11,976	15,092	17,906	18,167	18,375	18,615	18,858	19,113

Annual MW	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
2010 High Load Scenario	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	33,025	33,160	33,367	33,737	33,897	34,021	34,193	34,414	34,672	34,986	35,334
15x15 Scenario	32,934	32,945	32,805	32,662	32,521	32,377	32,794	33,172	33,529	33,866	34,227

EEPS Demand Impacts

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
15x15 Scenario	266	706	1,387	2,181	2,764	3,320	3,353	3,393	3,453	3,535	3,616

Figure 3-1: 2010 Base Case Forecast and Scenarios



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 for 2020. An annual profile of SCR data was developed for each area and each month of a year. This annual profile was used for each year, 2011 through 2020. Its impact can be seen in the RNA Load and Resource Margin Table (Table 3-6) below. From an ICAP perspective, this represents an approximate increase of 167 MW of resource capacity over the 2009 RNA.

3.3. Resource Additions

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

3.4. TO Firm Plans

Table 3-4 presents all of the firm transmission plans that were included the 2010 Gold Book and were included in the RNA Base Case.

Table 3-3: Unit Additions

	Queue	Project Name	2010	2011	2012	2013	Total MW
New Thermal Units							
	69	Empire Generating (July 2010) [(3)]	635				635
	232	Bayonne Energy (June 2011)		512.5			512.5
	308	Astoria Energy II (June 2011)		550			550
	237A	Chautauqua Landfill (Feb 2010)	6.4				6.4
	N/A[(1)]	Riverbay (June 2010) [(3)]	24				24
		New Thermal Units Sub-Total	**665.4**	**1062.5**	**0**	**0**	**1727.9**
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)] [(4)]	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	**710.4**	**1062.5**	**168**	**6**	**1946.9**

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) Overall total project uprate is 120 MW. Unit 4 is the last 30 MW uprate to be completed.

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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 Ratings* Summer	Winter	Project Description (10) / Conductor Size	Class Yea Type of Constructi
	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
Some of these proposed facilities reflect reconfiguration of the existing facilities
* Thermal Ratings in Amperes, except where labeled otherwise.

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**		890.7	
Greenidge 3	52.2		
Westover 7	40.2		
Total MW	**92.4**	**890.7**	**983.1**

** Unit retirements included in 2009 RNA

3.6. Base Case 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 Load and Resource Margins found in Table 3-6 below:

Table 3-6: NYCA 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	5,384	5,432	5,455	5,470	5,489	5,554	5,586	5,631	5,685	5,771
Resources										
NYCA										
Capacity	40,447	40,647	41,338	41,239	41,239	41,239	41,239	41,239	41,239	41,239
SCR	2,065	2,091	2,151	2,165	2,171	2,180	2,193	2,210	2,230	2,251
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	6,311	6,311	6,311	6,311	6,311	6,311	6,311	6,311	6,311	6,311
SCR	188	189	190	191	191	193	195	196	198	201
Total	**6,499**	**6,500**	**6,501**	**6,502**	**6,502**	**6,504**	**6,506**	**6,507**	**6,509**	**6,512**
Res./Load Ratio	120.7%	119.7%	119.2%	118.9%	118.5%	117.1%	116.5%	115.6%	114.5%	112.8%

"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.

SCR values reflect projected August 2010 ICAP capability period values (which are adjusted for the annual growth rate of 8.41%).

Table 3-7 below presents the comparison between the 2009 RNA and 2010 RNA in load forecast, unit additions, unit retirements, and SCRs. The 2010 RNA load forecast decreased by approximately 325 MW, while the overall NYCA capacity increased by approximately 880 MW and SCRs increased by approximately 167 MW. Due to these relatively small incremental changes, the resource adequacy assessment results of the 2010 RNA are similar to those of the 2009 RNA.

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

	2009 RNA Year 2018	**2010 RNA Year 2020**	**Delta MW**
NYCA Load	35,658	35,334	-324
SCR	2,084	2,251	167
Capacity without SCRs	40,452	41,330	878
Unit Retirements	1,272	983.1	-289

Pursuant to Section 4.5 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, load forecast uncertainty, new resources, retirements, and potential limitations imposed by environmental programs that are currently either pending or under consideration. The NYISO also conducts sensitivity analyses pursuant to Section 4.6 of OATT Attachment Y to test the robustness of the needs assessment studies and identify conditions under which reliability criteria may not be met.

3.7. 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 adequacy and security assessments. The NYISO conducts transmission adequacy and resource adequacy assessment jointly.

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. Adequacy considers the transmission systems, generation resources and other capacity resources, such as demand response. 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. As stated in Section 2.0, 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 days per year. This requirement forms the basis of New York's ICAP requirement.

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 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.

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.

4. Reliability Needs Assessment

4.1. Overview

Reliability is defined and measured through the use of the concepts of adequacy and security. 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 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. 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. The results of the AC contingency analysis demonstrated that the BPTFs were within the facilities' thermal and voltage limits. The NYISO observed 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. The local TO has operating procedures and plans in place to address the local area non-bulk power system issues.

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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 C 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 are currently under review. If breaker duties are found to exceed the ratings 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 load forecast, which includes adjustments for the EEPS 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

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 were combined into one interface grouping since the simultaneous limit is less than the sum of each individual limit.

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

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 primarily to the load growth on the 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 analysis encompasses the Five Year Base Case and the second five years. The RNA Base Case transfer limits under emergency conditions were employed to determine resource adequacy needs (defined as a loss-of-load-expectation or LOLE that exceeds 0.1 days per year).

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 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, since no Reliability Needs were identified in the first five years, 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 LOLE for the NYCA did not exceed 0.10 days per year in any year through 2020. The LOLE[1] results for the entire 10-year RNA Base Case are summarized in Table 4-4.

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									0.002	0.003

[1] 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.

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AREA_H										
AREA_I									0.005	0.007
AREA_J									0.005	0.007
AREA_K										
NYCA	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.006**	**0.008**

*Note: An LOLE value of 0.00 represents a rounded value, not a zero probability of loss of load.

For this study, the external systems emergency operating procedure data was removed. Capacity of the external systems was further adjusted so that the LOLE value of the Areas (Ontario, New England, Hydro Quebec, and PJM) was 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 2010 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.

4.3. Scenarios

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 following scenarios were evaluated as part of the RNA.

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

4.3.1. Load Forecast Scenarios

4.3.1.1. Econometric Forecast

The RNA base case includes the projected energy efficiency impacts associated with statewide energy efficency programs. This scenario removes these impacts from the forecast. Since the load in the econometric forecast is higher than the base case, the probability of violating the LOLE criterion increases. This forecast scenario is shown in Table 4-7.

This scenario increases the 2010 RNA's Base Case LOLE for 2020 from 0.01 to 0.25. This result reveals the impact of the energy efficiency programs on Reliability Needs (See Table 4-8).

Table 4-7: Econometric Growth Scenario

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Base Case MW	33,160	33,367	33,737	33,897	34,021	34,193	34,414	34,672	34,986	35,334
Econometric Case	33,651	34,192	34,844	35,285	35,696	36,147	36,565	36,983	37,401	37,843
EEPS Impact	491	825	1,107	1,388	1,675	1,954	2,151	2,311	2,415	2,510

Table 4-8: RNA Base Case LOLE Econometric Growth 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			0.001	0.003	0.004	0.01	0.018	0.03	0.053	0.088
AREA_H										
AREA_I			0.004	0.008	0.013	0.027	0.047	0.076	0.129	0.21
AREA_J			0.004	0.009	0.014	0.029	0.05	0.079	0.132	0.22
AREA_K						0.008	0.007	0.016	0.036	0.109
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 reflects the State's clean energy policy goal to have 30% of the State's energy served by renewable sources and 15% of energy consumption reduction by the year 2015. Approximately 1275 MW of wind projects are already in-service across NY State. Table 4-9 lists all the wind projects that are included in the 2010 RNA base case.

Table 4-9 Wind Projects in 2010 RNA Base Case

Unit Name	RNA 2010 Base Case (MW)	Status
Altona Windfield	97.5	In-Service
Bliss Windfield	100.5	In-Service
Canadaigua	125.0	In-Service
Chateaugay	106.5	In-Service
Clinton	100.5	In-Service
Ellenburg	81.0	In-Service
Fenner Wind Power	30.0	In-Service
High Sheldon	112.5	In-Service
Madison Wind	11.5	In-Service
Maple Ridge 1	231.0	In-Service
Maple Ridge 2	90.7	In-Service
Munnsville	34.5	In-Service
Steel Winds	20.0	In-Service
Wethersfield- Western NY Wind Power	6.6	In-Service
Wethersfield	126.0	In-Service
Steel Wind II	15	Proposed In-service 10/2011
Munnsville Uprate	6	Proposed In-service 12/2013
Total	**1,294.8**	

An additional 1368 MW of renewable wind and solar projects are proposed to be built before 2015. Table 4-10 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. Recognizing that the 1368 MW of additional renewable may not fully achieve the 30% penetration level sought by the state policy this additional capacity has contributed to the LOLE of 0.0.

Table 4-10: 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**				

The following load forecast is based on meeting the state energy efficiency goal . This reduced consumption for year 2015 is taken from the 2009 RNA scenario for full achievement of the goal. This forecast is 1107 MW below that included in the 2010 RNA base case for year 2020.

Table 4-11: Energy Efficiency Portfolio Standard Load Forecast

Year	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Base Case MW	33,160	33,367	33,737	33,897	34,021	34,193	34,414	34,672	34,986	35,334
2010 45x15 Scenario	32,945	32,805	32,662	32,521	32,377	32,794	33,172	33,529	33,866	34,227
EEPS Impact	706	1,387	2,181	2,764	3,320	3,353	3,393	3,453	3,535	3,616

The combined impact of adding 1368 MW of renewable resource capacity and reducing the load forecast by 1107 MW results in an LOLE of less than 0.01 throughout the 10 year Study Period.

4.3.2. Nuclear Retirement Scenario

Table 4-12 below illustrates the impact on resource adequacy of the retirement of the Indian Point nuclear power plant which has two base-loaded units that are located in Southeastern New York, the area of the State where transmission constraints exist and resource adequacy needs have been most prevalent:

For the analysis it was assumed that Indian Point 2 and Indian Point 3 cease operations at the end of their current license dates, September 2013 and December 2015, respectively. Transfer limit analysis was performed on the system model with both Indian Point units out-of-service.

The ability to transfer power to Zone J and Zone K will be constrained at the UPNY-SENY interface under peak load conditions well before the downstream interfaces can be stressed as all of the remaining capacity in zone G, H, and I is exhausted. However to determine the transfer limits in the Hudson Valley, the UPNY-ConEd and I to J and K interfaces were loaded ignoring the UPNY-SENY limit. The resulting voltage collapse limits over the UPNY-ConEd and I to J and K interfaces are much higher than the actual transmission system flow due to the upstream thermal constraints. The difference in voltage collapse limits is approximately 2000 MW because without Indian Point the UPNY-SENY interface was loaded at the same limit.

With both units out of service in 2016, the reliability criterion 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[2].

If the projected EEPS savings included in the 2010 base case are not realized, the reliability need year will be advanced to 2014..

Further transmission analysis also demonstrated local thermal violations per Reliability Criteria. Specifically, under N-1-1 facility outage conditions, generation located below the UPNY-SENY interface will not be sufficient to return the system back to normal transmission ratings, resulting in load relief measures for Zones G, H, I, J or K.

4.3.3. Zonal Capacity at Risk

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[2] The same scenario studied in the 2009 RNA with a lower load level and new generation additions in Zones J push the Reliability Needs from 2014 to 2016

4.3.4. NYSEG ETCNL Rights

NYSEG has the grandfathered Deliverability rights to bring in up to 1080 MW of capacity from PJM. This scenario in no way implies 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 NY was modeled. This results in the NYCA LOLE increasing from 0.006 to 0.008 in year 2020.

5. Other Areas of Interest

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 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 7,000 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.

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 (http://www.nysenergyplan.com/stateenergyplan.html) provides a long range vision and framework for New York's energy. The State's Department of Environmental Conservation (NYSDEC) annual publication of its regulatory agenda describes the new environmental initiatives that it will focus in the coming year. The 2010 agenda can be found at:

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

The U.S. Environmental Protection Agency also publishes a similar report on its regulatory agenda which can be found at:

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.

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

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 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.

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 system reliability caused by the newly adopted and proposed environmental regulations. Of equal importance, the results will also 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 (NOxRACT)

NYSDEC has proposed 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 NY. NYSDEC is seeking to reduce emissions from the effected 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.

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 NOxRACT 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.

5.1.1.2. Best Available Retrofit Technology (BART)

NYSDEC 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.

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 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 anticipated compliance date is November 2014.

In addition, NYSDEC 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)

NYSDEC 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 historically capacity factors less than 15%.

Once the NYSDEC 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

5.2. Wind Impact

The NYISO conducted a study of the reliability impacts of up to 8 GW of installed nameplate wind for selected years through 2018. A draft of the final report can be found at:

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

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 determined 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 reliability impacts.

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 need to increase due to the variability and the lower overall availability.

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 4,250 MW and 8,000 MW.

6. Observations and Recommendations

The 2010 RNA has not identified any new Reliability Needs through 2020. The reliability of the NYS Power System is dependent on three key factors; 1) implementation of EEPS to achieve the forecasted goal, 2) the addition of two power plants of over 1000 MW in zone J, 3) continued development of the firm transmission projects as reflected in the LTPs. Delay of these projects would require extending, and possibly expanding the use of operating procedures to maintain system reliability.

The scenario analyses also indicate potential risks to reliability. The scenarios are Indian Point plant retirement, failure to achieve significant energy efficiency goals, significant generation capacity retirement caused by various factors.

The NYISO recommends the continued monitoring and verification of the energy efficiency improvements. The NYISO will continue to track the development and progress of the transmission and generation projects assumed in the base case. The NYISO will continue to monitor the development of State and Federal regulatory programs and licensing proceedings. In addition, the NYISO may provide an assessment of the reliability, economic and emissions impact associated with these regulatory proceedings.

7. Historic Congestion

Appendix A of Attachment Y of the NYISO OATT states: "As part of its Comprehensive Reliability 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 one time 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 at: www.nyiso.com/public/services/planning/congestion_cost.jsp

Appendices

Appendix A – Reliability Needs Assessment Glossary

Appendix B- The CSPP's Reliability Planning Process and Summary of Prior RNA/CRPs

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[3]. A detailed discussion of the Reliability Planning Process, including applicable reliability criteria, is contained in NYISO Manual 26 entitled: "Comprehensive Reliability Planning Process Manual," which is posted on the NYISO's website and can be accessed at the following link:

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

Each biennial cycle begins with the Local Transmission Planning Process (LTPP). 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 and alternative regulated solutions 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.

7.1. Overview of the Reliability Planning Process

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

3 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 continue 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.

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

NYISO (Markets & Operations - Services - Planning - Long Term Transmission Planning)

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, transmission circuit, transformer, series or shunt compensating device, or 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 CRPP 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 can offer and promote alternative regulated solutions 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 TO's regulated backstop solutions[4]. 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 the 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 NYSPSC, 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 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.

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

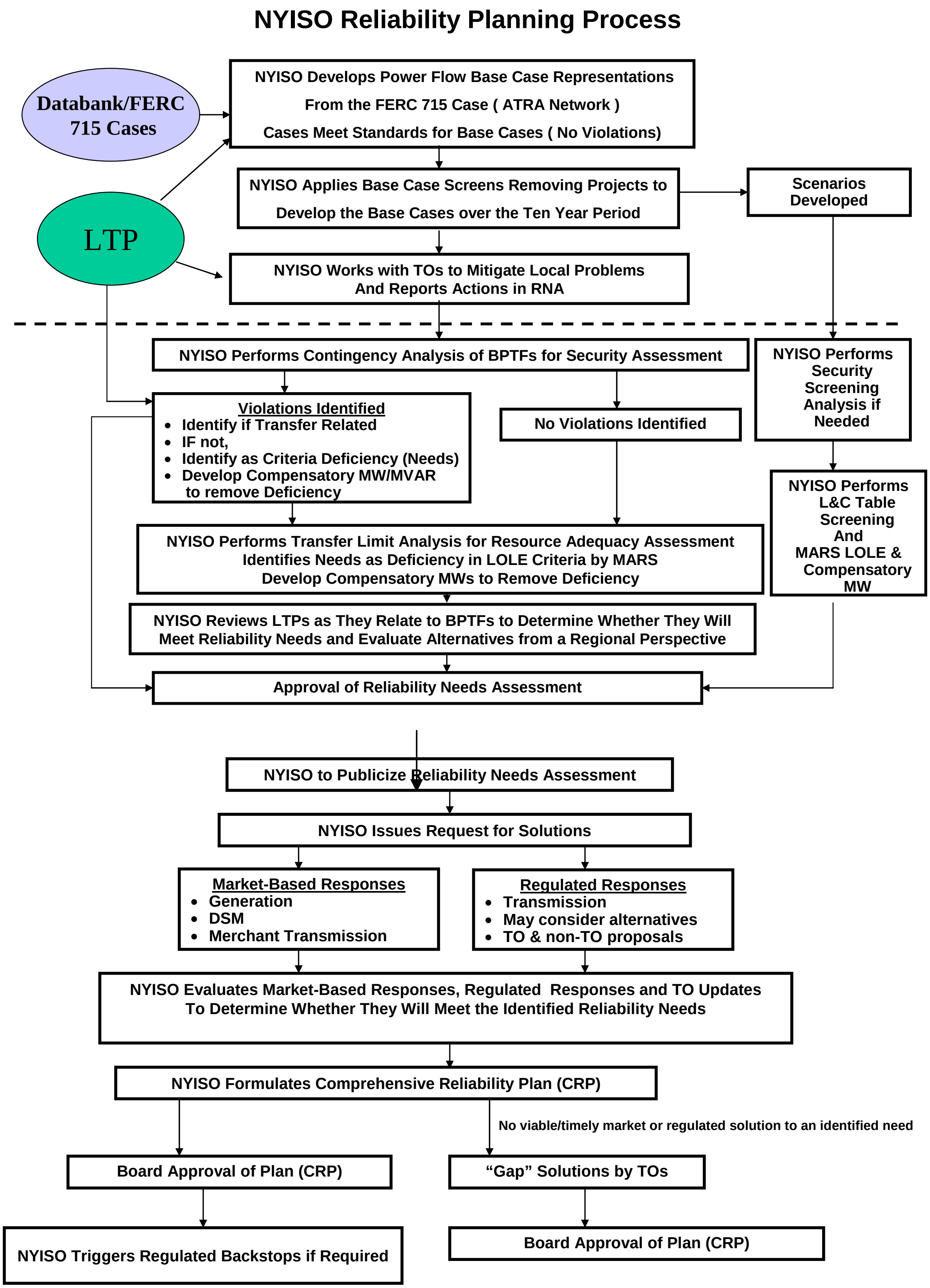


Figure B-1: NYISO Reliability Planning Process

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

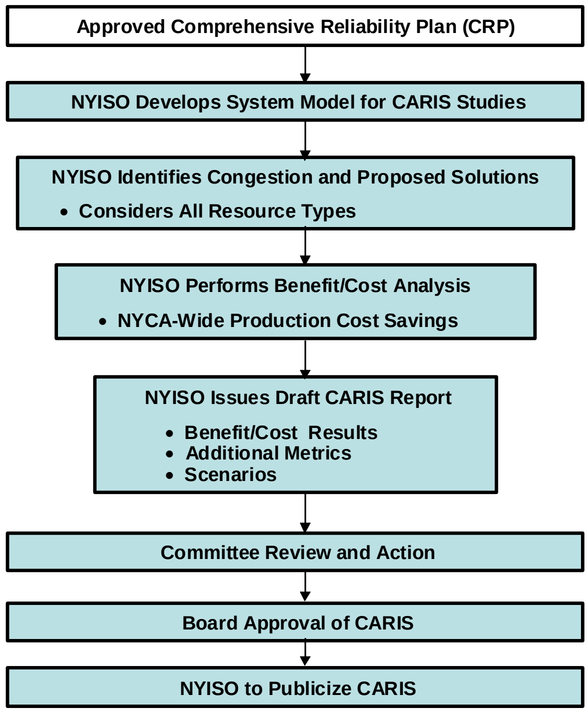


Figure B-2: Economic Planning Process

Appendix C – Load and Energy Forecast 2010-2020

B.1 Introduction

Overview

This section describes the annual energy and seasonal peak demand forecasts for the ten year period beginning with 2010 and extending through 2020. It begins with this Executive Summary, continues with an overview of historic electricity and economic trends in New York State, and concludes with the ten-year forecasts of summer and winter peak demands and annual energy requirements.

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 2010 –

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 sets as its goal a cumulative energy reduction of about 26,900 GWh and an estimated 5,500 MW in peak demand. The NYISO included fifty percent of the goal by the year 2020.

Table B-1: Summary of Econometric Forecasts

Economic Indicators	Average Annual Growth			
	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%

Employment Trends	Shares of Total Employment			
	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%

Historical Overview

NYCA System

Table B-2 shows the New York Control Area's (NYCA) historic peak and energy growth since 2000.

Table B-2: 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.

Regional Energy and Seasonal Peaks

Table B-3 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 B-3: Actual and Forecast Annual Energy

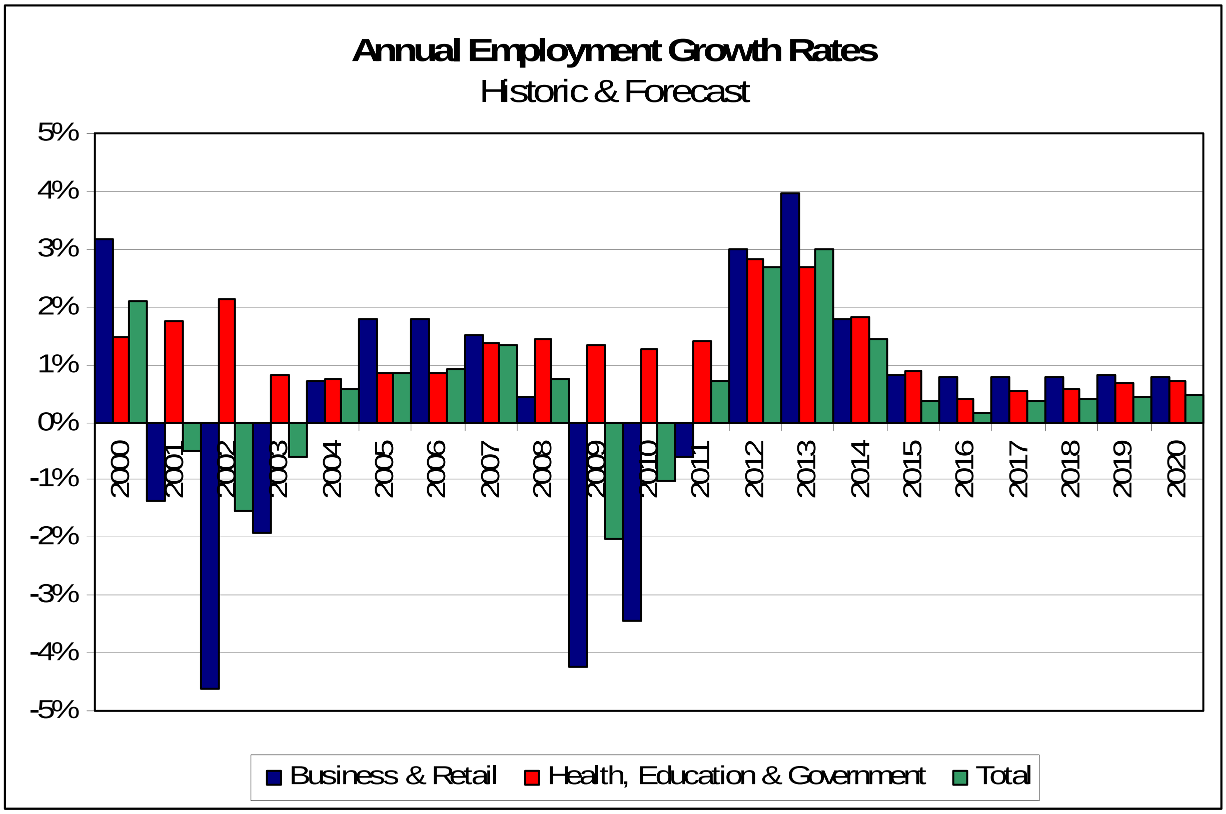
Year	Upstate Region	New York City	Long Island	NYCA
2000	87,376	49,183	20,072	156,631
2001	85,851	50,227	20,723	156,801
2002	85,852	51,356	21,544	158,752
2003	85,223	50,829	21,960	158,012
2004	85,935	52,073	22,203	160,211
2005	90,253	54,007	22,948	167,208
2006	86,956	53,096	22,185	162,237
2007	89,843	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%

B. Trends Affecting Electricity in New York

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, then slows to a rate of .5% thereafter.

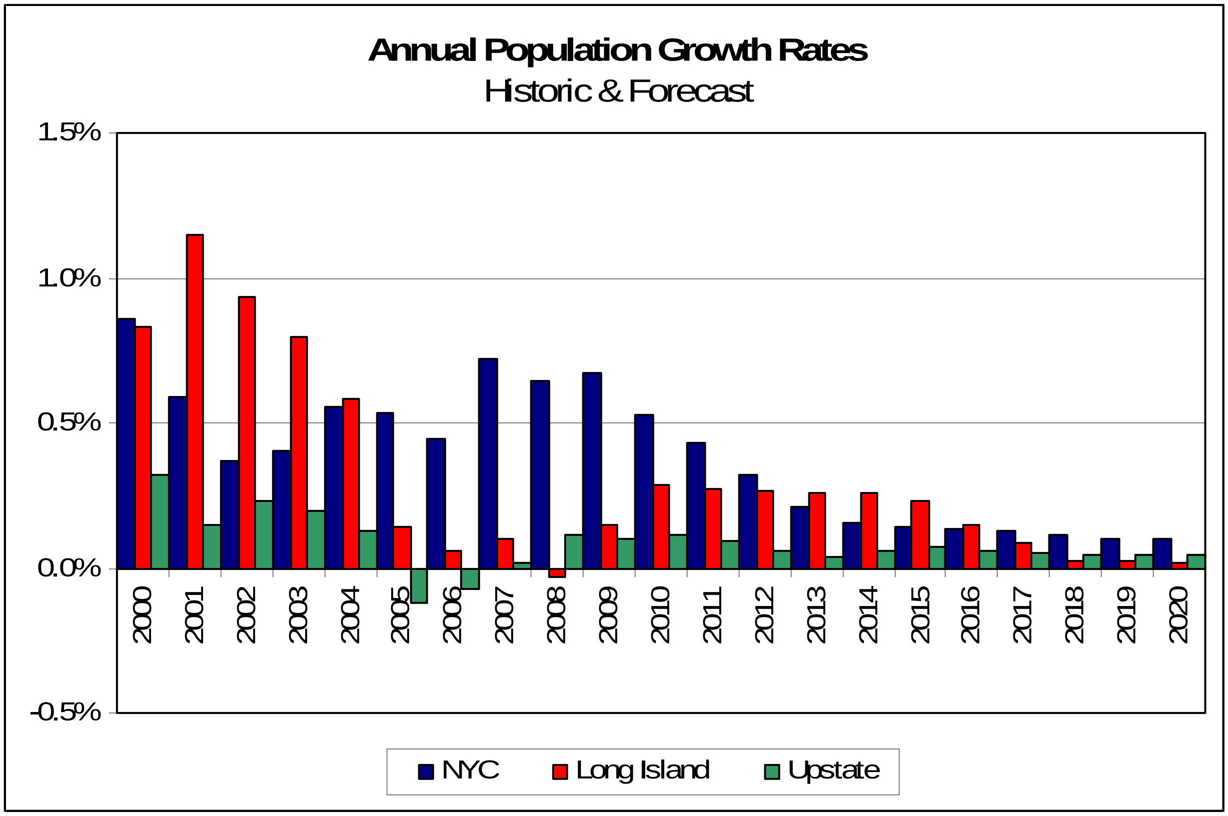
Figure B-1: Annual Employment Growth Rates



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 B-2: Annual Change in Population by Region

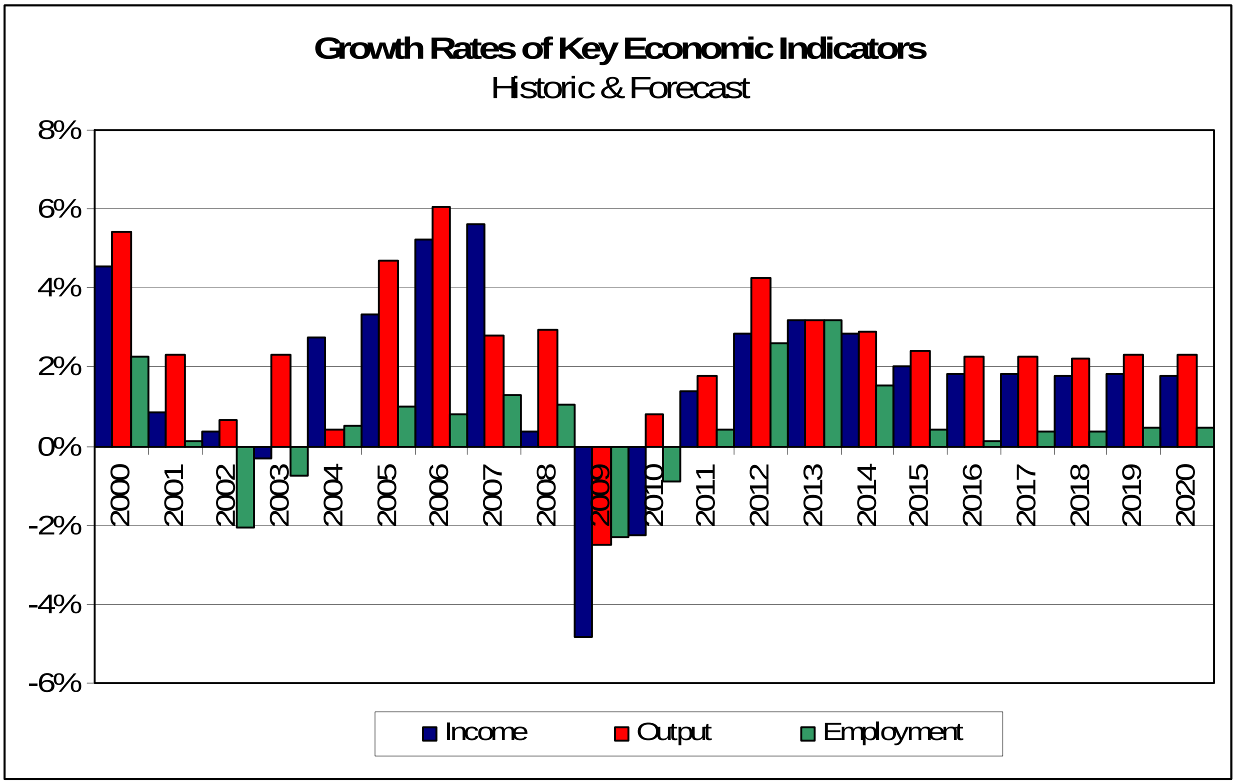


2010 Forecasts of Real Output, Real Income, Employment

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 B-3: Annual Growth Rates in Real Output and Income



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 B-4: 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%

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, we 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. We 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, we 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.

Energy Conservation

The Electric Energy 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 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 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 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, we 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. We considered the following factors in developing the 2010 RNA base case:

- the approved spending levels of NYPA, LIPA and the 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 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 B-5: Zonal Energy Forecast Growth Rates - 2008 to 2018

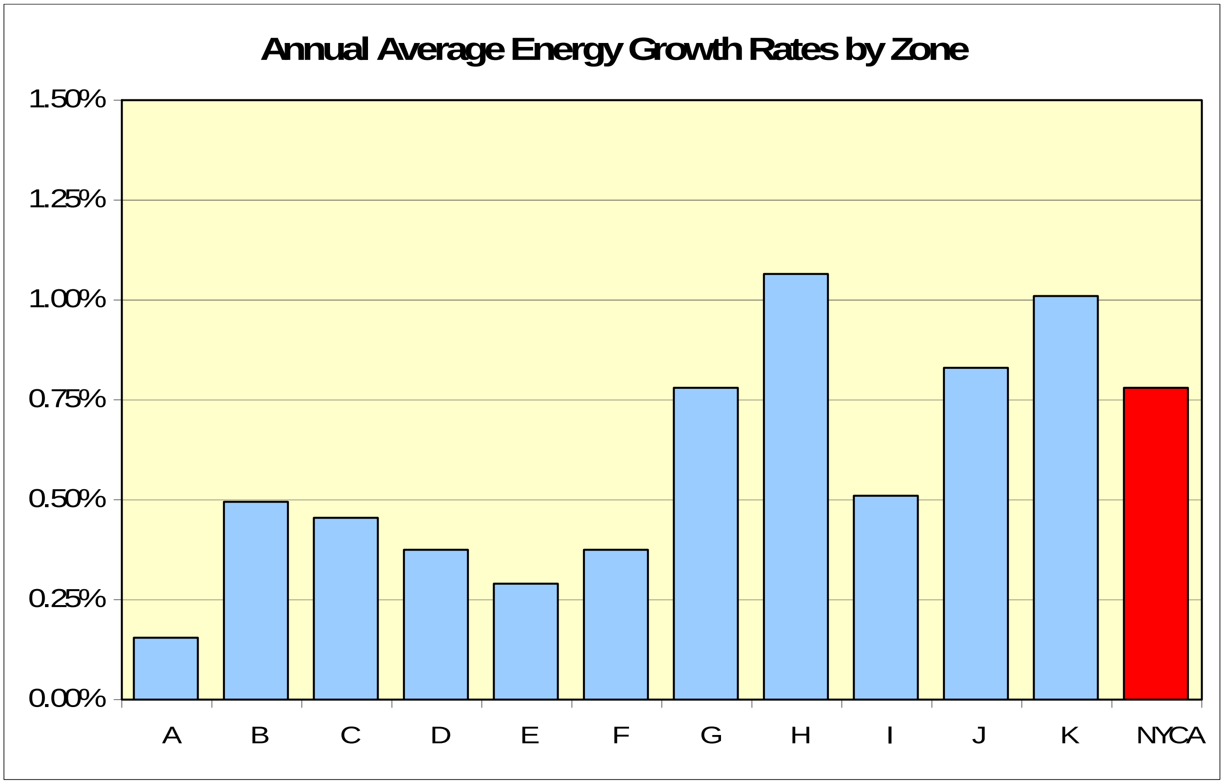


Figure B-6: Zonal Summer Peak Demand Forecast Growth Rates - 2007 to 2017

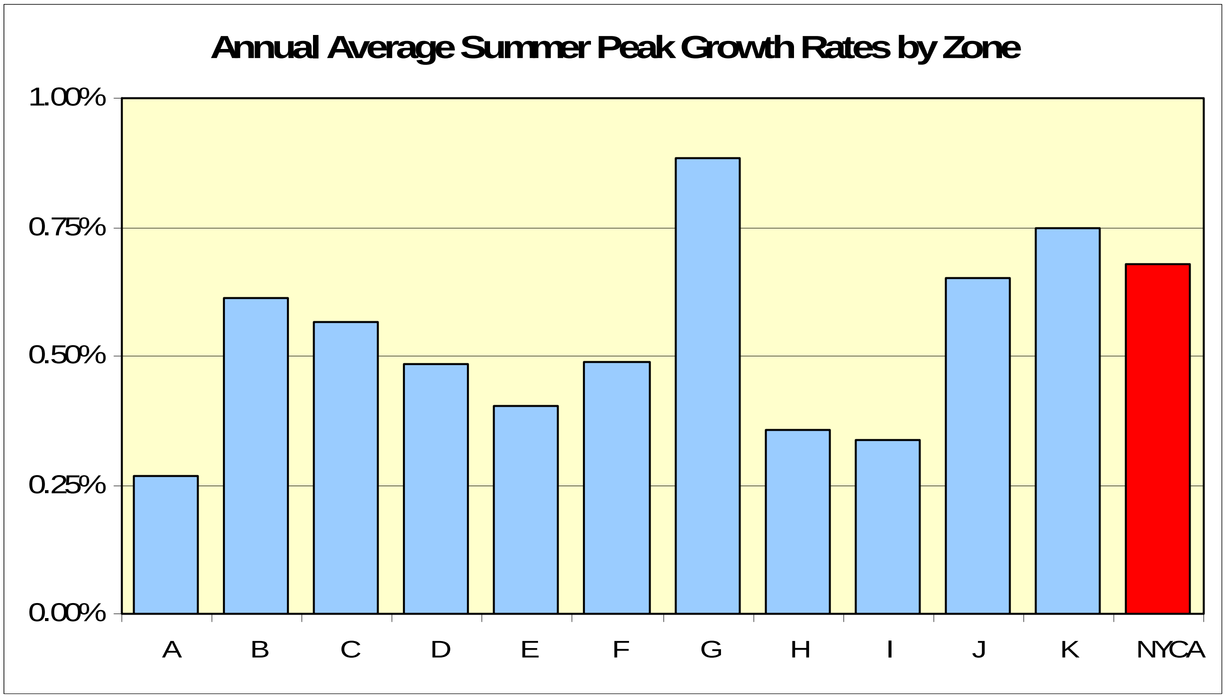


Table B-5: Actual and Forecast Annual Energy by Zone - GWh

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2000	16,785	9,635	16,182	6,527	8,182	11,398	10,795	1,942	5,929	49,183	20,072	156,631
2001	16,209	9,661	16,034	6,374	7,403	11,429	10,957	2,003	5,782	50,227	20,723	156,801
2002	16,355	9,935	16,356	6,450	7,116	11,302	10,215	2,162	5,962	51,356	21,544	158,752
2003	15,942	9,719	16,794	5,912	6,950	11,115	10,451	2,219	6,121	50,829	21,960	158,012
2004	16,102	9,888	16,825	5,758	7,101	11,161	10,696	2,188	6,216	52,073	22,203	160,211
2005	16,498	10,227	17,568	6,593	7,594	11,789	10,924	2,625	6,435	54,007	22,948	167,208
2006	15,998	10,003	16,839	6,289	7,339	11,337	10,417	2,461	6,274	53,096	22,185	162,237
2007	16,258	10,207	17,028	6,641	7,837	11,917	10,909	2,702	6,344	54,750	22,748	167,341
2008	15,835	10,089	16,721	6,734	7,856	11,595	10,607	2,935	5,944	54,835	22,461	165,613
2009	15,149	9,860	15,949	5,140	7,893	10,991	10,189	2,917	5,700	53,100	21,892	158,780
2010	15,364	9,990	16,245	4,236	8,011	11,383	10,448	2,997	6,658	52,838	22,187	160,358
2011	15,301	9,967	16,297	4,365	8,012	11,422	10,469	3,010	6,614	52,697	22,290	160,446
2012	15,211	9,972	16,343	4,920	7,989	11,436	10,554	2,992	6,714	53,026	22,461	161,618
2013	15,150	10,013	16,403	6,230	7,977	11,437	10,634	2,991	6,778	53,437	22,544	163,594
2014	15,194	10,058	16,429	6,358	7,959	11,439	10,669	3,037	6,823	53,966	22,623	164,556
2015	15,189	10,068	16,462	6,385	7,945	11,443	10,707	3,083	6,856	54,466	22,767	165,372
2016	15,202	10,103	16,494	6,397	7,970	11,464	10,754	3,131	6,896	54,939	23,122	166,472
2017	15,263	10,174	16,578	6,431	8,021	11,522	10,830	3,165	6,890	55,305	23,340	167,517
2018	15,352	10,262	16,692	6,489	8,084	11,601	10,952	3,216	6,952	55,886	23,646	169,132
2019	15,476	10,377	16,846	6,559	8,167	11,708	11,119	3,271	6,978	56,630	24,031	171,161
2020	15,602	10,494	17,001	6,625	8,249	11,815	11,289	3,332	7,004	57,385	24,535	173,332

Table B-6: Actual and Forecast Summer Coincident Peak Demand - MW

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2000	2,462	1,644	2,459	757	1,185	1,872	2,176	417	1,265	9,771	4,130	28,138
2001	2,519	1,889	2,719	780	1,260	2,068	2,361	537	1,347	10,602	4,900	30,982
2002	2,631	1,842	2,787	777	1,252	2,073	2,076	498	1,335	10,321	5,072	30,664
2003	2,510	1,782	2,727	671	1,208	2,163	2,146	498	1,395	10,240	4,993	30,333
2004	2,493	1,743	2,585	644	1,057	1,953	2,041	475	1,280	9,742	4,420	28,433
2005	2,726	1,923	2,897	768	1,314	2,164	2,236	592	1,409	10,810	5,236	32,075
2006	2,735	2,110	3,128	767	1,435	2,380	2,436	596	1,467	11,300	5,585	33,939
2007	2,592	1,860	2,786	795	1,257	2,185	2,316	595	1,438	10,970	5,375	32,169
2008	2,611	2,001	2,939	801	1,268	2,270	2,277	657	1,399	10,979	5,231	32,432
2009	2,608	1,939	2,780	721	1,420	2,188	2,178	600	1,323	10,661	5,194	30,844
2010	2,609	1,969	2,829	520	1,423	2,260	2,288	623	1,494	11,725	5,286	33,025
2011	2,605	1,970	2,844	537	1,426	2,274	2,297	624	1,494	11,775	5,314	33,160
2012	2,595	1,975	2,858	607	1,425	2,282	2,321	627	1,503	11,815	5,360	33,367
2013	2,591	1,988	2,875	768	1,427	2,287	2,344	633	1,515	11,925	5,383	33,737
2014	2,603	2,001	2,885	786	1,426	2,292	2,356	635	1,519	11,995	5,398	33,897
2015	2,604	2,005	2,894	790	1,425	2,294	2,367	636	1,524	12,065	5,417	34,021
2016	2,609	2,013	2,902	792	1,431	2,301	2,379	638	1,528	12,120	5,481	34,193
2017	2,621	2,028	2,918	796	1,440	2,313	2,397	640	1,531	12,218	5,513	34,414
2018	2,637	2,046	2,939	804	1,452	2,331	2,425	644	1,540	12,298	5,557	34,672
2019	2,658	2,069	2,966	813	1,466	2,351	2,461	645	1,543	12,404	5,611	34,986
2020	2,680	2,093	2,993	821	1,481	2,372	2,498	646	1,546	12,510	5,695	35,334

Table B-7: Actual and Forecast Winter Coincident Peak Demand

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2000-01	2,489	1,510	2,506	880	1,263	1,798	1,690	366	877	7,206	3,188	23,773
2001-02	2,248	1,455	2,340	843	1,129	1,742	1,626	344	860	7,013	3,198	22,798
2002-03	2,418	1,507	2,679	925	1,223	1,903	1,590	437	927	7,373	3,472	24,454
2003-04	2,433	1,576	2,755	857	1,344	1,944	1,720	478	981	7,527	3,647	25,262
2004-05	2,446	1,609	2,747	918	1,281	1,937	1,766	474	939	7,695	3,729	25,541
2005-06	2,450	1,544	2,700	890	1,266	1,886	1,663	515	955	7,497	3,581	24,947
2006-07	2,382	1,566	2,755	921	1,274	1,888	1,638	504	944	7,680	3,505	25,057
2007-08	2,336	1,536	2,621	936	1,312	1,886	1,727	524	904	7,643	3,596	25,021
2008-09	2,274	1,567	2,533	930	1,289	1,771	1,634	529	884	7,692	3,570	24,673
2009-10	2,330	1,555	2,558	648	1,289	1,788	1,527	561	813	7,562	3,443	24,074
2010-11	2,234	1,521	2,523	590	1,345	1,792	1,638	580	956	7,587	3,523	24,289
2011-12	2,225	1,517	2,531	608	1,345	1,799	1,642	582	950	7,567	3,539	24,304
2012-13	2,212	1,518	2,538	685	1,341	1,801	1,655	579	964	7,614	3,566	24,473
2013-14	2,203	1,524	2,548	867	1,339	1,801	1,668	579	973	7,673	3,579	24,754
2014-15	2,210	1,531	2,552	885	1,336	1,801	1,673	588	980	7,749	3,592	24,896
2015-16	2,209	1,532	2,557	889	1,334	1,802	1,679	597	984	7,821	3,615	25,018
2016-17	2,211	1,538	2,562	891	1,338	1,805	1,686	606	990	7,889	3,671	25,186
2017-18	2,220	1,549	2,575	895	1,346	1,814	1,698	612	989	7,941	3,706	25,346
2018-19	2,232	1,562	2,593	903	1,357	1,827	1,717	622	998	8,025	3,754	25,591
2019-20	2,251	1,579	2,616	913	1,371	1,843	1,744	633	1,002	8,132	3,815	25,899
2020-21	2,269	1,597	2,640	922	1,385	1,860	1,770	645	1,006	8,240	3,895	26,230

Appendix C – 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.

C.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 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 CRPP 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 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 NYSPSC 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 load forecasts for each of the Areas 2010 through 2013 and a New England load forecast from 2014 to 2019. The PJM load forecast for 2014 to 2019 was developed by applying the growth rate (ratio of load for each of years 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 not less than 0.10 and not greater than 0.15. The Table below illustrates the MOD-MW data.

Table D-1
MOD-MW Data To Avoid Overdependence From
Emergency Assistance From Outside World Areas

	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

C.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 C-2 illustrates the emergency thermal transfer limits for the RNA base system conditions:

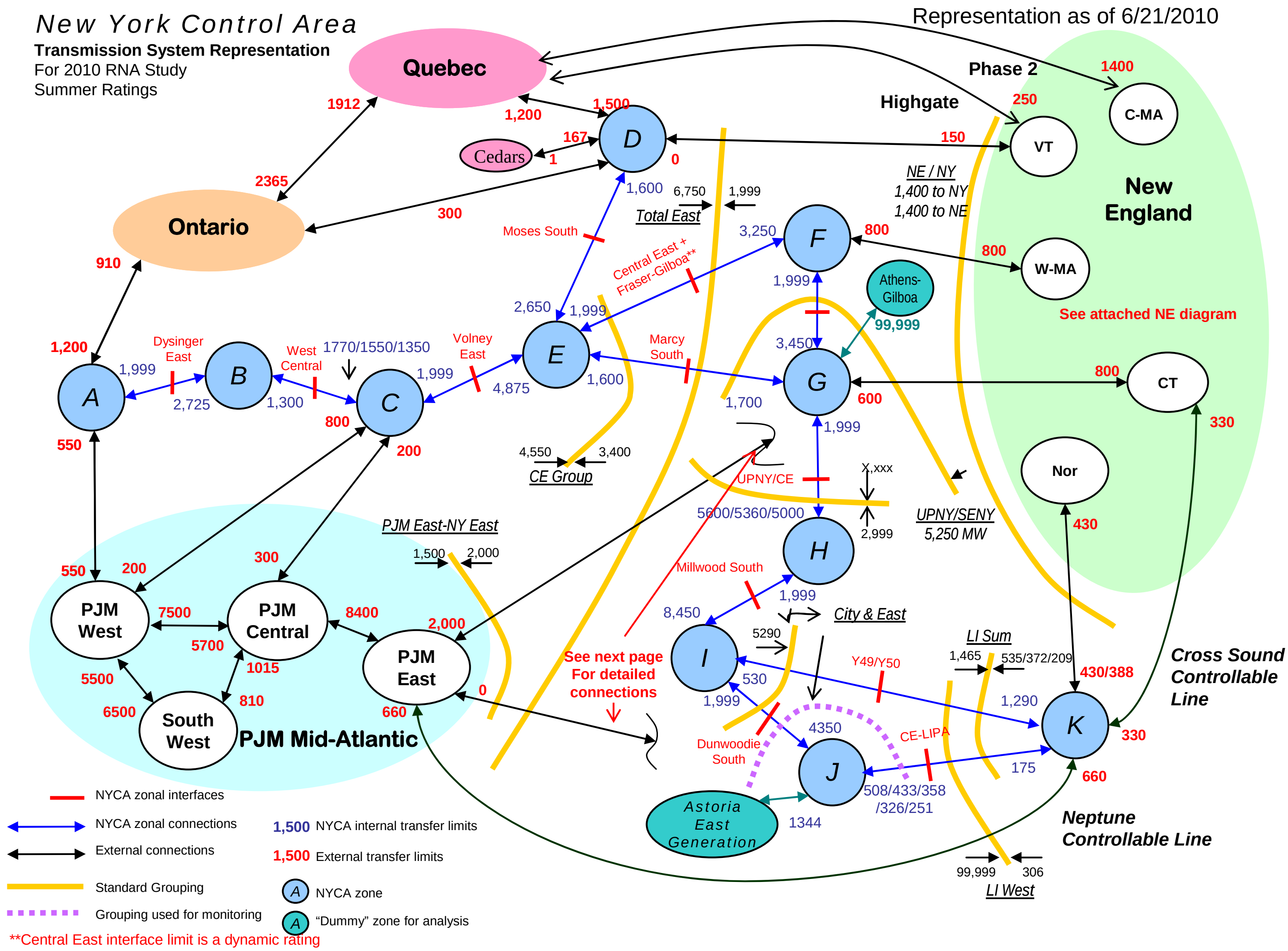
Table C-2: Emergency Thermal Transfer Limits

	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

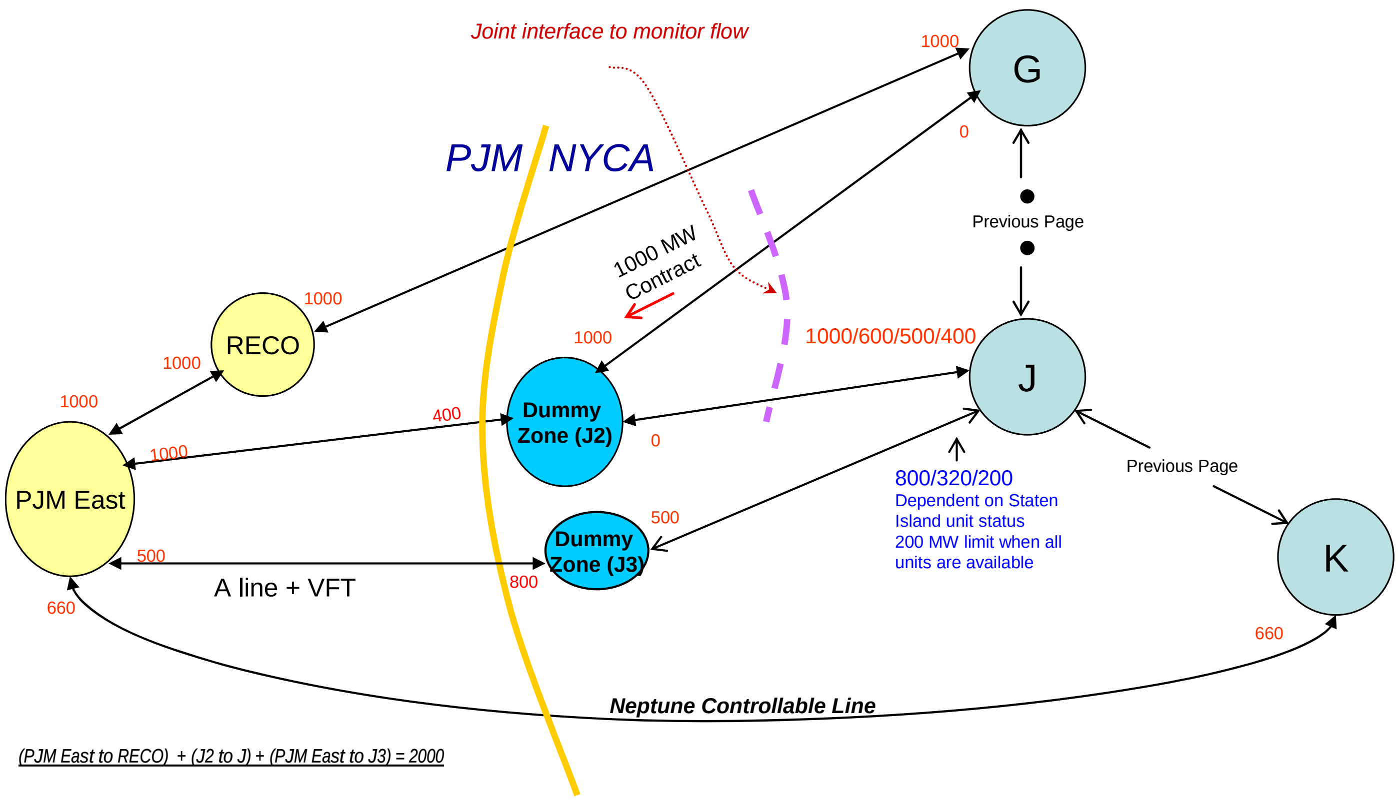
	Limiting Facility	Limiting Rating	Contingency
1	Wethersfield-Meyer 230 kV	430	Pre-disturbance
2	Browns Falls-Taylorville 115 kV	134	Chateaguay-Massena and Massena-Marcy 765 kV
3	Marcy 765/345 T2 transformer	1971	Marcy 765/345 T1 transformer
4	Oakdale-Fraser 345kV	1380	Edic-Fraser 345kV
5	New Scotland-Leeds 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.

C.4 Development of the MARS Topology



2010 PJM-SENY MARS Model – 6/21/2010

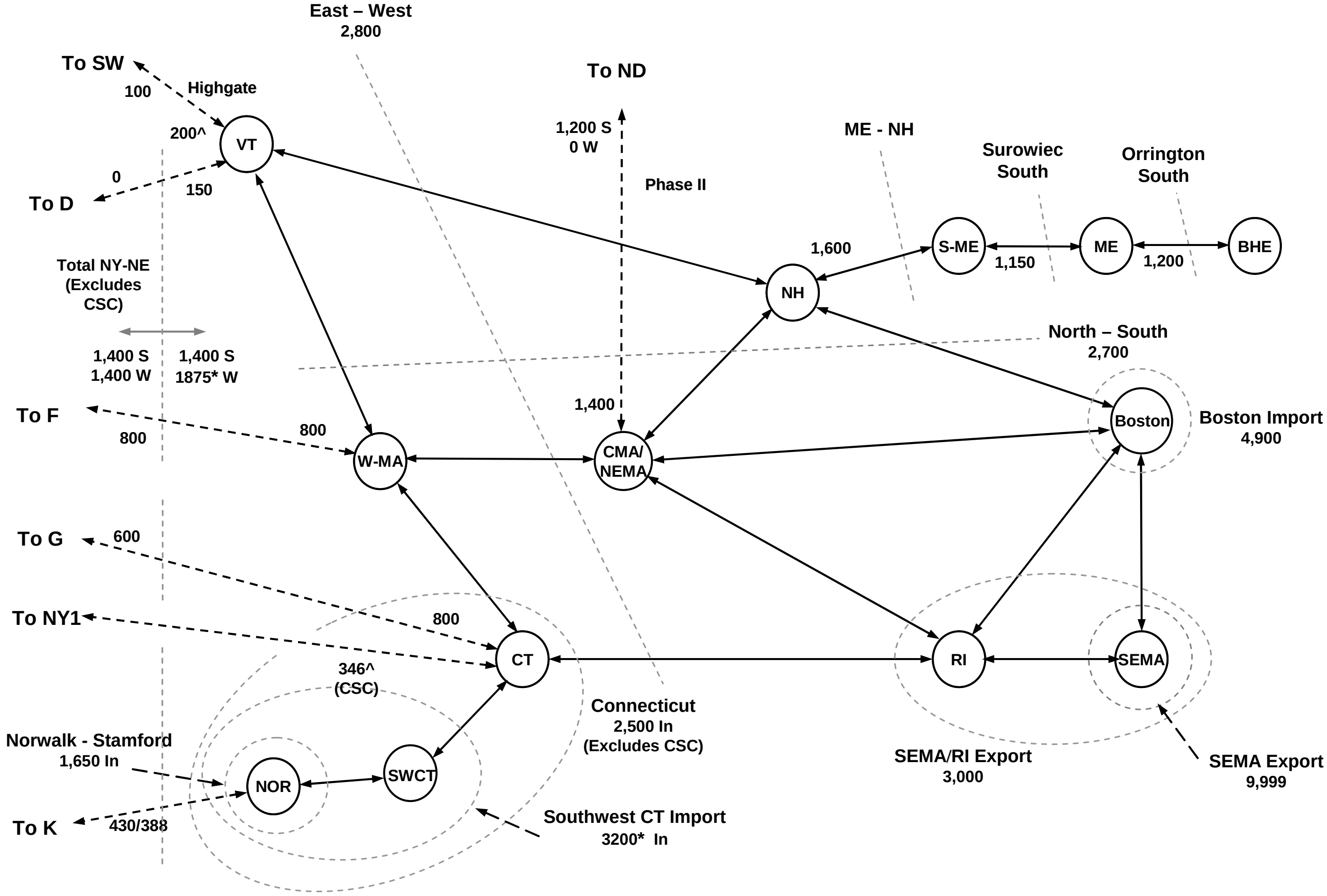


NEPOOL System (Assumed Ratings - MW)

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



C.5 Short Circuit Assessment

Table D-3 provides the reulsts 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
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
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
GRENWOOD	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, Jamacia 138kV and Northport 138 kV. Table C-4 provides the results of National Grid's IBA for Clay 115kV, Leeds 345 kV, New Scotland 345kV, Porter 115 kV and 230kV, Scriba 345 kV and Volney 345 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

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 7,000 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

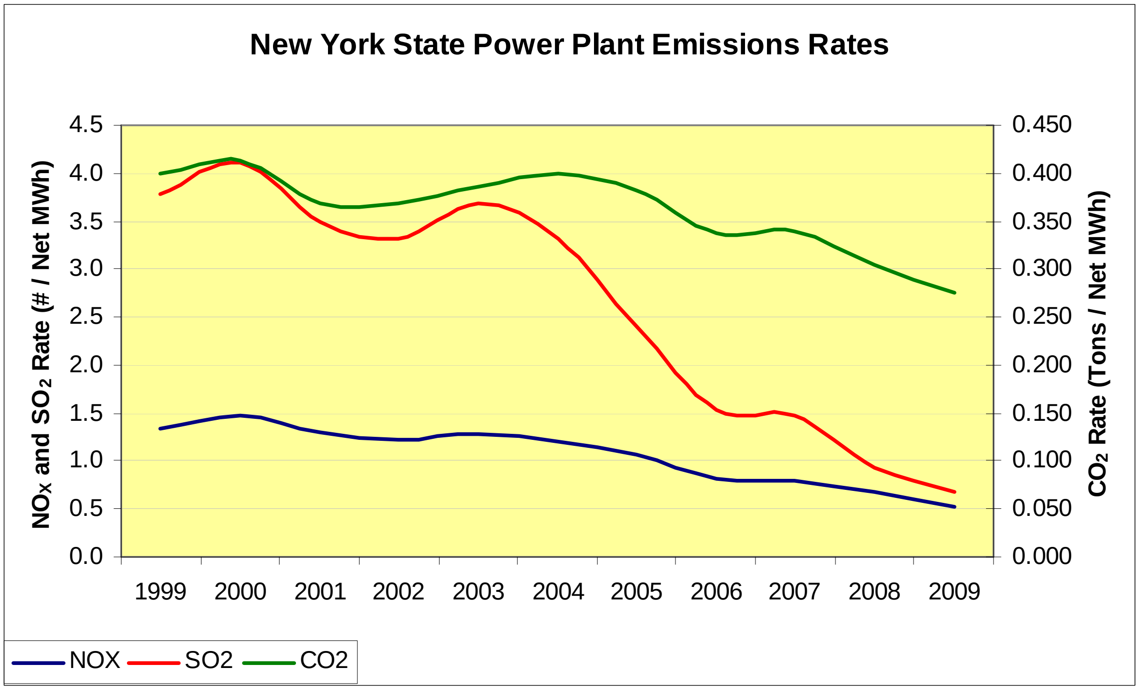


Figure E-2 New York State Power Plant Emissions

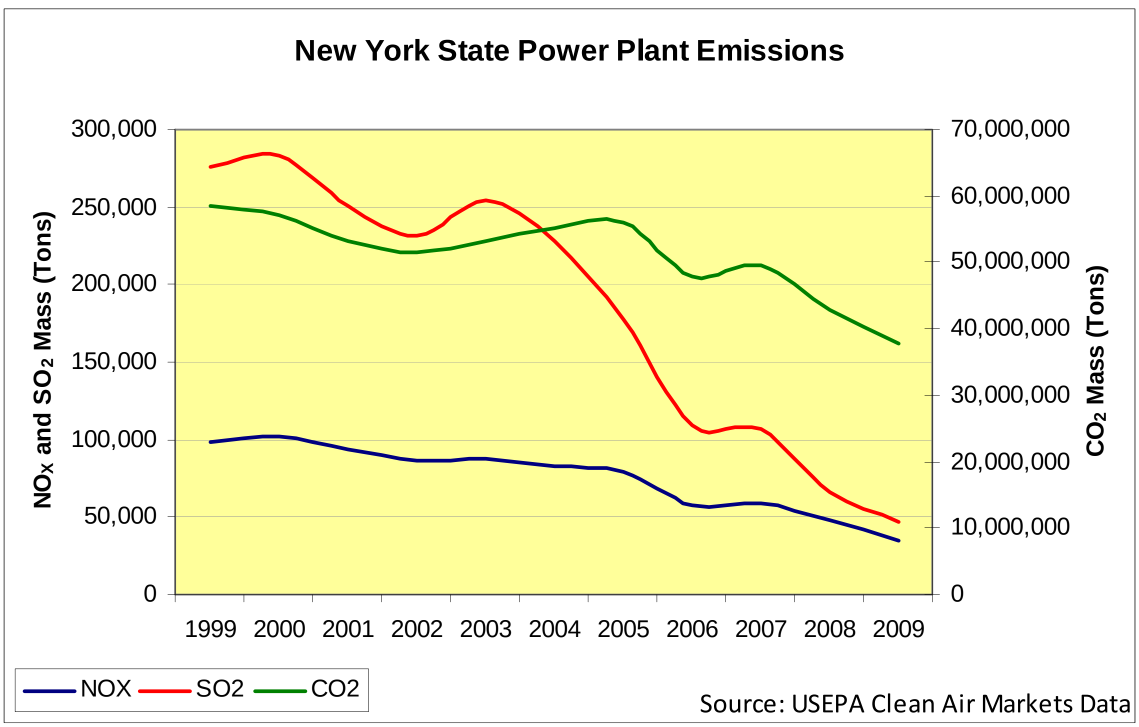
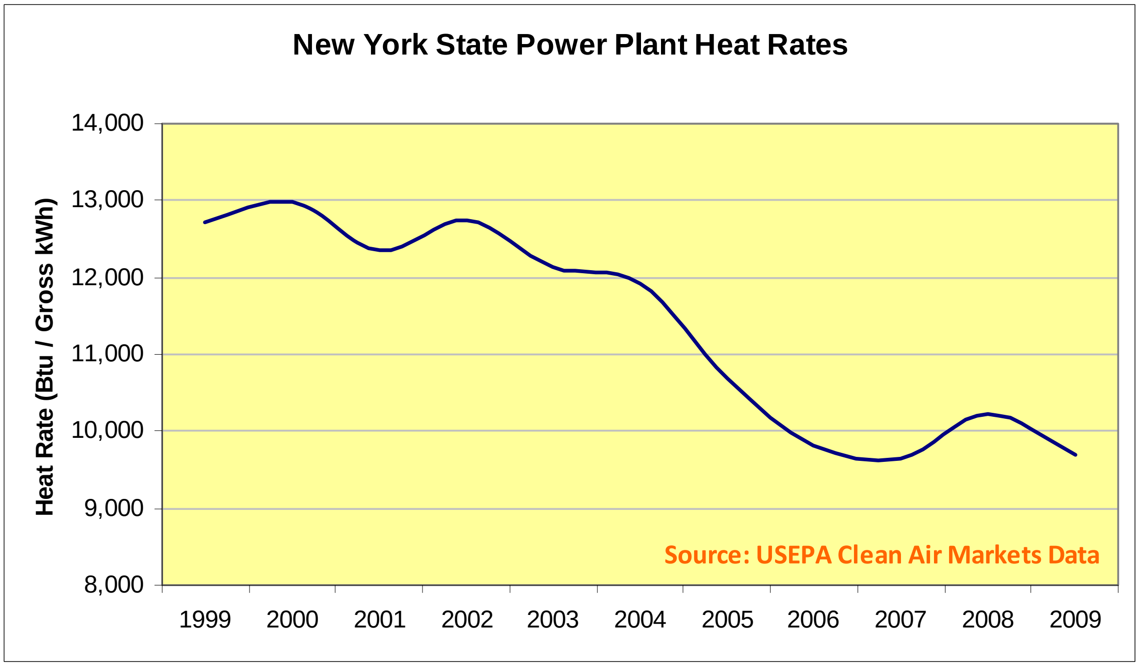


Figure E-3 New York State Power Plant Heat Rates



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 (http://www.nysenergyplan.com/stateenergyplan.html) 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 (NYSDEC) in the annual publication of its regulatory agenda. This agenda describes the new environmental initiatives that it will focus in the coming year. The 2010 agenda can be found at http://www.dos.state.ny.us/info/register/2010/jan6/pdfs/regagenda.pdf. The U.S. Environmental Protection Agency also publishes a similar report on its regulatory agenda which can be found at 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. 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 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.
- 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 system reliability caused by the newly adopted and proposed environmental regulations. Of equal importance, the results will also 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 Technology for Oxides of Nitrogen (NOxRACT)

E-2.1.1 NYSDEC has proposed 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 NY. The NOxRACT 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. NYSDEC is seeking to reduce emissions from the effected 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 NOxRACT 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.

E-2.2 Best Available Retrofit Technology (BART)

NYSDEC 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.

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, NYSDEC 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)

NYSDEC 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 historically 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

NYSDEC will be required to make a determination of BTA for the particular facility intake structures before granting a renewed SPDES permit. Once the NYSDEC 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.

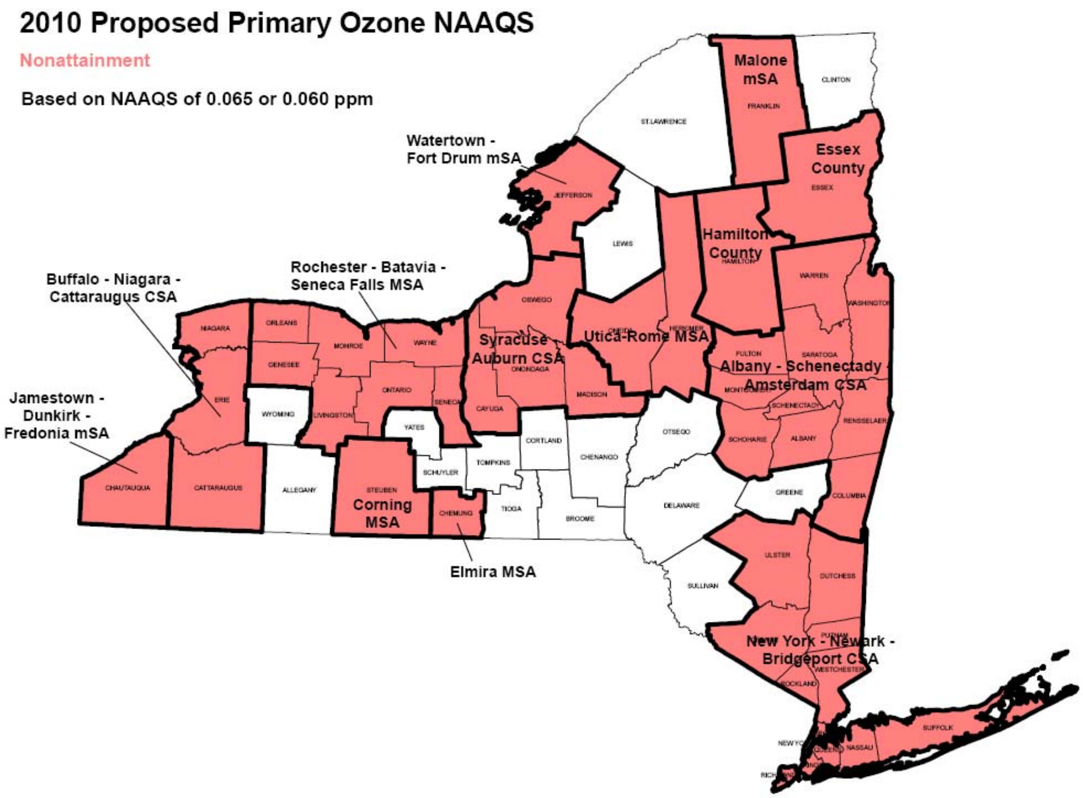
E-2.5 Clean Air Interstate Rule (CAIR)

The USEPA promulgated CAIR which established caps for emissions of SO2 and NOx and a system for allocating and trading allowances. The rule was subject to litigation and the US Supreme Court order the rule to be redesigned. USEPA has reported that it plans to release the revised rule within several months. There are no reliable public reports on how the rule will be designed.

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. NYSDEC has provided Figure D-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



NYSDEC 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)

NYSDEC 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 Providers (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 effected by this regulation. Diesel generators built since 2000, however, are generally be expected to comply the new emission limits expected to be proposed by NYSDEC..

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 NYSDEC's regulations under Part 360 which has 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-3 Reliability Impact Assessment Methodology