2009 Reliability Needs Assessment

Comprehensive Reliability Planning Process

DRAFT REPORT

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1st DRAFT - For Discussion Only

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1. Introduction

Implemented in 2005, the Comprehensive Reliability Planning Process (CRPP) is an annual, ongoing process that combines the expertise of the NYISO and its stakeholders – developed with NYISO stakeholders – to assess and establish the bulk electricity grid's reliability needs and solutions to maintain bulk power system reliability. The first step in the CRPP is the Reliability Needs Assessment (RNA), which evaluates the adequacy and security of the bulk power system over a ten 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. In the second step of the process, the NYISO solicits and evaluates market-based and regulated backstop solutions to the identified needs, and develops a Comprehensive Reliability Plan (CRP).

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 the identified need. In addition, the NYISO will solicit market-based and alternative regulated solutions to address the identified need. Solutions must satisfy reliability criteria, including resource adequacy. Nevertheless, the solutions evaluated by 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 modification of the needs identified in the RNA.

The future reliability of the bulk power system depends on a combination of additional resources, provided in response to market forces and by the electric utility companies that continue to deliver electricity to customers and are obligated to provide safe and adequate service. 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 CRPP 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 Comprehensive Reliability Planning Process. The 2008 CRPP and prior reliability plans are then summarized. The report continues with a summary of the 2009 RNA study case assumptions and methodology. Detailed analyses, data and results underlying the modeling assumptions are contained in the Supporting Document Appendices, which are available upon request.

The report then presents the 2009 needs assessment, which finds under base case assumptions that New York State does not have bulk power system reliability needs during the Study Period from 2009 to 2018. The RNA then analyzes certain sensitivities and scenarios to test the robustness of the system and the conditions under which needs would arise. Much attention is given to the risks to this assessment that could give rise to reliability needs, including unusually high loads, unexpected plant retirements, and delay or failure in implementation of state-sponsored energy efficiency programs. Accordingly, the report states that while the NYISO will not need to solicit market-based and regulatory backstop solutions this year, it will continue to monitor the bulk power system for risks to this assessment and will trigger the need for a solution if one is presented unexpectedly before the next RNA is completed. The NYISO will continue to track Base Case projects and TO Updates. Finally, the NYISO will be issuing a 2009 Comprehensive Reliability Plan based upon this RNA to update the 2008 CRP.

The document concludes with the latest information available regarding historic congestion, which is provided to the market place for informational purposes. Upon FERC approval of its Order 890 planning compliance filing, the NYISO will be undertaking its first forward-looking economic planning in the CARIS process that will be based upon the 2009 CRP.

1.1. Related Planning Activities

The public policy context underlying the NYISO's Comprehensive Reliability Planning Process (CRPP) changed substantially over the last year, at both the federal and state levels. In Order 890, the Federal Energy Regulatory Commission (FERC) determined that the Open Access Transmission Tariffs (OATTs) of electric transmission service providers nationwide should be reformed to provide for, among other things, an open, transparent and coordinated planning process at both a regional and a local level. Order 890 cited the decline in transmission investment since its landmark open access Order 888 was issued in 1996, and the consequent growth in significant transmission constraints. Hence, Order 890 required the NYISO to file an expanded process in conformance with nine planning principals.

On December 7, 2007, the NYISO filed a Comprehensive System Planning Process (CSPP) as an amendment to its OATT Attachment Y that contained three main components. First, the TOs will conduct a Local Transmission Owner Planning Process (LTPP) that will provide the opportunity for stakeholders to participate in their local planning efforts. Second, the outcome of the TOs' local plans will form an input into the CRPP. The NYISO filed only minor changes to the CRPP to make corrections and conform to the FERC planning principles. After receiving an extension from FERC, the NYISO negotiated and then filed on June 18, 2008 amendments to the CRPP to provide for cost allocation and recovery for transmission reliability backstop solutions through the NYISO's tariff, and for cost allocation and recovery for generation and demand response backstop solutions through a state law mechanism that is under development among the New York Public Service Commission (PSC), the New York Power Authority, and the Long Island Power Authority. Third, the Comprehensive Reliability Plan will form the basis of a new economic planning process, known as the Congestion Assessment and Resource Integration Study (CARIS). The CARIS will consist of a series of three studies of future congestion on the New York bulk power system, including the costs and benefits of alternatives to alleviate that congestion. The NYISO proposed that economic transmission upgrades could proceed with cost allocation to all beneficiaries if at least 80 percent of those beneficiaries vote in favor. On October 16, 2008, the FERC conditionally approved the NYISO's planning compliance filings.

The State of New York has been equally active in the energy planning context over the last two years. The Governor called for reducing retail energy consumption by 15 percent from forecasted levels by the year 2015 (known as "15 x 15"). Following extensive proceedings during 2007, the PSC issued an Order Establishing Energy Efficiency Portfolio Standard (EEPS) and Approving Programs, on June 23, 2008. The EEPS order approved an initial expenditure of $330 million per year for energy efficiency programs to be implemented by the Transmission Owners and by the New York State Energy Resource and Development Authority (NYSERDA), with the opportunity of up to $170 million more annually in the future. Evaluating and factoring in the effect of approved program expenditures on future electric loads and system demands for the 2009-2018 Study Period was a major component of the input phase for this 2009 RNA.

In another important move, the Governor established the New York State Energy Planning Board (SEPB) by Executive Order on April 9, 2007. The SEPB consists of representatives of nine state agencies and authorities, and the Governor's Deputy Secretary for Environment, and is chaired by the Governor's Deputy Secretary for Energy. The Final Scope of the 2009 New York State Energy Plan was approved August 7, 2008. A draft State Energy Plan (SEP) is due for public release by March 31, 2009 and a final plan must be approved by June 30, 2009. The Executive Order calls for consultation and "maximum input" from the NYISO in developing the SEP. The NYISO has been providing technical input to the Energy Coordination Working Group that consists of representatives of the state entities. The NYISO will be conducting reliability modeling work to assist with developing the Electric Resource Assessment. The SEP will also include a number of issue briefs on which the NYISO is providing input, including Energy Infrastructure Needs, Regional Collaboration and the impact of plug-in hybrid electric vehicles on the electric grid. Finally, the City of New York is undertaking its own transmission system assessment, to which the NYISO is also providing technical assistance.

These federal, state and local energy planning processes place a spotlight on this year's CRPP. The RNA base case, base case reliability needs assessment, and sensitivity and scenario analyses will serve as a spring board for economic planning called for by FERC, local Transmission Owner planning processes, the State Energy Plan assessment and issue briefs, and the City of New York energy planning process. The CRPP is a robust planning process that can provide the basis for these planning efforts, as well as for the market-based reliability planning process the NYISO has been carrying out with its stakeholders for the last four years.

2. CRP Process and Summary of Prior Plans

This section presents an overview of the CRPP followed by a summary of the CRP 2005, 2007 and 2008 plans and their current status. A detailed discussion of the CRPP, including applicable reliability criteria is contained in NYISO Manual 26 entitled: "Comprehensive Reliability Planning Process Manual (CRPP 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."

2.1. Overview of the CRPP

The CRPP is a long-range assessment of both resource adequacy and transmission reliability of the New York bulk power system conducted over five-year and 10-year planning horizons. The CRPP is part of the NYISO's Comprehensive System Planning Process (CSPP), which the NYISO filed at FERC in compliance with Order 890 on December 7, 2007. The CRPP was largely unchanged, except for cost allocation and cost recovery provisions for transmission reliability backstop solutions, which was filed on June 18, 2008. The New York Public Service Commission, New York Power Authority and Long Island Power Authority are negotiating cost recovery and cost allocation for non-transmission (demand response and generation) reliability backstop solutions.

A new Local Transmission Owner Planning Process (LTPP) will provide opportunities for stakeholders to have input into each Transmission Owner's system specific plans, which will form an input into future CRPs following FERC approval. The FERC has not yet ruled on the NYISO's planning filings. The 2009 CRPP will form the basis for the NYISO's new economic planning process, known as the Congestion Analysis and Resource Integration Study (CARIS). That process will examine congestion on the New York Bulk Power System and the costs and benefits of alternatives to alleviate that congestion. Figures 2.1 and 2.2 below illustrate how the CRPP fits into the proposed NYISO's CSPP.

In the CRPP, 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.

There are two different aspects to analyzing a bulk power system's reliability: security and adequacy. 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 a 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, N-1-1 or N-2. N is the number of system components; an N-1 requirement means that the system can withstand single disturbance events (e.g., one component outage) without violating thermal, voltage and stability limits or before affecting service to consumers. N-1-1 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, and after generation and power flows have been adjusted between outages by the use of 10-minute operating reserve and, where available, phase angle regulator control and HVDC control. Each control area usually maintains a list of critical elements and most severe contingencies that need to be assessed.

The CRPP is anchored in the market-based philosophy of the NYISO and its Market Participants, which posits that market solutions should be the first choice to meet the identified reliability needs. 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 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 TOs' regulated backstop solutions. Under the CRPP, the NYISO also has an affirmative obligation to report historic congestion on the transmission system and whether the marketplace is responding appropriately to the reliability needs of the bulk power system. 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 CRPP 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 reliability needs. The ultimate approval of those projects lies with regulatory agencies such as the Federal Energy Regulatory Commission (FERC), the New York State Public Service Commission (PSC), environmental permitting agencies, and local governments. The NYISO monitors the progress and continued viability of proposed market and regulated projects to meet identified needs, and reports its findings in annual plans. Figure 2.1 below summarizes the process:

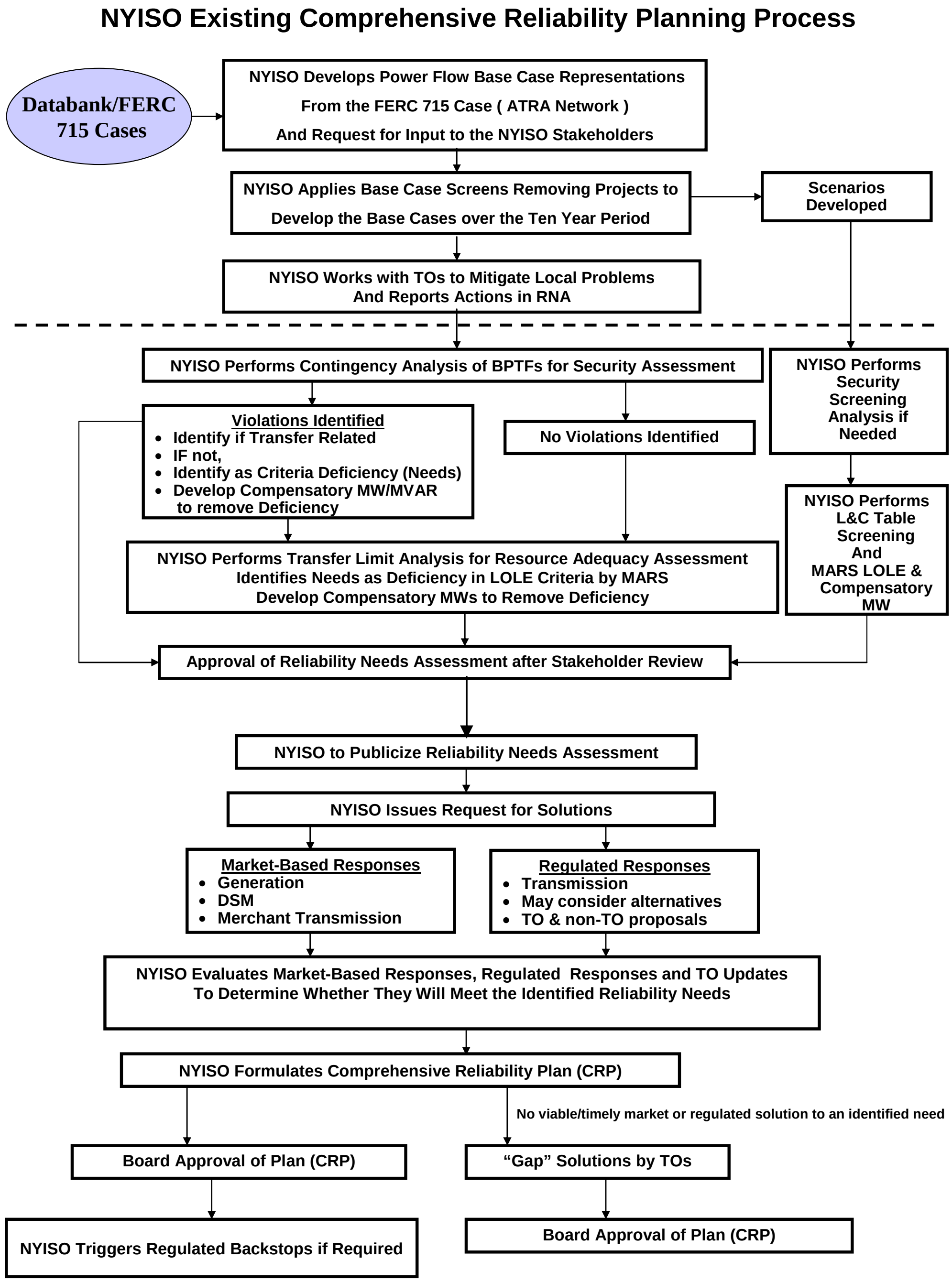

Figure 2.1: NYISO Reliability Planning Process

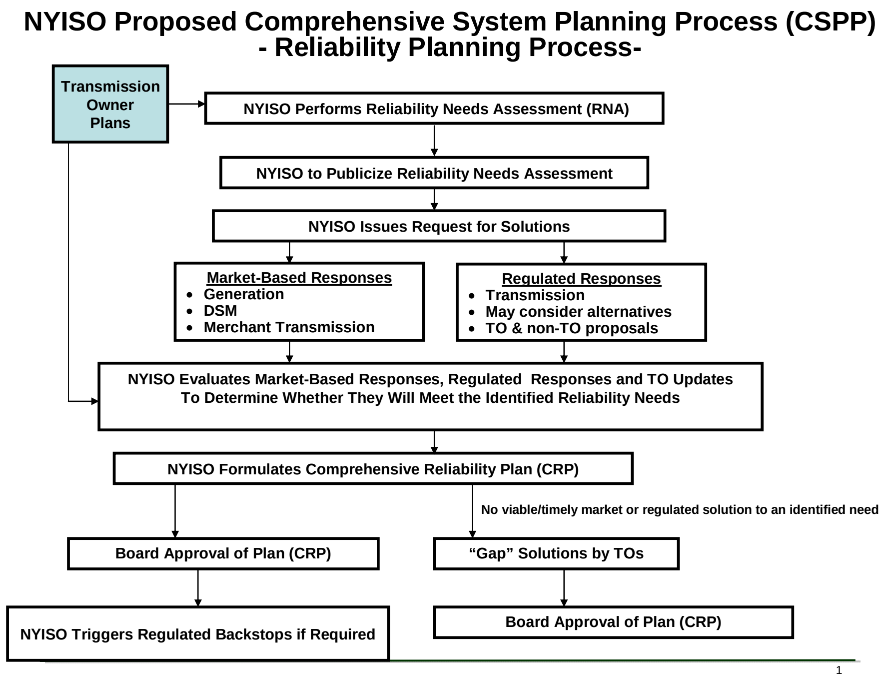

Figure 2.2: Reliability Planning Process

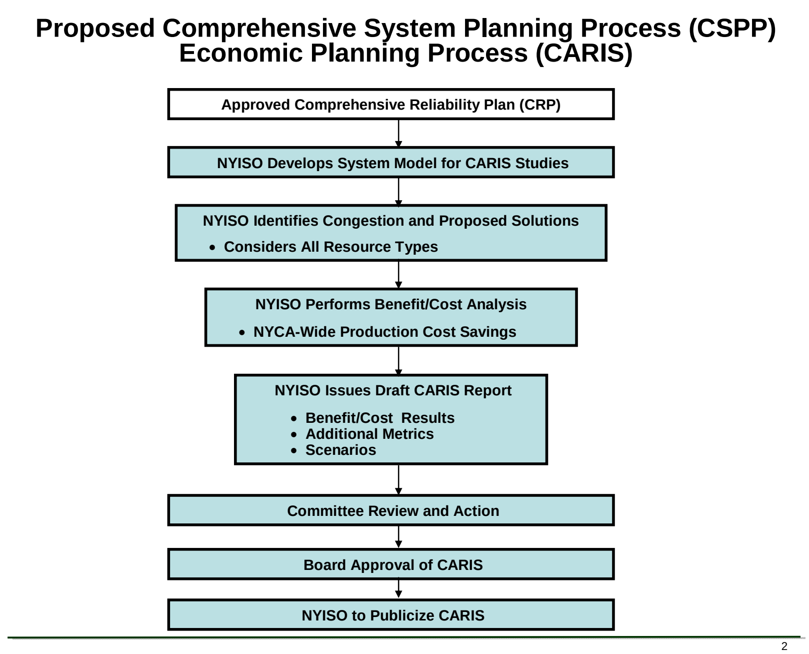

Figure 2.3: Economic Planning Process

3. Summary of Prior CRPP

This is the fourth cycle of the CRPP process since the NYISO's planning process was approved by FERC in December 2004. The first 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 second CRP[1], 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. Market solutions totaled 3,007 MW, with the balance provided by updated Transmission Owners' (TOs) plans. The third 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. As a result of updated TO plans and proposed market solutions, the NYISO has not had to trigger any regulated backstop solutions to meet reliability needs.

The success of the 2008 CRP is dependent on the market solutions moving forward. The 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 2,655 MW of solutions are still being reported to the NYISO as moving forward with the development of their projects. It should be noted that there are other projects in the NYISO queue that are moving forward, however they have not been offered as market solutions.

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[1] 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 2007-2016 Study Period. The latter naming convention has been applied, and will continue to be applied, to subsequent CRPP documents.

Table 3.1: Current Status of the 2008 CRP Market – Based Solutions and TOs' Plans

Project Type	Submitted	MW	Zone	In-Service Date	Status
Resource Proposals					
Gas Turbine NRG Astoria Re-powering	CRP 2005, CRP 2007, CRP 2008	412 *	J	Jan - 2011	New Target June 2012 NYISO interconnection queue projects # 201 and # 224
Simple Cycle GT Indian Point	CRP 2007, CRP 2008	300	H	May - 2011	New Target May 2012 Project suspended
Cross Hudson Combined Cycle Bergen 2	CRP 2008	550	J	June - 2011	New Target June 2012 NYISO interconnection queue project # 255 withdrawn. Re-submitted as queue #295 for 800MW.
DSM SCR EnerNOC	CRP 2008	125	G, H, J	2012 - 2017	Withdrawn
DSM SCR ECS	CRP 2008	300	F, G, H, I, J	2008 - 2012	Withdrawn
Empire Generation Project	CRP 2008	635	F	Q1 2010	New Target July 2010 Under Construction NYISO interconnection queue project # 69
Transmission Proposals					
Controllable AC Transmission Linden VFT	CRP 2007, CRP 2008	300 (No specific capacity identified)	PJM - J	Q4 2009	Under Construction NYISO interconnection queue project #125
Back-to-Back HVDC, AC Line HTP	CRP 2007, CRP 2008 and was an alternative regulated proposal in CRP 2005	660 (500 MW specific capacity identified)	PJM - J	Q2 2011	Under Construction NYISO interconnection queue projects # 206
Back-to-Back HVDC, AC Line Harbor Cable	CRP 2007, CRP 2008 and was an alternative regulated proposal in CRP 2005	550 (550 MW specific capacity identified)	PJM - J	June - 2011	Withdrawn NYISO interconnection queue projects # 195 and # 253
TOs' Plans					
ConEd M29 Project	CRP 2005	N/A	J	Dec - 2009	New Target May 2011 Under construction NYISO interconnection queue projects # 153
Caithness	CRP 2005	310	K	Jan - 2009	New Target June 2009 Under construction NYISO interconnection queue projects # 107
Millwood Cap Bank	CRP 2007	240 Mvar	H	Q1 2009	On Target Under construction

* *NRG sumbitted three proposals, one of them was subsequently withdrawn. For the purposes of the Market-Based solutions' evaluation NYISO assumed the lowest MW proposal. There is a retirement of approximately 100 reflected in this figure and in the base case.*

4. RNA Study 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 Reliability Needs Assessment. The NYISO's procedures are designed to allow the NYISO's planning activities associated with the CRPP 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 study case consists of the Five Year Base Case and the second five years of the Study Period. The Study Period analyzed in the 2009 RNA are the years 2009-2018. 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.

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); and (4) Market Participant input; (5) and 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 with the MW forecast. The load models developed for the RNA were initially based on the econometric based load forecast from the 2008 Load and Capacity Data Report, also known as the "Gold Book".

The 2009 RNA study case model of the New York system includes the following new and proposed facilities and updates to the forecasts in the Gold Book based on new information developed before the start date of the RNA studies:

TO projects on non-bulk power facilities;

Facilities that have accepted their Attachment S cost allocations and are in service or under construction as of June 1, 2008;

Transmission upgrades related to any projects and facilities that are included in the RNA study case, as defined above;

TO plans identified in 2008 CRP and the 2008 Gold Book as firm plans;

Facility reratings and uprates;

Scheduled retirements;

Updated forecasts of Special Case Resources and the impacts of the NYSPSC EEPS Order, as developed and reviewed at the ESPWG; and

External System Modeling

The RNA study case does not include all projects currently listed on the NYISO's interconnection queue or those shown in the 2008 Gold Book. It includes only those which meet the screening requirements for inclusion. Scenarios to include projects not meeting these screening requirements are developed for assessment.

4.1. RNA Study Case Assumptions and Drivers

Forecasts for peak load and energy as well as the impacts of programs such as EEPS and Special Case Resources were developed for the ten year period. Projections for the installation and retirements of resources and transmission facilities are developed in conjunction with Market Participants and Transmission Owners and included in the base cases. Resources that may choose to participate in markets outside of New York are given zero capacity credits towards meeting resource adequacy requirements in New York.

4.2. Impact of Energy Efficiency Portfolio Standard on the Load Forecast

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 a previously forecasted energy usage level for the year 2015 (the 15x15 initiative).

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,NYPA and other state agencies

The NYISO has been a party to the EEPS proceeding from its inception. In conjunction with market participants in the Electric System Planning Working Group, the PSC staff and NYSERDA, NYISO developed forecasts for the potential impact of the EEPS over the ten year planning period. The following factors were considered in developing the 2009 RNA base case forecast:

- the PSC-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 NYISO's econometric load forecast,
- the impacts of new appliance efficiency standards and building codes and

standards

- specific conservation plans proposed by LIPA, NYPA and Consolidated -Edison.

The resulting forecast used for the RNA base case included an adjustment to the Gold book econometric forecast that included approximately 30 percent of the entire EEPS goal. Also produced were two scenarios for the RNA, one in which higher levels of EEPS spending were available, and one in which the entire goal was realized, regardless of cost. Once the statewide energy and demand impacts were developed, zonal level forecasts were produced for the econometric forecast, for the base case, and for the two scenarios.

The table below summarizes the econometric forecasts of 2007 and 2008, the 2009 RNA Base Case forecast and two additional scenarios. For comparison purposes, the 2007 econometric forecast is also included. This forecast provided the basis for the 2008 RNA Base Case. As can bee seen from the red highlighted numbers in the table, the 2009 RNA base case peak demand forecast in 2018 (35,658 MW) is within 100 MW of the 2008 RNA forecast (35,566 MW) in 2012. The 2009 RNA Base Case forecast in 2018 is more than 2,100 MW lower than the current econometric forecast (37,784 MW). The impact of the EEPS load reductions is the major factor for the 2009 RNA result that there are no bulk power system reliability needs during the Study Period.

Utility-specific energy conservation programs are also incorporated in the 2009 RNA Base Case. Consolidated Edison has provided the NYISO a schedule of annual Demand-Side Management impacts for the years 2008 through 2016. The cumulative impact of these programs is 510 MW by 2016. These programs have received approval from the PSC and will be implemented in their local distribution system over the next eight years. The NYISO has reviewed this schedule with Con-Ed and incorporated these impacts in the Base Case at the zonal level, together with additional planned conservation impacts from the EEPS initiative.

The Long Island Power Authority has also provided the NYISO with information regarding its energy conservation programs during the development of the 2009 RNA. The NYISO worked with LIPA staff to develop an annual schedule of the LIPA program, which has a goal of 500 MW of conservation by 2018. There are small annual differences between the schedule in the 2009 RNA Base Case and the final LIPA schedule. After including additional planned conservation impacts from the EEPS initiative, the total annual conservation impacts on Long Island meet or exceed those of the LIPA program.

The details of the analysis for the development of the impacts of the EEPS on the forecast can be found in Appendix C.

Table 4.1 - RNA Forecast Scenarios

Annual GWh	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
2007 Econometric	167,440	169,470	171,744	174,032	176,615	178,759	181,126	183,544	186,256	188,728	
2008 Econometric	166,849	169,040	171,575	173,788	176,091	178,669	181,597	184,262	187,052	188,801	190,662
2009 RNA Base Case	166,677	168,127	169,747	170,953	171,926	173,158	174,799	176,176	178,250	179,283	180,427
Scenario 1	166,677	167,977	169,399	170,263	170,485	170,965	171,857	172,485	174,559	175,592	176,736
Scenario 2	166,241	166,389	165,923	164,929	162,772	160,712	159,182	157,382	159,808	161,466	163,326

EEPS Energy Impacts

Cumulative GWh	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
2009 RNA Base Case	172	913	1,828	2,835	4,165	5,511	6,798	8,086	8,802	9,519	10,235
Scenario 1	172	1,063	2,176	3,525	5,606	7,704	9,740	11,777	12,493	13,209	13,926
Scenario 2	608	2,651	5,652	8,859	13,319	17,957	22,414	26,880	27,244	27,335	27,335

Annual MW	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
2007 GB Econometric	33,871	34,300	34,734	35,141	35,566	35,962	36,366	36,749	37,141	37,631	
2008 GB Econometric	33,827	34,247	34,649	35,053	35,452	35,870	36,317	36,708	37,086	37,407	37,784
2009 RNA Base Case	33,792	34,059	34,269	34,462	34,586	34,725	34,905	35,029	35,258	35,430	35,658
Scenario 1	33,792	34,029	34,199	34,324	34,298	34,288	34,320	34,298	34,526	34,698	34,926
Scenario 2	33,703	33,704	33,489	33,234	32,722	32,197	31,739	31,227	31,530	31,833	32,209

EEPS Demand Impacts

Cumulative MW	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
2009 RNA Base Case	35	188	379	590	867	1,145	1,412	1,678	1,828	1,977	2,126
Scenario 1	35	218	449	729	1,155	1,582	1,997	2,410	2,560	2,709	2,858
Scenario 2	124	543	1,160	1,819	2,730	3,674	4,579	5,481	5,556	5,575	5,575

As can bee seen from the red highlighted numbers in the above table, the 2009 RNA base case year 2018 forecast is less than 100 MW higher than the 2008 RNA year 2012 forecast. The impact of a load reduction in the year 2018 of over 2,100 MW is a major driver for the 2009 RNA results.

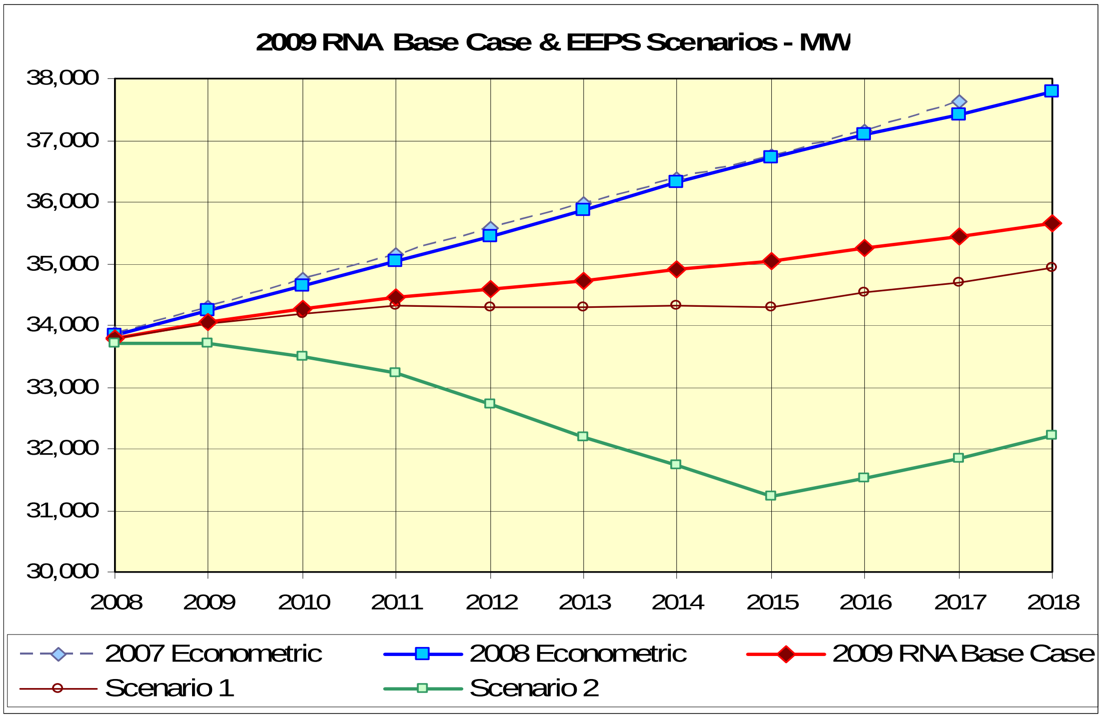


Figure 4.1

The details of the analysis for the development of these EEPS impact forecasts and the zonal breakdown can be found in Appendix C.

4.3. Forecast of Special Case Resources (SCRs)

The forecast for the 2009 RNA base case was modified from the 2008 Gold Book to reflect the increase in SCR registrations for this past summer. A new forecast was developed for the first year of the RNA study period and this value was held constant over the ten year study period. This was consistent with the 2009 IRM assumptions and details of this forecast can be found in Appendix C and its impact can be seen in the RNA load and Capacity table below. From an ICAP perspective, this represents an approximate increase of 750 MW of resource capacity over the 2008 RNA. A low and high SCR scenario was included for variations in the levels of SCRs over the planning horizon. For the low SCR scenario the initial 2009 IRM SCR value was reduced 7.5%

each year from 2010 to 2018. For the high SCR scenario the initial 2009 IRM SCR value was increase 7.5% each year from 2010 to 2018.

4.4. Resource Additions

Table 4.2 below presents the unit additions, which were represented in the RNA study case:

Table 4.2: Unit Additions

Unit/Year	2009	2010	2011	2013	
New Units					
Albany Landfill	3				
Caithness	310				
Clinton	4.8				
Danc	4.8				
Hyland	4.8				
Riverbay	45				
Besicorp		660			
*New Wind Units**					
Noble Altona	99				
Noble Belmont/Ellenburg II	21				
Noble Bliss	100.5				
Noble Chateaugay I	106.5				
Noble Clinton	100.5				
Noble Ellenburg	81				
UPC Canandaigua Cohocton	82.5				
UPC Canandaigua Dutch Hill	42.5				
Windfarm Prattsburgh	55.5				
3rd Tier	101.9				
Unit Uprates					
High Acres Uprate	6.4				
Blenheim-Gilboa Unit 1 uprate	30				
Sherman Island Uprate	8.5				
Blenheim-Gilboa Unit 3 uprate		30			
Seneca Energy Uprate		6.4			
Blenheim-Gilboa Unit 4 uprate			30		
Nine Mile Point Pt2			168		
Steel Winds II		60			
Munnsville Wind Power				6	
Total MW	**1,208**	**756**	**198**	**6**	**2,169**

* *New Wind Units MWs represent ICAP values at full namaplate capacity.*

TO Firm Plans

Add table showing M29, ConEd DSM, Millwood, Neptune, etc

4.5. Resource Retirements

Table 4.3 below presents the unit retirements, which were represented in the RNA study case:

Table 4.3: Scheduled Unit Retirements *

Unit/ Year	**2008**	**2010**	
Russell Station 3	41.7		
Russell Station 4	77.7		
Onondaga Cogen	78.3		
Lovett 5	182.9		
Poletti		891	
Total MW	**380.6**	**890.7**	**1271.6**

** As specified by the Owner/Operator*

4.6. Base Case Load and Resource Margins

The unit retirements and additions, when combined with the existing generation as of April 1, 2008 in the Gold Book and other adjustments, resulted in the following RNA study case load and resource margin table:

Table 4.4: NYCA Load and Resource Margins 2009 to 2018

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Peak Load										
NYCA	**34,059**	**34,269**	**34,462**	**34,586**	**34,725**	**34,905**	**35,029**	**35,258**	**35,430**	**35,658**
Zone J	12,127	12,257	12,361	12,452	12,537	12,627	12,683	12,787	12,879	12,980
Zone K	5,386	5,395	5,403	5,403	5,377	5,370	5,358	5,374	5,354	5,383
Resources										
NYCA										
Capacity	39,992	39,657	40,496	40,496	40,502	40,452	40,452	40,452	40,452	40,452
SCR	2,084	2,084	2,084	2,084	2,084	2,084	2,084	2,084	2,084	2,084
Total	**42,077**	**41,741**	**42,580**	**42,580**	**42,586**	**42,536**	**42,536**	**42,536**	**42,536**	**42,536**
Res./Load Ratio	123.5%	121.8%	123.6%	123.1%	122.6%	121.9%	121.4%	120.6%	120.1%	119.3%
Zone J										
Capacity	10,097	9,206	9,206	9,206	9,206	9,206	9,206	9,206	9,206	9,206
SCR	622	622	622	622	622	622	622	622	622	622
Total	**10,719**	**9,828**	**9,828**	**9,828**	**9,828**	**9,828**	**9,828**	**9,828**	**9,828**	**9,828**
Res./Load Ratio	88.4%	80.2%	79.5%	78.9%	78.4%	77.83%	77.49%	76.86%	76.31%	75.71%
Zone K										
Capacity	5,938	6,368	6,368	6,368	6,368	6,368	6,368	6,368	6,368	6,368
SCR	216	216	216	216	216	216	216	216	216	216
Total	**6,154**	**6,584**	**6,584**	**6,584**	**6,584**	**6,584**	**6,584**	**6,584**	**6,584**	**6,584**
Res./Load Ratio	114.3%	122.0%	121.9%	121.9%	122.4%	122.61%	122.88%	122.52%	122.98%	122.31%

NYCA "Capacity" values include resources internal to New York, Additions, Reratings, Retirements, Purchases and Sales, and UDRs with firm capacity. Zone K "Capacity" values include UDRs with firm capacity. Wind generation values include full nameplate capacity.

"SCR" values reflect projected August 2009 ICAP capability period values held constant over the ten year Study Period.

Pursuant to Section 4.5 of Attachment Y, 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 Attachment Y to test the robustness of the needs assessment studies and identify conditions under which reliability criteria may not be met.

4.7. Methodology for the Determination of Needs

Reliability needs are defined 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 Process includes 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 loss of load expectation (LOLE). As stated in Section II, the New York State bulk electricity system is planned to meet a loss of load expectation (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 criteria violations exist. These design criteria contingencies are sometimes referred to as N-1, N-1-1, or N-2.

As violations are found, compensatory MW needs for the New York Control Area (NYCA) are developed by adding generic 250 MW generating units to zones that are capable of addressing the 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.

In addition, the NYISO performs a short circuit analysis using ASPEN (Advanced Systems for Power Engineering) OneLiner to determine the impact of the maximum generation on the bulk power system. The NYISO "Guideline for Fault Current Assessment" was used. Three-phase, single-phase and line-line-ground short-circuit currents were determined for approximately 150 bulk power substations across the NYCA.

5. Reliability Needs Assessment

5.1. Overview

As discussed above, 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.

Below are the principal findings of the RNA for the 2009-2018 Study Period, including the 2008 Load and Capacity Data Report load forecast. Also, the needs assessment evaluated the following scenarios:

Comment [A1]: CFP; these scenarios need more description for the next draft

- Load Forecast
  - 2009 RNA Base Case Forecast
  - 2008 Econometric (Load and Capacity Data Report) Forecast
  - New York State's EEPS initiative of 15 percent reduction in energy consumption by 2015 (known as "15 x 15")
    - Scenario 1 – additional EEPS spending for increased energy efficiency
    - Scenario 2 – achievement of the entire EEPS goal regardless of cost
  - High Load Growth
- Regional Greenhouse Gas Initiative for carbon dioxide (CO_2) emissions environmental program impacts
- Operational limitations for certain units that may result from additional NOx emission reduction requirements
- Indian Point 2 and 3 nuclear unit retirements
- HQ Import
- High Wind Penetration
- Low and high SCR resources forecast
- External capacity adjustments
- Zones at Risk
- Revised Transmission Topology

5.2. Reliability Needs for Study Case

5.2.1. Transmission Security Assessment

The first step in identifying reliability needs is to assess transmission security. The NYISO reviewed many previously completed transmission security assessments and performed an AC contingency analysis for various bulk power system stations. This analysis was performed with PSS/E's automated Power-Voltage (PV) analysis for fast screening. Based on findings of the review and the screening analysis, more detailed analysis was performed for critical contingency evaluation and transfer limit evaluation with NYISO's Voltage Contingency Analysis Program (VCAP) analysis tool. The impact of critical generators being out of service was also assessed. Security for the BPTFs can usually be maintained by limiting power transfers.

5.2.2. 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 2013 with the latest version of the Class Year 2008 Annual Transmission Baseline Assessment (ATBA), modified to be consistent with the 2009 RNA study conditions. The fault levels were kept constant over the second five years because the methodology for fault duty calculation is not sensitive to load growth. The detailed analysis is presented in Appendix D. The NYISO observed no major changes in fault current from the previous RNAs. Overdutied circuit breakers appear in at least two substations in the analysis, Astoria West and Fitzpatrick. In 2007 an interim operating protocol was developed to limit the number of units connected to the Astoria West bus, thereby preventing the overduty situation. In April 2008 a Memorandum-of-Understanding was signed by Con Edison, NRG, and NYPA, which continues certain provisions of the interim operating protocol until the overdutied breakers can be replaced, with Con Edison committing to replace the breakers by the Summer 2010. Entergy will replace the Fitzpatrick overdutied breaker prior to the end of this year.

5.2.3. Resource and Transmission Adequacy

The resultant load forecast after EEPS has not resulted in any increased demands on the transmission system to meet capacity and energy needs in the NYCA system. The transfers into and through SENY will continue to be limited by voltage constraints, rather than thermal constraints. As a result of the three prior CRPs, the TOs are upgrading their systems by bypassing series reactors where appropriate, adding capacitor banks at the Millwood substation, and the installation of the M29 cable. These improvements have brought the transmission voltage limit close to the thermal limit for the cable interface into Zone J. For details on these improvements, please refer to Tables 4.2.2.1 – 4.2.2.3 below.

Table 5.1: Transmission System Thermal Transfer Limits for Key Interfaces in MWs

Interface	Year				
	2009	**2010**	**2011**	**2012**	**2013**
Central East + FG*	**3125**	**3075**	**3075**	**3075**	**3075**
F-G	**3450**	**3425**	**3475**	**3475**	**3450**
UPNY/SENY	**5150**	**5150**	**5150**	**5150**	**5150**
I-J	**4000**	**4075**	**4400**	**4400**	**4425**
I-K	**1290**	**1290**	**1290**	**1290**	**1290**

* F-G – Fraser-Gilboa circuit

Table 5.2: Transmission System Voltage Transfer Limits for Key Interfaces in MWs

Interface	Year				
	2009	**2010**	**2011**	**2012**	**2013**
Central East + FG	**3050**	**3050**	**3050**	**3050**	**3050**
F-G					
UPNY/SENY					
DS		**4200**	**4150**	**4150**	**4150**
I-K					

Note: Blank entries indicate that the voltage limits are more than 5% above the thermal limits.

Table 5.3: Transmission System Study Case Transfer Limits for Key Interfaces in MWs

Interface	Year

	2009	2010	2011	2012	2013
Central East + FG	3050 V	3050 V	3050 V	3050 V	3050 V
F-G	3450 T	3450 T	3450 T	3450 T	3450 T
UPNY/SENY	5150 T	5150 T	5150 T	5150 T	5150 T
I-J	4000 T	4000 T	4400 C	4400 C	4400 C
I-K	1290 T	1290 C	1290 C	1290 C	1290 C
I-J&K	5290 T	5290 V	5440 V	5440 V	5440 V

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

Resource and transmission adequacy is evaluated for the entire 10-year Study Period. Resource Adequacy is evaluated for the second five year period with transfer limits assumed constant. The analysis encompasses the Five Year Base Case and the second five years. The RNA study case transfer limits under emergency conditions (from the analysis conducted with the updated base cases) were employed to determine resource adequacy needs (defined as a loss-of-load-expectation or LOLE that exceeds 0.1 days per year). The LOLE for the NYCA did not exceed 0.10 days per year by 2018. The LOLE[2] results for the entire 10-year RNA study case are summarized in Table 4.2.2.4.

[2] It should be noted that the LOLE results presented for each load zone are determined based on the assumption that load in a particular load Zone has "first rights" to that capacity in that load Zone even though that capacity could be contractually obligated to load in another load Zone or area. General Electric's Multi-Area Reliability Simulations (MARS) logic prorates capacity among zones if more than one zone is capacity deficient.

Table 5.4: LOLE for the RNA Study Case Transfer Limits

Area/Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
AREA-A										
AREA-B										
AREA-C										
AREA-D										
AREA-E										
AREA-F										
AREA-G										
AREA-H										
AREA-I						<0.01	<0.01	<0.01	<0.01	0.02
AREA-J						<0.01	<0.01	<0.01	0.01	0.02
AREA-K										
NYCA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.01	0.02

5.2.4. External Tie Derate Sensitivity

The NYISO performed a sensitivity analysis to test the system by limiting the amount of external assistance which could be provided from neighboring Areas . This analysis was conducted by running the MARS model for the base case and derating the tieline capabilities. The following Table 4.2.3.1 illustrates the full and derate tie line capacity:

Table 5.5: External Tie Capability vs Derated Values

	Tieline Limit		Derated Tieline Limit	
Tieline	Positive	Negative	Positive	Negative
F-NE	800	800	800	771.4
G-NE	800	600	800	578.6
D-NE	150	0	150	0
K-NE	286	286	286	286
A-PJMW	550	550	550	95.8
C-PJMW	200	800	200	139.4
C-PJMC	300	200	300	34.8
G-PJME	2000	500	2000	500
J-PJME	0	1200	0	1200
D-HQ	1000	1500	1000	300
D-Cedars	1	1	1	1
A-OH	1550	1450	1550	1132.6
D-OH	400	400	400	312.4
Total	8037	8287	8037	5352

Table 5.6: LOLE for the RNA Study Case Transfer Limits With Derated Tieline Capacity

Area/Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
AREA-A										
AREA-B										
AREA-C										
AREA-D										
AREA-E										
AREA-F										
AREA-G										
AREA-H										
AREA-I						<0.01	<0.01	0.01	0.01	0.02
AREA-J						0.01	0.01	0.01	0.01	0.03
AREA-K										
NYCA	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.01	0.01	0.01	0.03

5.2.5. Reliability Needs Summary

Given that the base case analysis produced LOLE results that are below 0.1 days per year and identified no transmission security violations for the ten year Study Period, no additional resources are required to maintain reliability.

5.3. Scenarios

Scenarios are variations on key assumptions in the RNA study 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.

5.3.1. Long Term Econometric Load Forecast - High Load Forecast

The *2008 Load & Capacity Report* contains a high load forecast (95th percentile) that accounts for both extreme weather conditions and strong economic growth. The annual percentage increases of this forecast over the 2008 econometric forecast were applied to the 2009 RNA base case forecast to obtain a high load forecast consistent with the impact of the EEPS on the econometric forecast. Since the load is higher than the base case forecast, the LOLE criterion violation identified in this RNA would occur by 2010, shown in Table 4.3.1.1.

Table 5.7: High Economic Growth Scenario

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Base Case MW	34,059	34,269	34,462	34,586	34,725	34,905	35,029	35,258	35,430	35,658
High Growth Case	36,607	36,843	37,064	37,211	37,378	37,586	37,737	37,998	38,201	38,464
MW Increase	2,548	2,574	2,602	6,252	2,653	2,681	2,708	2,740	2,771	2,806

Table 5.8: RNA Study Case LOLE High Economic Growth Scenario

Area/Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018

AREA-A										
AREA-B	0.01								0.01	0.03
AREA-C										
AREA-D										
AREA-E										0.01
AREA-F	0.01									
AREA-G	0.07							0.01	0.01	0.01
AREA-H										
AREA-I	0.07	0.10	0.12	0.14	0.16	0.22	0.21	0.24	0.28	0.37
AREA-J	0.08	0.12	0.12	0.15	0.17	0.26	0.24	0.27	0.33	0.45
AREA-K	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01
NYCA	0.09	0.13	0.13	0.16	0.18	0.27	0.26	0.29	0.34	0.47

The high load growth scenario increases the 2018 study case LOLE from 0.02 to 0.47. The load in this year's 2010 high load forecast (36,843 MW) is slightly higher than last year's RNA 2015 base case load forecast (36,749 MW).

A transmission security assessment for N-1-1 conditions was performed for Western New York with a higher load level than the study case. Although specifically developed as a high load growth scenario, the higher load level is similar to the higher non-coincident peak conditions forecast for Western New York. This higher load level exacerbated the identified non-BPTF violations in the study case, and caused some BPTFs at the Gardenville 230 kV substation to also be in violation.

5.3.2. Long Term Econometric Load Forecast - Econometric Load Forecast (Gold Book)

The *2008 Load & Capacity Report* contains a base load forecast that which was based upon econometric factors and did not include the EEPS proposal. Since the load is higher than the base case forecast, the LOLE criterion violation identified in this RNA would occur by 2016, shown in Table 5.8.

Table 5.9: High Economic Growth Scenario

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Base Case MW	34,059	34,269	34,462	34,586	34,725	34,905	35,029	35,258	35,430	35,658
Econometric Case	34,247	34,649	35,053	35,452	35,870	36,317	36,708	37,086	37,407	37,784
EEPS Impact	188	379	590	867	1,145	1,412	1,678	1,828	1,977	2,126

Table 5.9.a: RNA Study Case LOLE Economic Growth Scenario

Area/Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
AREA-A										
AREA-B								0.00	0.00	0.01

AREA-C										
AREA-D										
AREA-E										**0.00**
AREA-F										
AREA-G						**0.00**	**0.00**	**0.00**	**0.00**	**0.01**
AREA-H										
AREA-I	**0.00**	**0.00**	**0.01**	**0.01**	**0.02**	**0.60**	**0.07**	**0.12**	**0.17**	**0.27**
AREA-J	**0.00**	**0.00**	**0.01**	**0.01**	**0.03**	**0.69**	**0.08**	**0.12**	**0.19**	**0.31**
AREA-K						**0.00**	**0.00**	**0.00**	**0.01**	**0.01**
NYCA	**0.00**	**0.00**	**0.01**	**0.01**	**0.03**	**0.07**	**0.09**	**0.13**	**0.20**	**0.33**

The load in this year's 2015 econometric load forecast (36,708 MW) is slightly lower than last year's RNA 2015 base case load forecast (36,749 MW). The econometric load growth scenario increases the 2018 study case LOLE from 0.02 to 0.33. This result reveals the importance to long term bulk power system reliability of achieving the load reductions ordered by the PSC in its EEPS order.

5.3.3. Environmental Scenarios

All generators must plan to comply with an increasingly complex and uncertain set of Federal and State environmental regulations. These regulations impact the duration and outcome of permitting processes, the operation of existing plants, and decisions to modify or retire plants. The potential impacts of two of the more significant initiatives in environmental regulation will be analyzed for their respective potential impacts on electric system reliability.

Following the invalidation of the United States Environmental Protection Agency's (USEPA) Clean Air Interstate Rule (CAIR) by the federal courts, great uncertainty surrounds the direction and timing of the combined Federal and State initiatives to control power plant emissions of nitrogen oxides (NOx) for the purpose of achieving compliance with National Ambient Air Quality Standards (NAAQS) for ozone. Not withstanding this uncertainty, it is reasonable to expect some emission limitation requirements will emerge from the regulatory process. Accordingly, the NYISO examined the potential impacts on reliability from possible NOx emission limitations over the Study Period.

New York recently promulgated rules to implement the Regional Greenhouse Gas Initiative (RGGI). The RGGI program places a cap on the total emissions of carbon dioxide (CO2) from affected power plants in the ten member states. Starting in 2015 the cap is reduced. RGGI will effectively make affected fossil fueled units become energy limited units for reliability considerations. The program is seen as prototype for an increasingly-likely Federal program to limit emissions of carbon dioxide (CO2) from power plants. There appears to be a developing consensus about the regulatory approach to CO2 control, and legislation is likely to be enacted by Congress during the next administration.

The purpose of these analyses is to determine to what extent the potential impact on reliability can be quantified. This information is intended to assist in developing compliance strategies that achieve the goals of these environmental initiatives while maintaining reliability.

5.3.4. NOx Reduction Initiatives, CAIR, HEDD, and RACT

The analysis below makes clear that the path to satisfactory air quality will significant NOx emission reductions from sectors other than New York generators and will also need to recognize the limited set of feasible technologies available for some generators.

Ground level ozone is the product of hydrocarbons (HC) and NOx emissions, and sunlight. Fossil-powered generating stations are the largest source of NOx emission in New York. New York State has not achieved compliance with the NAAQS for ozone. The State of New York is required to comply with the National Ambient Air Quality Standards (NAAQS) for criteria pollutants, including ozone, that were established by the U.S. Environmental Protection Agency (EPA) pursuant to the Federal Clean Air Act. On March 12, 2008, the USEPA promulgated a new lower standard for ozone. The new standard is 75 ppb down from the current standard of 84 ppb. There are a number of challenges underway to lower the standard further to 70 ppb.

New York's State Implementation Plan (SIP) to achieve compliance with NAAQS was submitted to USEPA in August 2007 and is currently under review. The SIP has three design elements. First, the SIP depended upon both in state and upwind reductions to be achieved under CAIR program, which called for using two allowances for each ton emitted. Second, the New York SIP also commits to achieve an additional reduction in NOx emissions of 50 tons/day on High Electric Demand Days (HEDD) as part of the Ozone Transport Commission (OTC) process agreed to last year. DEC has informed the NYISO that these NOx emission reductions are goals that the OTC states will try to achieve. DEC has also indicated that these commitments are not legally binding upon any state. In the August 31, 2007 State Implementation Plan (SIP) submittal, DEC's Department of Air Resources (DAR) stated that it would establish appropriate operating parameters and emission controls for HEDD units. No estimates of the level of the resulting NOx emission reductions were cited in the SIP submittal. Third, NYSDEC has recently begun the process of revising Reasonably Available Control Technology Standards for NOx (NOx RACT) regulations to further reduce emissions of NOx from fossil fired boilers.

As indicated above, on July 11, 2008, the United States Circuit Court of Appeals for the District of Columbia vacated the USEPA's Clear Air Interstate Rule (CAIR). CAIR had been promulgated in 2005 as a regulatory mechanism to bring large portions of the Eastern US into compliance with National Ambient Air Quality Standards (NAAQS) for ozone and particulate matter (PM 2.5).

Thus New York finds itself in need of a new plan as the obligation to meet NAAQS is paramount. While New York has stringent emission limitations and the State Implementation Plan (SIP) calls for significant additional in state emission reductions, it can not achieve compliance with NAAQS without upwind states also making significant emission reductions. Thus a regional plan such as CAIR will be a necessary component of New York's new SIP.

It is reasonable to evaluate the potential impact of significant new NOx emission limitations. A review of recent generation and air quality data should aid in the understanding of the nature of possible reduction requirements. According to NYSDEC data, throughout the period of 2005-2007 there have been a total of 49 days when New York's air quality did not meet the existing NAAQS for ozone of 84 ppb. With the new standard of 75 ppb in place, it is reasonable to expect that additional exceedances would have been recorded with the current level of emissions. On these days of high ozone levels, NYCA generation levels varied from a minimum of 387 GWHrs to a maximum of 679 GWHrs. According to USEPA data, NYCA NOx emissions varied from a minimum of 93 tons to a maximum of 439 tons. While the data shows a strong correlation between NYCA generation and NYCA NOx emissions, Fig XX., the correlation between NYCA NOx emissions and ambient ozone concentrations is much weaker, Fig XX. Following this correlation to its limit, we note that operating NYCA in a zero emissions mode (which is not possible) would still find exceedances of the standard. It should be apparent that the problem can only be solved on a regional basis. Thus the first assumption for the analysis is that some form of regulation effectively similar to CAIR will be in place by 2012.

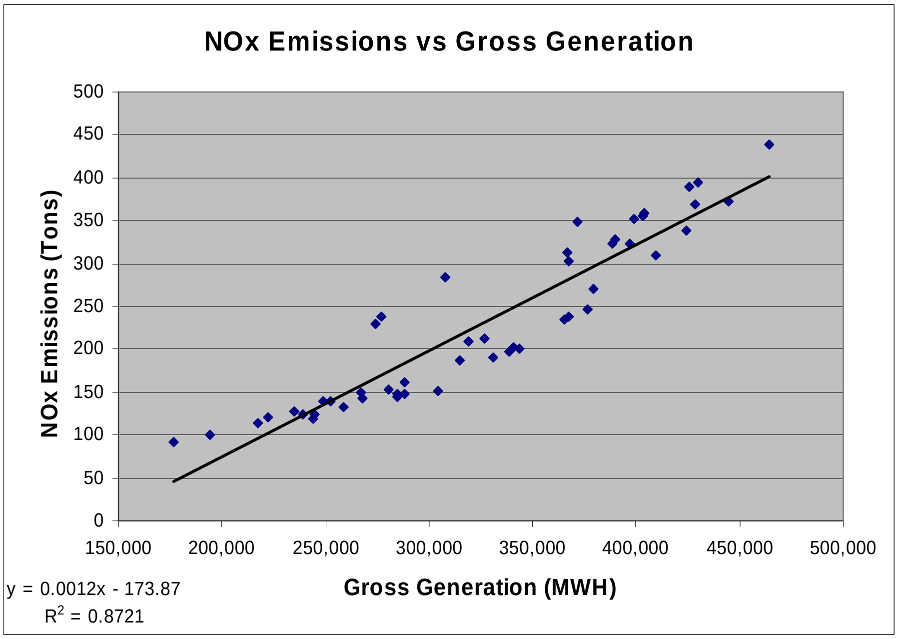
Examining the same dataset to determine the potential impact of the OTC HEDD program by first focusing on the High Emitting Combustion Turbines (HECT) which have provided 2,816 MW of capacity, the NYISO finds that production on high ozone days varies from a minimum of 0.2 GWHrs to a maximum of 35 GWHrs. Reported emissions varied from zero to a maximum of 136 tons of NOx.

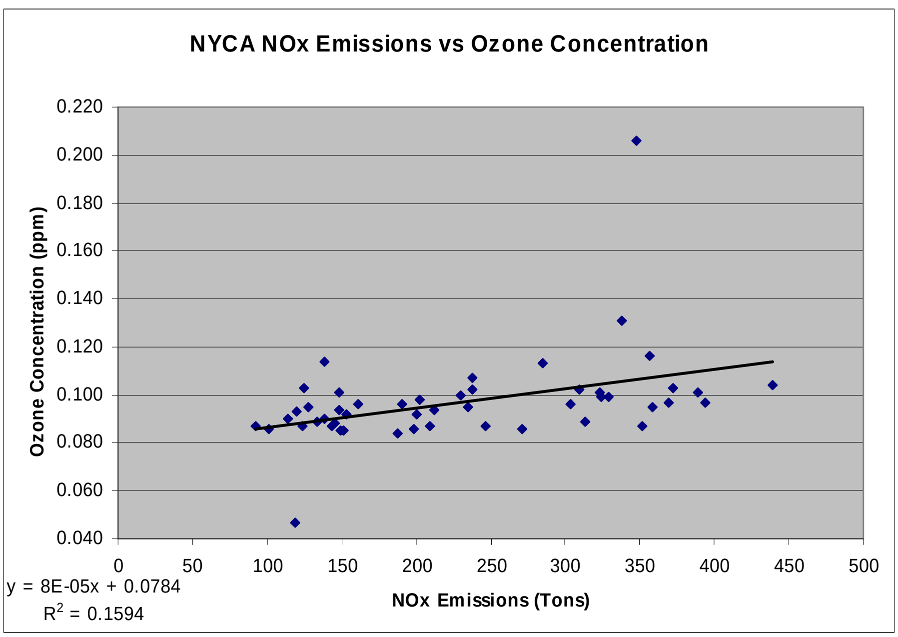
The Environmental Energy Alliance (EEA), in speaking for many of the owners of the identified HEDD units, has advised the NYISO that the proposed technology retrofits are not economically feasible. Therefore, the preliminary analysis of the effects of HEDD on reliability was approximated by making a *pro rata* reduction of DMNC for the Summer Capability Period for units identified by the OTC and DEC as HEDD units based on the targeted reduction for each unit call upon on that day. As a first approximation for the analysis, the following assumptions were made:

The HEDD units will operate for the same number of hours as they did on each of the high ozone days

The HEDD units will operate at a capacity equivalent to its DMNC *(1-(OTC RACT %).

NOx Emission Rates will be equal to the reported emission rate. The equivalent capacity reduction required varied from a minimum of zero to a maximum of 1,231 MW, with 610 MW of the derating occurring in load pockets. NOx emission reductions varied from zero to 28 tons. Resource adequacy criteria were exceeded across the planning period. Because technology retrofits are not economically feasible, programs designed to reduce NOx emissions from the HECT units will require at a minimum, equivalent capacity replacement.


NOx Emissions vs Gross Generation
NOx Emissions (Tons)
Gross Generation (MWH)
500
450
400
350
300
250
200
150
100
50
0
150,000
200,000
250,000
300,000
350,000
400,000
450,000
500,000
y = 0.0012x - 173.87
R2 = 0.8721


NYCA NOx Emissions vs Ozone Concentration
Ozone Concentration (ppm)
NOx Emissions (Tons)
0.220
0.200
0.180
0.160
0.140
0.120
0.100
0.080
0.060
0.040
0
50
100
150
200
250
300
350
400
450
500
y = 8E-05x + 0.0784
R2 = 0.1594

A similar analysis is focused on the Load Following Boilers (LFB) identified in the OTC HEDD program which have provided 4,051 MW of capacity. The equivalent capacity reduction required varied from a minimum of 1,704 MW to a maximum of 1,739 MW with 165 MW of the derating occurring in load pockets. NOx emission reductions varied from 10 tons to 75 tons. Resource adequacy criteria were exceeded across the planning period.

NYSDEC has started the review process for updating Reasonably Available Control Technology Standards for all fossil generating units with the exception of the most recent additions. This proposal could affect approximately 25,000 MW of capacity in New York. For this scenario, it is assumed that 75% of the capacity can be retrofitted to achieve the required emission reductions, and the remaining 25% of the effected capacity can only achieve 50% of the required reduction, resulting in an effective capacity derating of 3,125 MW. For purposes of this analysis, the derating was assumed to be distributed evenly across all capacity. Resource adequacy criteria were exceeded across the planning period.

5.3.5. CO2 or Regional Greenhouse Gas Initiative ("RGGI")

As the analysis below demonstrates, if the new RGGI Allowance market operates under unremarkable circumstances, reliability will not be negatively impacted in the near term. If on the other hand, market disruptions occur or the RGGI market is allowed to converge with the world CO2 allowance markets undesirable outcomes will quickly occur. Convergence with world markets would lead to Allowance prices in the range of $35 to $50/ton and the likely exit from the marketplace of the coal capacity placing undue strain on other resources

The recently promulgated Regional Greenhouse Gas Initiative (RGGI) implements a regional program through which 10 states have agreed to cap CO_2 emissions from power plants larger than 25 MW of capacity beginning in 2009. RGGI will require most affected generators to purchase allowances. RGGI, Inc. will distribute these allowances initially through an auction process that is open to affected generators and others that wish to participate in the allowance market. Once purchased at auction, allowances will be tradable. Under RGGI, generators will need one allowance to emit one ton of CO_2. During the 2015-2018 period, the carbon emissions cap for each state will be reduced by 2.5 percent annually. RGGI, Inc.'s published reports of CO_2 emissions from affected generators for 2005 show that New York's carbon emissions were near the cap level of 64 million tons. RGGI, Inc. reports for the year 2006 show that emissions from New York generators are below the state's cap, at approximately 53.6 million tons/year[3]. In 2007, 53 percent of the energy generated in the NYCA was

[3] Emissions levels are affected by: (i) the cost differential between oil and gas with the cost of gas below the cost of oil in 2006; and (ii) moderate weather conditions.

produced using fossil fuels, which represents and increase from 2006. Thus when emissions are finally reported, it is expected that CO_2 emissions will have increased in 2007. More than 99% of the fossil-fuel generated energy, came from units for which carbon emissions will be controlled under RGGI in 2009.

RGGI, Inc. conducted the first carbon allowance auction on September 25. A total of 12,565,387 CO_2 Allowances were sold in portfolios from the States of Connecticut, Massachusetts, Maryland, Maine, Rhode Island, and Vermont. This auction represents 6.7% of 2009 allowances as shown in Fig. XX . The reported clearing price for the auction was $3.07/ allowance. Potomac Economics has been retained by RGGI, Inc. as a market monitor for the auction. Potomac's review of the auction concluded in part that "The auction was administered in a fair and transparent manner…". No allowances with later vintages were offered in the first auction.

Septermber 25, 2008 Auction			
State	Allowances Offered (000,000) Tons	% of 2009 Allowances	% of 2009 Allowances In This Auction
CT	1.37	12.80%	10.9%
DE	0.00	0.00%	0.0%
MA	4.35	16.29%	34.6%
MD	5.33	14.21%	42.4%
ME	0.87	14.75%	6.9%
NH	0.00	0.00%	0.0%
NJ	0.00	0.00%	0.0%
NY	0.00	0.00%	0.0%
RI	0.44	16.30%	3.5%
VT	0.20	16.67%	1.6%
Total	12.56	6.68%	100.0%

RGGI, Inc. has announced the second auction, scheduled for December 17, 2008, where it is planned that all ten States will participate by offering portfolios 31,505,898 allowances. This amount represents 16.7% of the total 2009 Allowances, as shown in Fig. XX

December 17, 2008 Auction Plan			
State	Allowances Offered (000,000) Tons	% of 2009 Allowances	% of 2009 Allowances In This Auction
CT	1.37	12.8%	4.3%
DE	0.76	10.0%	2.4%
MA	4.39	16.4%	13.9%
MD	5.33	14.2%	16.9%
ME	0.87	14.7%	2.8%
NH	1.19	13.8%	3.8%
NJ	4.53	19.8%	14.4%
NY	12.42	19.3%	39.4%
RI	0.44	16.3%	1.4%
VT	0.20	16.7%	0.6%
Total	31.50	16.7%	100.0%

Previous RNAs examined the impact on resource adequacy of the hypothetical retirement of varying amounts of coal fired capacity in New York State. It was determined that the LOLE criterion was violated when approximately one half of the coal fired capacity was removed from service. All RGGI-affected generators in New York will require allowances to comply with this program. Several situations can be postulated that can result in an insufficient supply of allowances after accounting for fuel switching, offsets, and efficiency improvements. For example, a loss of a major nuclear unit would translate into a need for an additional 11.4 million tons per year of CO_2 allowances[4]. It is also possible that non-RGGI-affected entities could remove significant quantities of allowances from the New York markets for other purposes.

There is a finite number of allowances below which generators in New York affected by RGGI will become energy-limited resources. That is, without sufficient allowances, generators cannot operate to meet bulk power system electricity needs and also comply with the RGGI program. Said another way, RGGI sets a carbon emissions cap that the system must remain below, and reliability considerations determine a emission allowance floor that the system must remain above. For these reasons, the minimum acceptable number of allowances required for New York generators in the marketplace should be known, and the consequences of not having sufficient allowances should be well understood. The minimum level of allowances needed in the New York State will vary from year to year, depending upon a number of factors including, but not limited to, relative and absolute energy prices, weather conditions and the availability of hydroelectric and nuclear generation.

[4] This is equivalent to the tons of CO2 emitted by generators sufficient to replace the annual production of a nuclear power plant – 9,000,000 MWh.

RGGI Low Emission Case Results

RGGI High Emission Case Results

5.3.6. “15x15” Energy Efficiency Scenario

The New York State Governor announced a new Clean Energy Strategy in April 2007 to reduce energy consumption in New York by 15 percent from forecasted levels in 2015. Known as the “15x15” program, this initiative is designed to increase energy efficiency and energy supply, and reduce energy demand. To implement these programs, the Public Service Commission (PSC) has opened an Energy Efficiency Portfolio Standard (EPS) proceeding (Case 07-M-0548).

As described above in Section 3.1, the 2009 RNA Base Case forecast includes a portion of the EEPS goal of a 15% reduction in energy usage from forecast levels in 2015. Two additional scenarios related to the EEPS were also prepared. The first scenario includes a higher level of expenditures on energy conservation. The second scenario achieves the full 15% reduction regardless of cost. Since the Base Case forecast showed no reliability needs, the inclusion of even higher levels of conservation likewise result in no reliability needs through the planning horizon of 2018.

The 2009 RNA Base Case schedule for conservation activity associated with the EEPS is based on the spending levels authorized by the June 2008 order (approximately $160 million dollars per year) beginning in October 2008 and extending through 2011. For the Base case, we assumed that this level of annual spending would extend through 2015. For Scenario 1, we made two additional changes to the schedule of expenditures. First, we added an additional $160 million per year from 2012 through 2015. We also included an additional level of spending of up to $85 million dollars per year, which was discussed in the EEPS Order but not authorized. The $85 million per year was ramped up in 25% steps from 2009 through 2011, then remained at $85 per year from 2012 through 2015. The annual conservation impacts in Scenario 2 were developed at a rate designed to reach 15% energy reduction by 2015, regardless of cost. Annual energy savings were obtained from the schedule of expenditures by applying an assumed cost of $305 per MWh, as referenced in the EEPS order.

Table 5.10: “15x15” Energy Efficiency Scenario 1

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Base Case MW	34,059	34,269	34,462	34,586	34,725	34,905	35,029	35,258	35,430	35,658
Scenario 1 MW	34,029	34,199	34,324	34,298	34,288	34,320	34,298	34,526	34,698	34,926
MW Decrease	-30	-70	-138	-288	-437	-585	-731	-732	-732	-732

Table 5.11: LOLE Results for “15x15” Energy Efficiency Scenario 1

Area/Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
AREA-A										
AREA-B										
AREA-C										
AREA-D										
AREA-E										
AREA-F										
AREA-G										
AREA-H										
AREA-I			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
AREA-J			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
AREA-K										
NYCA			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Table 5.12: “15x15” Energy Efficiency Scenario 2

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Base Case MW	**34,059**	**34,269**	**34,462**	**34,586**	**34,725**	**34,905**	**35,029**	**35,258**	**35,430**	**35,658**
Scenario 2 MW	33,704	33,489	33,234	32,722	32,197	31,739	31,227	31,530	31,833	32,209
MW Decrease	**-355**	**-780**	**-1,228**	**-1,864**	**-2,528**	**-3,166**	**-3,802**	**-3,728**	**-3,597**	**-3,449**

Table 5.13: LOLE Results for “15x15” Energy Efficiency Scenario 2

Area/Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
AREA-A										
AREA-B										
AREA-C										
AREA-D										
AREA-E										
AREA-F										
AREA-G										
AREA-H										
AREA-I			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
AREA-J			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
AREA-K										
NYCA			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

5.3.7. External Capacity Scenario

The New York installed capacity (ICAP) market historically has had up to 2,755 MWs of external import rights made available for external ICAP suppliers to participate in the New York capacity market[5]. Any capacity available from the external systems is modeled as emergency assistance. However, the RNA modeling reduced external interface capability by 2,755 MWs in total. The purpose of this scenario was to assess the impact on resource adequacy of an additional amount of 800 MWs of firm external capacity over the 10-year Study Period. The capacity was made available in upstate New York in Zone D to reflect the most likely delivery points for this capacity upstream of UPNY/SENY and Central East. The LOLE results for this scenario are presented in Table 5.14.

Table 5.14: NYCA External HQ to Area_D Capacity Scenario

Area/Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
AREA-A										
AREA-B										
AREA-C										
AREA-D										
AREA-E										
AREA-F										
AREA-G										
AREA-H										
AREA-I										
AREA-J										
AREA-K										
NYCA		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

This scenario shows that if 800 MWs of additional capacity outside the NYCA were to participate in the New York ICAP market for the Study Period, the LOLE levels would improve.

An additional external capacity scenario was performed to assess the impact on resource adequacy of a reduction of 800 MWs of capacity over the 10-year Study Period. One half of the reduction in capacity (400 MW) was made from Zone F and the other half (400 MW) was made Zone G. The 800 MW of capacity was delivered to New England. The LOLE results for this scenario are presented in Table 5.15.

Table 5.15: NYCA Area_F and G External Sale To New England Scenario

Area/Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
AREA-A										
AREA-B										
AREA-C										
AREA-D										
AREA-E										
AREA-F										
AREA-G										
AREA-H										
AREA-I								.01	.01	.02
AREA-J						.01	.01	.01	.01	.02
AREA-K										

5 Because such capacity is not under long term contract to New York, it is not included in the study case for the Study Period.

NYCA		**<0.01**	**<0.01**	**<0.01**	**<0.01**	**0.01**	**<0.01**	**0.01**	**0.01**	**0.02**

This scenario shows that a reduction of 800 MWs of capacity in upstate NY would not impact resource adequacy needs significantly.

5.3.8. Nuclear Retirement Scenario

Table 5.16 below illustrates the impact on resource adequacy of the retirement of the Indian Point Unit 2 and Unit 3 nuclear power plants:

Table 5.16: Indian Point 2 and 3 Nuclear Retirement Scenario

Area/Year	2010	2011	2012	2013	2014	2015	2016	2017	2018
AREA-A									
AREA-B							0.00	0.00	0.01
AREA-C									
AREA-D									
AREA-E									0.00
AREA-F									
AREA-G	0.01	0.02	0.01	0.02	0.03	0.03	0.05	0.06	0.10
AREA-H	0.50	0.64	0.82	1.03	1.52	1.46	1.80	2.26	3.22
AREA-I	0.69	0.92	1.12	1.37	1.52	1.89	2.26	2.85	3.90
AREA-J	0.58	0.72	0.89	1.11	1.94	1.55	1.88	2.41	3.38
AREA-K	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
NYCA	0.74	0.99	1.20	1.48	2.08	2.02	2.41	3.02	4.11

5.3.9. Revised Transmission Topology

This scenario illustrates the impact on resource adequacy of revising the transmission topology to change the representation of the transmission path between Area G, PJM East, and Area J. The existing transmission topology is illustrated in Figure 1 in Section III page 8. The existing transmission path between Area G and PJM East includes the Branchburg-Ramapo 500 kV and South Mahwah to Waldwick 345 kV transmission lines. The transmission path between PJM East to Area J includes the Hudson to Farragut 345 kV and Linden to Goethals 230 kV transmission lines. The revised transmission topology would separate the Area G to PJM East path into to paths, one representing the Branchburg-Ramapo transmission line controlled by the Ramapo Phase Shifter and the other the South Mahwah to Waldwick 345 kV lines controlled by the Waldwick phase shifters. The PJM East to Area J transmission path would be separated into two paths, one representing the flows scheduled on the Hudson-Farragut and Linden-Goethals phase shifters and the other path representing the flows scheduled on the Linden VFT. The objective of the revised transmission topology is to ensure that the power flows that occur south on the Waldwick phase shifters equal the power flows that occur east on the Farragut and Goethals phase shifters. Table 5.18 below illustrates LOLE results of the base case load forecast with the revised transmission topology:

Table 5.18: Revised Transmission Topology

Area/Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
AREA-A										
AREA-B										
AREA-C										
AREA-D										
AREA-E										
AREA-F										
AREA-G										
AREA-H										
AREA-I						0.01	0.01	0.02	0.03	0.06
AREA-J						0.02	0.02	0.02	0.04	0.07
AREA-K										
NYCA	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.02	0.03	0.04	0.07

For the year 2018 the revised transmission topology increased the NYCA LOLE from 0.02 to 0.07.

5.3.10. Zones At Risk Scenario

Given that the LOLE of the base case conditions did not exceed 0.10 for the 10 year study period, additional analysis was performed to determine the reduction in capacity which would cause the LOLE to exceed 0.10. The NYISO did not reduce capacity from particular units or model the effect on load pockets within zones of removing specific amounts of capacity from load pockets. The analysis was performed for the 2018 year in Areas B, G, J, and K. For each of these Areas, the capacity in the Area was derated by increments of 250 MW until the NYCA LOLE exceeded 0.10. The following Table 5.19 summarizes the results:

Table 5.19 Zones at Risk Results

	Capacity Derated	NYCA LOLE
Area_B	500	0.13
Area G	750	0.10
Area J	500 750	0.08 0.15
Area_H	750	0.10

The results demonstrate that removing between 500 MW and 750 MW from Zone J in 2018 would cause a violation of the resource adequacy criterion.

5.3.11. High Wind Penetration Scenario

A high wind penetration scenario was developed by reviewing the proposed wind resources identified in the NYISO Generation Interconnection queue. Table 5.20 illustrates the assumptions used to develop the additional wind generation capacity assuming a 50% penetration level.

Table 5.20: Wind Penetration Scenario Assumptions

	Proposed Capacity (MW)	Base Case Capacity (MW)	Additional Capacity (MW)
Area A	2481	121	1120
Area C	1462	212	519
Area D	916	499	0
Area E	2217	366	743
Area F	80	80	0
Total	7156	1278	2382

The following Table 5.21 summarizes the LOLE results for the high wind penetration Scenario:

Table 5.21: LOLE with High Wind Penetration

Area/Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
AREA-A										
AREA-B										
AREA-C										
AREA-D										
AREA-E										
AREA-F										
AREA-G										
AREA-H										
AREA-I								.01	.01	.02
AREA-J							.01	.01	.01	.02
AREA-K										
NYCA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	.01	.01	.01	.02

5.3.12. SCR Penetration Scenarios

A low SCR penetration scenario was developed by reducing the base case SCR resources by 50%. Table 5.22 illustrates the LOLE results with the reduced SCR resources.

Table 5.22: LOLE with SCR Resourced Reduced by 50%

Area/Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
AREA-A										
AREA-B										.01
AREA-C										
AREA-D										
AREA-E										
AREA-F										
AREA-G										

AREA-H										
AREA-I		**.01**	**.02**	**.02**	**.03**	**0.04**	**0.04**	**0.07**	**0.10**	**0.16**
AREA-J		**.01**	**.02**	**.02**	**.03**	**0.04**	**0.05**	**0.08**	**0.12**	**0.18**
AREA-K										
NYCA	**<0.01**	**0.01**	**0.02**	**0.02**	**0.03**	**0.04**	**0.05**	**0.08**	**0.12**	**0.19**

A high SCR penetration scenario was developed by reducing the base case SCR resources by increasing the SCRs annually by 5%. Table 5.23 illustrates the LOLE results with the high penetration of SCR resources.

Table 5.23: LOLE with SCR Resourced Increased Annually by 5%

Area/Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
AREA-A										
AREA-B										
AREA-C										
AREA-D										
AREA-E										
AREA-F										
AREA-G										
AREA-H										
AREA-I								**.01**	**.01**	**.02**
AREA-J							**.01**	**.01**	**.01**	**.02**
AREA-K										
NYCA	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**.01**	**.01**	**.01**	**.02**

5.3.13. External LOLE Modeling Scenario

The RNA base case results assumed the load and capacity for external control areas represented in the MARS model was fixed to the IRM values for the first five years. For the second five years, the external control area peak load was adjusted so that the LOLE external control areas would be approximately 0.10 for the base case assumptions. Table 4.3.10.1 illustrates the LOLE results with the external control area loads adjusted to a LOLE value of approximately 0.10. Table 5.24 illustrates the LOLE results for the external control area loads and capacity fixed to the IRM 2009 values.

Table 5.24: External Areas Adjusted to Achieve 0.10 LOLE

Area/Year	2014	2015	2016	2017	2018
NYCA	0.01	0.01	0.01	0.01	0.02
PJM	0.11	0.11	0.10	0.10	0.11
ISONE	0.10	0.15	0.09	0.07	0.08
IESO	0.12	0.13	0.12	0.12	0.13
HQ	0.11	0.12	0.09	0.10	0.09

Table 4.3.10.2: External Areas Fixed to IRM 2009 Load and Capacity Values

Area/Year	2014	2015	2016	2017	2018
NYCA	0.01	0.01	0.01	0.01	0.03
PJM	0.26	0.26	0.22	0.23	0.25
ISONE	0.07	0.06	0.08	0.06	0.07
IESO	0.03	0.01	0.01	0.01	0.02
HQ	0.09	0.10	0.06	0.06	0.06

6. Observations and Recommendations

6.1. Study Case

This 2009 RNA builds upon the NYISO's first three CRPs, which included major resource and transmission system additions meeting study case inclusion rules in Zones C through K. These additions have been incorporated into the 10-year RNA study case. The additions from the 2005 CRP include new transmission lines such as M29, reactive resources, capacity additions totaling 455 MWs, HVDC ties totaling 990 MWs from PJM and ISO-NE, and DSM programs. The additions from the 2008 CRP include the addition of capacitor banks at the Millwood Substation.

The 2009 RNA also reflects the results of expected energy efficiency program additions pursuant to the PSC's EEPS order and program spending of at least $330 million per year along with other state programs to which the PSC committed in the order. The expected reduction of approximately five percent of load from forecasted levels by 2015 based upon current spending levels obviated any finding of a resource adequacy need in New York during the Study Period. That is, the expected reductions in load, and the equivalent capacity resources that these load reductions represent, mean that New York will have adequate resources to need bulk power system reliability needs from 2009 to 2018, so long as these programs are successfully implemented at the levels assumed in this study.

In sum, this Reliability Needs Assessment for the New York State Bulk Power System indicates that the forecasted system does not violate the 0.1 days per year reliability criterion in years 2009 through 2018.

6.2. Scenarios

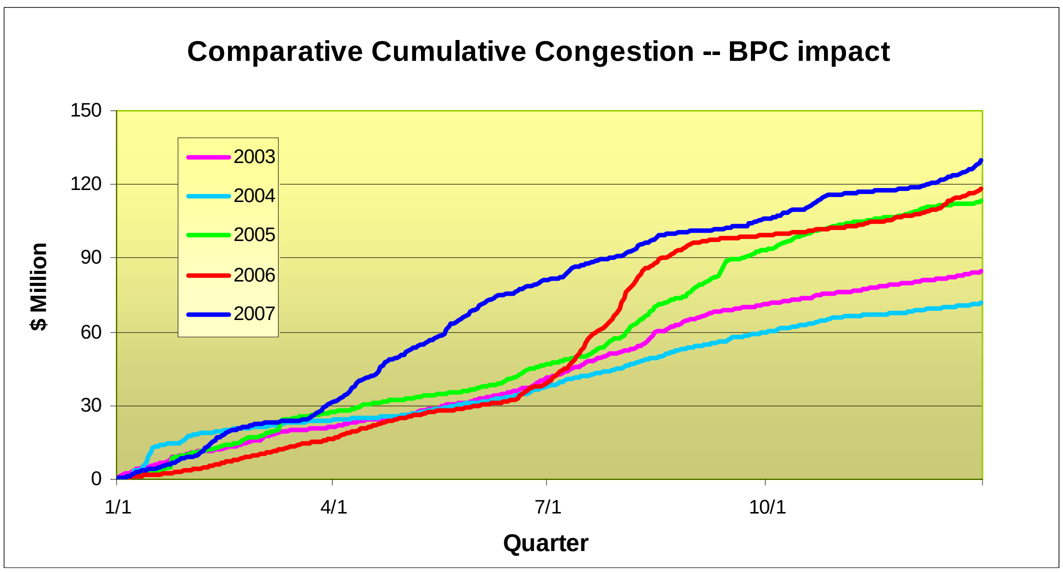
The NYISO conducted a number of scenarios analyses to test the robustness of the bulk power system under future regulatory programs and possible shifts in resource and load levels.

NOTE: Section to be developed. It will include summary of MARS constraining interfaces for the base case and scenarios to show what interfaces are limiting.

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
The graph below presents the latest available summary of cumulative historical Day Ahead Market (DAM) congestion dollars as determined by the bid-production-cost-savings methodology for the years 2003, 2004, 2005, 2006, and 2007. This information is available on the NYISO web site. The results for 2007 are above 2006. The detailed congestion information can be found on the NYISO Web site under Services Planning.

Figure VI-1: Cumulative Historic Congestion by Year 2003 to 2007



The table below presents the breakdown of unhedged congestion for the top five monitored elements as percentages of the total amount of congestion. The top five accounted for almost 90 percent of the total congestion.

Table VI-1: Breakdown of 2007 Total Unhedged Congestion – Top Five Facilities

Monitored Facility	% of Annual Total
CENTRAL EAST - VC	39.0
PLSNTVLY 345 LEEDS 345 1	30.4
DUNWOODIE 345 SHORE_RD 345 1	17.7
RAINEY 345 DUNWOODIE 345 1	1.4
MOTTHAVEN 345 RAINEY 345 2	1.3
Other Facilities	10.2
Total	100.0

8. Appendix A - Reliability Needs Assessment Glossary

Term	Definition
Adequate:	A system is considered adequate if the probability of having sufficient transmission and generation resources to meet expected demand is greater than the minimum standard to avoid a blackout. A system has adequate resources under the standard if the probability of an involuntary loss of service is no greater than one occurrence in 10 years. This is known as the loss of load expectation (LOLE), which forms the basis of New York's installed capacity (ICAP) requirement.
Aggregator:	An entity that buys or brokers electricity in bulk for a group of retail customers to increase their buying power.
Annual Transmission Reliability Assessment (ATRA):	The Annual Transmission Reliability Assessment. An assessment, conducted by the NYISO staff in cooperation with Market Participants, to determine the System Upgrade Facilities required for each generation and merchant transmission project included in the Assessment to interconnect to the New York State Transmission System in compliance with Applicable Reliability Requirements and the NYISO Minimum Interconnection Standard.
Article X:	New York's siting process (Article X of the state Public Service Law) for new large power plants which expired Dec. 31, 2002. Article X provided a streamlined process to review, approve and locate new generation facilities in the state.
Bulk Power Transmission Facilities (BPTFs):	Transmission facilities that are system elements of the bulk power system which is the interconnected electrical system within northeastern North America comprised of system elements on which faults or disturbances can have a significant adverse impact outside of the local area.
Capability Period:	The Summer Capability Period lasts six months, from May 1 through October 31. The Winter Capability Period runs from November 1 through April 30 of the following year.

Term	Definition
Comprehensive Reliability Plan (CRP):	An annual study undertaken by the NYISO that evaluates projects offered to meet New York's future electric power needs, as identified in the Reliability Needs Assessment (RNA). The CRP may trigger electric utilities to pursue regulated solutions to meet reliability needs if market-based solutions will not be available by that point. It is the second step in the Comprehensive Reliability Planning Process (CRPP).
Comprehensive Reliability Planning Process (CRPP):	The annual process that evaluates resource adequacy and transmission system security of the state's bulk electricity grid over a 10-year period and evaluates solutions to meet those needs. The CRPP consists of two studies: the RNA, which identifies potential problems, and the CRP, which evaluates specific solutions to those problems.
Congestion:	Transmission paths that are constrained, which may limit power transactions because of insufficient capability.
Contingencies:	Contingencies are electrical system events (including disturbances and equipment failures) that are likely to happen.
Day-Ahead Demand Response Program (DADRP):	A NYISO Demand Response program to allow energy users to bid their load reductions, or "negawatts", into the Day-Ahead energy market.
Day-Ahead Market (DAM):	A NYISO-administered wholesale electricity market in which capacity, electricity, and/or Ancillary Services are auctioned and scheduled one day prior to use. The DAM sets prices as of 11 a.m. the day before the day these products are bought and sold, based on generation and energy transaction bids offered in advance to the NYISO. More than 90 percent of energy transactions occur in the DAM.
Demand Response Programs:	A series of programs designed by the NYISO to maintain the reliability of the bulk electrical grid by calling on electricity users to reduce consumption, usually in capacity shortage situations. The NYISO has three Demand Response programs: Day Ahead Demand Response Program (DADRP), Emergency Demand Response Program (EDRP), and Special Case Resources (SCR).

Term	Definition
Distributed Generation:	A small generator, typically 10 megawatts or smaller, attached to the distribution grid. Distributed generation can serve as a primary or backup energy source, and can use various technologies, including wind generators, combustion turbines, reciprocating engines, and fuel cells.
Electric Reliability Organization (ERO):	Under the Energy Policy Act of 2005, the Federal Energy Regulatory Commission (FERC) is required to identify an ERO to establish, implement and enforce mandatory electric reliability standards that apply to bulk electricity grid operators, generators and TOs in North America. In July 2006, the FERC certified the North American Electric Reliability Corporation (NERC) as America's ERO.
Electric System Planning Work Group (ESPWG):	A NYISO governance working group for Market Participants designated to fulfill the planning functions assigned to it. The ESPWG is a working group that provides a forum for stakeholders and Market Participants to provide input into the NYISO's Comprehensive Reliability Planning Process (CRPP), the NYISO's response to FERC reliability-related Orders and other directives, other system planning activities, policies regarding cost allocation and recovery for reliability projects, and related matters.
Emergency Demand Response Program (EDRP):	A NYISO Demand Response program designed to reduce power usage through the voluntary electricity consumption reduction by businesses and large power users. The companies are paid by the NYISO for reducing energy consumption upon NYISO request.
Energy Policy Act of 2005 (EPAct):	An extensive energy statute approved by President George W. Bush in August 2005 that requires the adoption of mandatory electric reliability standards. The EPAct also made major changes to federal energy law concerning wholesale electricity markets, fuels, renewable resources, electricity reliability and the energy infrastructure needs of the nation.
Federal Energy Regulatory Commission (FERC):	The federal energy regulatory agency within the U.S. Department of Energy that approves the NYISO's tariffs and regulates its operation of the bulk electricity grid, wholesale power markets, and planning and interconnection processes.

Term	Definition
Five Year Base Case:	The model representing the New York State power system over the first five years of the Study Period.
Forced Outage:	An unanticipated loss of capacity, due to the breakdown of a power plant or transmission line. It can also mean the intentional shutdown of a generating unit or transmission line for emergency reasons.
Fuel Capacity:	The amount, or percentage, of fuel available for use to produce electricity.
Gap Solution:	A solution to a Reliability Need that is designed to be temporary and to strive to be compatible with permanent market-based proposals. A permanent regulated solution, if appropriate, may proceed in parallel with a Gap Solution.
High Electric Demand Days (HEDD):	Days of high electricity demand, which can dramatically increase ozone-forming air pollution from electric generation, often resulting in nitrogen oxide (NOx) emissions that can be greater than two times their average levels. Days of high electrical use often coincide with days with high ozone levels.
Installed Capacity (ICAP):	A generator or load facility that complies with the requirements in the Reliability Rules and is capable of supplying and/or reducing the demand for energy in the NYCA for the purpose of ensuring that sufficient energy and capacity are available to meet the Reliability Rules.
Installed Reserve Margin (IRM):	The amount of installed electric generation capacity above 100 percent of the forecasted peak electric consumption that is required to meet New York State Reliability Council (NYSRC) resource adequacy criteria. Most planners consider a 15-20 percent reserve margin essential for good reliability.
Interconnection Queue:	A queue of merchant transmission and generation projects (greater than 20 MWs) that have submitted an Interconnection Request to the NYISO to be interconnected to the state's bulk electricity grid. All projects must undergo three studies – a Feasibility Study (unless parties agree to forgo it), a System Reliability Impact Study (SRIS) and a Facilities Study – before interconnecting to the grid.

Term	Definition
Load:	A consumer of energy (an end-use device or customer) or the amount of energy (MWh) or demand (MW) consumed.
Load Pocket:	Areas that have a limited ability to import generation resources from outside their areas in order to meet reliability requirements.
Locational Installed Capacity Requirement:	A NYISO determination of that portion of the statewide ICAP requirement that must be located electrically within a locality to provide that sufficient capacity is available there to meet the reliability standards.
Loss of load expectation (LOLE):	LOLE establishes the amount of generation and demand-side resources needed - subject to the level of the availability of those resources, load uncertainty, available transmission system transfer capability and emergency operating procedures - to minimize the probability of an involuntary loss of firm electric load on the bulk electricity grid. The state's bulk electricity grid is designed to meet an LOLE that is not greater than one occurrence of an involuntary load disconnection in 10 years, expressed mathematically as 0.1 days per year.
Lower Hudson Valley:	The southeastern section of New York, comprising New York Control Area Load Zones G, H and I. Greene, Ulster, Orange Dutchess, Putnam, Rockland and Westchester counties are located in those Load Zones.
Management Committee (MC):	A standing committee of the NYISO of that name created pursuant to the ISO Agreement. The MC is a group of Market Participants that, among other things, supervises and reviews the work of all other NYISO committees, develops positions on NYISO operations, policies, rules and procedures; provides recommendations to the NYISO Board of Directors; proposes changes to and makes recommendations to the NYISO Board on the NYISO's tariffs; and prepares the NYISO capital and operating budgets for review and approval by the NYISO Board.
Market-Based Solutions:	Investor-proposed projects that are driven by market needs to meet future reliability requirements of the bulk electricity grid as outlined in the RNA. Those solutions can include generation, transmission and Demand Response Programs.

Term	Definition
Market Participant:	An entity, excluding the NYISO, that produces, transmits sells, and/or purchases for resale capacity, energy and ancillary services in the wholesale market. Market Participants include: customers under the NYISO's tariffs, power exchanges, TOs, primary holders, load serving entities, generating companies and other suppliers, and entities buying or selling transmission congestion contracts.
Megavar (MVAR):	See Reactive Resources.
Megawatt (MW):	A measure of electricity that is the equivalent of 1 million watts.
New York Control Area (NYCA):	The area under the electrical control of the NYISO. It includes the entire state of New York, and is divided into 11 zones.
New York Independent System Operator (NYISO):	Formed in 1997 and commencing operations in 1999, the NYISO is a not-for-profit organization that manages New York's bulk electricity grid – a 10,775-mile network of high voltage lines that carry electricity throughout the state. The NYISO also oversees the state's wholesale electricity markets. The organization is governed by an independent Board of Directors and a governance structure made up of committees with Market Participants and stakeholders as members.
New York Power Pool (NYPP):	The predecessor to the NYISO. The New York Power Pool, at the time NYISO began operations, consisted of the State's six investor-owned utilities plus New York's Power Authority. The NYPP was established July 21, 1966, in response to the Northeast Blackout of 1965.
New York State Public Service Commission (PSC):	The New York State Public Service Commission, as defined in the New York Public Service Law.
New York State Bulk Power Transmission Facilities (BPTF):	The facilities identified as the New York State Bulk Power Transmission Facilities in the annual Area Transmission Review submitted to NPCC by the NYISO pursuant to NYSRC requirements.
New York State Department of	The New York State Department of Public Service, as defined in the New York Public Service Law,

Term	Definition
Public Service (DPS):	which serves as the staff for the New York State Public Service Commission.
Operating Committee (OC):	A standing committee of the NYISO of that name created pursuant to the ISO Agreement. The OC is a group of Market Participants that, among other things, establishes procedures related to the coordination and operation of the NYS bulk power system, Power System; oversees operating and performance studies, and determines minimum system operating reserves and locational ICAP requirements.
Order 890:	Adopted by FERC in February 2007, Order 890 is a change to FERC's 1996 open access regulations (established in Orders 888 and 889). Order 890 is intended to provide for more effective competition, transparency and planning in wholesale electricity markets and transmission grid operations, as well as to strengthen the Open Access Transmission Tariff (OATT) with regard to non-discriminatory transmission service. Order 890 requires Transmission Providers – including the NYISO – have a formal planning process that provides for a coordinated transmission planning process, including reliability and economic planning studies.
Other Developers:	Parties or entities sponsoring or proposing to sponsor regulated solutions to reliability needs who are not Transmission Owners.
Outage:	Removal of generating capacity or transmission line from service, either forced or scheduled.
Peak Demand:	The maximum instantaneous power demand averaged over any designated interval of time, which is measured in megawatt hours (MWh). Peak demand, also known as peak load, is usually measured hourly.
Reactive Resources:	Facilities such as generators, high voltage transmission lines, synchronous condensers, capacitor banks, and static VAr compensators that provide reactive power. Reactive power is the portion of electric power that establishes and sustains the electric and magnetic fields of alternating-current equipment. Reactive power is usually expressed as kilovolt-amperes reactive (kVAr) or megavolt-ampere reactive (MVAr).

Term	Definition
Regulated Backstop Solutions:	Proposals required of certain TOs to meet reliability needs as outlined in the RNA. Those solutions can include generation, transmission or Demand Response. Non-Transmission Owner developers may also submit regulated solutions. The NYISO may call for a Gap solution if neither market-based nor regulated backstop solutions meet reliability needs in a timely manner. To the extent possible, the Gap solution should be temporary and strive to ensure that market-based solutions will not be economically harmed. The NYISO is responsible for evaluating all solutions to determine if they will meet identified reliability needs in a timely manner.
Reliability Criteria:	The electric power system planning and operating policies, standards, criteria, guidelines, procedures, and rules promulgated by the North American Electric Reliability Council (NERC), Northeast Power Coordinating Council (NPCC), and the New York State Reliability Council (NYSRC), as they may be amended from time to time.
Reliability Need:	A condition identified by the NYISO in the RNA as a violation or potential violation of Reliability Criteria.
Reliability Needs Assessment (RNA):	An annual report that evaluates resource adequacy and transmission system security over a 10-year planning horizon, and identifies future needs of the New York electric grid. It is the first step in the NYISO's CRPP.
Responsible Transmission Owner (Responsible TO):	The Transmission Owner or TOs designated by the NYISO, pursuant to the NYISO Planning Process, to prepare a proposal for a regulated solution to a Reliability Need or to proceed with a regulated solution to a Reliability Need. The Responsible TO will normally be the Transmission Owner in whose Transmission District the NYISO identifies a Reliability Need.
Security:	The ability of the power system to withstand the loss of one or more elements without involuntarily disconnecting firm load.
Southeastern New York (SENY)	The NYCA south of the interface between Upstate New York (UPNY) and southeastern New York (SENY).
Special Case	A NYISO Demand Response program designed to reduce

Term	Definition
Resources (SCR):	power usage by businesses and large power users qualified to participate in the NYISO's ICAP market. Companies that sign up as SCRs are paid in advance for agreeing to cut power upon NYISO request.
Study Period:	The 10-year time period evaluated in the RNA.
Transfer Capability:	The amount of electricity that can flow on a transmission line at any given instant, respecting facility rating and reliability rules.
Transmission Constraints:	Limitations on the ability of a transmission facility to transfer electricity during normal or emergency system conditions.
Transmission Planning Advisory Subcommittee (TPAS):	A group of Market Participants that advises the NYISO Operating Committee and provides support to the NYISO Staff in regard to transmission planning matters including transmission system reliability, expansion, and interconnection.
Unforced Capacity Delivery Rights (UDR):	Unforced capacity delivery rights are rights that may be granted to controllable lines to deliver generating capacity from locations outside the NYCA to Localities within NYCA.
Upstate New York (UPNY):	The NYCA north of the interface between Upstate New York (UPNY) and southeastern New York (SENY).
Volt Ampere Reactive (VAr):	A measure of reactive power.
Weather Normalized:	Adjustments made to remove fluctuation due to weather changes when making energy and peak demand forecasts. Using historical weather data, energy analysts can account for the influence of extreme weather conditions and adjust actual energy use and peak demand to estimate what would have happened if the hottest day or the coldest day had been the typical, or "normal," weather conditions. Normal is usually calculated by taking the average of the previous 30 years of weather data.
Zone:	One of the eleven regions in the NYCA connected to each other by identified transmission interfaces. Designated as Load Zones A-K.

9. Appendix B - Environmental Regulation Glossary

Term	Definition
CAIR	Clean Air Interstate Rule
CAMR	Clean Air Mercury Rule
CC	Combined Cycle
CF	Capacity Factor
DG	Distributed Generation, e.g. behind the meter
DTH	Decatherm = mmBTU
EDRP	Emergency Demand Response Program
eGRID	Emissions & Generation Resource Integrated Database
HEDD	High Electrical Demand Day
LOGMOB	Loss of Gas Minimum Oil Burn
MACT	Maximum Achievable Control Technology
NG	Natural Gas
NOx	Nitrogen Oxides
OTC	Ozone Transport Commission
REC	Renewable Energy Credit
RGGI	Regional Greenhouse Gas Initiative
RFO	Residual Fuel Oil
RPS	Renewable Portfolio Standard
SCR	Special Case Resource
SF6	Sulfur Hexafluoride
SNCR	Selective Non-Catalytic Reduction
SO2	Sulfur Dioxide

Appendix C – Load and Energy Forecast, 2008-2018

C Load and Energy Forecast, 2008-2018

C.1 Introduction

Overview

This section describes the annual energy and seasonal peak demand forecasts for the ten year period beginning with 2008 and extending through 2018. 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 has initiated the CRPP to assess the adequacy of New York's electricity infrastructure for meeting reliability and market needs over the 2008 – 2018 horizon. As part of this assessment, a ten year forecast of summer and winter peak demands and annual energy requirements was performed.

The electricity forecast is based on projections of New York's economy performed by Economy.com in the spring of 2008. The Economy.com 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 the reduction of energy consumption by 15 percent from forecasted levels as of 2015. This is an annual energy reduction of about 26,000 GWh and 5,700 MW in peak demand. The NYISO modified the 2008 econometric forecast to account for that portion of the PSC goal that was considered sufficiently reliable to include in the 2009 RNA.

Table C-1: Summary of Econometric Forecasts

Economic Indicators	Average Annual Growth			
	97-02	02-07	08-13	13-18
Total Employment	0.9%	0.5%	0.5%	0.3%
Gross State Product	3.4%	3.0%	2.3%	2.4%
Population	0.5%	0.2%	0.0%	-0.1%
Total Real Income	2.2%	3.4%	1.9%	1.4%
Summer Peak (actual data through 2006)	1.5%	1.0%	0.5%	0.5%
Annual Energy (actual data through 2006)	1.5%	1.1%	0.8%	0.8%

Employment Trends	Shares of Total Employment			
	2002	2007	2013	2018
Business, Services & Retail	52.6%	53.3%	53.3%	53.6%
Health, Education, Government, Agriculture	34.7%	35.3%	36.1%	36.7%
Manufacturing	12.7%	11.4%	10.6%	9.7%

C.2 Historical Overview

NYCA System

Table 5.2.1 shows the New York Control Area's (NYCA) historic peak and energy growth since 1993.

Table C-2: 21-Year Historic Peak and Energy Data and Growth Rates

Year	Annual GWh	Percent Growth	Summer Capability Period: Summer MW	Summer Capability Period: Percent Growth	Winter Capability Period	Winter Capability Period: Winter MW	Winter Capability Period: Percent Growth
1993	146,915		27,139		93-94	23809	
1994	147,777	0.60%	27,065	-0.30%	94-95	23,345	-1.90%
1995	148,429	0.40%	27,206	0.50%	95-96	23,394	0.20%
1996	148,527	0.10%	25,585	-6.00%	96-97	22,728	-2.80%
1997	147,374	-0.80%	28,699	12.20%	97-98	22,445	-1.20%
1998	149,855	1.70%	28,161	-1.90%	98-99	23,878	6.40%
1999	154,841	3.30%	30,311	7.60%	99-00	24,041	0.70%
2000	155,140	0.20%	28,138	-7.20%	00-01	23,774	-1.10%
2001	155,240	0.10%	30,982	10.10%	01-02	22,798	-4.10%
2002	158,507	2.10%	30,664	-1.00%	02-03	24,454	7.30%
2003	158,013	-0.30%	30,333	-1.10%	03-04	25,262	3.30%
2004	160,211	1.40%	28,433	-6.30%	04-05	25,541	1.10%
2005	167,208	4.40%	32,075	12.80%	05-06	24,948	-2.30%
2006	162,237	-3.00%	33,939	5.80%	06-07	25,057	0.40%
2007	167,341	+3.15%	32,169	-5.22%	07-08	25,021	-0.14%
Annual Avg Growth:		0.93%		1.22%			0.36%

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.

Table C-3 shows trends in weather-normalized annual energy and seasonal peaks for the NYCA system. The summer peak is the fastest growing and the winter peak is the slowest.

Table C-3: Weather Normalized Annual Energy and Seasonal Peak Loads

Year	Annual GWh	Percent Change	Summer MW	Percent Change	Winter MW	Percent Change
1993	144,883		26,204		23,685	
1994	145,674	0.50%	27,161	3.70%	23,654	-0.10%
1995	146,008	0.20%	27,167	0.00%	23,554	-0.40%
1996	148,071	1.40%	27,938	2.80%	22,788	-3.30%
1997	148,465	0.30%	28,488	2.00%	22,762	-0.10%
1998	150,030	1.10%	28,999	1.80%	24,031	5.60%
1999	153,572	2.40%	28,925	-0.30%	23,909	-0.50%
2000	156,779	2.10%	28,974	0.20%	24,218	1.30%
2001	155,166	-1.00%	29,767	2.70%	25,045	3.40%
2002	157,650	1.60%	30,028	0.90%	24,294	-3.00%
2003	158,673	0.60%	30,450	1.40%	24,849	2.30%
2004	161,363	1.70%	29,901	-1.80%	25,006	0.60%
2005	164,425	1.90%	31,821	6.40%	24,770	-0.90%
2006	162,853	-1.00%	32,992	3.70%	25,618	3.40%
2007	165,309	1.51%	33,444	1.37%	25,490	-0.50%
Avg Ann Growth		0.95%		1.76%		0.53%

Regional Energy and Seasonal Peaks

Table C-4 shows historic and forecast annual energy and growth rates for the different regions in New York The Upstate region is NYCA Zones A – I. Zones J and K, NYCA's most critical load centers, are shown individually. These groupings are meant to combine Zones that have similar economies. These regions are also separated by the most important electrical interfaces in New York. Upstate-West is separated from Upstate-East by the Central-East interface. Upper Hudson Valley (Zone F) and Lower Hudson Valley (Zones G, H and I) are separated by the UPNY/SENY interface. Lower Hudson Valley and J are separated by Dunwoodie South. J and K are separated by the Con Ed – LIPA interface.

Table C-4: Actual and Forecast Annual Energy

Year	Upstate Regions	New York City	Long Island	NYCA
1998	84,923	46,076	18,856	149,855
1999	86,888	48,281	19,671	154,841
2000	85,885	49,183	20,072	155,140
2001	84,290	50,227	20,723	155,240
2002	85,607	51,356	21,544	158,507
2003	85,224	50,829	21,960	158,013
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	89,445	54,272	22,960	166,677
2009	90,132	54,987	23,008	168,127
2010	90,840	55,905	23,002	169,747
2011	91,277	56,661	23,015	170,953
2012	91,443	57,503	22,981	171,926
2013	91,911	58,358	22,888	173,158
2014	92,503	59,430	22,866	174,799
2015	92,952	60,353	22,870	176,176
2016	93,560	61,628	23,062	178,250
2017	94,073	62,083	23,127	179,283
2018	94,580	62,569	23,278	180,427
98-02	0.20%	2.75%	3.39%	1.41%
02-07	0.97%	1.29%	1.09%	1.09%
08-13	0.55%	1.46%	-0.06%	0.77%
13-18	0.57%	1.40%	0.34%	0.83%
97-08	0.63%	1.94%	2.11%	1.23%
08-18	0.56%	1.43%	0.14%	0.80%

Table C-5: Weather Normalized Summer Peaks and Forecast By Region

Year	Upstate Regions	New York City	Long Island	NYCA
1998	14,184	9,581	4,396	28,161
1999	15,086	10,467	4,758	30,311
2000	14,237	9,771	4,130	28,138
2001	15,480	10,602	4,900	30,982
2002	15,271	10,321	5,072	30,664
2003	15,100	10,240	4,993	30,333
2004	14,271	9,742	4,420	28,433
2005	16,029	10,810	5,236	32,075
2006	17,054	11,300	5,585	33,939
2007	15,824	10,970	5,375	32,169
2008	16,473	11,964	5,355	33,792
2009	16,546	12,127	5,386	34,059
2010	16,617	12,257	5,395	34,269
2011	16,699	12,361	5,403	34,462
2012	16,731	12,452	5,403	34,586
2013	16,811	12,537	5,377	34,725
2014	16,909	12,627	5,370	34,905
2015	16,988	12,683	5,358	35,029

2016	17,097	12,787	5,374	35,258
2017	17,198	12,879	5,354	35,430
2018	17,296	12,980	5,383	35,658
98-02	1.86%	1.88%	3.64%	2.15%
02-07	0.71%	1.23%	1.17%	0.96%
08-13	0.41%	0.94%	0.08%	0.55%
13-18	0.57%	0.70%	0.02%	0.53%
97-08	1.22%	1.52%	2.26%	1.49%
08-18	0.49%	0.82%	0.05%	0.54%

The historic weather-normalized peaks and forecast peaks are reported in Table C-5. These forecasts are developed using results from some Transmission Owners and/or from the NYISO's own econometric forecasts. TO results are not always available at the zonal level. Due to different methods and levels of aggregation, the historic weather-normalized values may change in future years as we continue to review and refine these weather-normalized peaks. Peak demand growth from 2002 through 2007 has been 1.4% statewide. This rate of growth is expected to decline during the forecast horizon to a rate of 0.55%.

C.4 Forecast Methodology

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

Econometric forecasts were developed for zonal energy using quarterly data from 1993 through 2007. This differs from past years in which we used annual energy from 1975 to the current year. The benefits of this change are that we have more observations to fit data and we include only the more recent data in our models. While data prior to 1993 still provides useful information on how the state economy reacts to economic cycles, these data may no longer be appropriate in representing the future trends in the state's economy. For each zone, we estimated an ensemble of econometric models using population, households, economic output, employment, cooling degree days and heating degree days and other economic variables. 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 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 2007. The 2008 summer peak forecast was matched to coincide with the 2008 ICAP forecast. Non-coincident peaks were obtained by developing historic averages of diversity factors for each zone.

C.5 Conservation Adjustments

The 2008 econometric forecast provided the starting point for the 2009 RNA Base Case forecast. In June 2008, the NY PSC issued its order regarding the Energy Efficiency Portfolio Standard, which has as its goal an energy reduction of approximately 26,885 GWh from the forecast levels as of 2015. About 2/3 of the goals was divided among several state agencies, while the remainder was expected to be obtained through building codes and improved state and federal energy efficiency standards.

EEPS 2015 Goals by Administration or Jurisdictional Unit

	EEPS Goals			
State Organization	Sales Goal - MWh	Sendout Goal - MWh	Percent	Estimated MW
LIPA[1]	2,167,035	2,337,305	8.7%	500
NYPA	1,756,426	1,894,434	7.0%	395
Other State Agencies	790,718	852,847	3.2%	175
NYSERDA - SBC 3	3,499,995	3,775,001	14.0%	785
Utilities	353,806	381,606	1.4%	80
Codes & Standards	7,947,588	8,572,055	31.9%	1,780
Utility T&D	724,379	781,296	2.9%	165
PSC's Jurisdictional Gap - NYSERDA & Utilities	7,687,095	8,291,094	30.8%	1,720
Total	24,927,042	26,885,638	100.0%	5,600

1. LIPA's expressed goal is 500 MW and has an average load factor of 49%.

The NYISO conducted interviews or discussions with all major parties to the EEPS order. The NYISO also reviewed the following studies, reports, and forecasts:

- the EEPS order itself
- ACEEE analyses used to derive the impacts of Codes and Standards
- the 2008 Energy Information Administration Long Term Annual Outlook forecast for the Mid-Atlantic states
- the 2007 ERISA legislation on energy efficiency codes & standards
- NYSERDA's impact evaluation reports and annual reports
- the NYSERDA-sponsored 2003 Optimal study of statewide technical conservation potential.

The purpose of the review was to perform an assessment of the degree to which the impacts of the EEPS should be considered sufficiently reliable for inclusion in the 2009 RNA Base Case. As part of this assessment, the NYISO compared its estimates of energy efficiency codes and standards to those of the EIA and ACEEE.

The NYISO reported to the Electric System Planning Working group its conclusion that the EIA estimates were more reliable than those of ACEEE.

To obtain a quantitative basis for inclusion of the EEPS goal in the 2009 RNA, the NYISO developed confidence factors and realization rates that were applied to the individual segments of the EEPS order. These are summarized in the table below.

	(a)	(b)	(c)	(d)	(e)
State Organization	Realization Rates	Confidence, RNA Base Case	Confidence, Scenario 1	Ultimate Horizon	Annual Share of Goal
LIPA	80%	100%	100%	2018	1/10
NYPA	80%	100%	100%	2015	Per NYPA
Other State Agencies	0%	0%	0%	2015	1/8
NYSERDA - SBC 3	33% [1]	100%	100%	2018	Per NYSERDA
Utilities	80%	50%	50%	2015	1/8
New Codes & Standards [2,3]	**80%**	**80%**	**80%**	2018	per EIA
Utility T&D	50%	50%	50%	2018	1/8
Fast Track & NYSERDA	80%	100% / 50% [4]	100% / 75% [4]	2015	Per NYSERDA
Possible Added PSC Spending [5]	**80%**	**0% / 0%**	**25% - 50% - 75%**	2015	per PSC Order

1. A large portion of the SBC program is considered part of the NYISO baseline forecast.
2. Adjusted to reflect that some impacts are also included in Fast Track programs.
3. Impact of New Codes and Standards based on NYISO analysis of EIA 2008 Annual Energy Outlook, Mid-Atlantic region. These begin to impact baseline in 2012.
4. PSC's $160 M budget is considered 100% certain through 2011, 50% or 75% certain thereafter.
5. In Scenario 1, an additional $170 M budget is considered 25% certain in 09, 50% in 2010, and 75% certain thereafter.

Finally, the NYISO used PSC-approved levels of annual spending to construct a schedule of annual energy savings specific to each element of the EEPS goal. The result was the development of a projection of annual and cumulative EEPS impacts that could be applied zone-by-zone to the NYISO's 2008 econometric forecast. The annual conservation impacts for each element of the EEPS order are shown in the table below.

Two additional scenarios were constructed in which higher levels of conservation impacts were obtained than in the NYISO's Base Case forecast.

Base Case - Achievement Based on $160M/yr through 2015

RR %	80%	80%	0%	33%	50%	80%	80%	80%			
Year	LIPA	NYPA	Other State Agencies	NYSERDA - SBC 3	Utilities + T&D	Codes & Standards	PSC - NYSERDA	PSC - Utilities	Maximum GWh	Achieved Annual GWh	Achieved Cumulative GWh
2008	0	0	0	365	0	0	65	0	430	172	172
2009	117	45	0	365	165	0	262	300	1,254	741	913
2010	234	155	0	365	165	0	262	290	1,471	915	1,828
2011	234	300	0	365	165	0	262	260	1,586	1,007	2,835
2012	234	300	0	475	165	775	262	260	2,471	1,330	4,165
2013	234	300	0	475	165	800	262	260	2,496	1,346	5,511
2014	257	400	0	475	165	550	262	265	2,375	1,287	6,798
2015	257	400	0	475	170	550	262	265	2,380	1,288	8,086
2016	257	0	0	480	0	550	0	0	1,287	716	8,802
2017	257	0	0	480	0	550	0	0	1,287	716	9,519
2018	257	0	0	480	0	550	0	0	1,287	716	**10,235**
GWh	2,340	1,900	0	4,800	1,160	4,325	1,901	1,900	**18,326**	**10,235**	

Figure 5.5: Zonal Energy Forecast Growth Rates - 2008 to 2018

RNA Forecast Scenarios

Annual GWh	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
2007 Econometric	167,440	169,470	171,744	174,032	176,615	178,759	181,126	183,544	186,256	188,728	
2008 Econometric	166,849	169,040	171,575	173,788	176,091	178,669	181,597	184,262	187,052	188,801	190,662
2009 RNA Base Case	166,677	168,127	169,747	170,953	171,926	173,158	174,799	176,176	178,250	179,283	180,427
Scenario 1	166,677	167,977	169,399	170,263	170,485	170,965	171,857	172,485	174,559	175,592	176,736
Scenario 2	166,241	166,389	165,923	164,929	162,772	160,712	159,182	157,382	159,808	161,466	163,326

EEPS Energy Impacts

Cumulative GWh	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
2009 RNA Base Case	172	913	1,828	2,835	4,165	5,511	6,798	8,086	8,802	9,519	10,235
Scenario 1	172	1,063	2,176	3,525	5,606	7,704	9,740	11,777	12,493	13,209	13,926
Scenario 2	608	2,651	5,652	8,859	13,319	17,957	22,414	26,880	27,244	27,335	27,335

Annual MW	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
2007 Econometric	33,871	34,300	34,734	35,141	35,566	35,962	36,366	36,749	37,141	37,631	
2008 Econometric	33,827	34,247	34,649	35,053	35,452	35,870	36,317	36,708	37,086	37,407	37,784
2009 RNA Base Case	33,792	34,059	34,269	34,462	34,586	34,725	34,905	35,029	35,258	35,430	35,658
Scenario 1	33,792	34,029	34,199	34,324	34,298	34,288	34,320	34,298	34,526	34,698	34,926
Scenario 2	33,703	33,704	33,489	33,234	32,722	32,197	31,739	31,227	31,530	31,833	32,209

EEPS Demand Impacts

Cumulative MW	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
2009 RNA Base Case	35	188	379	590	867	1,145	1,412	1,678	1,828	1,977	2,126
Scenario 1	35	218	449	729	1,155	1,582	1,997	2,410	2,560	2,709	2,858
Scenario 2	124	543	1,160	1,819	2,730	3,674	4,579	5,481	5,556	5,575	5,575

Appendix D: Transmission System Assessment

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D. Transmission System Assessment

A key element underlying the determination of reliability needs is an assessment to determine if the transmission system meets reliability criteria, and to establish the transfer limits to be used in the Multi-Area Reliability Simulation (MARS) model. This assessment is conducted through a series of power flow, stability and short circuit studies. In general, the RNA analyses indicated that the bulk power transmission system can be secured, but that transfer limits for certain key interfaces must be reduced in order to respect voltage collapse criteria. However, a reduction in transfer limits or a limiting interface can result in higher LOLE findings and/or needs occurring earlier than they otherwise would. As a result, LOLE analysis was conducted for the RNA study case, a case with thermal limits, and finally a case with no internal NYCA transmission limits. These cases were conducted to demonstrate the impact that transmission limits have on the LOLE results.

D.1 Development of RNA study case System Cases

Table D.1 below summarizes the Area load plus losses.

Table D.1: Area Load plus Losses (MW)

	2009	2010	2011	2012	2013
LOAD+LOSSES MW					
WEST	2657	2666	2674	2678	2690
GENESSEE	1941	1949	1947	1948	1959
CENTRAL	2873	2873	2884	2884	2896
NORTH	826	847	853	853	856
MOHAWK	1392	1394	1401	1404	1410
CAPITAL	2306	2301	2300	2318	2335
HUDSON	2358	2375	2401	2409	2427
MILLWOOD	646	650	661	659	669
DUNWOODIE	1565	1576	1581	1597	1613
NYC	12073	12166	12265	12402	12547
L ISLAND	5385	5395	5403	5403	5377
	34022	34192	34368	34555	34781

Table D.2 below summarizes the Area generation dispatched for the RNA study case system.

Table D.2: Generation Dispatched (MW)

	2009	2010	2011	2012	2013
GEN DISP MW					
WEST	5002	5036	5036	5037	5036
GENESSEE	667	689	689	689	689
CENTRAL	5803	5845	5845	5923	5923
NORTH	1223	1236	1236	1237	1236
MOHAWK	605	643	643	642	642
CAPITAL	3163	3481	3481	3467	3466
HUDSON	3026	2802	2917	2918	2918
MILLWOOD	2110	2169	2169	2169	2169
DUNWOODIE	0	3	3	3	3
NYC	7292	7302	7302	7477	7477
L ISLAND	3757	3832	3832	3926	3927
	32648	33038	33154	33486	33486

Appendix 5.3 contains the summary of significant system performance results of each of the RNA study cases.

D.2 Emergency Thermal Transfer Limit Analysis

RNA study case emergency thermal transfer limits analysis was performed for the key interfaces used in the MARS Resource Adequacy analysis. The definitions of the transmission interfaces are described in Appendix 5.1.

Table D.3 illustrates the emergency thermal transfer limits for the RNA study case system conditions:

Table D.3: Emergency Thermal Transfer Limits[6]

	2010		2011		2012		2013	
Dysinger East	3025	1	3050	1	2925	1	3075	1
West Central	1800	1	1825	1	1800	1	1825	1
Moses South	2675	7	2675	7	2675	7	2675	7
Volney East	4400	2	4400	2	4425	2	4375	2
Total East	6500	2	6500	2	6550	2	6625	2
Central East	2675	3	2675	3	2700	3	2700	3
Central East+Fras-gilb	3075	3	3075	2	3075	2	3075	2
CE Group	5175	3	5150	2	5175	2	5150	2
F to G	3425	4	3475	4	3475	4	3450	4
UPNY-SENY Open	5150	4	5150	4	5150	4	5150	4
UPNY-ConEd Open	6300	5	6300	5	6325	5	6350	5

[6] The 2008 RNA MARS limits were derived from IRM base case.

Millwood South Closed	9525	8	9550	8	9550	8	9850	8
Dunwoodie-South Plan	5215	9	5690	6	5690	6	5725	6
I to J	4075	9	4400	6	4400	6	4425	6
LI Import	2090	10	2090	10	2090	10	2090	10

Table D.3 Continued

	Limiting Facility	Limiting Rating	Contingency
1	Stolle-Meyer 230 kV	1685	Pre-disturbance
2	Coopers Corners-Fraser 345 kV	1207	Pre-disturbance
3	New Scotland-Leeds 345 kV	1724	L/O New Scotland-Leeds 345 kV
4	Pleasant Valley-Leeds 345 kV	1725	L/O Athens-Pleasant Valley 345 kV
5	MiddletownTap-Coopers Corners 345 kV	1793	L/O RockTavern- Coopers Corners 345 kV
6	Dunwoodie-Reactor71 345 kV	795	Pre-disturbance
7	Moses-Adirondack 230 kV	440	L/O Massena-Marcy & Massena-Chateaguay 765 kV
8	Roseton-Fishkill 345 kV	1936	Pre-disturbance
9	Rainey-Mott_H 345 kV	1196	L/O Rainey-Mott_H 345 kV
10	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.

Appendix 5.3 contains the TLTG output reports for each interface through time.

D.3 Emergency Voltage Transfer Limit Analysis

RNA study case system voltage analysis was performed using Power-Voltage (PV) analysis for the transmission interfaces. The voltage contingency analysis program, or VCAP analysis, was used for key transmission interfaces in order to more accurately represent generation contingencies and perform more detailed analysis of specific transfer cases.

Table D.4 illustrates the initial RNA study case system voltage analysis. Appendix 5.3 illustrates the pre-disturbance and post-contingency voltage as a function of transfers.

Table D.4: Emergency Voltage Transfer Limits[7]

	2010		2011		2012		2013	
Dysinger East	2600	1	2600	1	2600	1	2550	1
West Cent	1725	1	1700	1	1650	1	1425	1
Moses South	2000	2	2000	2	2000	2	2000	2
Volney East	3500	3	3500	3	3750	3	3750	3
Total East	6675	4	6575	4	6550	4	6425	4
Central East	2850	4	2600	4	2825	4	2800	4
Cent East+Fras-gilb	3050	4	3050	4	3050	4	3050	4
CE Group	4550	4	4550	4	4550	4	4525	4
F to G	3750	5	3525	5	3650	5	3800	5
UPNY-SENY Open	6150	5	6150	5	6150	5	6150	5
UPNY-ConEd Open	5000	7	5000	7	5000	7	5000	7
Millwood South Closed	8450	8	8450	7	8450	7	8450	7
Dunwoodie-South Plan	5290	8	5515	7	5465	7	5465	7
I to J	3925	9	4000	9	4400	9	4400	9

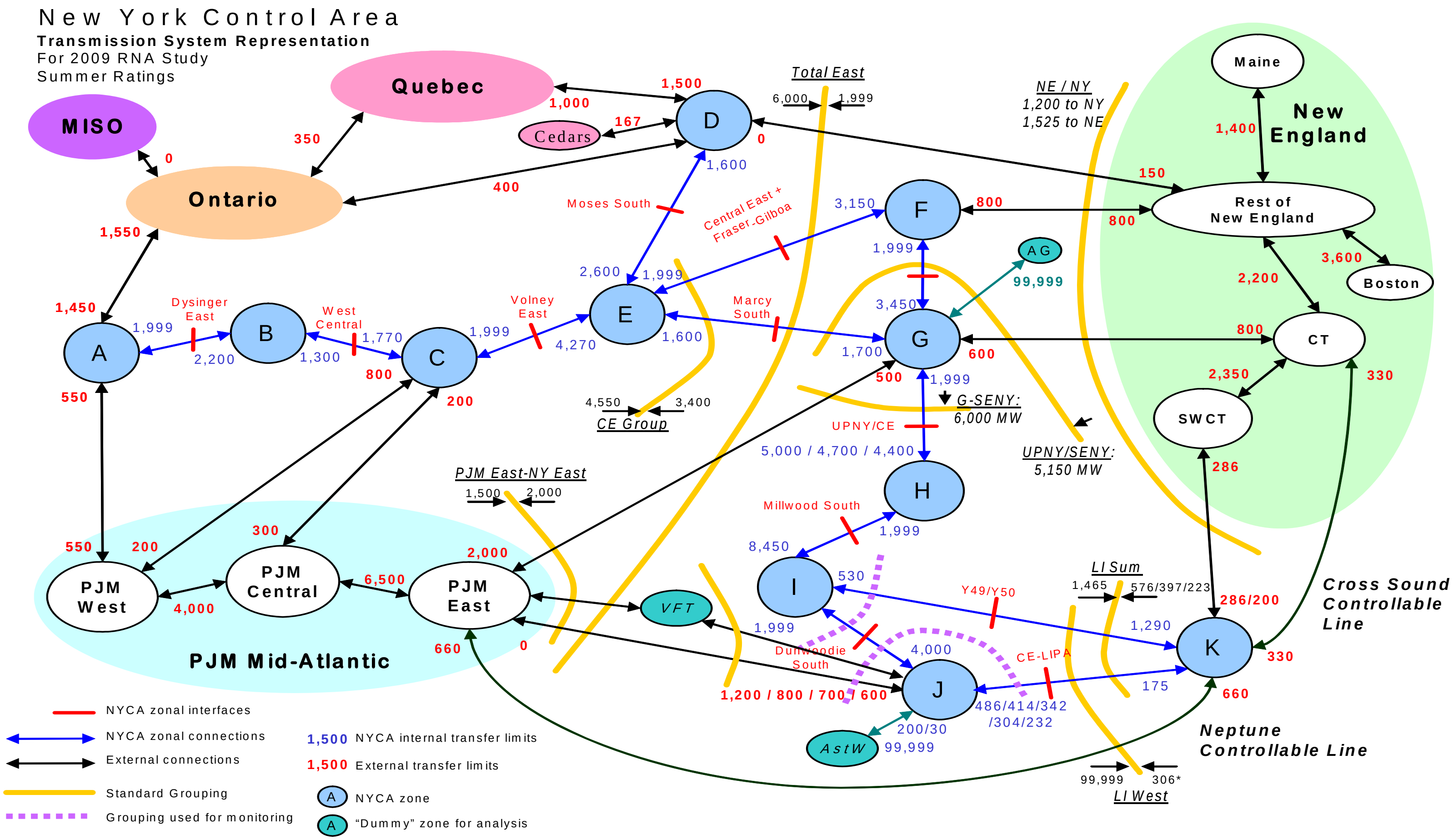
	Limiting Facility	Limiting Voltage (kV)	Contingency
1	Rochester 345	328	L/O Somerset-Rochester 345
2	Porter 230	218	L/O Marcy-New Scotland 345
3	Edic 345	328	L/O 9 Mile Point #2
4	New Scotland 345	328	New Scotland 77 Bus Fault
5	Pleasant Valley 345	328	L/O Leeds-Pleasant Valley 345
6	Pleasant Valley 345	328	L/O Millstone #3
7	Sprain Brook 345	328	L/O Tower 67/68 at Ladentown
8	Sprain Brook 345	328	L/O W89/W90 Tower at Pleasantville
9	Voltage Collapse Limit		L/O Ravenswood 3

D.4 Development of the MARS Topology

As described earlier, the MARS model was used to determine the NYCA and zonal LOLE's. A key input into the MARS modeling process is the transmission network topology. The starting point for the CRPP is the most recently approved New York State Reliability Council installed reserve margin study topology. Figure 1 below is the most recently approved topology, which is the one that was used for the study entitled: "NEW YORK CONTROL AREA INSTALLED CAPACITY REQUIREMENTS FOR THE PERIOD MAY 2008 THROUGH APRIL 2009". This topology was the starting point for the RNA but was modified as dictated by assessment of future transmission system conditions, as discussed herein.

[7] Id.

Figure 1: 2009 RNA MARS Topology



D.5 Short Circuit Assessment

A short circuit analysis was performed using ASPEN OneLiner (Advanced Systems for Power Engineering) to determine the impact of the maximum generation on the bulk power system. The NYISO “Guideline for Fault Current Assessment” was used. Three-phase, single-phase and line-line-ground short-circuit currents were determined for approximately 150 bulk power substations across the NYCA.