Exhibit ___ (JPB-3)

2008 RNA

Final Report

2008 Reliability Needs Assessment, Supporting Documents, and List of Appendices For The 2008 Comprehensive Reliability Planning Process

December 10, 2007

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Overview

This document is the RNA 2008 and its supporting document. The purpose of this document is to provide more detailed information to support the material, findings and recommendations contained in the RNA. For completeness the supporting document begins with a restatement of the RNA 2008. This is followed by a detailed write up of the load and energy forecast utilized in the RNA. The balance of the document provides more detail for the analyses conducted for RNA 2008 as well as a list of available appendices.

Section I: RNA 2008

NEW YORK INDEPENDENT SYSTEM OPERATOR

Building the Energy Markets of Tomorrow . . . Today

Final Report

Comprehensive Reliability Planning Process (CRPP)

2008 Reliability Needs Assessment

December 10, 2007

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I. Introduction

In today's world, 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.

With these goals in mind, the New York Independent System Operator (NYISO), in conjunction with stakeholders, developed and implemented in 2005 its Comprehensive Reliability Planning Process (CRPP), codified in Attachment Y of the NYISO's Open Access Transmission Tariff (OATT). The NYISO's 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 in or modification of the needs identified in the RNA.

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 a summary of the CRPP and prior plans, with detailed analysis, data and results included in a separate Supporting Document. The balance of the document presents the 2008 needs assessment which finds under base case assumptions that New York State will have reliability needs beginning in 2012. With the Neptune project modeled as firm capacity available at Zone K, the first year of need is 2013. The document concludes with the latest information available regarding historic congestion, which is provided to the market place for informational purposes.

II. CRP Process and Summary of Prior Plans

This section presents an overview of the CRPP followed by a summary of the CRP 2005 and 2007 plans and their current status. A detailed discussion of the CRPP, including applicable reliability criteria is contained in the draft NYISO Manual 26 entitled: "Comprehensive Reliability Planning Process Manual (CRPP Manual)."[1]

A. 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 reliability of the bulk power system is assessed and solutions to reliability need 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 approaches to analyzing a bulk power system's reliability: security and adequacy. Adequacy is a planning and probabilistic concept. The New York State bulk power system is planned to meet a loss of load expectation (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. 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). 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.

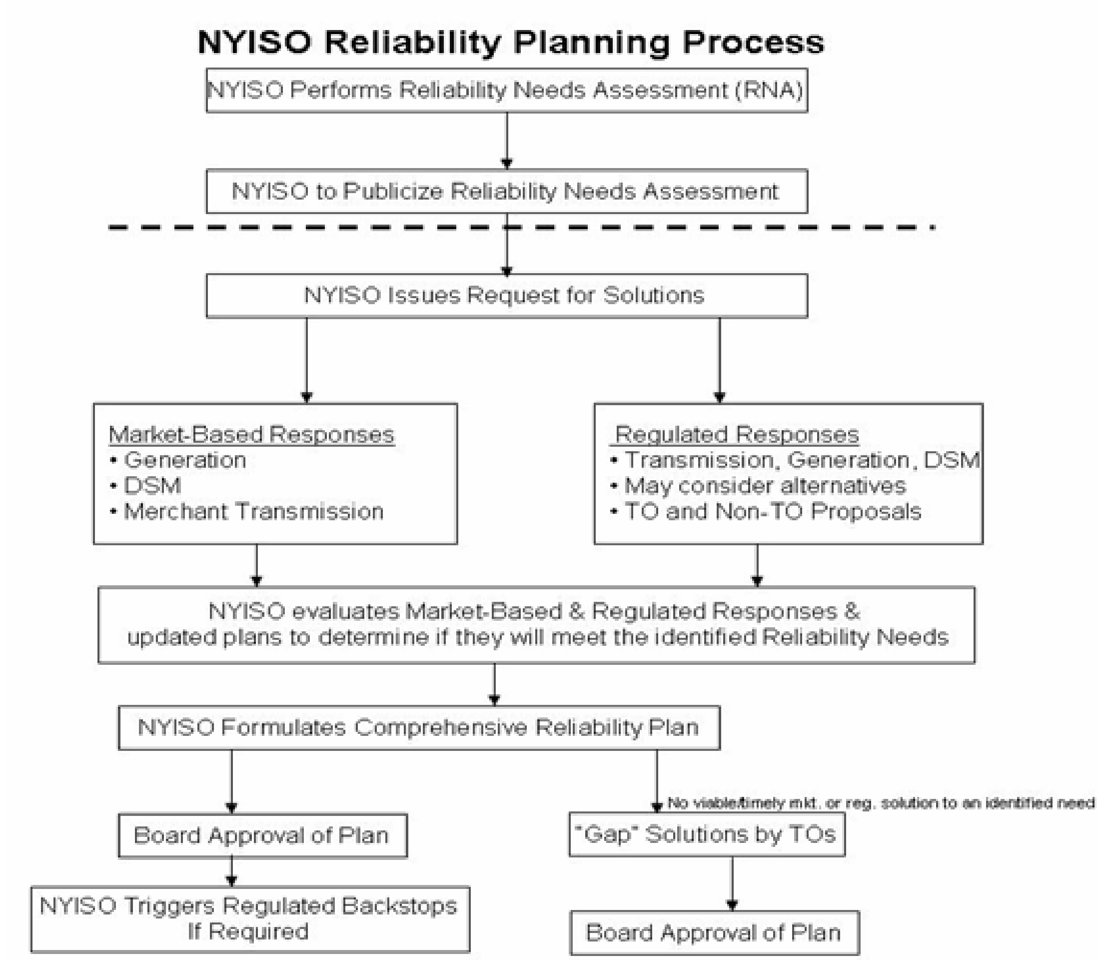
The CRPP is anchored in the market-based philosophy of the NYISO and its Market Participants, which posits that market solutions should be the first choice to meet the identified reliability needs. In the event that market-based solutions do not materialize to meet a reliability

[1] A draft of the CRPP Manual has been circulated and is under discussion at the Electric System Planning Working Group.

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. 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



B. Summary of Prior CRPP

This is the third 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[2], 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 totaling 3,007 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 plan is dependent on the market solutions moving forward. The Table 2.1 presents the market solutions that were submitted during the previous two CRPP cycles as solutions to the needs and their current status.

During the previous two CRPP cycles, a total of 3,557 MW solutions were submitted as market solutions to the identified reliability needs. Table 2.1 indicates that 3,007 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 have not been offered as market solutions that are moving forward. For example, the NYISO has learned that the Besicorp-Empire (Energy Capital Partners) power project located in Rensselaer, New York, will soon begin construction. The Besicorp project is projected to add in excess of 600 MW of capacity to the New York bulk power system.

[2] The first CRP was entitled the 2005 CRP, while the second was entitled the 2007 CRP. This difference of two years is the result of a change in naming convention in the 2007 CRP which adopted the first year of the Study Period, 2007, as the identifier for the CRPP study year as opposed to the year from which the study assumptions were derived. This year's CRPP used assumptions derived from the 2007 Load and Capacity Data Book and other sources, while last year's CRPP was based upon data and assumptions from 2006.

Table 2.1: CRPP Market Solutions and Current Status

Project Type	Submitted	Size of Resource(MW)	Zone	In-service Date	Status
Resource Proposals					
Combined Cycle Oak Point - KeySpan	CRP 2005	550	J	3/2009	Project withdrawn as solution, still listed in NYISO interconnection queue
Combined Cycle Spagnoli Rd - KeySpan	CRP 2005 and CRP 2007	222	K	6/2009	Rejected class year 2006 cost allocation, still in NYISO queue
Gas Turbine Astoria Re-powering - NRG	CRP 2005 and CRP 2007	200 (Phase I) 300 (Phase II) (375MW Net)	J	6/2009 6/2011	NYISO queue projects #201 and #224
Simple Cycle GT Indian Point - Entergy	CRP 2007	300	H	5/2011	Not in NYISO interconnection queue
Combined Cycle Arthur kill - NRG	CRP 2007	600	J	7/2012	Not in NYISO interconnection queue
Transmission Proposals					
Controllable AC Transmission – VFT Linden VFT	CRP 2007	300 (No ICAP/UDR)	PJM-J	4th quarter 2009 PJM Queue G22	Completed NYISO class year 2006 process, IA in progress
Back-to-Back HVDC, AC Line HTS/FPL	CRP 2007 and was an alternative regulated proposal in CRP 2005	660 (500MW ICAP/UDR)	PJM-J	Late 2010 PJM Queue O66	NYISO interconnection queue project # 206 NYPA RFP
Back-to-Back HVDC, AC Line Harbor Cable - Brookfield	CRP 2007 and was an alternative regulated proposal in CRP 2005	550 (550MW ICAP/UDR)	PJM-J	6/2011	NYISO interconnection queue projects #195 and #253

III. RNA Study Case Assumptions, Drivers and Methodology

A. RNA study case system

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 studies that were performed during the CRPP. 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. 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 2008 RNA is 2008-2017. The Five Year Base Case was developed based on the 2007 Annual Transmission Reliability Assessment (ATRA) base case, input from Market Participants, and the project screening procedure as 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. 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 load model resulting from load growth are incorporated. The load model reflected the load forecast from the 2007 Load and Capacity Data Report, also known as the "Gold Book".
The 2008 RNA study case model of the New York system includes the following new and proposed facilities:

- 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, 2007;
- Transmission upgrades related to any projects and facilities that are included in the RNA study case, as defined above;
- TO plans identified in 2007 CRP.

The RNA study case does not include all projects currently listed on the NYISO's interconnection queue. It includes only those which meet screening requirements for inclusion. Based upon those requirements, no additional market-based resources were added during the second five years of the Study Period.

Table 3.1 below presents the unit retirements, which were represented in the RNA study case:

Table 3.1: Unit Retirements *

Unit\ Year	2008	2010	2013	Reason for Retirement
Lovett 5	188.3			Mirant North America, LLC Form 10-Q 5/14/04 Update to 2006 10-K
Russell 1 – 4	236.4			Environmental
Poletti		890.7		Article X Stipulation
Astoria GT Units 5,7,8,10 -13[3]			112.7	Company Plan
Total MW	424.7	890.7	112.7	1,428.1

* As specified by the Owner/Operator

Table 3.2 below presents the unit additions, which were represented in the RNA study case:

Table 3.2: Unit Additions

Unit\Year	2008	2009	2010	
Gilboa Uprates	30	30	30	
Prattsburg Wind	55			
Caithness			310.0	
Total MW	85	30	340	455

3 NRG has submitted a market-based solution in both the 2005 and 2007 CRPPs to replace and repower the Astoria gas turbines (See Table 2.1)

The unit retirements and additions, when combined with the existing generation as of April 1, 2007 in the "Gold Book" and other adjustments, resulted in the following RNA study case load and resource margin table:

Table 3.3: NYCA Load and Resource Margins 2008 to 2017

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Peak Load										
NYCA	33,871	34,300	34,734	35,141	35,566	35,962	36,366	36,749	37,141	37,631
Zone J	11,975	12,150	12,325	12,480	12,645	12,780	12,915	13,030	13,140	13,360
Zone k	5,485	5,541	5,607	5,664	5,730	5,791	5,855	5,919	6,002	6,076
Resources										
NYCA										
"- Capacity"	38,917	39,257	38,396	38,396	38,396	38,284	38,284	38,284	38,284	38,284
"- SCR"	1323	1323	1323	1323	1323	1323	1323	1323	1323	1323
Total	40,240	40,580	39,719	39,719	39,719	39,607	39,607	39,607	39,607	39,607
Zone J										
"- Capacity"	10,019	10,019	9,128	9,128	9,128	9,015	9,015	9,015	9,015	9,015
"- SCR"	468.7	468.7	468.7	468.7	468.7	468.7	468.7	468.7	468.7	468.7
Total	10,487	10,487	9,596	9,596	9,596	9,484	9,484	9,484	9,484	9,484
Zone K										
"- Capacity"	5,612	5,922	5,922	5,922	5,922	5,922	5,922	5,922	5,922	5,922
"- SCR"	159.5	159.5	159.5	159.5	159.5	159.5	159.5	159.5	159.5	159.5
Total	5,772	6,082	6,082	6,082	6,082	6,082	6,082	6,082	6,082	6,082
NYCA Resource Margin % (1)	118.8%	118.3%	114.4%	113.0%	111.7%	110.1%	108.9%	107.8%	106.6%	105.3%
Zons J Res./Load/ Ratio	87.6%	86.3%	77.9%	76.9%	75.9%	74.2%	73.4%	72.8%	72.2%	71.0%
Zons K Res./Load Ratio	105.2%	109.8%	108.5%	107.4%	106.1%	105.0%	103.9%	102.7%	101.3%	100.1%

Note (1): NYCA Resource Margin only includes resources internal to New York (generation located in New York, generation radially connected to New York, SCRs (2), and UDRs with firm capacity contracts (3) and does not include external resources of 2,755 MW that have historically participated in the NYCA installed capacity market. The LOLE includes support from neighboring control areas.
Note (2): SCRs are demand-side resources that are eligible to participate in the NYISO's capacity markets.
Note (3): UDRs are unforced capacity delivery rights.

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.

B. 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.

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.

Adequacy is the ability of the electric systems to supply the aggregate electrical demand and energy requirements of their customers at all times, taking into account scheduled and reasonably expected unscheduled outages of system elements. Adequacy applies to the transmission systems and the generation resources. Security is the ability of the electric systems to withstand sudden disturbances, such as electric short circuits or unanticipated loss of system elements.

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). The New York power system is designed to meet an LOLE that 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 ICAP requirement. The NYISO conducts transmission adequacy and resource adequacy assessment jointly.

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.

C. Short Circuit Analysis

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.

IV. Reliability Needs Assessment

A. Overview

Load growth in excess of two percent per year over the last several years in load Zones G through K has resulted in increasing demands placed on the transmission system to meet capacity and energy needs in these areas. By 2012, the NYCA load forecast estimates that approximately two thirds of the NYCA load will be located in load Zones G through K which is downstream of the Upstate New York – Southeastern New York (UPNY/SENY)[4] transmission interface. In addition, approximately 52 percent of the NYCA load will be located in load Zones J and K, downstream of the Dunwoodie-South transmission interface, which represents a slight increase from current percentages.

Increasing demands on the transmission system, in conjunction with other system changes, consisting primarily of generating unit retirements listed in Table 3.1, load growth, neighboring system changes and the lack of sufficient new capacity downstream of the UPNY/SENY interface, have and will continue to result in transfer limits based on voltage constraints. The result is that over time, transfers into and through SENY will continue to be limited by voltage constraints, rather than thermal constraints. As a result of the two prior CRPs, the TOs are upgrading their systems by bypassing series reactors where appropriate and adding capacitor banks at the Millwood substation. These improvements have made 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 4.1 – 4.3 below:

Table 4.1: Transmission System Thermal Transfer Limits for Key Interfaces in MWs

Interface	Year				
	2008	2009	2010	2011	2012
Central East + FG*	3375	3350	3175	3250	3100
F-G	3475	3475	3475	3475	3475
UPNY/SENY	5150	5150	5150	5150	5150
I-J	3925	4000	4400	4400	4400
I-K	1290	1290	1290	1290	1290

* F-G – Fraser-Gilboa circuit

Table 4.2: Transmission System Voltage Transfer Limits for Key Interfaces in MWs

Interface	Year				
	2008	2009	2010	2011	2012
Central East + FG	3150	3150	3150	3150	3150
F-G					
UPNY/SENY					
I-J			4225	4175	4150
I-K					

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

4 UPNY or Upstate New York is defined as load Zones A through F while SENY, or Southeastern New York, is defined as load Zones G through K

Table 4.3: Transmission System Study Case Transfer Limits for Key Interfaces in MWs

Interface	Year				
	2008	2009	2010	2011	2012
Central East + FG	3150 V	3150 V	3150 V	3150 V	3100 T
F-G	3475 T	3475 T	3475 T	3475 T	3475 T
UPNY/SENY	5150 T	5150 T	5150 T	5150 T	5150 T
I-J	3925 T	4000 T	4400 C	4400 C	4400 C
I-K	1290 T	1290 T	1290 C	1290 C	1290 C
I-J&K	5215 T	5290 T	5515 V	5465 V	5440 V

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

Below are the principal findings of the RNA for the 2008-2017 Study Period, including the 2007 Load and Capacity Data Report load forecast. The forecast for RNA 2008 is more than 500 MW higher than the RNA 2007 forecast by 2016. By the end of the Study Period, this forecast represents a total increase in demand of more than 1,000 MW. Also, the needs assessment evaluated the following scenarios:

- Higher Economic Growth
- Environmental Program Impacts
    - High Electric Demand Day (HEDD) initiative for nitrogen oxide (NOx) emissions
    - Regional Greenhouse Gas Initiative for carbon dioxide (CO_2) emissions
- New York State's Energy Efficiency Initiative of 15 percent reduction in energy consumption by 2015 (known as "15 x 15")
- Addition of the Besicorp-Empire (Energy Capital Partners) power project
- Addition of 500 MW of In-City Capacity
- Increased External Capacity

B. Reliability Needs

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 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.

As part of the transmission security analysis of the NYISO BPTFs, it was determined that with load growth, unit retirements, and limited resource additions, a more comprehensive N-1-1 assessment may become necessary. As indicated, the assessment is part of a transmission security analysis. It was not used in the determination of the emergency transfer limits presented in Tables 4.1, 4.2, and 4.3. Given the extensive requirements of this type of study, the NYISO tested a limited number of critical elements and contingencies, many of which were identified by

National Grid and are listed in the Supporting Document in accordance with NPCC A-2 and the NYSRC reliability rules. Based on the study case conditions, no violations on the BPTF were identified from this analysis: however, the NYISO observed that many non-BPTFs exceeded their equipment ratings on the local transmission system for the BPTF contingencies listed in the Supporting Document. Under high load conditions, the NYISO observed both BPTF and non-BPTFs violations due to BPTF contingencies. Specifically, the area around the Gardenville substation was identified as being more sensitive to the load levels evaluated than to the transfer levels evaluated. Potential violations on non-BPTFs are to be addressed by the TOs. NYISO will conduct a more thorough N-1-1 transmission security analysis in support of the upcoming Annual Transmission Review (ATR).

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 2012 with the latest version of the Class Year 2007 Annual Transmission Baseline Assessment (ATBA), modified to be consistent with the 2008 RNA study conditions. This was judged to be the worst year for the First Five Year Base Case. 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 the Supporting Document. There are no major changes in fault current from the previous RNAs. Where there are differences, they are directly related to transmission and generation changes in the respective locations. For example, the increase in fault current at the Lockport 115 kV station is due to the proposed Paradise 115 kV project. Overdutied circuit breakers appear in at least two substations in the analysis, Astoria West and Fitzpatrick. Astoria West is currently being addressed in the short term with an interim operating protocol, and in the long term a solution is being worked out between the affected parties. With regard to Fitzpatrick, the overdutied circuit breaker is currently being replaced.

2. Resource and Transmission Adequacy

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 first year that the NYCA is at or exceeds 0.1 days per year is 2012, with a LOLE of 0.19 days per year. The LOLE for the NYCA increases to 0.90 days per year by 2017. The LOLE[5] results for the entire 10-year RNA study case are summarized in Table 4.4.

[5] 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 4.4: LOLE for the RNA Study Case Transfer Limits

Area/Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
AREA-A										
AREA-B			0.03	0.04	0.08	0.13	0.20	0.30	0.41	0.48
AREA-C										
AREA-D										
AREA-E			0.01	0.01	0.03	0.05	0.09	0.16	0.23	0.25
AREA-F										
AREA-G						0.01	0.02	0.03	0.04	0.04
AREA-H										
AREA-I	0.01	0.01	0.06	0.08	0.18	0.30	0.42	0.59	0.76	0.82
AREA-J		0.01	0.06	0.08	0.18	0.32	0.46	0.65	0.81	0.85
AREA-K			0.01	0.01	0.03	0.06	0.07	0.13	0.23	0.26
NYCA	0.01	0.01	0.07	0.09	0.19	0.34	0.47	0.67	0.85	0.90

3. Thermal Limit Transmission Sensitivity

Based on the assumption that only thermal limits are binding, the NYISO staff conducted a sensitivity analysis of LOLE based on thermal transfer limits for the internal NYCA transmission system. Utilizing thermal transfer limits to determine resource adequacy needs provides information on the impact that the more restrictive limits other than thermal limits have on LOLE. The LOLE results for this sensitivity indicate virtually no difference when rounded to two decimal places between the study case and the thermal sensitivity case. The major reasons for this result follow:

- The UPNY/SENY interface is thermally limited in both cases and this “upstream” interface limits the ability to send power to the deficient zones downstream before the voltage limits would become constraining;
- The Zone I-to-Zone J voltage limit increases to its thermal limit when flows on the Zone I-to-Zone K interface are reduced;
- Increased availability of resources in the voltage constrained zones;
- The LOLE violations are more a function of resource deficiencies rather than transmission constraints. The detailed results are presented in Table 4.5.

Table 4.5: LOLE for the RNA Study Case System Based on Thermal Transfer Limits

Area/Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
AREA-A										
AREA-B			0.03	0.04	0.08	0.13	0.20	0.30	0.41	0.48
AREA-C										
AREA-D										
AREA-E			0.01	0.01	0.03	0.05	0.09	0.16	0.23	0.25
AREA-F										
AREA-G						0.01	0.02	0.03	0.04	0.04
AREA-H										
AREA-I	0.01	0.01	0.06	0.08	0.18	0.30	0.42	0.59	0.76	0.82
AREA-J		0.01	0.06	0.08	0.18	0.32	0.46	0.65	0.81	0.85
AREA-K			0.01	0.01	0.03	0.06	0.07	0.13	0.23	0.26
NYCA	0.01	0.01	0.07	0.09	0.19	0.34	0.47	0.67	0.85	0.90

4. NYCA Unconstrained or Free Flowing Transmission Sensitivity

The LOLE results for the NYCA unconstrained internal transmission interface sensitivity, also known as the "free flowing" sensitivity, are listed in Table 4.6. The free flowing sensitivity assumes that the NYCA's internal transmission system has unlimited or infinite capability. The purpose of this sensitivity is to identify whether the LOLE criteria deficiency is a result of a statewide resource deficiency or transmission limitations. The results indicate the first year of need is the result of both statewide resource adequacy criteria deficiencies and transmission constraints.

Table 4.6: LOLE for the RNA Study Case System Based on Free Flowing Conditions

Area/Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
AREA-A										
AREA-B			0.03	0.05	0.10	0.17	0.28	0.40	0.52	0.58
AREA-C										
AREA-D										
AREA-E			0.01	0.01	0.04	0.06	0.11	0.18	0.26	0.27
AREA-F										
AREA-G						0.01	0.01	0.02	0.04	0.04
AREA-H										
AREA-I			0.03	0.05	0.11	0.18	0.29	0.42	0.57	0.63
AREA-J			0.03	0.05	0.11	0.20	0.32	0.47	0.62	0.68
AREA-K						0.01	0.02	0.03	0.08	0.12
NYCA			0.04	0.05	0.12	0.21	0.33	0.48	0.64	0.71

5. Neptune with Firm Capacity Sensitivity

In early October, the LIPA Board of Trustees at its open meeting approved a long term capacity contract, beginning in 2010, with a resource located in PJM to be delivered to Long Island using the UDR associated with the Neptune HVDC project. This sensitivity evaluates the impact of this firm capacity contract on the study case results. Table 4.7 presents the LOLE results for this sensitivity.

Table 4.7: LOLE for the RNA Study Case System with the Neptune Sensitivity

Area/Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
AREA-A										
AREA-B	0.01		0.01	0.03	0.06	0.09	0.15	0.24	0.34	0.43
AREA-C										
AREA-D										
AREA-E				0.01	0.02	0.03	0.06	0.11	0.18	0.23
AREA-F										
AREA-G						0.01	0.01	0.01	0.02	0.02
AREA-H										
AREA-I			0.02	0.04	0.08	0.16	0.24	0.38	0.53	0.65
AREA-J			0.02	0.04	0.09	0.17	0.26	0.40	0.58	0.69
AREA-K						0.01	0.01	0.02	0.04	0.06
NYCA			0.03	0.05	0.09	0.18	0.27	0.42	0.61	0.72

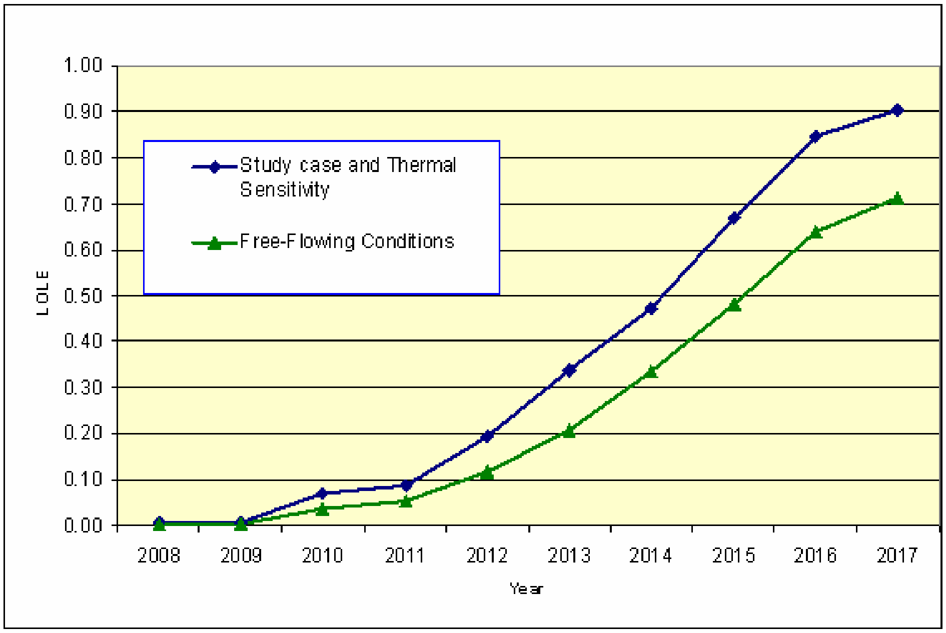
These results indicate that the firm capacity with the Neptune project moves the year of need from 2012 to 2013 and reduces the levels of compensatory MW required throughout the study period. Review of the free flowing for this sensitivity case indicates that 2013 is still a statewide need.

6. Reliability Needs Summary

Figure 4.1 below presents a summary of the LOLE results for the RNA study case and the thermal and free flowing sensitivities. In general, an LOLE result above 0.1 days per year indicates that resources are required to maintain reliability and, therefore, there is a need for resources. These results indicate the first definitive year of need is 2012 for the RNA study case and the thermal sensitivity case, and that the first year of need for the free flowing sensitivity case was also 2012.

Further, the review of both the free flowing transmission sensitivity (with an LOLE of 0.12 in 2012, 0.21 in 2013 and 0.71 in 2017) and the thermally limited transmission sensitivity (with an LOLE of 0.19 in 2012, 0.34 in 2013 and 0.90 in 2017) indicates that the need in 2012 results from a statewide capacity deficiency as well as zonal deficiency resulting from transmission constraints. Therefore, the need could be resolved by adding capacity resources downstream of the constraints or by adding resources above constraints in conjunction with transmission reinforcement. Figure 4.1 presents a summary of the results.

Figure 4.1: Summary of the LOLE Results – Thermal and "Free Flowing" Sensitivities



C. Compensatory MWs

Once the reliability needs are initially identified as deficiencies in meeting reliability criteria, the NYISO translates those deficiencies into compensatory MWs that could satisfy the needs. This translation provides further information to the marketplace on the magnitude of the resources that are required to meet bulk power system reliability needs. The NYISO is providing these calculations for illustrative purposes only. The calculations are not meant to reflect specific facilities or types of resources that may be offered as reliability needs solutions. Accordingly, compensatory MWs may reflect either capacity, demand management or transmission additions.

For this analysis, the amount and effective location of the compensatory MWs is determined by testing combinations of generic 250 MWs combined cycle generating units located in various load Zones until the NYCA LOLE is reduced to 0.1 days per year or less. A unit size of 250 MWs was chosen because this unit size is consistent with nominal power rating of combined cycle unit power blocks that have been observed in practice and provides reasonable step sizes for simulation purposes. If an LOLE violation is, to some extent, caused by a frequently constrained interface, locating compensatory MWs upstream of that load zone will result in higher level of compensatory MWs to meet resource adequacy. It is also recognized that solutions such as combustion turbine generating units and demand-side management (DSM) solutions can be added in much smaller increments.

The results of the MARS simulations for the RNA study case and scenarios provide information that can be used to guide the compensatory MW analyses. It should be noted that there may be other combinations of compensatory MWs that would also meet the statewide reliability criteria. It is not the intent of this analysis to identify preferred locations or combinations for potential solutions. In addition to the zonal LOLE, the MARS simulation reports what interfaces are constraining and the frequency of the constraint. From this information, it could be determined whether the LOLE violation is driven more by capacity deficiencies or transmission system transfer constraints.

The purpose of the analyses is not only to show the level of compensatory MWs needed to meet the LOLE criterion but also the importance of the location of the compensatory MWs. Not all alternatives tested were able to achieve an LOLE of less than or equal to 0.1 days per year. By 2016, a total of 2,500 MWs are required to compensate for retiring units and load growth. Eleven generic units, or 2,750 MWs of compensatory MWs, are required by 2017. These results represent an increase of about 750 compensatory MWs in 2016, compared to last year's RNA. Most of this increase is due to a peak demand forecast in 2016 that is about 515 MWs higher than last year's forecast. The energy forecast is about 0.2 percent higher than last year's and the load factor is about 0.4% lower. Both of these factors combine to produce the higher peak demand forecast in this year's RNA process. Additional information on the energy and peak demand forecasts is provided in the Supporting Document. Tables 4.8 and 4.9 list the simulated results.

Table 4.8: Compensatory MW Additions for 2012 through 2017

Alternative	Year	B	F	G	H	J	K	NYCA
2012 A1	2012			250		250		500
2012 A2	2012			500				500
2012 A3	2012			250		500		750
2012 A4	2012		250	250		250		750
2012 A5	2012					500		500
2012 A6	2012				250	250		500
2012 A7	2012		250		250	250		750
2013 A1	2013			250		750		1000
2013 A1	2013		250	250		500		1000
2013 A3	2013		500	250		500		1250
2013 A4	2013					1000		1000
2013 A5	2013				250	750		1000
2014 A1	2014			500		1000		1500
2014 A2	2014				500	1000		1500
2015 A1	2015			750		1000		1750
2015 A2	2015			250	500	1000		1750
2016 A1	2016			500		1000		1500
2016 A2	2016	250		1000		1250		2500
2016 A3	2016	250			1000	1250		2500
2017 A1	2017	250		1250		1250		2750
2017 A2	2017	250		1000		1250		2500
2017 A3	2017	250		1000		1000	250	2500
2017 A4	2017	250	250	1000		1000	250	2750
2017 A5	2017	250	250		1000	1000	250	2750

Table 4.9: LOLE with Compensatory MW Additions for 2012 through 2017

Alternative	Capacity	Year	B	E	G	I	J	K	NYCA
2012 A1	500	2012	0.05	0.02	0.00	0.10	0.10	0.02	0.11
2012 A2	500	2012	0.05	0.02		0.10	0.11	0.02	0.11
2012 A3	750	2012	0.04	0.01	0.00	0.07	0.07	0.02	0.07
2012 A4	750	2012	0.04	0.01	0.00	0.08	0.08	0.02	0.09
2012 A5	500	2012	0.05	0.02	0.00	0.09	0.09		0.10
2012 A6	500	2012	0.05	0.02		0.10	0.11	0.02	0.11
2012 A7	750	2012	0.04	0.01	0.00	0.08	0.08	0.02	0.09
2013 A1	1000	2013	0.06	0.02	0.00	0.08	0.09	0.03	0.10
2013 A2	1000	2013	0.06	0.02	0.00	0.10	0.10	0.03	0.12
2013 A3	1250	2013	0.04	0.01	0.00	0.08	0.09	0.03	0.09
2013 A4	1000	2013	0.06	0.02	0.01	0.08	0.08	0.03	0.09
2013 A5	1000	2013	0.06	0.02	0.01	0.08	0.08	0.03	0.09
2014 A1	1500	2014	0.06	0.02	0.00	0.07	0.07	0.03	0.08
2014 A2	1500	2014	0.06	0.02	0.00	0.07	0.07	0.03	0.08
2015 A1	1750	2015	0.07	0.03		0.08	0.09	0.05	0.10
2015 A2	1750	2015	0.07	0.03		0.08	0.09	0.05	0.10
2016 A1	2000	2016	0.10	0.03		0.12	0.11	0.09	0.15
2016 A2	2500	2016	0.05	0.02		0.07	0.06	0.06	0.09
2016 A3	2500	2016	0.05	0.02		0.07	0.06	0.06	0.09
2017 A1	2750	2017	0.06	0.02		0.07	0.07	0.05	0.08
2017 A2	2500	2017	0.08	0.03		0.10	0.09	0.07	0.11
2017 A3	2500	2017	0.08	0.03		0.10	0.10	0.03	0.11
2017 A4	2750	2017	0.06	0.02		0.08	0.08	0.03	0.09
2017 A5	2750	2017	0.06	0.02		0.08	0.08	0.03	0.09

Review of the LOLE results indicates that there is a minimum amount of compensatory MWs that must be located in Zone J because of the existing transmission constraints into that zone. Potential solutions could also include a combination of additional transmission and resources located within Zone J. Further examination of the results reveals that the constraining hours of UPNY/SENY and the Zone K export (from Zone K to Zones I and J) are increasing over the Study Period. These constraints require that a minimum amount of compensatory MWs must be located in Zones G, H, or I in addition to the minimum MWs amount in Zone J. Although the effectiveness of compensatory MWs located in Zones A through F and Zone K diminishes as the transmission constraints to the deficient zones become more binding, these compensatory MWs will provide benefit by helping to mitigate the LOLE violations. As statewide capacity deficiencies become more of a contributing factor to the LOLE violations through time, the effectiveness of compensatory MWs in Zones A through F and Zone K will increase accordingly. Due to the "lumpiness" of the 250 MW block resource additions and the non-linearity of the results, comparisons of the effectiveness of different compensatory MW locations are difficult. There was no attempt to optimize the amount of compensatory MW located in a specific area in this report.

It should be noted that the above findings are based upon the bulk power transmission system as modeled in the RNA study case. The NYISO will evaluate any proposed solutions to increase transfer capability during the development of the 2008 CRP.

The regulatory backstop solutions may take the form of alternative solutions of possible resource additions and system changes. Such proposals shall also provide an estimated implementation schedule so that trigger dates could be determined by the NYISO for purposes of beginning the regulatory approval and development processes for the backstop solutions if market solutions do not materialize in time to meet the reliability needs.

The NYISO's market rules recognize the need to have defined quantities of capacity specifically located on Long Island, within New York City and available as dedicated resources to the NYCA as a whole so that the system can perform reliably. The NYISO has implemented a capacity market that is designed to procure and pay for at least the minimum requirements in each area. If these mechanisms work as intended and continue to require resources at the same levels as in the past, they should result in the addition of new resources to meet most or all of the New York City and Long Island needs identified in this RNA. The NYCA wide requirement should result in additions that are needed to meet statewide reliability requirements.

D. 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.

1. Load Forecast Uncertainty - High Load Forecast

The *2007 Load & Capacity Report* contains a high load forecast that accounts for both extreme weather conditions and strong economic growth. The forecast uncertainty due to weather is already accounted for in the MARS runs as it determines LOLE. The remaining load growth due to the possibility of stronger than expected economic conditions is included in Table 4.10. Since the load is higher than the base case forecast, the LOLE criterion violation identified in this RNA would occur two years sooner in this scenario, or by 2010, shown in Table 4.11.

Table 4.10: High Economic Growth Scenario

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Base Case MW	33,871	34,300	34,734	35,141	35,566	35,962	36,366	36,749	37,141	37,631
High Growth Case	34,887	35,603	36,267	36,702	37,156	37,580	38,014	38,426	38,848	39,373
MW Increase	1,016	1,303	1,533	1,561	1,590	1,618	1,648	1,677	1,707	1,742

Table 4.11: RNA Study Case LOLE High Economic Growth Scenario

Area/Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
AREA-A										
AREA-B	0.02	0.04	0.17	0.18	0.33	0.46	0.68	0.94	1.21	1.36
AREA-C										
AREA-D										
AREA-E	0.01	0.01	0.08	0.08	0.17	0.25	0.38	0.57	0.72	0.82
AREA-F							0.01	0.01	0.01	0.01
AREA-G			0.02	0.02	0.03	0.04	0.07	0.11	0.14	0.15
AREA-H										
AREA-I	0.03	0.05	0.40	0.35	0.66	0.91	1.21	1.59	1.96	2.02
AREA-J	0.03	0.05	0.44	0.38	0.70	0.95	1.25	1.64	2.03	2.10
AREA-K	0.02	0.01	0.08	0.08	0.18	0.27	0.40	0.57	0.74	0.80
NYCA	0.04	0.06	0.46	0.46	0.73	1.01	1.33	1.73	2.14	2.21

The high load growth scenario increases the 2017 study case LOLE from 0.90 to 2.21 or by a factor of almost 2.5 with an equivalent increase in compensatory MWs.

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 noncoincident 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.

2. Environmental Scenarios

There are many environmental regulations under consideration that, if implemented, may require changes in either plant design or operation. In some circumstances, compliance can be achieved through the use of retrofit technologies. Two environmental initiatives, one of which is designed to reduce ozone precursor emissions of NOx and the other designed to reduce CO_2 emissions, are currently being considered by environmental regulators in New York and the Northeast. The NYISO analyzed these two initiatives separately and found that both have the potential to affect the availability of generating capacity. The purpose of this analysis is to determine to what extent their 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.

The NYISO did not analyze the combined potential impacts of these scenarios. The NYISO did, however, also analyze the reliability impacts of New York's energy efficiency initiative intended to achieve a 15 percent reduction in energy use by 2015 ("15 x 15"). This analysis reveals that successful implementation of this program will assist in realizing the goals of both environmental initiatives analyzed below in a manner that augments, rather than degrades, reliability.

2.1 NOx or High Electric Demand Day (HEDD) Initiative

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. Ground level ozone is the product of hydrocarbons (HC) and NOx emissions, and sunlight. Fossil-powered generating stations are the largest source of NOx in New York. New York State has not achieved compliance with the NAAQS for ozone.

On March 2, 2007, the Ozone Transport Commission (OTC) approved a Memorandum of Understanding (MOU) whereby six states, including New York, committed to develop strategies to reduce NOx emissions on High Electric Demand Days (HEDD) by 134.9 tons/day. New York's share of this commitment was 50.8 tons/day. 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.

To determine the extent to which the goal for NOx reductions set forth in the OTC MOU could impact reliability, the NYISO utilized the OTC assumption for unit-specific reasonably available control technology (RACT) for each unit to achieve the 50.8 tons/day of total NOx emission reductions. 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 to achieve NOx reductions totaling 50.8 tons/day. That is, units that need to run less to meet the NOx emissions reductions will be assumed to be less available to meet electric system needs, and the electric system's reliability will be analyzed to determine the ability of system's remaining units to meet electricity demands.

This scenario examines the reliability and resource adequacy impacts of limiting the maximum capacity available from HEDD units. Table 4.12 quantifies the impacts on reliability that could result from a simple NOx emission control strategy of limiting the capacity available from HEDD units. This analysis is intended to highlight the need for multiple strategies to reduce NOx emissions from New York power plants, implemented over several years.

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 the Design Day;
- The HEDD units will operate at a capacity equivalent to its DMNC *(1-RACT %);
- NOx Emission Rates will be equal to the reported emission rate for the Design Day.

The OTC has used July 26, 2005 as the design day for its proposal. It is observed that High Emitting Combustion Turbines (HECTs) would be required to reduce capacity by 634 MW, and Load Following Boilers (LFB) would be required to limit capacity available by 1,700 MW to obtain the NOx emission reductions. Other strategies of limiting combinations of capacity, energy, and using limited reduction technology to achieve required emission reductions may lead to smaller capacity reductions but were not examined here.

Of particular interest are the limitations for units within load pockets. HECTs in load pockets would be required to limit capacity available by 541 MW. LFBs in load pockets would be required to limit capacity by 165 MW.

Table 4.12: HEDD Design Day

HEDD Design Day July 26 2005											
	DMNC MW	Gross Fossil MWHrs	% of NYCA Fossil Daily Output	Daily CF	NOx Tons	% of Emissions	Emission Rate #NOx/MWH	DEC Phase I Target Reduction %	DEC Phase I Target Reduction Tons	Daily Capacity Available from HEDD Units MW	Equivalent Reduction in Daily Capacity Available MW
NYCA	38,956	428,688	100		370	100	1.72				
High Emitting CTs	2,771	31,769	7.40%	47.80%	92	25.00%	5.81	40%	21.1	2,137	634
Load Following Boilers	5,779	89,733	20.90%	64.70%	99	26.80%	2.2	30%	29.7	4,079	1,700
High Emitting CTs in Load Pockets	1,497	18,698	4.40%	52.00%	58	15.60%	6.17	40%	20.8	957	541
Load Following Boilers in Load Pockets	550	10,969	2.60%	83.10%	8	2.00%	1.37	30%	2.3	385	165

Table 4.13: HEDD Scenario LOLE Results

Area/Year	2009	2010	2011	2012	2013	2014	2015	2016	2017
AREA-A									
AREA-B	0.06	0.10	0.13	0.21	0.27	0.40	0.60	0.80	0.96
AREA-C									
AREA-D									
AREA-E	0.02	0.06	0.06	0.12	0.16	0.26	0.41	0.54	0.64
AREA-F									
AREA-G	0.03	0.11	0.11	0.20	0.28	0.38	0.53	0.66	0.62
AREA-H									
AREA-I	0.27	0.74	0.63	1.05	1.39	1.75	2.15	2.50	2.60
AREA-J	0.29	0.79	0.66	1.08	1.42	1.77	2.22	2.62	2.75
AREA-K	0.11	0.14	0.13	0.28	0.39	0.53	0.70	0.93	1.00
NYCA	0.33	0.83	0.71	1.15	1.52	1.90	2.34	2.75	2.86

The HEDD scenario as simulated has a significant impact on resource adequacy requirements as shown in Table 4.13. Given the goal reduction sought in the OTC MOU of 50.8 tons/day, and assuming a 2009 implementation, resource adequacy criterion violations occur as early as 2009 with more than a threefold increase in LOLE by 2017. Other factors not considered in this scenario, but which could aggravate compliance efforts include: i) similar programs in surrounding states that may reduce power available for import on HEDD days; ii) the load pocket location of many of the HEDD units, which would require closer scrutiny than is available from the MARS runs that calculate as modeled; and iii) a possible alternative compliance strategy which would be to retire the highest emitters and run the remaining units at full output, thus producing an even greater impact on reliability. Other factors not considered in this scenario, but which could improve compliance efforts include: i) wholesale replacement of units contributing significantly to NOx emissions on HEDD days, depending on location; ii) greater penetration of wind or other renewable resources, depending on location; iii) successful implementation of New York's "15 x 15" energy efficiency program; iv) increasing transmission to load pockets; and, perhaps most importantly, v) development of an expedited permitting process that will lead to new, clean, multi-fueled, and operationally flexible generation in load pocket areas.

Throughout the HEDD Initiative stakeholder process which DEC began in April 2006, DEC-DAR has stated that they will work with stakeholders to reduce emissions throughout the ozone season in a way which does not adversely impact the reliability of the bulk electricity grid.

2.2 CO2 or Regional Greenhouse Gas Initiative ("RGGI")

The proposal to cut CO_2 emissions is the Regional Greenhouse Gas Initiative (RGGI), through which 10 states have agreed to cap CO_2 emissions from power plants larger than 25 MW of capacity beginning in 2009. RGGI is expected to use a "cap and trade" system that will limit the total tons of carbon that can be emitted, and will require affected generators to purchase allowances to comply with the emission cap. Under RGGI, generators will need one allowance to emit one ton of CO_2. During the 2015-2018 period, the cap for each state will be reduced 2.5 percent annually. Estimates of CO_2 emissions from RGGI affected generators for 2005 show that New York's carbon emissions were at the cap level of 64 million tons. Preliminary estimates for the year 2006 show that New York is under its cap, at approximately 56 million tons/year[6]. In 2006, 50 percent of the energy generated in the NYCA was produced using fossil fuels. Of that output, 93.1 percent came from units that will have to control their carbon emissions under RGGI.

The NYISO's RGGI scenario in the 2007 RNA examined the retirement of most of the coal units in the New York State and determined that the LOLE criterion was violated. Transmission reinforcements that have been completed would slightly improve the LOLE but the LOLE would still not meet the criterion.

[6] 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.

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 10 million tons per year of CO_2 allowances[7]. 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 the RGGI affected generators 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. 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, weather conditions and the availability of hydroelectric and nuclear generation.

The study case for this year's RNA process includes the retirements of the Lovett 5, Russell 1 through 4 and Poletti 1 units by January 31, 2010. The NYISO's analysis to determine the minimum number of allowances needed to generate electricity in New York is based on that scenario. The NYISO's estimate for the minimum number of allowances necessary to produce the required energy and capacity in 2010 is 52 million tons. This value should be applied to 2010 only. It was derived by using the following assumptions: (i) estimating the effects of the actual and study case plant retirements; (ii) reducing the production of energy and the supply of capacity from coal-based units; (iii) replacing such energy with increased production from gas fired units; and (iv) holding non-emitting production levels and import levels static[8]. Specifically, in addition to the scheduled retirements noted above of Poletti, coal-based capacity was reduced by a total of 1,248 MW of the most carbon intensive units. The 8,000,000 MWh associated with this capacity were switched to gas generation. This resulted in a net reduction of approximately 3.5 million tons/year of CO2. This scenario yields an LOLE of 0.1 in 2010, which just meets the resource adequacy criterion. Thus, any market manipulation, such as hoarding, or market power activity, intended to restrict allowance availability to New York generators and that successfully restricts a liquid supply of allowances to New York generators below 52 million tons, may lead to an unacceptable LOLE levels that violate reliability requirements.

Further development of renewable resources and energy efficiency programs can, depending on their location, reduce the minimum number of allowances necessary to meet electric resource requirements in New York. This is discussed further below.

New York State, in its Renewable Portfolio Standard (RPS), has established a target for the purchase of Renewable Energy Credits (RECs) associated with sufficient additional energy intended to increase New York's proportion of energy produced from renewable resources to 25% by 2013. The NYISO evaluated the impact of this target on the estimated minimum number of CO2 allowances necessary to satisfy the reliability criteria under the RGGI scenario.

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[7] 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.

[8] It is possible that generation levels could be somewhat lower if demand response measures are increased successfully.

That is, the NYISO examined the amount of CO2 emissions savings from renewable resources that would offset the need for carbon allowances that would otherwise be necessary to operate fossil fuel generators needed to meet the reliability criteria. The NYISO also evaluated whether these additional resources moved the year of need for new capacity. The details of this analysis are contained in the Supporting Document.

The NYISO's analysis indicates that the addition of 8,700 MWh/yr in renewable energy will reduce the minimum number of tons of CO2 necessary to maintain an acceptable LOLE. The reduction in the number of CO2 allowances that RPS projects would provide depends upon the specific location and operational performance of the new renewable resources, as well as potential impacts on the performance of other resources. Assuming the resource location and operational characteristics were optimal and the RPS environmental benefits were comparable to those estimated by the New York State Energy Research and Development Authority (NYSERDA) for its first two solicitations, RPS resources would reduce the minimum tons of CO2 necessary to maintain an acceptable LOLE by approximately 3.1 million tons as compared to the minimum amount of carbon allowances in million of tons that would otherwise be needed to maintain reliability in 2013. It should be noted, however that, an additional 3,292 MW of renewable capacity would not change the year of need from 2012, because this additional capacity is expected to be added to portions of the State that do not otherwise require capacity additions.

3. "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 PSC has opened an Energy Efficiency Portfolio Standard (EPS) proceeding (Case 07-M-0548). On a peak demand basis, the Governor's plan would need to achieve a reduction of about 6,000 MW of generating capability. The specific targets and the schedule for obtaining them have not yet been established. Based upon information obtained at meetings with the DPS staff and stakeholders in the EPS proceeding, the energy efficiency measures will include at least some conservation activities that are already underway. As an initial step towards incorporating the "15x15" plan in the RNA, we have assumed that 50% of the goal will be achieved by programs that are already underway.

For the sake of this analysis, the NYISO scheduled the additional measures as a reduction in demand of 300 MW per year for 10 years, resulting in the following "15x15" Energy Efficiency Scenario. Because the EPS proceeding is still underway, the assumptions and implementation schedule used in this analysis will probably change. The analysis indicates that, because the forecasted load is considerably lower than the NYISO's study case as shown in Table 4.14, the LOLE criterion violation identified in this RNA will occur much later than in the study case as shown in Table 4.15.

Table 4.14: "15x15" Energy Efficiency Scenario

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Base Case MW	33,871	34,300	34,734	35,141	35,566	35,962	36,366	36,749	37,141	37,631
15x15 Case	33,271	33,400	33,534	33,641	33,766	33,862	33,966	34,049	34,141	34,331
MW Decrease	-600	-900	-1,200	-1,500	-1,800	-2,100	-2,400	-2,700	-3,000	-3,300

The "15x15" scenario eliminates the compensatory MW needed to meet resource adequacy requirements identified in the study case. This result would occur because the load reductions from the base case forecast are well in excess of the compensatory MW that would otherwise be needed to meet resource adequacy requirements in the 10-year study case.

Table 4.15: LOLE Results for "15x15" Energy Efficiency Scenario

Area/Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
AREA-A										
AREA-B				0.01	0.01	0.01	0.01	0.01	0.01	0.02
AREA-C										
AREA-D										
AREA-E										0.01
AREA-F										
AREA-G										
AREA-H										
AREA-I			0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.03
AREA-J			0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.03
AREA-K										
NYCA			0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.03

4. Besicorp Scenario

At the end of July, Besicorp-Empire Development Company, LLC announced that it had obtained sufficient funding to proceed with the construction of the Besicorp-Empire power project located in Rensselaer, New York. The project, now owned by Energy Capital Partners, falls within Zone F and north of the UPNY-SENY interface. This project has met all the NYISO interconnection requirements and has an Article X certificate as well as an Article VII certificate for the transmission lines to connect it to the bulk electricity grid. The project is expected to break ground after final preparations and regulatory review are completed. The project was studied as a nominal 660 MW combined cycle unit with a net output of 635 MW. At the time of the development of the 2008 RNA, this facility did not meet the requirements for inclusion in the base line for the study period. This project is being studied as a scenario in the 2008 RNA and the LOLEs are shown in Table 4.16.

Table 4.16: Besicorp Scenario

Area/Year	2010	2011	2012	2013	2014	2015	2016	2017
AREA-A								
AREA-B	0.01	0.02	0.05	0.07	0.11	0.16	0.22	0.27
AREA-C								
AREA-D								
AREA-E	0.03	0.01	0.02	0.03	0.05	0.08	0.12	0.15
AREA-F								
AREA-G				0.01	0.01	0.02	0.03	0.04
AREA-H								
AREA-I	0.06	0.06	0.14	0.23	0.35	0.48	0.65	0.69
AREA-J	0.06	0.06	0.15	0.25	0.38	0.54	0.70	0.75
AREA-K	0.03	0.01	0.02	0.03	0.06	0.10	0.19	0.22
NYCA	0.07	0.06	0.16	0.26	0.40	0.56	0.73	0.79

This scenario analysis shows that the addition of the Besicorp facility does not eliminate the need for additional resources in NYCA in 2012 because the NYCA LOLE levels are still in excess of 0.1 in that year.

5. In-City 500 MWs Scenario

There are a number of projects proposed in New York City in response to the New York Power Authority's (NYPA) request for proposals issued March 11, 2005 for 500 MWs of unforced capacity (UCAP) in Zone J. The purpose of this scenario is to evaluate the impact on resource adequacy if 500 MWs of additional capacity comes on line in Zone J by 2011.

Table 4.17: In-City 500 MWs LOLE Results

	2010	2011	2012	2013	2014	2015	2016	2017
AREA-A								
AREA-B	0.02	0.02	0.05	0.09	0.14	0.22	0.33	0.37
AREA-C								
AREA-D								
AREA-E		0.01	0.02	0.03	0.06	0.10	0.16	0.19
AREA-F								
AREA-G				0.01	0.01	0.02	0.03	0.03
AREA-H								
AREA-I	0.03	0.04	0.09	0.15	0.24	0.36	0.50	0.55
AREA-J	0.03	0.03	0.09	0.16	0.26	0.39	0.54	0.59
AREA-K				0.03	0.05	0.10	0.18	0.23
NYCA	0.04	0.04	0.10	0.17	0.27	0.41	0.57	0.62

The addition of 500 MWs of resources in Zone J in response to the request for proposals issued by the NYPA would satisfy resource adequacy needs in 2012 and make 2013 the first year of need in the NYCA, as shown in Table 4.17.

6. 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[9]. 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 4.18.

Table 4.18: NYCA External Capacity Scenario

Area/Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
AREA-A										
AREA-B			0.01	0.01	0.03	0.04	0.07	0.11	0.15	0.19
AREA-C										
AREA-D										
AREA-E					0.01	0.02	0.03	0.05	0.08	0.10
AREA-F										
AREA-G						0.01	0.01	0.02	0.03	0.03
AREA-H										
AREA-I			0.03	0.04	0.12	0.19	0.32	0.45	0.61	0.66
AREA-J			0.03	0.04	0.12	0.21	0.34	0.50	0.66	0.71
AREA-K					0.02	0.03	0.05	0.09	0.16	0.20
NYCA			0.04	0.05	0.13	0.22	0.36	0.52	0.69	0.75

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 and the compensatory MW levels would be reduced. However, the additional capacity would not change the initial year of need, which remains 2012.

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

V. Observations and Recommendations

A. Study Case

This 2008 RNA builds upon the NYISO's first two 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 2007 CRP include the addition of capacitor banks at the Millwood Substation and a breaker replacement at the Gowanus Substation.

This Reliability Needs Assessment for the New York State Bulk Power System indicates that the forecasted system violates the 0.1 days per year reliability criterion starting in 2012 through 2017 with Neptune modeled as emergency assistance between NYCA and PJM. With Neptune modeled as firm capacity available at Zone K, the first year of the 0.1 days-per-year reliability criterion violation is 2013.

The NYISO's analysis of the RNA study case system, compensatory MWs, scenarios, and the sensitivities and identified resource adequacy deficiencies indicate that there are various combinations of resources located in different NYISO load Zones that could address the reliability needs. Following issuance of the RNA, the NYISO will solicit market-based solutions to the identified reliability needs pursuant to Section 6.2, Attachment Y.

As stated above, the reliability needs for 2012 through 2017 can be satisfied through the addition of compensatory MWs statewide as well as in Zones G through K below the UPNY/SENY interface. The need is also a statewide resource adequacy need for the Neptune sensitivity case. Because there is a statewide resource adequacy need in 2012, all TOs, except for the NYPA, are designated as the Responsible TOs for purposes of identifying regulated backstop solutions for the years 2012-2017. The NYISO expects that NYPA will work with the other TOs on the development of regulated backstop solutions to the statewide needs on a voluntary basis.

B. 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. The NYISO's analysis of the impacts of DEC's initial proposal to regulate NOx emissions from low capacity factor units, known as HEDD units, shows that reliability criteria would be violated in 2009. Additional options will need to be developed in order to simultaneously achieve the necessary NOx reductions and satisfy reliability criteria. Examples might include replacement of simple cycle gas turbines with new modern units, with lower emissions, which would be facilitated greatly by the re-enactment of Article X legislation to facilitate the siting process.

As simulated by the NYISO and using the assumption herein, the scenario conducted to evaluate the reliability impacts of the RGGI program proposed by the DEC and nine other northeastern

States yields an LOLE of 0.1 in 2010, which just complies with the resource adequacy criterion in that year. Based upon NYISO's analysis, any allowance market activity that restricts a liquid supply of allowances below 52 million tons in 2010 will likely lead to an unacceptable LOLE levels that violate reliability requirements. It must be noted that this level is robust for 2010 only; the minimal level at allowances needed in New York will vary from year to year depending upon a number of factors including, but not limited to, weather conditions and the availability of hydro and nuclear generation. All else being equal, with further development of renewable resources and energy efficiency programs the minimum number of allowances necessary to meet electric resource requirements in New York may be reduced. To maintain reliability, measures will need to be developed to assure that the minimum number of allowances is always available to the generators in New York.

If successful, the program proposed by the New York State Governor to reduce energy consumption by 15 percent by 2015 ("15x15") would, as simulated by the NYISO, eliminate the need to add new resources to the state's bulk electricity grid during the 10 year study period. This result would occur because load reductions from the base case forecast are well in excess of the compensatory MWs that would otherwise be needed to meet resource adequacy requirements in the 10-year study case.

Finally, the NYISO evaluated the impact of the addition of various resources on the resource adequacy needs of the New York bulk power system. The addition of the Besicorp-Empire (Energy Capital Partners) power project in Rensselaer, New York would not eliminate the need for additional resources in NYCA in 2012 because the NYCA LOLE level is still in excess of 0.1 days per year in that year. The addition of 500 MWs of resources in Zone J, in response to the request for proposals issued by the NYPA in March 11, 2005 would satisfy resource adequacy needs in 2012 and make 2013 the first year of need in the New York Control Area. Lastly, if 800 MWs of capacity outside the NYCA were made available to New York on a long term basis, the LOLE levels would improve and the compensatory MW levels would be reduced, but it would not change the initial year of need from 2012.

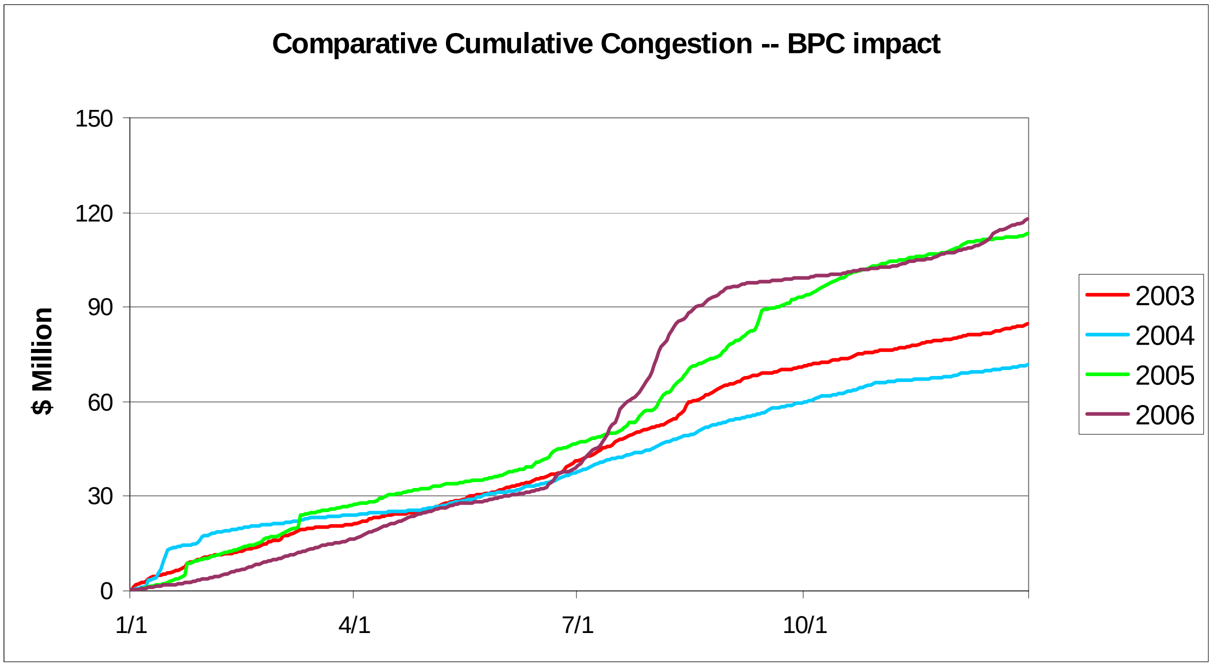
VI. Historic Congestion

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 congestion dollars as determined by the bid-production-cost-savings methodology for the years 2003, 2004, 2005 and 2006. This information is available on the NYISO web site. The results for 2006 are slightly above 2005. 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 2006



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 2006 Total Unhedged Congestion – Top Five Elements

Monitored Facility	% of Annual Total
CENTRAL EAST - VC	12.8
DUNWODIE 345 SHORE_RD 345 1	35.1
PLSNTVLY 345 LEEDS 345 1	33.8
RAINEY 345 DUNWODIE 345 1	3.6
W49TH_ST 345 SPRNBRK 345 1	3.7
Other Facilities	10.9
Total	100.0

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 capacity. Congestion can be relieved by increasing generation or by reducing load.
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

Term	Definition
	Case Resources (SCR).
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 Public Service (DPS):	The New York State Department of Public Service, as defined in the New York Public Service Law, which serves as the staff for the New York State Public Service Commission.

Term	Definition
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).
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-

Term	Definition
	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 Resources (SCR):	A NYISO Demand Response program designed to reduce power usage by businesses and large power users qualified to participate in the NYISO's ICAP market. Companies that sign up as SCRs are paid in advance for agreeing to cut power upon NYISO request.
Study Period:	The 10-year time period evaluated in the RNA.

Term	Definition
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.

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

Section II: Load and Energy Forecast

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II. NYCA Load and Energy Forecast: 2007 – 2017

II.1 **Introduction**

Overview

This section describes the annual energy and seasonal peak demand forecasts for the ten year period beginning with 2007 and extending through 2017. 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 2007 – 2017 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 autumn of 2006. 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.

Table 2.1.1: Summary of Econometric Forecasts

Economic Indicators	Average Annual Growth			
	96-01	01-06	07-12	12-17
Total Employment	1.6%	0.0%	0.7%	0.4%
Gross State Product	4.3%	2.5%	2.1%	1.5%
Population	0.5%	0.2%	0.1%	0.0%
Total Real Income	3.4%	1.4%	1.9%	1.2%
Average Real Electric Price	-1.8%	1.1%	0.9%	0.4%
Summer Peak (actual data through 2006)	1.4%	2.4%	1.2%	1.1%
Annual Energy (actual data through 2006)	1.0%	1.0%	1.3%	1.3%

Employment Trends	Shares of Total Employment			
	2001	2006	2012	2017
Business, Services & Retail	53.3%	53.1%	53.3%	53.4%
Health, Education, Government, Agriculture	33.5%	35.3%	36.0%	36.5%
Manufacturing	13.3%	11.5%	10.7%	10.2%

II.2 **Historical Overview**

NYCA System

Table 2.2.1 shows the New York Control Area's (NYCA) historic peak and energy growth since 1993.

Table 2.2.1: 21-Year Historic Peak and Energy Data and Growth Rates

			Summer Capability Period		Winter Capability Period		
Year	Annual GWh	Percent Growth	Summer MW	Percent Growth		Winter MW	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%
Annual Avg Growth:		0.80%		1.70%			0.40%

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 2.2.2 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 2.2.2: 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%
Avg Ann Growth		0.90%		1.80%		0.60%

Regional Energy and Seasonal Peaks

Table 2.2.3 shows historic and forecast growth rates of annual energy for the different regions in New York. (Actual zonal energy is shown in Table 2.4.1 below.) The West region is NYCA Zones A – E. The East region is Zones F - 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. West is the part of the State that has historically been the most associated with manufacturing, particularly heavy manufacturing. The East region includes Albany, the State capitol, and comprises both the Upper and Lower Hudson Valley areas. The East economy is strongly influenced by state government employment and industries along the Hudson. It has also benefited from the spillover of New York City's economy, as suburban development has spread up the Hudson Valley.

These regions are also separated by the most important electrical interfaces in New York. West is separated from the 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 2.2.3: Historic Weather-Normalized and Forecast Annual Energy

	West	Upper Hudson Valley	Lower Hudson Valley	New York City	Long Island	NYCA
Year	Zones A-E	Zone F	Zones G-H-I	Zone J	Zone K	
1993	56,486	12,130	16,465	41,914	17,822	144,817
1994	55,369	12,492	16,605	43,269	18,003	145,738
1995	54,861	13,273	16,476	43,508	17,918	146,036
1996	56,122	12,883	16,477	44,336	18,130	147,948
1997	57,069	11,836	16,224	44,722	18,310	148,161
1998	56,723	11,839	16,651	46,072	18,701	149,986
1999	57,537	11,917	17,035	47,942	19,329	153,760
2000	57,683	11,500	17,346	49,732	20,324	156,585
2001	55,746	11,427	17,219	50,095	20,699	155,186
2002	56,094	11,278	18,037	51,024	21,434	157,867
2003	55,575	11,097	18,855	51,084	22,089	158,700
2004	55,958	11,201	19,192	52,263	22,493	161,107
2005	57,823	11,576	19,615	53,172	22,591	164,777
2006	56,770	11,428	19,241	53,085	22,271	162,795
2007	56,939	11,523	20,188	53,921	22,643	165,214
2008	57,639	11,480	20,469	54,940	22,912	167,440
2009	58,325	11,563	20,788	55,719	23,075	169,470
2010	59,039	11,600	21,067	56,708	23,330	171,744
2011	59,787	11,641	21,325	57,709	23,570	174,032
2012	60,565	11,694	21,538	58,899	23,919	176,615
2013	61,386	11,752	21,729	59,770	24,122	178,759
2014	62,307	11,823	21,834	60,744	24,418	181,126
2015	63,245	11,901	21,920	61,747	24,731	183,544
2016	64,081	11,971	22,095	62,907	25,202	186,256
2017	64,856	12,025	22,329	63,977	25,541	188,728
96-01	-0.1%	-2.4%	0.9%	2.5%	2.7%	1.0%
01-06	0.4%	0.0%	2.2%	1.2%	1.5%	1.0%
07-12	1.2%	0.3%	1.3%	1.8%	1.1%	1.3%
12-17	1.4%	0.6%	0.7%	1.7%	1.3%	1.3%
96-06	0.1%	-1.2%	1.6%	1.8%	2.1%	1.0%
07-17	1.3%	0.4%	1.0%	1.7%	1.2%	1.3%

Since 2001, LHV has been New York's fastest growing region. While growth in the Lower Hudson Valley is expected to continue at a moderate pace, forecast growth rates in NYC and on Long Island are slightly higher. Growth upstate continues to lag behind the downstate regions.

Table 2.2.4: Weather Normalized Zonal Summer Peaks and Forecast

	West	Upper Hudson Valley	Lower Hudson Valley	New York City	Long Island	NYCA
Year	Zones A-E	Zone F	Zones G-H-I	Zone J	Zone K	
1993	9,479	2,334	3,090	8,380	3,491	26,774
1994	9,329	2,253	3,121	8,578	3,682	26,963
1995	9,348	2,277	3,165	9,024	3,837	27,650
1996	9,394	2,353	3,606	9,020	3,876	28,249
1997	9,399	2,146	3,624	9,670	4,273	29,112
1998	9,795	2,258	3,683	9,797	4,363	29,895
1999	9,472	2,134	3,541	9,900	4,178	29,224
2000	9,718	2,091	4,039	10,100	4,600	30,548
2001	9,477	2,043	3,772	10,280	4,680	30,252
2002	9,428	2,114	4,087	10,460	4,880	30,969
2003	9,673	2,193	4,769	10,600	4,920	32,155
2004	9,308	2,118	4,518	10,740	5,000	31,684
2005	10,198	2,235	4,547	10,900	5,160	33,040
2006	10,812	2,272	4,408	11,300	5,200	33,992
2007	9,713	2,247	4,385	11,780	5,322	33,447
2008	9,828	2,238	4,446	11,975	5,384	33,871
2009	9,942	2,254	4,515	12,150	5,439	34,300
2010	10,068	2,262	4,576	12,325	5,503	34,734
2011	10,199	2,269	4,633	12,480	5,560	35,141
2012	10,339	2,280	4,678	12,645	5,624	35,566
2013	10,487	2,291	4,719	12,780	5,685	35,962
2014	10,658	2,305	4,741	12,915	5,747	36,366
2015	10,831	2,320	4,758	13,030	5,810	36,749
2016	10,980	2,334	4,796	13,140	5,891	37,141
2017	11,116	2,344	4,847	13,360	5,964	37,631
96-01	0.2%	-2.8%	0.9%	2.6%	3.8%	1.4%
01-06	2.7%	2.2%	3.2%	1.9%	2.1%	2.4%
07-12	1.3%	0.3%	1.3%	1.4%	1.1%	1.2%
12-17	1.5%	0.6%	0.7%	1.1%	1.2%	1.1%
96-06	1.4%	-0.3%	2.0%	2.3%	3.0%	1.9%
07-17	1.4%	0.4%	1.0%	1.3%	1.1%	1.2%

The historic weather-normalized peaks are reported in Table 2.2.4. These are developed using results from Transmission Owners and from the NYISO's own methods. 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 2001 through 2006 has been

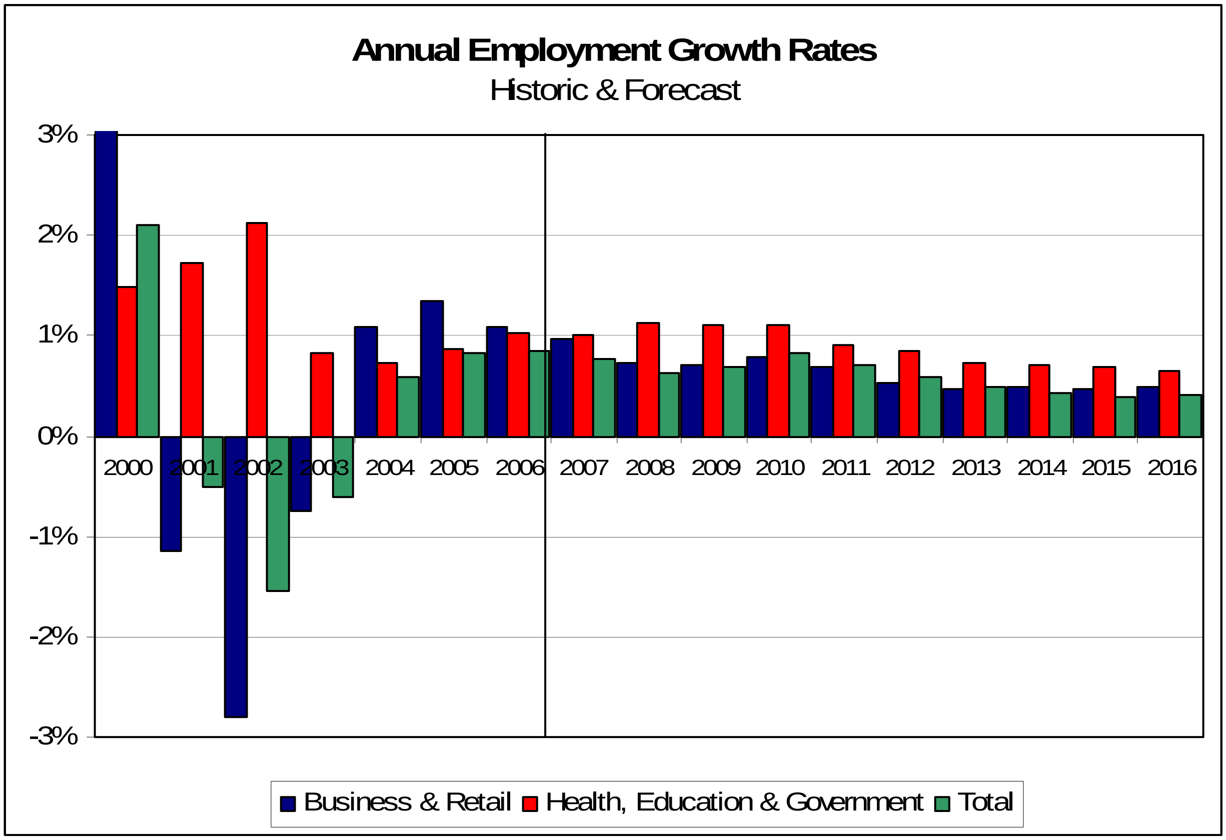
2.4% statewide. This rate of growth is expected to decline during the forecast horizon to a rate of 1.2%.

II.3 Trends Affecting Electricity in New York

II.3.1 2006 Employment Forecast

The 2006 economic outlook for employment projected modest economic growth (about 1.2%) through 2010, followed by slower growth thereafter.

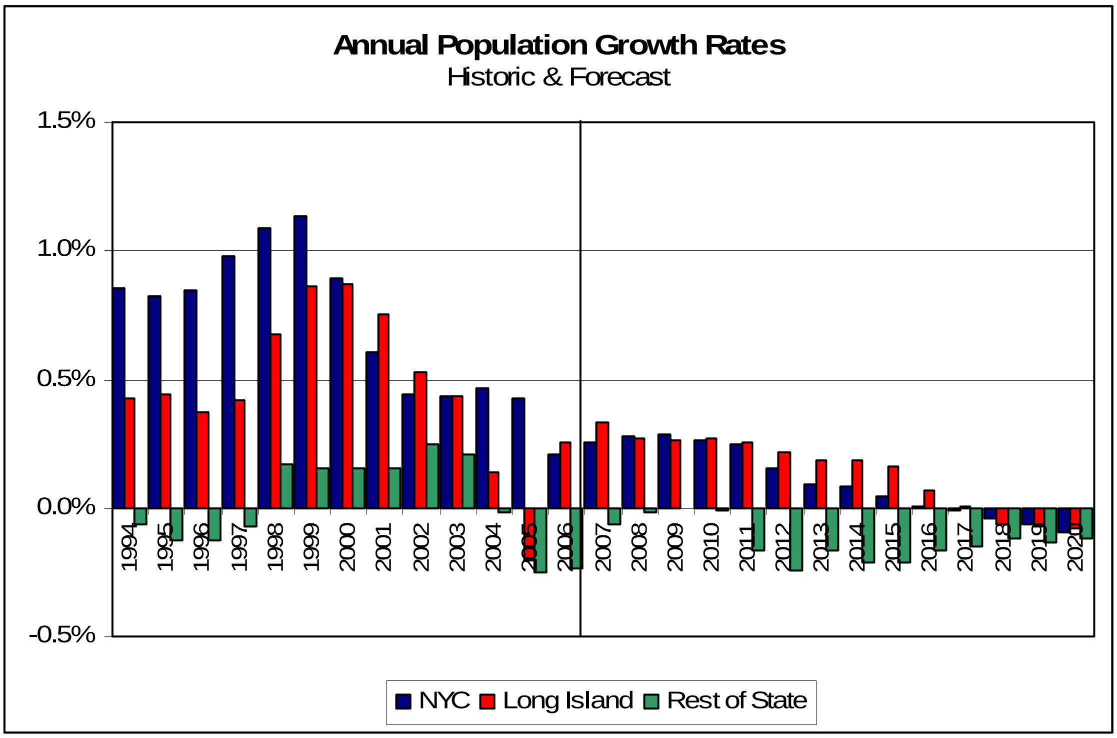
Figure 2.1: Annual Employment Growth Rates



II.3.2 2006 Population Forecast

The 2006 population forecast projects slower population growth in every region. Population decreases occurred upstate in both 2005 and 2006. The upstate population is expected to remain flat through 2010, then decline. In NYC and Long Island, population growth is expected to be small but positive until 2015, after which the population is expected to decline. This is attributed to the relocation of the retirement age population cohort to other states. By 2016, the population in the state as a whole is expected to decrease.

Figure 2.2: Annual Change in Population by Region

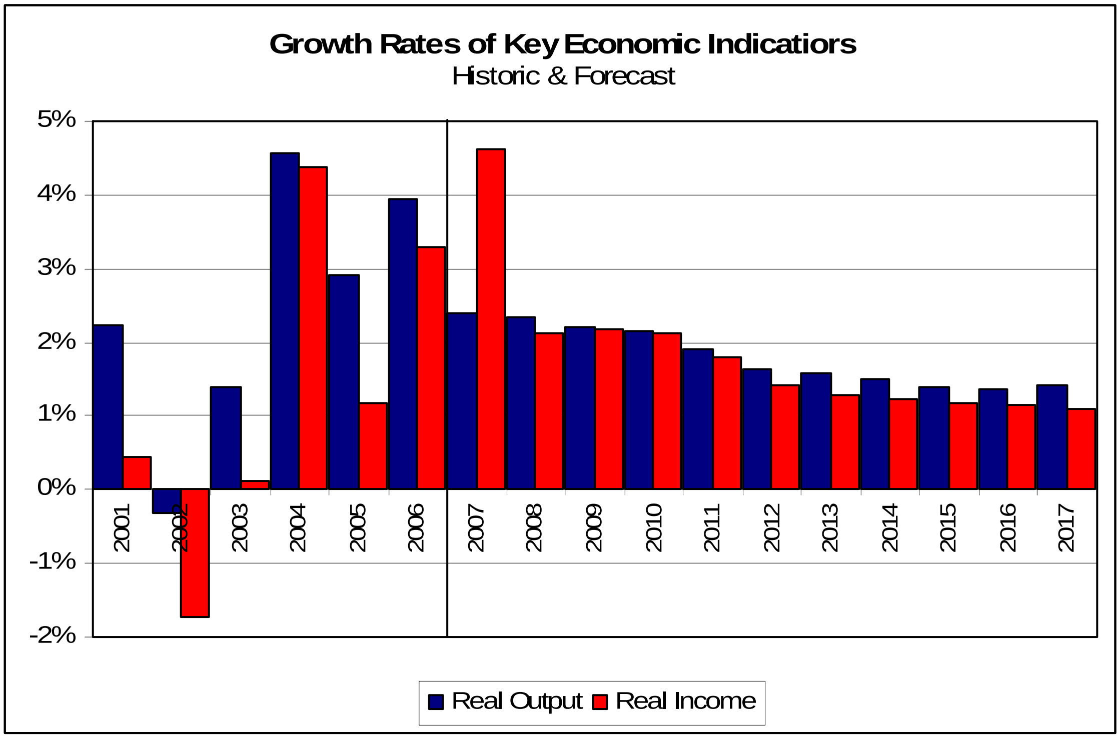


II.3.3 2006 Forecasts of Real Output & Real Income

Two key economic trends in the state are measured by real gross output and total income. One index measures the prosperity of business and the other the prosperity of households. The period from 2001 to 2003 showed erosion in buying power and economic output. Both indicators recovered by 2004 and have led the state to positive economic activity, which then translates into electricity growth.

The 2006 forecast projects real economic output growth in the range of 2% through 2010. Afterwards, economic output continues to grow at a rate of about 1.5%. Real income growth has a similar pattern to output. Both indices are characterized by faster growth in the near term followed by slower growth in the long term.

Figure 2.3: Annual Growth Rates in Real Output and Income



II.3.4 Regional Economic Trends

There is a wide variation in the economic and energy growth throughout the state. The development of long term zonal energy and demand forecasts cannot be performed unless these regional differences are accounted for. Zones A through E are defined as the West region; zones F-I are defined as the East; Zone J corresponds to New York City and Zone K to Long Island. This section discusses the regional variation for a series of economic indicators.

Total Employment & Employment Shares

Historically, employment growth rates have been weakest in the West, at 0.3%. During the forecast, employment in the West is expected to be -0.1%. All other regions have historic growth rates of 0.8% to 1.2% for the same period. In the forecast, the employment growth rate is about the same in NYC but lower in the East and on Long Island. Manufacturing employment decreases in every region. Business/retail/services is 0% in the West and grows elsewhere but at rates lower than historic. The sectors of health, education and government maintain positive growth but always at rates less than historic.

Table 2.3.1: Regional Economic Growth Rates of Key Economic Indicators

West

	Average Annual Growth	
Economic Indicators	1996-2006	2007-2017
Total Employment	0.3%	-0.1%
Gross Product	2.3%	0.5%
Population	-0.2%	0.0%
Total Income	1.6%	1.2%

	Employment Trends	
Employment Trends	1996-2006	2007-2017
Business/Services/Retail	0.6%	0.0%
Health/Educ/Gov/Ag.	1.4%	0.2%
Manufacturing	-2.3%	-1.0%

New York City

	Average Annual Growth	
Economic Indicators	1996-2006	2007-2017
Total Employment	0.8%	0.9%
Gross Product	3.6%	1.9%
Population	0.7%	0.1%
Total Income	2.6%	1.6%

	Employment Trends	
Employment Trends	1996-2006	2007-2017
Business/Services/Retail	1.0%	0.9%
Health/Educ/Gov/Ag.	1.3%	0.9%
Manufacturing	-2.5%	-0.1%

East

	Average Annual Growth	
Economic Indicators	1996-2006	2007-2017
Total Employment	1.0%	0.8%
Gross Product	3.0%	1.4%
Population	0.3%	0.0%
Total Income	2.6%	1.7%

	Employment Trends	
Employment Trends	1996-2006	2007-2017
Business/Services/Retail	1.2%	1.0%
Health/Educ/Gov/Ag.	1.1%	0.7%
Manufacturing	0.0%	-0.2%

Long Island

	Average Annual Growth	
Economic Indicators	1996-2006	2007-2017
Total Employment	1.2%	0.7%
Gross Product	3.4%	1.5%
Population	0.5%	0.2%
Total Income	2.5%	1.4%

	Employment Trends	
Employment Trends	1996-2006	2007-2017
Business/Services/Retail	1.3%	0.6%
Health/Educ/Gov/Ag.	1.6%	1.2%
Manufacturing	0.4%	-0.1%

Regional Forecasts of Real Gross Product

Real gross product is a measure of the economic value of all goods and services produced in a geographic region, after allowing for the effects of inflation. Historically, gross product increased at an annual average rate of about 3.0% to 3.5% per year in every region except the West, where it was only 2.3%. The growth rates range from 1.5% to 1.9% from the East down to Long Island. But in the West, the growth rate is 0.5%.

Regional Forecasts of Population

Historically, population growth rates have been slowing throughout the state. Decreasing population growth rates are expected to continue throughout the forecast horizon and in every region.

Regional Forecasts of Real Total Income

Historically, real income has grown at about 1.6% in the West and at 2.5% every where else. In the forecast, real income growth slows to a rate of 1.2% in the West and about 1.5% elsewhere.

II.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 2006. 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 this earlier data 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. 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 2006. The 2007 summer peak forecast was matched to coincide with the 2007 ICAP forecast.

Figure 2.4: Zonal Energy Shares - Historic and Forecast

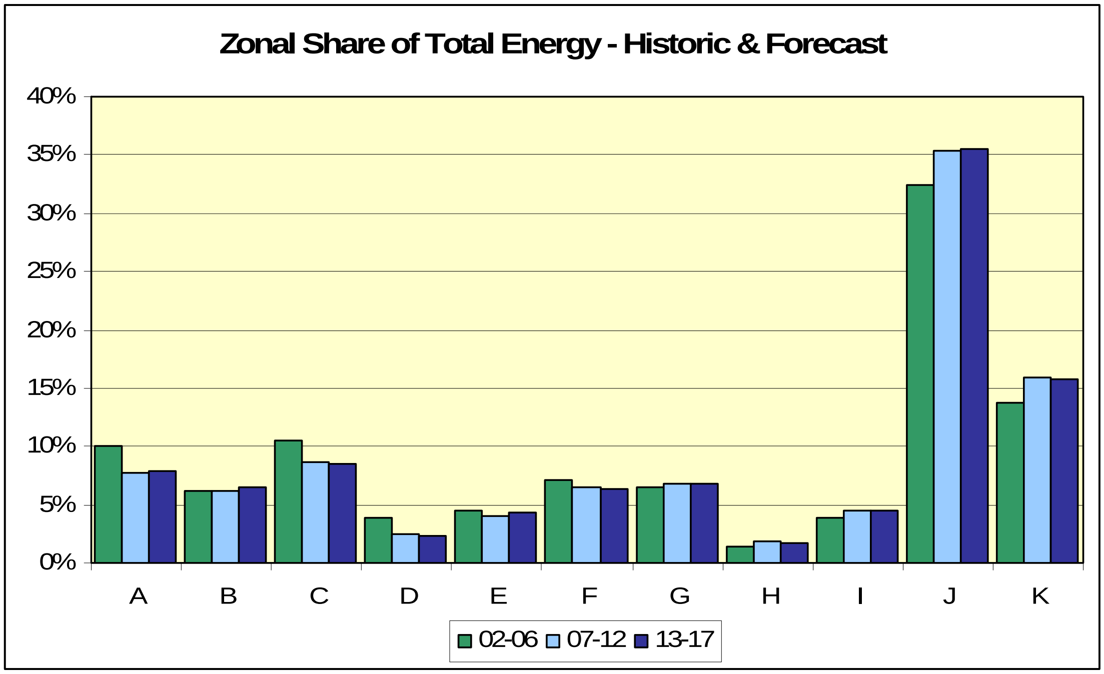


Figure 2.5: Zonal Energy Forecast Growth Rates - 2007 to 2017

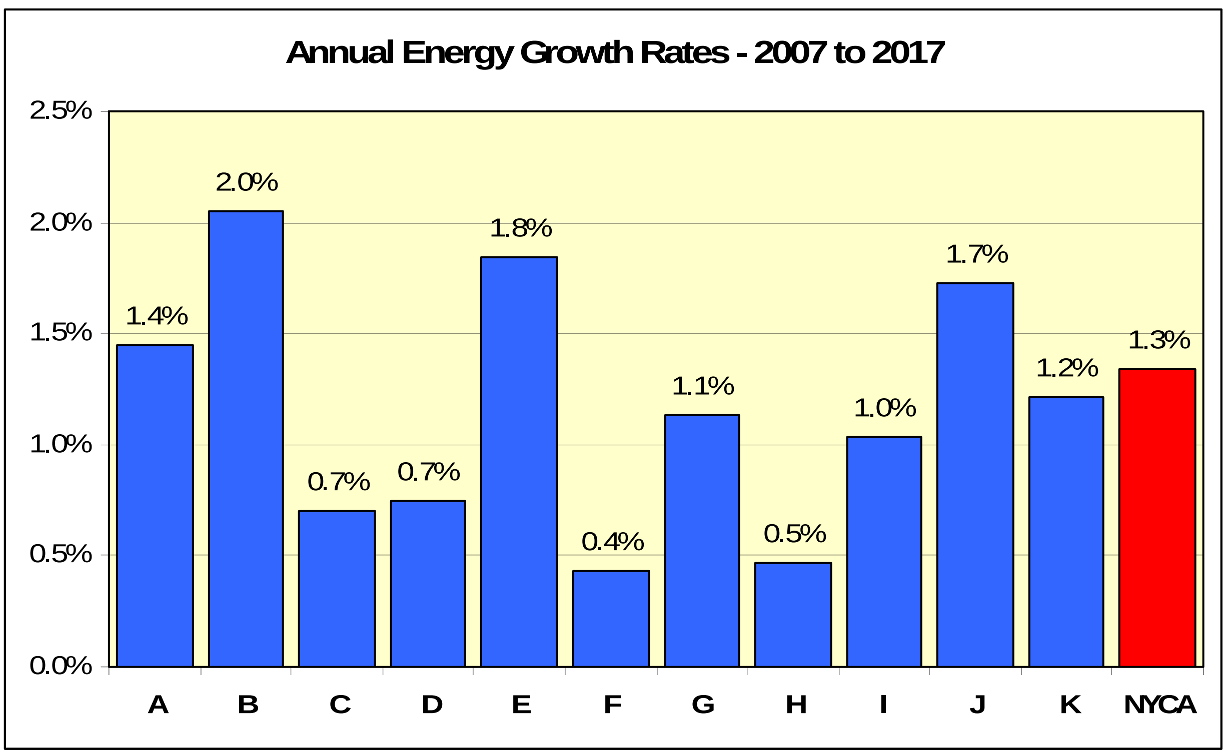


Figure 2.6: Zonal Summer Peak Demand Forecast Growth Rates - 2007 to 2017

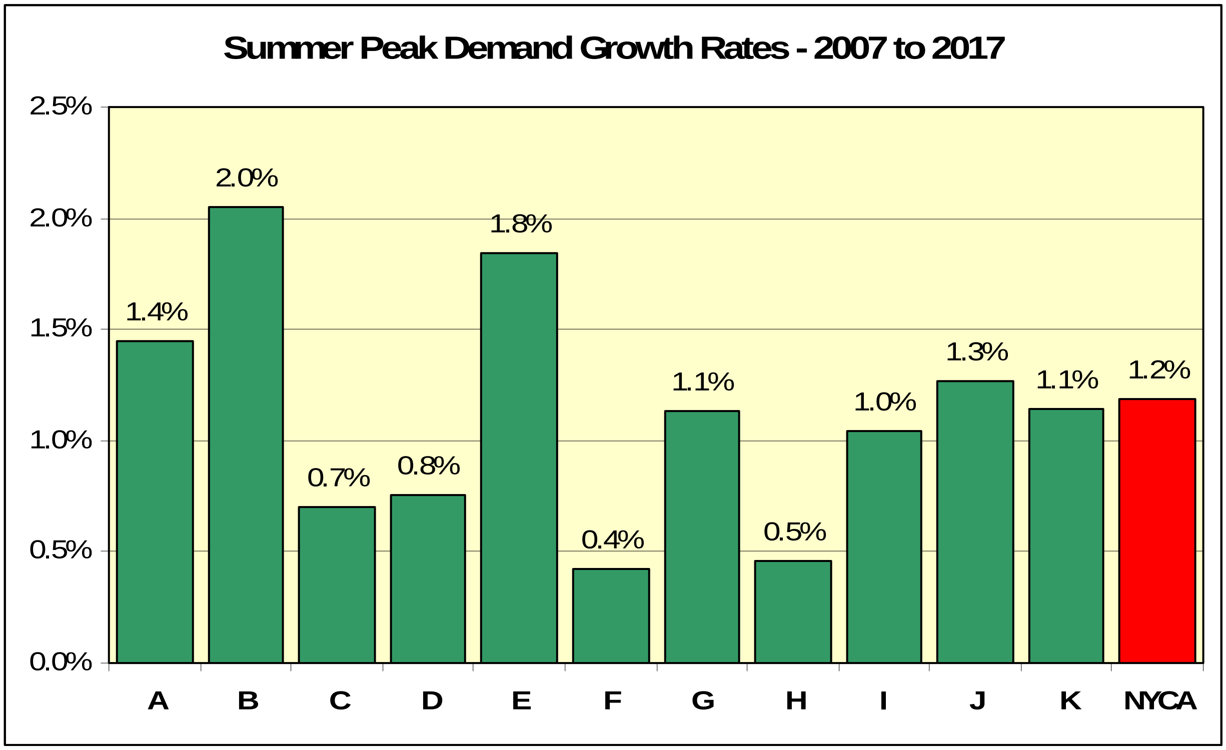


Figure 2.7: Zonal Winter Peak Demand Forecast Growth Rates - 2007 to 2017

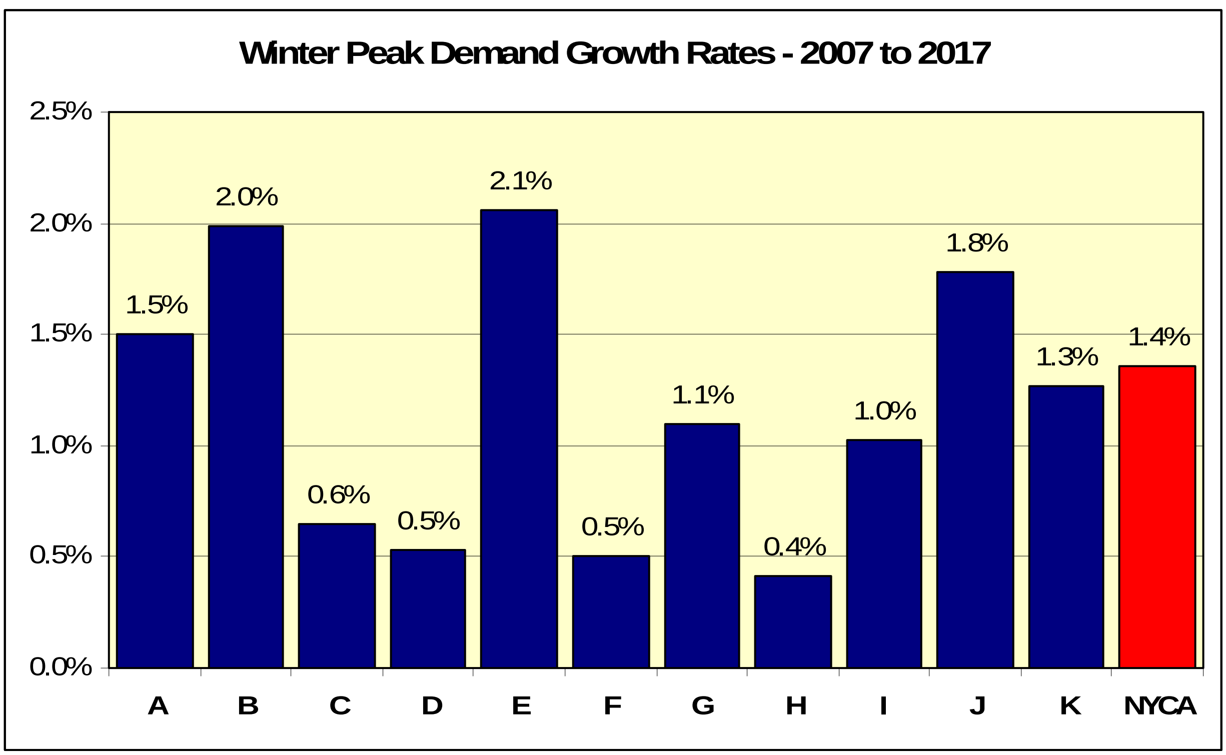


Table 2.4.1: Actual and Forecast Annual Energy by Zone - GWh

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
1997	18,450	8,225	16,223	4,708	9,201	11,777	8,697	1,954	5,436	44,463	18,241	147,374
1998	18,207	8,408	14,878	5,488	9,545	11,781	8,956	1,958	5,702	46,076	18,856	149,855
1999	18,210	8,611	15,713	6,184	8,956	11,994	9,266	1,894	6,060	48,281	19,671	154,841
2000	16,785	9,635	16,182	6,527	8,182	11,398	9,304	1,942	5,929	49,183	20,072	155,140
2001	16,209	9,661	16,034	6,374	7,403	11,429	9,396	2,003	5,782	50,227	20,723	155,240
2002	16,355	9,935	16,356	6,450	7,116	11,302	9,970	2,162	5,962	51,356	21,544	158,507
2003	15,942	9,719	16,794	5,912	6,950	11,115	10,451	2,219	6,121	50,829	21,960	158,013
2004	16,102	9,888	16,825	5,758	7,101	11,161	10,696	2,188	6,216	52,073	22,203	160,211
2005	16,498	10,227	17,568	6,593	7,594	11,789	10,924	2,625	6,435	54,007	22,948	167,208
2006	15,998	10,003	16,839	6,289	7,339	11,337	10,417	2,461	6,274	53,096	22,185	162,237
2007	15,654	10,472	17,181	6,783	6,849	11,523	10,770	2,677	6,741	53,921	22,643	165,214
2008	15,738	10,731	17,353	6,995	6,822	11,480	10,909	2,719	6,841	54,940	22,912	167,440
2009	15,855	10,959	17,518	7,147	6,846	11,563	11,050	2,772	6,966	55,719	23,075	169,470
2010	16,032	11,208	17,629	7,227	6,943	11,600	11,199	2,805	7,063	56,708	23,330	171,744
2011	16,261	11,454	17,733	7,285	7,054	11,641	11,345	2,830	7,150	57,709	23,570	174,032
2012	16,504	11,689	17,824	7,323	7,225	11,694	11,479	2,840	7,219	58,899	23,919	176,615
2013	16,776	11,915	17,939	7,346	7,410	11,752	11,602	2,844	7,283	59,770	24,122	178,759
2014	17,149	12,137	18,070	7,295	7,656	11,823	11,712	2,818	7,304	60,744	24,418	181,126
2015	17,548	12,357	18,199	7,230	7,911	11,901	11,820	2,785	7,315	61,747	24,731	183,544
2016	17,855	12,583	18,318	7,241	8,084	11,971	11,935	2,784	7,376	62,907	25,202	186,256
2017	18,077	12,827	18,420	7,307	8,225	12,025	12,051	2,806	7,472	63,977	25,541	188,728

Table 2.4.2: Actual and Forecast Summer Coincident Peak Demand - MW

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
1997	2,837	1,529	2,718	559	1,411	2,188	2,109	349	1,198	9,596	4,205	28,699
1998	2,643	1,442	2,381	623	1,465	1,998	2,045	419	1,168	9,581	4,396	28,161
1999	2,769	1,564	2,615	669	1,273	2,169	2,321	429	1,277	10,467	4,758	30,311
2000	2,462	1,644	2,459	757	1,185	1,872	2,176	417	1,265	9,771	4,130	28,138
2001	2,519	1,889	2,719	780	1,260	2,068	2,361	537	1,347	10,602	4,900	30,982
2002	2,631	1,842	2,787	777	1,252	2,073	2,076	498	1,335	10,321	5,072	30,664
2003	2,510	1,782	2,727	671	1,208	2,163	2,146	498	1,395	10,240	4,993	30,333
2004	2,493	1,743	2,585	644	1,057	1,953	2,041	475	1,280	9,742	4,420	28,433
2005	2,726	1,923	2,897	768	1,314	2,164	2,236	592	1,409	10,810	5,236	32,075
2006	2,735	2,110	3,128	767	1,435	2,380	2,436	596	1,467	11,300	5,585	33,939
2007	2,593	2,017	2,925	811	1,367	2,247	2,262	618	1,505	11,780	5,322	33,447
2008	2,607	2,067	2,956	837	1,361	2,238	2,291	627	1,528	11,975	5,384	33,871
2009	2,626	2,111	2,984	855	1,366	2,254	2,321	639	1,555	12,150	5,439	34,300
2010	2,656	2,159	3,003	864	1,386	2,262	2,352	647	1,577	12,325	5,503	34,734
2011	2,694	2,206	3,020	871	1,408	2,269	2,383	653	1,597	12,480	5,560	35,141
2012	2,734	2,251	3,036	876	1,442	2,280	2,411	655	1,612	12,645	5,624	35,566
2013	2,779	2,295	3,055	879	1,479	2,291	2,437	656	1,626	12,780	5,685	35,962
2014	2,841	2,338	3,078	873	1,528	2,305	2,460	650	1,631	12,915	5,747	36,366
2015	2,907	2,380	3,100	865	1,579	2,320	2,483	642	1,633	13,030	5,810	36,749
2016	2,958	2,423	3,120	866	1,613	2,334	2,507	642	1,647	13,140	5,891	37,141
2017	2,994	2,470	3,137	874	1,641	2,344	2,531	647	1,669	13,360	5,964	37,631

Table 2.4.3: Actual and Forecast Winter Coincident Peak Demand

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
1997-98	2,752	1,289	2,337	651	1,516	1,816	1,539	401	787	6,491	2,866	22,445
1998-99	2,616	1,273	2,330	849	1,555	2,030	1,712	369	852	7,161	3,131	23,878
1999-00	2,454	1,499	2,497	870	1,443	1,906	1,726	420	976	7,072	3,177	24,041
2000-01	2,489	1,510	2,506	880	1,263	1,798	1,690	366	877	7,206	3,188	23,774
2001-02	2,248	1,455	2,340	843	1,129	1,742	1,626	344	860	7,013	3,198	22,798
2002-03	2,418	1,507	2,679	925	1,223	1,903	1,590	437	927	7,373	3,472	24,454
2003-04	2,433	1,576	2,755	857	1,344	1,944	1,720	478	981	7,527	3,647	25,262
2004-05	2,446	1,609	2,747	918	1,281	1,937	1,766	474	939	7,695	3,729	25,541
2005-06	2,450	1,544	2,700	890	1,266	1,886	1,663	515	955	7,497	3,581	24,948
2006-07	2,382	1,566	2,755	921	1,274	1,888	1,638	504	944	7,680	3,505	25,057
2007-08	2,304	1,639	2,651	988	1,059	1,866	1,706	427	1,068	7,980	3,636	25,324
2008-09	2,321	1,674	2,676	1,009	1,063	1,880	1,728	436	1,088	8,111	3,762	25,748
2009-10	2,347	1,712	2,693	1,020	1,078	1,886	1,751	441	1,103	8,237	3,780	26,048
2010-11	2,380	1,749	2,709	1,029	1,096	1,892	1,774	445	1,116	8,344	3,807	26,341
2011-12	2,416	1,785	2,723	1,034	1,122	1,901	1,795	446	1,127	8,451	3,856	26,656
2012-13	2,455	1,819	2,740	1,037	1,151	1,911	1,814	447	1,137	8,758	3,901	27,170
2013-14	2,510	1,853	2,760	1,030	1,189	1,922	1,831	443	1,140	8,894	3,950	27,522
2014-15	2,568	1,887	2,780	1,021	1,228	1,935	1,848	438	1,142	9,044	4,002	27,893
2015-16	2,613	1,922	2,798	1,022	1,255	1,946	1,866	438	1,152	9,217	4,009	28,238
2016-17	2,646	1,959	2,814	1,032	1,277	1,955	1,884	441	1,167	9,367	4,072	28,614
2017-18	2,674	1,996	2,828	1,042	1,298	1,963	1,902	445	1,183	9,522	4,125	28,978

Section III: Transmission System Assessment

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III. 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.

III.1 Development of RNA study case System Cases

Table 3.1.1 below summarizes the Area load plus losses.

Table 3.1.1: Area Load plus Losses (MW)

	2008	2009	2010	2011	2012
LOAD+LOSS MW					
WEST	2625	2659	2683	2727	2772
GENESSEE	2073	2126	2168	2226	2293
CENTRAL	3138	3147	3171	3188	3212
NORTH	836	854	863	871	881
MOHAWK	1375	1359	1373	1407	1413
CAPITAL	2243	2260	2275	2278	2287
HUDSON	2396	2445	2479	2513	2541
MILLWOOD	723	734	739	740	753
DUNWOODIE	1535	1550	1566	1581	1605
NYC	11866	12041	12069	12307	12479
LISLAND	5383	5467	5532	5592	5645
	34191	34642	34917	35430	35882

Table 3.1.2 below summarizes the Area generation dispatched for the RNA study case system.

Table 3.1.2: Generation Dispatched (MW)

	2008	2009	2010	2011	2012
GEN DISP MW					
WEST	4577	4694	4678	4787	5194
GENESSEE	688	701	704	715	660
CENTRAL	5819	5889	5960	6006	6168
NORTH	1118	1127	1110	1150	1231
MOHAWK	834	965	849	985	724
CAPITAL	3336	3394	3599	3497	3614
HUDSON	2573	2619	2640	2672	3095
MILLWOOD	1848	1865	1884	1903	2215
DUNWOODIE	3	3	3	3	3
NYC	7214	7120	7161	7339	6819
LISLAND	3783	3867	3932	3992	3877
	31792	32243	32518	33047	33599

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

III.1.1 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 3.1.3 illustrates the emergency thermal transfer limits for the RNA study case system conditions:

Table 3.1.3: Emergency Thermal Transfer Limits[10]

	2009		2010		2011		2012	
Dysinger East	3125	1	3150	1	3150	1	3150	1
West Central	1725	1	1700	1	1650	1	1600	1
Moses South	2550	7	2550	7	2550	7	2550	7
Volney East	4270	10	4270	10	4270	10	4270	10
Total East	6575	2	6450	2	6550	2	6425	2
Central East	2890	3	2897	3	2858	3	2847	3
Central East+Fras-gilb	3350	3	3175	2	3250	2	3100	2
CE Group	5325	3	5125	2	5200	2	5050	2
F to G	3475	4	3475	4	3475	4	3475	4
UPNY-SENY Open	5150	4	5150	4	5150	4	5150	4
UPNY-ConEd Open	6850	5	6850	5	6775	5	6825	5
Millwood South Closed	8450	8	8450	8	8450	8	8450	8
Dunwoodie-South Plan	5215	9	5690	6	5690	6	5690	6
I to J	4000	9	4400	6	4400	6	4400	6
LI Import	2090	11	2090	11	2090	11	2090	11

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

Table 3.1.3 Continued

	Limiting Facility	Limiting Rating	Contingency
1	Niagara-Rochester 345 kV	1685	L/O Kintingh-Rochester 345 kV
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	Fraser-Coopers Corners 345 kV	1207	Pre-disturbance
11	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.

III.1.2 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 3.1.4 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 3.1.4: Emergency Voltage Transfer Limits[11]

	2009		2010		2011		2012	
Dysinger East	2600	1	2600	1	2600	1	2600	1
West Cent	1725	1	1700	1	1650	1	1600	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	3150	4	3150	4	3150	4	3150	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	5440	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

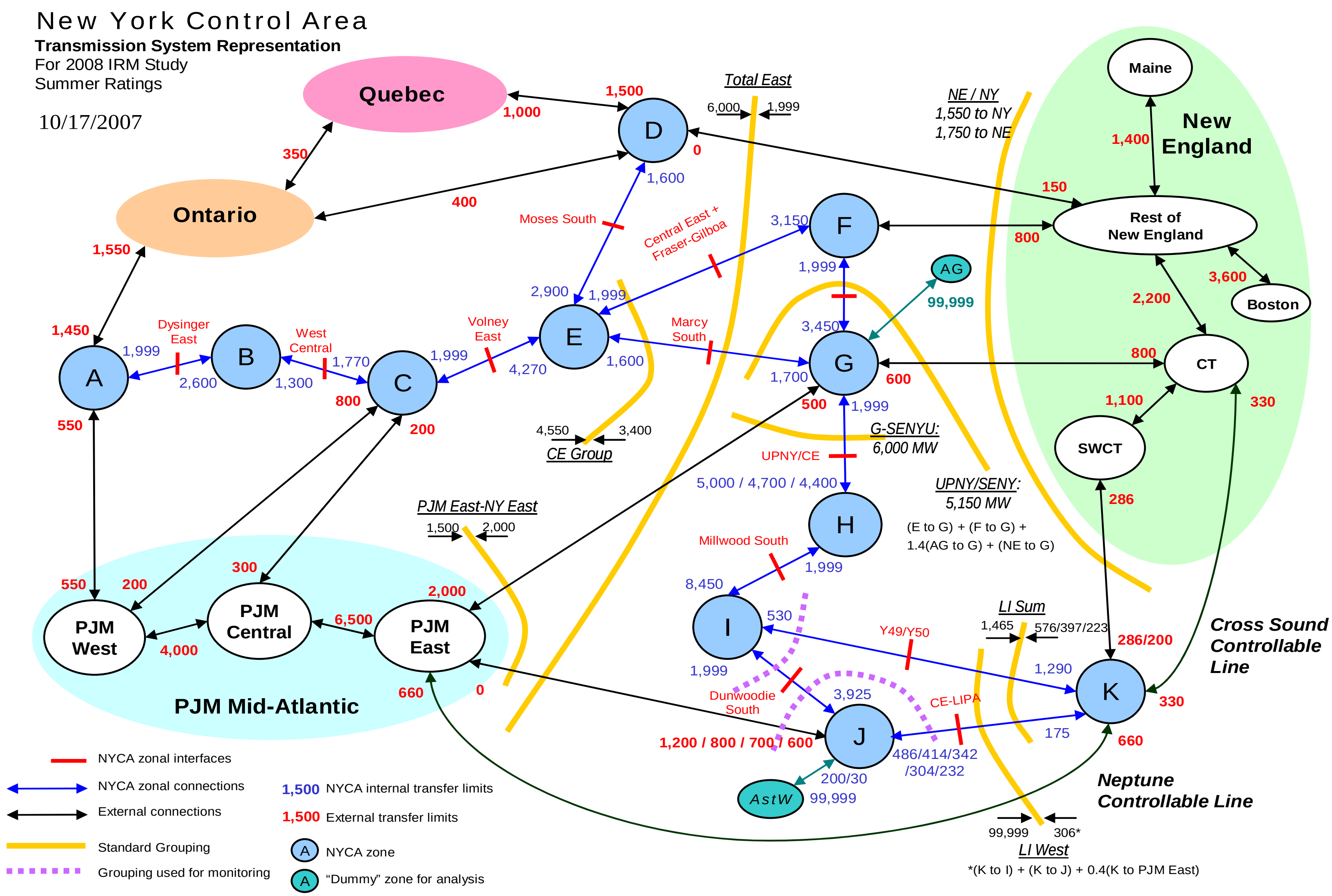
III.2 Development of the MARS Topology

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

[11] Ibid

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.

Figure 1: 2007 IRM Study MARS Topology



The following presents the impact on LOLE of alternative transmission transfer limits.

III.2.1 Free Flow Transmission Model

Table 3.1.5 illustrates the NYCA LOLE for an unconstrained free-flowing transmission model. Initially, in 2007 the RNA study case System NYCA Capacity Reserve Margin initially is well above the 18% IRM and the Locational Requirements of 80% In City and 99% for Long Island. The continued growth in load in South East New York, generation retirements, and the limited number of new generating units that are presently under construction would reduce the NYCA Reserve Margin to below 114% and increase the NYCA LOLE to .12 by 2012.

Table 3.1.5 LOLE for the RNA study case System Based on Free Flowing Conditions

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
AREA-A										
AREA-B	0.00	0.00	0.03	0.05	0.10	0.17	0.28	0.40	0.52	0.58
AREA-C										
AREA-D								0.00		
AREA-E	0.00	0.00	0.01	0.01	0.04	0.06	0.11	0.18	0.26	0.27
AREA-F					0.00	0.00	0.00	0.00	0.00	0.00
AREA-G			0.00	0.00	0.00	0.01	0.01	0.02	0.04	0.04
AREA-H										
AREA-I	0.00	0.00	0.03	0.05	0.11	0.18	0.29	0.42	0.57	0.63
AREA-J	0.00	0.00	0.03	0.05	0.11	0.20	0.32	0.47	0.62	0.68
AREA-K				0.00	0.00	0.01	0.02	0.03	0.08	0.12
NYCA	0.00	0.00	0.04	0.05	0.12	0.21	0.33	0.48	0.64	0.71

III.2.2 CRPP Transmission Constraint Model with Thermal Limits Only

Table 3.1.6 below illustrates the LOLE results utilizing the through-time thermal transfer limits for the CRPP Transmission Constraint Model.

Table 3.1.6 LOLE Results for the RNA study case System Based on Thermal Transfer Limits

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
AREA-A										
AREA-B	0.00	0.00	0.03	0.04	0.08	0.13	0.20	0.30	0.41	0.48
AREA-C										
AREA-D								0.00		
AREA-E	0.00	0.00	0.01	0.01	0.03	0.05	0.09	0.16	0.23	0.25
AREA-F					0.00	0.00	0.00	0.00	0.00	0.00
AREA-G			0.00	0.00	0.00	0.01	0.02	0.03	0.04	0.04
AREA-H										
AREA-I	0.01	0.01	0.06	0.08	0.18	0.29	0.42	0.59	0.76	0.82
AREA-J	0.00	0.00	0.06	0.80	0.18	0.31	0.46	0.65	0.81	0.85
AREA-K	0.00	0.00	0.01	0.01	0.03	0.04	0.07	0.13	0.23	0.26
NYCA	0.01	0.01	0.07	0.09	0.19	0.32	0.47	0.67	0.85	0.90

III.2.3 CRPP Transmission Constraint Model with Thermal and Voltage Limits

Table 3.1.7 below illustrates the LOLE results utilizing the through-time thermal and voltage transfer limits for the CRPP Transmission Constraint Model.

Table 3.1.7 LOLE for the RNA study case Transfer Limits[12]

Area/Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
AREA-A										
AREA-B			0.03	0.04	0.08	0.13	0.20	0.30	0.41	0.48
AREA-C										
AREA-D										
AREA-E			0.01	0.01	0.03	0.05	0.09	0.16	0.23	0.25
AREA-F										
AREA-G						0.01	0.02	0.03	0.04	0.04
AREA-H										
AREA-I	0.01	0.01	0.06	0.08	0.18	0.30	0.42	0.59	0.76	0.82
AREA-J		0.01	0.06	0.08	0.18	0.32	0.46	0.65	0.81	0.85
AREA-K			0.01	0.01	0.03	0.06	0.07	0.13	0.23	0.26
NYCA	0.01	0.01	0.07	0.09	0.19	0.34	0.47	0.67	0.85	0.90

[12] The RNA study case transfer limits apply the most restrictive limit determined from the power flow and dynamics analysis based on thermal, voltage and stability reliability criteria.

III.3 **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.

III.4 **N-1-1 Assessment**

As part of the transmission security analysis of the NYISO BPTFs, it was determined that with load growth, unit retirements, and limited resource additions, a more comprehensive N-1-1 assessment may become necessary. As indicated, the assessment is part of a transmission security analysis. It was not used in the determination of the emergency transfer limits. Given the extensive requirements of this type of study, the NYISO tested a limited number of critical elements and contingencies, many of which were identified by National Grid and are listed Appendix 5.3 in accordance with NPCC A-2 and the NYSRC reliability rules. Based on the study case conditions, no violations on the BPTF were identified from this analysis. However, the NYISO observed that many non-BPTFs exceeded their equipment ratings on the local transmission system for the BPTF contingencies listed in the Supporting Document. Under high load conditions, the NYISO observed both BPTF and non-BPTFs violations due to BPTF contingencies. The area around the Gardenville substation was identified as being more sensitive to the load levels evaluated than to the transfer levels evaluated. Potential violations on non-BPTFs are to be addressed by the TOs. NYISO will conduct a more thorough N-1-1 transmission security analysis in support of the upcoming Annual Transmission Review (ATR).

Supporting Document Appendices

(Available upon request)*

1.0 Short Circuit Methodology

1.1 Short Circuit Results

2.0 Load and Capacity Tables by Zone

3.1 Capacity (by type) and Load by Year for NYCA

3.2 Generation by Zone, by Year, by Type

4.1 Resource Adequacy Assessment

4.2 LOLE Results

5.0 Transmission Adequacy Assessment

5.1 Interface Definitions

5.2 Power Flow Contingency Lists

5.3 Assessment Results

* Email request to idunn@nyiso.com