2nd Draft 10/18/07

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Comprehensive Reliability Planning Process (CRPP)

2008 Reliability Needs Assessment

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October 18, 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 electric utility companies, which continue to deliver electricity to customers and have the obligation to provide safe and reliable services. To maintain the system's long-term reliability, those resources must be readily available or in development to meet future needs.

Deleted: The introduction of competition in the electric industry in New York State and in many parts of the Northeast separated the costs of utilities' services into distinct producers and marketers, and led to the unbundling of power generation and transmission development. As a result, the State's electric utilities no longer conduct vertically-integrated planning through which generation and transmission plans are tightly coordinated. ¶

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With these goals in mind, the NYISO, in conjunction with stakeholders, developed and implemented in 2005 its Comprehensive Reliability Planning Process (CRPP), which is contained in Attachment Y of the NYISO's Open Access Transmission Tariff (OATT). The NYISO's CRPP is an annual, ongoing process – developed with NYISO stakeholders – to assess and establish the 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 ten year Study Period, the NYISO will designate one or more Responsible Transmission Owners (TOs), who are responsible for the development of a regulated back-stop solutions to address the identified need. 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 of compensatory Megawatt (MW) or Megavar (MVAR) amounts 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. 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.

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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. Besides addressing reliability, the CRPP is also designed to provide information that is both informative and of value to the New York wholesale electricity marketplace.

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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 and concludes with the latest information available regarding historic congestion, which is provided to the market place for informational purposes.

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II. CRP Process and Summary of Prior Plans

The following discussion presents an overview of the CRPP followed by a summary of the CRP 2005 and 2007 plans and current status. A detailed discussion of the CRPP including applicable reliability criteria are 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, but are briefly summarized below.

There are two different approaches to analyzing a bulk power system's 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 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 refers 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 ten (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.

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The CRPP is anchored in the market-based philosophy of the NYISO and its Market Participants, which posits that market solutions should be the first choice to meet the identified Reliability Needs. In the event that market-based solutions do not materialize to meet a reliability need in a timely manner, the NYISO designates the Responsible TO or 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

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

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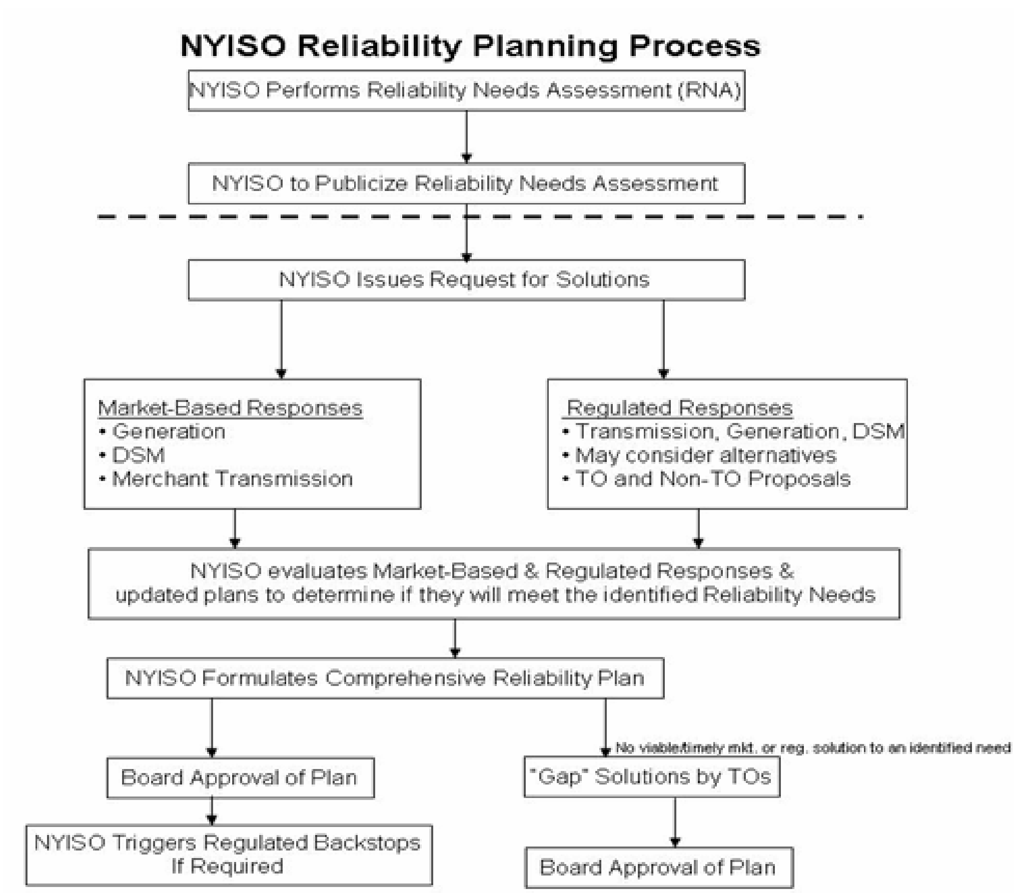
identified Reliability Needs and by regulators to be more desirable, may displace some or all of the TOs' regulated backstop solutions. Under the CRPP, the NYISO also has an affirmative obligation to report historic congestion on the transmission system and whether the marketplace is responding appropriately 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 itself possess the authority to license or to construct projects to respond to Reliability Needs, and the ultimate approval of those projects lies with regulatory agencies such as the Federal Energy Regulatory Commission (FERC), the New York Public Service Commission, 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



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B. Summary of Prior CRPP

Planning is an ongoing process and this is the third cycle of the CRPP process since the NYISO's planning process was approved by FERC in December of 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 ten year Study Period ending in 2015. Market solutions totaled 1,200 MW with the balance provided by updated TO 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 ten year Study Period ending in 2016. Market solutions totaling 3,007 MW were submitted to meet these needs. As a result of TO plans and proposed market solutions, the NYISO has not had to trigger any regulated backstop solutions to meet Reliability Needs. However, 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. The above status 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 further that there are other projects in the NYISO queue that have not been offered as market solutions that are moving forward with the development of their projects. For example, the NYISO has learned that the Besicorp-Empire power project located in Rensselaer, New York, which is projected to add in excess of 600 MW of capacity to the New York Bulk Power System, has recently begun construction.

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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.

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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

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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 Comprehensive Reliability Planning Process (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 both 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 2006 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; 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 Case. In addition, 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.

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

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

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Table 3.1: Unit Retirements *

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Unit\ Year	2008	2010	2013	
Lovett 5	176.2			
Russell 1 – 4	236.4			
Poletti		888.3		
NRG Astoria Units 5,7,8,10 -13			112.7	
Total	412.6	888.3	112.7	1,413.6

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* 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	85	30	340	455

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	38,396	38,396	38,396	38,396	38,396
-SCR	1323	1323	1323	1323	1323	1323	1323	1323	1323	1323
Total	40,240	40,580	39,719	39,719	39,719	39,719	39,719	39,719	39,719	39,719
Zone J										
-Capacity	10,019	10,019	9,128	9,128	9,128	9,128	9,128	9,128	9,128	9,128
-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	9,596	9,596	9,596	9,596	9,596
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 %	110.4 %	109.2 %	108.1 %	106.9 %	105.5 %
Zons J Res./Load Ratio	87.6%	86.3%	77.9%	76.9%	75.9%	75.1%	74.3%	73.6%	73.0%	71.8%
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(3) and does not include external resources of 2755 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 and are supported by generation in neighboring control areas.

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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. 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 Bulk Power Transmission Facilities (BPTFs) that are 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 and the second is to evaluate the adequacy of the system subject to the security constraints.

Security is more of 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 both 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.

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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 State Power System is planned (or designed) to meet the 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 installed capacity requirement. The NYISO conducts transmission adequacy and resource adequacy assessment jointly.

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As violations are found, compensatory MW needs for the 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 needed to match the level of compensatory MW needs identified will

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vary. In addition, 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 New York Control Area.

IV. Reliability Needs Assessment

A. Overview

Load growth over the last several years in excess of two percent per year in load Zones G through K has resulted in increasing demands being placed on the transmission system to meet capacity and energy needs in this area. 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 UPNY – SENY[3] transmission interface. In addition, approximately 52% 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.

The demands that are increasingly being placed 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 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. However, 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 the table below

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

Interface	Year				
	2008	2009	2010	2011	2012
Central East	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

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

Interface	Year				
	2008	2009	2010	2011	2012
Central East	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.

[3] UPNY or Upstate New York is defined as load Zones A through F while SENY or Southeast New York is defined as load Zones G through K

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

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Interface	Year				
	2008	2009	2010	2011	2012
Central East	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}

T = Thermal; V = Voltage, C = Combined

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Below are the principal findings of the Reliability Needs Assessment for the Study Period identified in section three, 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 a 1,000 MW when compared to RNA 2007. Also, the needs assessment evaluated the following scenarios:

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

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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 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[4] assessment may become necessary. Given the extensive requirements of this type of study,

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[4] 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.

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NYISO tested a limited number of critical elements[5] 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. Nevertheless, the NYISO observed that many non-BPTFs exceeded their equipment ratings on local transmission systems that may impact the BPTFs under different study case conditions[7]. Potential violations on non-BPTFs are to be addressed by the TOs. NYISO will conduct further N-1-1 transmission security analysis in support of the upcoming Annual Transmission Review (ATR).

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Deleted: N-1-1 criteria violations.[6] Using

Deleted: list of critical elements, a limited N-1-1 testing was performed. No

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 years' RNA. 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

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Resource and transmission adequacy is evaluated for the entire ten years of the Study Period with transmission security problems assumed to be solved. The analysis encompasses the Five Year Base Case and the second five years. The RNA study case transfer limits (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[8] results for the entire ten-year RNA study case are summarized in the Table 4.4.

[5] Critical elements were identified by National Grid and are listed in the Supporting Document.

[7] The area around the Gardenville substation was identified as having numerous non BPTFs violations that were more sensitive to the load levels evaluated than transfer levels evaluated. Results from the higher load level that was evaluated are presented in the scenario analysis Section D. 1.

[8] It should be noted, 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. The MARS logic prorates capacity to zones if more than one zone is capacity deficient.

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Table 4.4: LOLE for the RNA Study Case Transfer Limits

Area/Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
AREA-B	0.00	0.00	0.03	0.04	0.08	0.13	0.20	0.30	0.41	0.48
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	0.00	0.00	0.00	0.00
AREA-G	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.04	0.04
AREA-I	0.01	0.01	0.06	0.08	0.18	0.30	0.42	0.59	0.76	0.82
AREA-J	0.00	0.01	0.06	0.08	0.18	0.32	0.46	0.65	0.81	0.85
AREA-K	0.00	0.00	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 upon 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 are: (1) 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, (2) the Zone I to Zone J voltage limit increases to its thermal limit when flows on the Zone I to Zone K interface can be reduced, (3) increased availability of resources that can be delivered to voltage- constrained zones, and (4) the LOLE violations are more a function of resource deficiencies rather than transmission constraints. The detailed results are presented in the 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	0.00	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
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	0.30	0.42	0.59	0.76	0.82
AREA-J	0.00	0.01	0.06	0.08	0.18	0.32	0.46	0.65	0.81	0.85
AREA-K	0.00	0.00	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. Unconstrained or Free Flowing Transmission Sensitivity

Below Table 4.6 lists the LOLE results for the NYCA unconstrained internal transmission interface sensitivity, also known as the “free flowing” sensitivity. The “free flowing” sensitivity assumes that the NYCA 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 as well as 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	0.00	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

5. Reliability Needs Summary

Figure 4.1 below presents a summary of the LOLE results for the RNA study case, as well as 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 that there is a need for resources. These results indicate the first definitive year of need is 2012 for the RNA study case, for 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 study case and 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 for 2012 results from a statewide resource adequacy need as well as from transmission constraints. Figure 4.1 presents a summary of the results.

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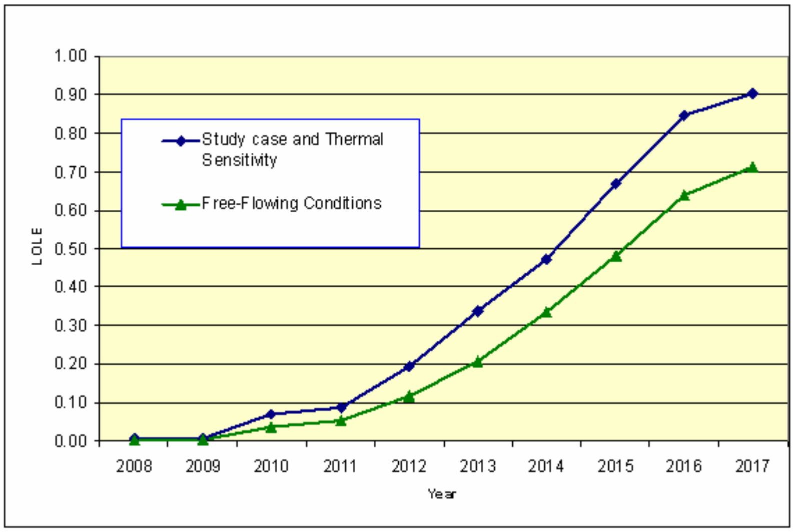
Figure 4.1: Summary of the LOLE Results – Thermal and "Free Flowing" Sensitivities



C. Compensatory MW

After the reliability needs are initially identified as deficiencies in meeting reliability criteria, the NYISO translates those deficiencies into compensatory MW 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. It is not meant to reflect specific facilities or types of resources that may be offered as solutions to reliability needs. Accordingly, compensatory MW may reflect either capacity, demand management or transmission additions.

For this analysis, the amount and effective location of the compensatory MW is determined by testing combinations of generic 250 MW 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 MW 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. Locating compensatory MW upstream of a load zone were a LOLE violation is to some extent caused by a frequently constrained interface will result in higher level of compensatory MW to meet the NYCA LOLE criterion. It is also recognized that solutions such as combustion turbine generating units and demand-side management solutions can be added in much smaller increments.

The results of the MARS simulations for the RNA study case transfer limit sensitivities, and scenario assessments provide information that can be used to guide the compensatory MW analyses. It should be noted that there may be other combinations of compensatory MW that

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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 can be determined whether the LOLE violation is driven more by capacity deficiencies or transmission system transfer constraints.

Because the purpose of the analyses is not only to show the level of compensatory MW needed to meet LOLE criteria but also the importance of the location of the compensatory MW. 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 MW or ten generic units are required to compensate for retiring units and load growth. Eleven generic units or 2,750 MW of compensatory MW are required by 2017. These results represent an increase of about 750 compensatory MW 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 MW higher than last year's forecast. The energy forecast is about 0.2% 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. Additional information on the energy and peak demand forecasts is provided in the Supporting Document. Tables 4.7 and 4.8 list the simulated results.

Table 4.7: 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

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Table 4.8: LOLE with Compensatory MW Additions for 2012 through 2017

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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 indicate that there is a minimum amount of compensatory MW that must be located in Zone J because of the existing transmission constraints into Zone J. Potential solutions could also include a combination of additional transmission as well as resources located within Zone J. Examination of the LOLE results and the transmission constraint summary indicate that there are also binding transmission constraints on UPNY/SENY and the export limit from Zone K to Zones I and J. These two constraints will limit the effectiveness of compensatory MW in Zones A through F and K. These circumstances indicate that there is a minimum amount of compensatory MW that must be located on Zones G, H, or I, in addition to the minimum in Zone J. Although the effectiveness of compensatory MW located in Zones A through F and K diminishes as the transmission constraints become more binding, these compensatory MW provide an initial benefit by removing the LOLE violations that are strictly related to capacity deficiencies. 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.

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It should be noted that the above findings are based upon the Bulk Power Transmission System as modeled in the RNA study case. In the 2007 Comprehensive Reliability Plan, an evaluation of the benefits of increasing the transfer capability across key transmission interfaces indicated that resources upstream of those transmission interfaces could then have a greater impact on reducing the LOLE to meet the overall NYCA reliability needs. 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 can 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 current New York ISO 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 New York Control Area 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 have existed 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 control area 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 4.9. 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 4.10.

Table 4.9: 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

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Table 4.10: 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			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AREA-E	0.01	0.01	0.08	0.08	0.17	0.25	0.38	0.57	0.72	0.82
AREA-F				0.00	0.00	0.00	0.01	0.01	0.01	0.01
AREA-G	0.00	0.00	0.02	0.02	0.03	0.04	0.07	0.11	0.14	0.15
AREA-H	0.00									0.00
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 MW.

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A transmission security assessment for N-1-1 conditions was performed for Western New York with a higher load level than the study case. This higher load forecast exacerbated the identified non BPTF violations in the study case and caused BPTF at the Gardenville 230 kV substation to also be in violation.

2. Environmental Scenarios

While there are many environmental regulations that will require changes in plant design and operation, compliance can often be achieved through the use of retrofit technologies. Two environmental initiatives, one of which is designed to reduce ozone precursor emissions of nitrogen oxides (NOx) and the other designed to reduce carbon dioxide emissions (CO_2), 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 or LOLE can be quantified. This information is intended to assist in developing compliance strategies that achieve the goals of these environmental initiatives while maintaining reliability.

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The NYISO did not analyze the combined potential impacts of these scenarios. The NYISO did, however, also analyze the reliability impacts of the Governor's energy efficiency initiative intended to achieve a 15% 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 the environment initiatives analyzed below in a manner that augments rather than degrades reliability.

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2.1 NOx or High Electrical Demand Day ("HEDD") Initiative

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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 United States Environmental Protection Agency pursuant to the federal Clean Air Act. Ground level ozone is the product of emissions of hydrocarbons (HC), nitrogen oxides (NOx) 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.

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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 Electrical Demand Days (HEDD) by 134.9 Tons/day. New York's share of this commitment was 50.8 Tons/day. NYSDEC has informed the NYISO that these NOx emission reductions are goals that the OTC states will try to achieve. NYSDEC has also indicated that these commitments are not legally binding upon any state. In the August 31, 2007 State Implementation Plan 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.

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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 prorata 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 reliability of the electric system will be analyzed to determine the ability of the remaining units on the electric system to meet electricity demands.

Deleted: proposes new regulations that will lead to sufficient reductions in ozone precursors to demonstrate satisfactory progress towards achieving the ozone NAAQS. Fossil powered generating stations are the largest source of NOx in NY. More detailed information regarding the HEDD initiative can be found in the supporting document.¶
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This scenario examines the reliability and resource adequacy impacts of limiting the maximum capacity available from HEDD units. Table 4.11 was developed to quantify 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.

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As a first approximation for the analysis, the following assumptions were made:

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- 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 %)

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- 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 the required emission reductions may lead to smaller capacity reductions but will not be examined here.

Of particular interest are the limitations for units within load pockets. Load pockets are areas that have a limited ability to import generation resources from outside their areas in order to meet electricity needs. 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 4.11: 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 4.12: HEDD Scenario LOLE Results

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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					0.00	0.00	0.00	0.00	0.00
AREA-E	0.02	0.06	0.06	0.12	0.16	0.26	0.41	0.54	0.64
AREA-F				0.00	0.00	0.00	0.00	0.00	0.00
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

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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 4.12. 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 three-fold 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 may reduce power available for import on HEDD days; ii) the load pocket location of many of the HEDD units requires closer scrutiny than is available from the MARS runs that average LOLE over the entire zone; and iii) generation owners have indicated that a more likely response may be to retire the highest emitters and run the remaining units more likely 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; ii) greater penetration of wind or other renewable resources; iii) successful implementation of New York's "15 x 15" energy efficiency program and, perhaps most importantly, iv) 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 electrical 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 its cap level 64 million tons. Preliminary estimates for year 2006 shows that New York is under its cap, at approximately 56 million Tons/year[9]. In 2006, 50 percent of the energy generated in the New York Control Area 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 New York and determined that the LOLE criterion was violated. Transmission reinforcements

9 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.

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that have been completed would have a slightly positive impact on that result by improving the LOLE but the LOLE would still not meet the criterion.

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[10]. 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 effected 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 very reasons the minimum acceptable number of allowances required for New York generators in the market place should be known and the consequences of not having sufficient allowances should be well understood. The minimum level of 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.

The 2008 RNA base case includes the retirements of the Lovett 5, Russell 1 through 4 and Poletti 1 units prior to January 21, 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 base 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[12]. 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 that successfully restricted a liquid supply of allowances to New York generators below 52 million tons may lead to an unacceptable LOLE.

All else being equal, however, further development of renewable resources and energy efficiency programs can reduce the minimum number of allowances necessary to meet electric resource requirements in New York. This is discussed below and in Section 3.

New York State, in its Renewable Portfolio Standard, 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.

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[10] This is equivalent to the tons of CO2 emitted by generators sufficient to replace the annual production of a nuclear power plant – 9GW/hrs.

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

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The NYISO evaluated the impact of this target on the estimated minimum number of CO2 allowances necessary to satisfy reliability criteria in New York under the RGGI scenario. 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 needed to operate fossil fuel generators needed to meet 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 8.7 GWHr/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. However, assuming the RPS environmental benefits were comparable to those estimated by 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. Nonetheless, an additional 3,292 mw of renewable capacity would not change the year of need, 2012.

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 State by 15 percent from forecasted levels in the year 2015. Known as the "15x15" program, this initiative is designed to increase energy efficiency, increase energy supply, and reduce energy demand. To implement these programs, the New York Public Service Commission has opened an Energy Efficiency Portfolio Standard (EEPS) 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 DPS staff and stakeholders in the EEPS 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.

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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 sake of this analysis, the NYISO scheduled the additional measures as a reduction 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 base case as shown in Table 4.13, the LOLE criterion violation identified in this RNA will occur much later than in the base case as shown in Table 4.14.

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Table 4.13: "15x15" Energy Efficiency Scenarios

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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

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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.

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Table 4.14: LOLE Results for "15x15" Energy Efficiency Scenario

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Area/Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
AREA-A										
AREA-B	0.00		0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02
AREA-C										
AREA-D										
AREA-E			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
AREA-F										
AREA-G						0.00				0.00
AREA-H										
AREA-I	0.00		0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.03
AREA-J	0.00		0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.03
AREA-K						0.00	0.00	0.00		0.00
NYCA	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.03

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4. Besicorp Scenario

At the end of July, Besicorp-Empire Development Company, LLC (BEDCO) 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 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 power system. The project is expected to break ground after final preparations and regulatory review are completed. The project was studied as a 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 Study Period. This project is being studied as sensitivity in the 2008 RNA and the LOLEs are included in Table 4.15.

Table 4.15: NUG Besicorp Scenario

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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							0.00	0.00
AREA-E	0.03	0.01	0.02	0.03	0.05	0.08	0.12	0.15
AREA-F								
AREA-G	0.00	0.00	0.00	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

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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 MW Scenario

There are a number of projects proposed in New York City in response to the NYPA request for proposals for 500 MW of UCAP in Zone J. The purpose of this scenario is to evaluate the impact on resource adequacy if 500 MW of additional capacity comes on line in Zone J by 2011.

Table 4.16: In-City 500 MW 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	0.02
AREA-C								
AREA-D			0.00				0.00	0.00
AREA-E	0.00	0.01	0.02	0.03	0.06	0.10	0.16	0.19
AREA-F			0.00		0.00	0.00	0.00	0.00
AREA-G		0.00	0.00	0.01	0.01	0.02	0.21	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		0.00		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 MW of resources in Zone J in response to the request for proposals issued by the New York Power Authority would satisfy resource adequacy needs in 2012 and make 2013 the first year of need in the New York Control Area, as shown in Table 4.16.

6. External Capacity Scenario

The New York installed capacity (ICAP) market has made 2,755 MW of external import rights available to external ICAP suppliers to participate in the New York capacity market. The purpose of this scenario was to assess the impact on resource adequacy of 800 MW of additional external capacity participating in the New York ICAP market over the ten year study period. The capacity was made available in upstate New York in Zone D. The LOLE results for that scenario are presented in Table 4.17.

Table 4.17: NYCA External Capacity Scenario

Area/Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
AREA-A										
AREA-B	0.00	0.00	0.01	0.01	0.03	0.04	0.07	0.11	0.15	0.19
AREA-C										
AREA-D										
AREA-E			0.00	0.00	0.01	0.02	0.03	0.05	0.08	0.10
AREA-F										
AREA-G			0.00	0.00	0.00	0.01	0.01	0.02	0.03	0.03
AREA-H										
AREA-I	0.00	0.00	0.03	0.04	0.12	0.19	0.32	0.45	0.61	0.66
AREA-J	0.00	0.00	0.03	0.04	0.12	0.21	0.34	0.50	0.66	0.71
AREA-K	0.00			0.00	0.02	0.03	0.05	0.09	0.16	0.20
NYCA	0.00	0.00	0.04	0.05	0.13	0.22	0.36	0.52	0.69	0.75

This scenario shows that if 800 MW of additional capacity outside the NYICA were to participate in the New York ICAP market, the LOLE levels would improve and the compensatory MW would be reduced, but it would not change the initial year of need from 2012.

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V. Observations and Recommendations

A. Study Case

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 criteria starting in the year 2012. Continued load growth and adding only those resources that have met the base case inclusion rules increases the deficiency to well above 0.1 for the years 2013 through 2017 of the ten-year Study Period.

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 G through K. These additions have been incorporated into the ten-year RNA study case. The additions from the 2005 CRP include new transmission lines such as M29, reactive resources, capacity additions totaling 310 Megawatts (MW), Unforced Deliverability Rights (UDRs) totaling 990 MW from PJM, and demand-side management (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.

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The NYISO's analysis of the RNA study case system, compensatory MW, scenarios, and the sensitivities and the resource adequacy deficiencies identified herein 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 the 2012 through 2017 can be satisfied through the addition of compensatory megawatts statewide as well as in Zones G through K below the UPNY – SENY interface. This result is consistent with the previous 2007 RNA and CRP which identified 2012 as the first year of statewide need. The 2011 need which was identified in the 2007 RNA as a need attributed to load Zones G through J has been resolved through the addition of transmission upgrades such as the Millwood capacitor banks identified in the 2007 CRP. Accordingly, all TOs, except for the New York Power Authority, are designated as the Responsible TOs for purposes of identifying backstop regulated 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 and sensitivity 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 NYSDEC'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.

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As simulated by the NYISO and using the assumption herein, the scenario conducted to evaluate the reliability impacts of the Regional Greenhouse Gas Initiative (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

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market activity that restricts a liquid supply of allowances below 52 million tons in 2010 will likely lead to an unacceptable LOLE. 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.

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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 New York bulk power system during the 10 year Study Period. This result would occur because the load reductions from the base case forecast are well in excess of the compensatory MW needed that would otherwise be needed to meet resource adequacy requirements in the 10 year study case.

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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 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 MW of resources in Zone J in response to the request for proposals issued by the New York Power Authority would satisfy resource adequacy needs in 2012 and make 2013 the first year of need in the New York Control Area. Lastly, if 800 MW of additional capacity outside the NYCA were made available to New York, the LOLE levels would improve and the compensatory MW would reduce, but it would not change the initial year of need from 2012.

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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 5.1: Cumulative Historic Congestion by Year 2003 to 2006

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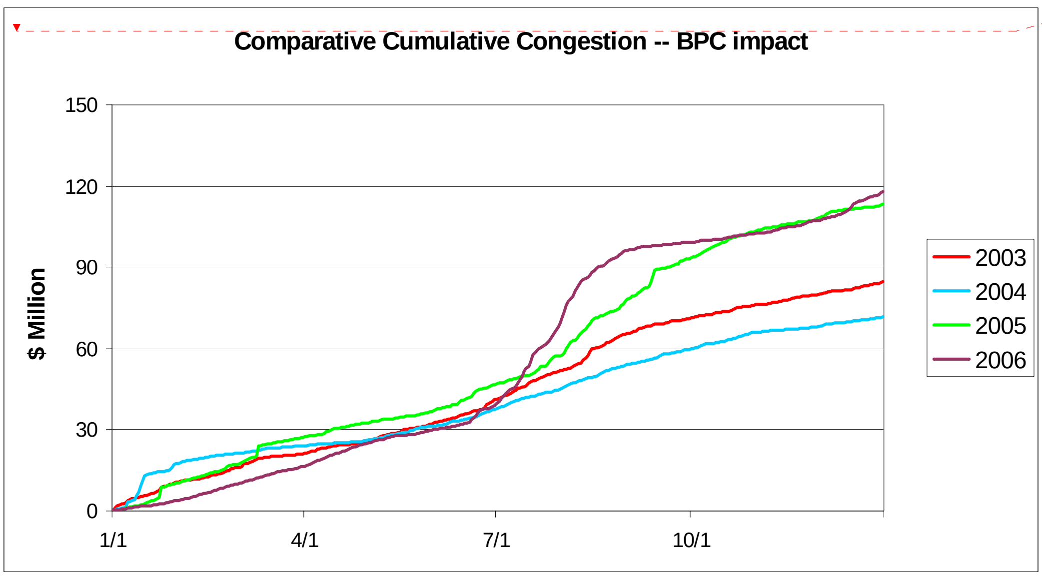

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The table below presents the breakdown of the unhedged congestion total for the top five monitored elements as percent of the total. The top five accounted for almost 90% of the total congestion.

Table 5.1: 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

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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.

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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: 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 "megawatts", 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

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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):	Market Participant working group designated to fulfill the planning functions assigned to it. A working group that provides a forum for stakeholders and Market Participants to provide input into the NYISO's comprehensive reliability planning process, 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.
Five Year Base Case:	The model representing the New York State Power System

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Term	Definition
	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 MW) that have submitted an Interconnection Request to the NYISO to be interconnected to the state's bulk electricity grid. All projects must undergo three studies – a Feasibility Study (unless parties agree to forgo it), a System Reliability Impact Study (SRIS) and a Facilities Study – before interconnecting to the grid.
Load:	A consumer of energy (an end-use device or customer) or the amount of energy (MWh) or demand (MW) consumed.

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Term	Definition
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):	The standing committee of the NYISO of that name created pursuant to the ISO Agreement. 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; 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.
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.

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Term	Definition
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:	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.
Operating Committee (OC):	The standing committee of the NYISO of that name created pursuant to the ISO Agreement. A group of Market Participants that, among other things, establishing procedures related to the coordination and operation of the NYS bulk power system, Power System; overseeing operating and performance studies, and determining minimum system operating reserves and locational ICAP

Deleted: Megawatt (MW):

Deleted: A measure of electricity that is the equivalent of 1 million watts.

Deleted: New York Control Area (NYCA):

Deleted: The area under the electrical control of the NYISO. It includes the entire state of New York, and is divided into 11 zones.

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Term	Definition
	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 TOs.
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-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

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Term	Definition
	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.
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 ten-year time period evaluated in the RNA.
Transfer Capability:	The amount of electricity that can flow on a transmission line at any given instant, respecting facility rating and reliability rules.
Transmission Constraints:	Limitations on the ability of a transmission facility to transfer electricity during normal or emergency system conditions.
Transmission Planning Advisory Subcommittee	A group of Market Participants that advises the NYISO Operating Committee and provides support to the NYISO

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Term	Definition
(TPAS):	Staff in regard to transmission planning matters including transmission system reliability, expansion, and interconnection.
UDR:	Unforced capacity delivery rights are rights granted to controllable lines to deliver generating capacity from locations outside the NYCA to Localities within NYCA.
Upstate New York:	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.

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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

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Study Case

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System Based on Thermal

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Free Flowing Conditions

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Scenario LOLE Results...

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Table 4.13: 15 x 15 Conservation Scenarios ....

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Table 4.14: LOLE Results for 15 x 15 Conservation Scenario ....

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Table 4.16: In-City 500 MW LOLE Results ....

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Table 4.17: NYCA External Capacity Scenario ....

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Table 5.1: Breakdown of 2006 Total Unhedged Congestion – Top Five Elements............

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Total	412.6		888.3	1,300.9

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Alternative	Year	B	F	G	I	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
2013 A1	2013			250		750		1000
2013 A2	2013		250	250		500		1000
2013 A3	2013		500	250		500		1250
2014 A1	2014			500		1000		1500
2015 A1	2015			750		1000		1750
2016 A1	2016			500		1000		1500
2016 A2	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

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Alternative	Cap	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
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
2014 A1	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
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
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