2012 Reliability Needs Assessment

New York Independent System Operator

FINAL DRAFT REPORT

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Table of Contents

Table of Tables

Table of Figures

Executive Summary

The 2012 Reliability Needs Assessment (RNA) provides a long-range reliability assessment of both resource adequacy and transmission security of the New York bulk power system conducted over a ten-year Study Period (2013-2022). The RNA evaluates the New York Bulk Power Transmission Facilities to determine if Reliability Criteria are not met, and identifies Reliability Needs if they are not met. Solutions will be requested to mitigate any identified needs and maintain system reliability throughout the Study Period.

Reliability Needs were not identified in the 2009 and 2010 RNAs due to increased generation resources and the reduced load forecast resulting from the economic recession. Increased participation in the NYISO's demand response program also contributed to a reliable system.

The system represented in the 2012 RNA ("Base Case") includes existing and certain eligible planned generation and transmission facilities which are currently under construction. The Base Case model includes all existing generation facilities that did not file their intention to retire or mothball with the NYSPSC prior to April 15, 2012. Several existing generation resources, totaling 1,792 MW, did submit a notice prior to April 15, 2012 of their intent to retire or mothball and these units were removed from the RNA Base Case.

<u>Reliability Needs</u>

A Reliability Need is defined as a potential violation of Reliability Criteria which requires transmission security and resource adequacy assessments. Transmission security is the ability of the power system to withstand disturbances such as electric short circuits or unanticipated loss of system elements. Resource adequacy is the ability of the electric system to supply the aggregate electrical demand and energy requirements at all times, taking into account scheduled and unscheduled outages of system elements. This RNA identifies Reliability Needs beginning in 2013 based on transmission security needs, and by 2020 based on resource adequacy needs.

> Transmission Security: The NYISO has identified potential transmission security violations on BPTF (bulk power transmission facilities) throughout the study period. Some violations occur as early as 2013 as the result of the additions made in late 2010 to the NYISO's BPTF list rather than due to any significant system changes since the 2010 RNA. Because Reliability Needs arise in Zones B, C, and G within the first five years of the study period (2013-2017) as a result of identified transmission security violations, the TOs in those zones must provide Updated Local Transmission Plans or detailed Regulated Backstop Solutions to address these violations. The Responsible TOs are National Grid, RGE, and Orange & Rockland.
>
> The study also found a transmission security violation in 2022 in Zone F. However the violation could be resolved by solution(s) that respond to the resource adequacy deficiencies identified for 2020 – 2022.

It is also expected that National Grid will present an updated Local Transmission Plan (LTP) for Zone A to address underlying local system transmission security issues that were observed by National Grid in its studies. The NYISO, when developing the RNA Base Case, modeled two 250 MW units as a generic solution in the Base Case which resolved the local system issues and no bulk system issues were observed. The modeling of the generic solutions is provided for in the CRPP Manual and the size of the blocks is consistent with the size used in other planning studies. The NYISO expects that National Grid's updates to its LTP will resolve the underlying local issues, which would leave no corresponding Bulk Power Transmission issues in Zone A. In the absence of such LTP updates in time for issuance of the 2012 Comprehensive Reliability Plan, the NYISO may identify Reliability Needs on the Bulk Power Transmission Facilities in Zone A, for which market based and regulated solutions will be requested. If an imminent threat to reliability is found, the NYISO will consult with the New York Department of Public Service and request gap solutions to be provided.

Resource Adequacy: The 2012 Reliability Needs Assessment for the New York State Bulk Power System indicates that the Bulk Power Transmission Facilities as modeled violates the 0.1 days per year reliability criterion starting in 2020 and extending through 2022. The Reliability Needs identified for resource adequacy in 2020 through 2022 can be satisfied through the addition of resources in the form of generic compensatory MWs in Zones G through K below the UPNY/SENY interface. Because the NYISO identifies a resource adequacy need in 2020 in Zones G through K, the TOs in these Zones are designated as Responsible TOs for purposes of proposing Regulated Backstop Solutions for the second five years of the ten-year planning period (2018-2022) and presenting updated LTPs as applicable. The Responsible TOs are Orange & Rockland, Central Hudson, New York State Electric and Gas, Consolidated Edison Company of New York, Inc. (ConEdison), and LIPA. Although NYISO does not designate NYPA as a Responsible TO, the NYISO expects that NYPA will work with the other TOs on resolving the identified needs on a voluntary basis.

There are several reasons this year's RNA found Reliability Needs related to resource adequacy by 2020 while the 2010 RNA did not:

1. Generation Capacity – Generation modeled for 2020 is about 1,000 MW less;

2. Load Forecast – The baseline load forecast for 2020 is slightly (200 MW) higher; and

3. Special Case Resources (SCRs) – projections for 2020 are about 100 MW less.

<u>Scenario Analyses</u>

The NYISO has conducted scenario analyses in order to test the robustness of the Base Case and the corresponding needs assessment studies. Scenarios are variations on key assumptions in the RNA Base Case to assess the impact of possible changes in circumstances that could impact the system reliability. In some scenarios, potential violations of Reliability Criteria were identified and in others, deficiencies may be resolved; however, in accordance with Attachment Y of the OATT, the results of a scenario cannot be used to determine additional Reliability Needs for which solutions must be sought. The findings under the scenario conditions are:

1. The High Load (Econometric) Forecast Scenario reveals that reliability violations would occur as soon as 2017 at the higher peak load levels which do not account for the projected energy efficiency reductions included in the Base Case.

2. The Low Load (15 x 15 Achievement) Scenario demonstrates that LOLE levels would not exceed 0.1 by 2022 if the State energy efficiency goals are fully met.

3. Reliability violations would occur in 2016 if the Indian Point Plant were to be retired at the latter of the two units' current license expiration dates using the Base Case load forecast assumptions. In addition to the LOLE violations, transmission analysis demonstrated thermal violations per applicable Reliability Criteria. Under stress conditions, the voltage performance on the system without Indian Point would be degraded. To relieve the transmission security violations, load relief measures would be required for Zones G through K.

4. The Zonal Capacity at Risk Scenario looked at how much capacity could be removed from downstate Zones J and K, lower-Hudson Valley Zones G-H-I, and upstate Zones A through F while maintaining the LOLE requirement. The study did not attempt to assess a comprehensive set of potential scenarios that might arise from specific unit retirements. In all zones, transmission security analyses would need to be performed to determine the precise reliability impact and to test the impact from specific unit retirements to the transmission system operations. This can be particularly important around congested interfaces. The analysis considered 2017 and 2022. The results showed that in 2017 it may be possible to remove approximately 750 MW from Zone J, or 500 MW from Zone K, or 750 MW from the combined Zones of G-H-I, without violating the resource adequacy criterion, but not simultaneously from all these Zones. For the combined Zones A-F, removal of up to 3,000 MW of capacity would not cause a resource adequacy violation. However the reliability of the transmission system and the transmission system's transfer capability were not studied under this scenario. For 2022, the Base Case showed an LOLE violation that would require 750 MW in compensatory MW in Southeast New York (SENY). The scenario modeled the addition of 750 MW in Zone J and then determined that between 500 and 750 MW could be removed from combined Zones A-F without violating the resource adequacy criterion.

5. The Coal Plant Retirement Scenario analyzed resource adequacy without any of the existing coal-fired generating units by the end of 2015. The results showed that the year of need (showing an LOLE value greater than 0.1) would be 2019, which is one year earlier than the base case results.

In summary, the NYISO has identified multiple Reliability Needs during the ten year RNA study period (2013-2022), assuming that all modeled transmission and generation facilities, including Indian Point, remain in service in New York from 2013 through 2022. Therefore, requests for market based and regulated solutions to address Reliability Needs will be issued by the NYISO as the first step in the development of the 2012 Comprehensive Reliability Plan. The NYISO, in accordance with Attachment Y of the OATT, will evaluate the solutions which are received and will issue a 2012 CRP Report as required. Moreover, the NYISO will look for updates to the National Grid LTP concerning Zone A in preparing its Comprehensive Reliability Plan.

The NYISO will continue monitoring and evaluating the progress of new market based projects interconnecting to the bulk power system, the development and installation of local transmission facilities, the status of mothballed facilities, the continued implementation of State energy efficiency programs, participation in the NYISO demand response programs, and the impact of new and proposed environmental regulations on the existing generation fleet. This monitoring is an essential component of NYISO's reliability planning processes and is key to the determinations that will be made in the CRP. Should the NYISO determine that conditions have changed during its preparation of the CRP or later in its planning cycle, it will determine whether market-based solutions that are currently progressing are sufficient to meet the resource adequacy and transmission security needs of the New York power grid. New capacity resources which are under development may further improve and help maintain the reliability of the bulk power system if they become operational. Similarly, system changes such as new, unanticipated retirements, could result in future Reliability Criteria violations and could generate future Reliability Needs depending on their timing and location. The NYISO will address any newly identified Reliability Need and may, if necessary, issue a request for gap solutions.

1. Introduction

The Reliability Needs Assessment (RNA) is developed by the NYISO in conjunction with Market Participants and all interested parties as its first step in the Comprehensive System Planning Process (CSPP). It is the foundation study used in the development of the NYISO's Comprehensive Reliability Plan (CRP). The RNA is performed to evaluate electric system reliability, for both transmission security and resource adequacy, over a ten year study period. If the RNA identifies any violation of Reliability Criteria for Bulk Power Transmission Facilities (BPTF) the NYISO will report a Reliability Need, quantified by an amount of compensatory megawatts (MW) and/or megavars (MVAr). In addition, after approval of the RNA, the NYISO will request market-based and alternative regulated proposals from interested parties to address the identified Reliability Needs, and designate one or more Responsible Transmission Owners to develop a Regulated Backstop Solution to address each identified need. This document reports the 2012 RNA findings for the Study Period 2013-2022.

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

Proposed solutions that are submitted in response to an indentified Reliability Need are evaluated in the CRP report and must satisfy Reliability Criteria. However, the solutions submitted to the NYISO for evaluation in the CRP do not have to be in the same amounts of compensatory MW/MVAr or the locations reported in the RNA. There are various combinations of resources and transmission upgrades that could meet the needs identified in the RNA. The reconfiguration of transmission facilities and/or modifications to operating protocols identified in the solution phase could result in changes and/or modifications of the needs identified in the RNA.

This report begins with an overview of the CSPP. The 2010 Comprehensive Reliability Plan (CRP) and prior reliability plans are then summarized. The report continues with a summary of the 2012 RNA Base Case assumptions and methodology and reports the RNA findings for 2013 - 2022. Detailed analyses, data and results underlying the modeling assumptions are contained in the Appendices.

In addition to assessing the Base Case conditions, the RNA analyzes certain scenarios to test the robustness of the system and the conditions under which needs would arise. Attention is given to risks that may give rise to Reliability Needs, including higher and lower peak loads, Indian Point Plant retirement, zonal capacity at risk, and retirement of all NYCA coal generation.

The NYISO will prepare and issue its 2012 CRP based upon this 2012 RNA report. The NYISO will continue to monitor the progress of the market-based solutions submitted in earlier CRPs and projects that have met the NYISO's Base Case inclusion rules for this RNA. In addition, the NYISO will continue to monitor the various assumptions that are reflected or impact the RNA Base Case to assess whether these projects are progressing as expected and whether any delays or changes in system conditions are likely to adversely impact system reliability. These base case assumptions include, but are not limited to, the measured progress towards achieving the State energy efficiency program standards, the impact(s) of ongoing developments in State and Federal environmental regulatory programs on existing power plants, the status of plant re-licensing efforts, and the development of transmission owner projects identified in the Local Transmission Plans (LTPs).

For informational purposes, this RNA report also provides the marketplace with the latest historical information available for the past five years of congestion via a link to the NYISO's website. The 2012 CRP will be the foundation for the 2013 Congestion Assessment and Resource Integration Study (CARIS). A more detailed evaluation of system congestion is presented in the CARIS. The NYISO completed its second CARIS economic planning assessment of future congestion in March 2012.

2. Summary of Prior CRPs

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

The 2009 CRP, approved by the NYISO Board of Directors in May 2009, and the 2010 CRP, approved by the NYISO Board of Directors in January 2011, indicated that the system was reliable and no solutions were necessary in response to their respective 2009 and 2010 RNAs. Therefore, market solutions were not requested. The primary reasons that no needs were identified in the 2009 and 2010 RNAs, as compared to the 2008 RNA, were: 1) an increase in generation and transmission facilities, 2) a decrease in the energy forecast due to the Energy Efficiency Portfolio Standard Order (EEPS), and 3) an increase in Special Case Resources (SCRs).[1] Although the 2009 and 2010 CRPs did not identify any needs, as a risk mitigation measure, the NYISO has continued to monitor the market-based solutions submitted for the 2008 CRP.

Table 2-1 presents the market solutions and TOs' plans that were submitted in response to previous requests for solutions and were included in the 2008 CRP. The table also indicates that 1815 MW of solutions are either in-service or are still being reported to the NYISO as moving forward with the development of their projects.

It should be noted that there are a number of other projects in the NYISO interconnection study queue which are also moving forward through the interconnection process, but have not been offered as market solutions in this process. Some of these additional generation resources have either accepted their cost allocation as part of a Class Year Facilities Study process or are currently included in the 2011 or 2012 Class

[1] Comparisons between the 2010 RNA and the 2012 RNA models can be found in Table 3-2 (load forecast differences) and Table 3-7 (differences in load, capacity and SCRs). Additionally the 2012 RNA models the addition of the HTP transmission line between New Jersey and Manhattan (Table 2-1) and the addition of the Marble River Wind Farms (Table 2-2).

Year Facilities Studies. These projects are listed in Tables 2-2 and 2-3. Tables 2-1, 2-2, 3-3, and 3-4; report the projects that meet the RNA Base Case inclusion rules. The listings of other Class Year Projects can be found along with other non-modeled transmission and non-modeled generator re-rating projects in the 2012 Gold Book. http://www.nyiso.com/public/webdocs/services/planning/planning_data_reference_documents/2012_GoldBook.pdf

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

Project Type	NYISO Queue #	Submitted	MW	Zone	Original In-Service Date	Current Status	Included in 2012 RNA Base Case
			Resource Proposals				
Gas Turbine NRG Astoria Re-Powering	**201 and 224**	CRP 2005, CRP 2007, CRP 2008	520	J	June 2010	New Target June 2014	No
Empire Generation Project	**69**	CRP 2008	635	F	Q1 2010	Placed in Service September 2010	Yes
			Transmission Proposals				
Back-to-Back HVDC, AC Line HTP	**206**	CRP 2007, CRP 2008 and was an alternative regulated proposal in CRP 2005	660	PJM - J	Q2 2011 PJM Queue O66	New Target Q2 2013 Article VII approved under	Yes
			TO's Plans				
Con Ed M29 Project	**153**	CRP 2005	N/A	J	May 2011	Placed in Service February 2011	Yes

*2009 and 2010 CRPs did not generate any tracked projects

Table 2-2: Proposed New Generation per 2012 Gold Book

QUEUE POS.	OWNER / OPERATOR	STATION UNIT	ZONE	DATE*	NAME PLATE RATING (MW)	CRIS (MW)	SUMMER	UNIT TYPE	CLASS YEAR	Included in 2012 RNA Base Case
Completed Class Year Facilities Study										
232	Bayonne Energy Center, LLC**	Bayonne Energy Center	J	2012/05	500.0	512.0	500.0	Dual Fuel	2009	Yes
147	NY Windpower, LLC	West Hill Windfarm	C	2012/09	31.5	31.5	31.5	Wind Turbines	2006	No
161	Marble River, LLC	Marble River Wind Farm	D	2012/10	83.0	83.0	83.0	Wind Turbines	2006	Yes
171	Marble River, LLC	Marble River II Wind Farm	D	2012/10	132.2	132.2	132.2	Wind Turbines	2006	Yes
197	PPM Roaring Brook, LLC / PPMR	Roaring Brook Wind	E	2012/12	78.0	0.0	78.0	Wind Turbines	2008	No
263	Stony Creek Wind Farm , LLC	Stony Creek Wind Farm	C	2012/12	94.4	88.5	94.4	Wind Turbines	2010	No
237	Allegany Wind, LLC	Allegany Wind	A	2013/08	72.5	0.0	72.5	Wind Turbines	2010	No
166	Cape Vincent Wind, LLC	St. Lawrence Wind Farm	E	2013/09	79.5	79.5	79.5	Wind Turbines	2007	No
207	BP Alternative Energy NA, Inc.	Cape Vincent	E	2013/09	210.0	0.0	210.0	Wind Turbines	2008	No
119	ECOGEN, LLC	Prattsburgh Wind Farm	C	2013/12	78.2	78.2	78.2	Wind Turbines	2003-05	No
222	Noble Ball Hill Windpark, LLC	Ball Hill Windpark	A	2014/Q1	90.0	90.0	90.0	Wind Turbines	2009	No

* Proposed In-Service Date is taken from NYISO interconnection queue

** Unit became fully operational in June 2012

Table 2-3: Class Year 2011 and 2012 New Generation Projects

QUEUE POS.	OWNER / OPERATOR	STATION UNIT	ZONE	DATE*	NAME PLATE RATING (MW)	CRIS (MW)	SUMMER	UNIT TYPE	Included in 2012 RNA Base Case
Class 2011 Generation Projects									
349	Taylor Biomass Energy, LLC	Taylor Biomass	G	2012/Q4	22.5	TBD	19.0	Solid Waste	No
198	New Grange Wind Farm, LLC	Arkwright Summit Wind Farm	A	2013/09	79.8	TBD	79.8	Wind Turbines	No
169	Alabama Ledge Wind Farm, LCC	Alabama Ledge Wind Farm	B	2013/10	79.8	TBD	79.8	Wind Turbines	No
201	NRG Energy	Berrians GT	J	2014/06	200.0	TBD	200.0	Combined Cycle	No
224	NRG Energy, Inc.	Berrians GT II	J	2014/06	90.0	TBD	50.0	Combined Cycle	No
310	Cricket Valley Energy Center, LLC	Cricket Valley Energy Center	G	2015/09	1136.0	TBD	1019.9	Combined Cycle	No
251	CPV Valley, LLC	CPV Valley Energy Center	G	2016/05	690.6	TBD	677.6	Combined Cycle	No
Class 2012 Generation Projects Candidates									
189	PPM Energy, Inc.	Clayton Wind	E	2013/10	126.0	TBD	126.0	Wind Turbines	No
322	Rolling Upland Wind Farm, LLC	Rolling Upland Wind	E	2014/12	59.4	TBD	59.4	Wind Turbines	No
26	NRG Energy, Inc.	Berrians GT II	J	2016/06	290.0	TBD	250.0	Combined Cycle	No
Other Non Class Year Generation Projects									
284	Broome Energy Resources, LLC	Nanticoke Landfill	C	2012/12	1.6	0.0	1.6	Methane	No
264	RG&E	Seth Green	B	2013/Q1	2.8	0.0	2.8	Hydro	No
338	RG&E	Brown's Race II	B	2013/Q1	8.3	0.0	8.3	Hydro	No
204A	Duer's Patent Project, LLC	Beekmantown Windfarm	D	2013/06	19.5	19.5	19.5	Wind Turbines	No
180A	Green Power	Cody Road	C	2013/Q4	10.0	10.0	10.0	Wind Turbines	No

* Proposed In-Service Date is taken from NYISO interconnection queue

3. RNA Base Case Assumptions, Drivers and Methodology

The NYISO has established procedures and a schedule for the collection and submission of data and for the preparation of the models used in the RNA. The NYISO's CSPP procedures are designed to allow its planning activities to be performed in an open and transparent manner and to be aligned and coordinated with the related activities of the NERC, NPCC, and NYSRC. The assumptions underlying the RNA were reviewed at the Transmission Planning Advisory Subcommittee (TPAS) and the Electric System Planning Working Group (ESPWG). The Study Period analyzed in the 2012 RNA is the 10-year period from 2013 through 2022 for both the Base Case and Scenarios.

The RNA Base Case consists of the first Five Year Base Case and the system representations for the second five years of the Study Period as required by Attachment Y of the tariff. All studies and analyses in the RNA Base Case reference a common energy forecast, which is the Baseline Forecast from the NYISO 2012 Load and Capacity Data Report, also known as the "Gold Book". The Baseline Forecast is an econometric forecast with an adjustment for statewide energy efficiency programs. This forecast is the 2012 RNA Base Case forecast.

The Five Year Base Case was developed in accordance with NYISO Procedures using projections for the installation and retirement of generation resources and transmission facilities that were developed in conjunction with market participants and Transmission Owners. These are included in the Base Case beginning with the FERC 715 filing and consistent with base case inclusion screening process provided in the CRPP Manual. Further, resources that choose to participate in markets outside of New York are modeled as contracts, thus removing their available capacity for meeting resource adequacy requirements in New York.

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

- The most recent data from the 2012 Gold Book
- The most recent versions of NYISO reliability analyses and assessments provided for or published by NERC, NPCC, NYSRC, and neighboring control areas
- Information reported by neighboring control areas such as power flow data, forecasted energy, significant new or modified generation and transmission facilities, and anticipated system conditions that the NYISO determines may impact the bulk power transmission facilities (BPTF)
- Market Participant input, and
- Changes in the MW and MVAr components of the load model made to maintain a constant power factor.

The 2012 RNA 2013 – 2022 Base Case model of the New York bulk power system includes the following new and proposed facilities and forecasts in the Gold Book:

- TO projects on non-bulk power facilities included in the FERC 715 Cases
- LTPs identified in the 2012 Gold Book as firm plans and meeting Base Case inclusion rules
- Facilities that have accepted their Attachment S cost allocations and are in service or under construction as of April 1, 2012
- Facilities that have obtained a NYS PSC Certificate (or other regulatory approvals and SEQRA review) and an approved System Reliability Impact Study ("SRIS") and an executed contract with a credit-worthy entity
- Transmission upgrades related to any projects and facilities that are included in the RNA Base Case, as defined above
- Facility re-ratings and uprates
- Noticed retirements[2]
- The forecasted level of Special Case Resources for Summer 2012 (SCR)

Tables 3-3 and 3-4 show those new projects which meet the screening requirements for inclusion.

The NYISO develops reliability scenarios for the first five years and second five years of the Study Period pursuant to Section 31.2.2.5 of Attachment Y of the OATT. The NYISO also conducts sensitivity analyses pursuant to Section 31.2.2.6 of Attachment Y to determine whether Reliability Needs previously identified can be mitigated through alternate system configurations or operational modes.

3.1. Annual Energy and Summer Peak Demand Forecasts

There are three primary load forecasts modeled in the 2012 RNA. The first forecast is an econometric forecast of annual energy and peak demand. The second forecast, which is used for the 2012 RNA Base Case, includes a reduction to the econometric forecast reflecting a portion of the goal of the statewide energy efficiency initiative, including the programs authorized by the New York State Public Service Commission (NYSPSC) Energy Efficiency Portfolio Standard (EEPS). The third forecast is the low

[2] Pursuant to the PSC Orders in Case 05-E-0889, some generators have provided, by the RNA lock down date, either a notice of their intention to or their notice of Retirement, Mothball, protective layup, etc. For the purposes of this study the NYISO has assumed that all of these units will not be available for the period of the RNA study beginning once the applicable PSC notice period runs. A listing of these units can be found in Table 3-5.

load scenario as reflected by a 15 percent energy efficiency achievement by 2015, which represents full achievement of the statewide energy goal by 2015. Additional information on the Base Case load forecast and underlying economic data is contained in Appendix C.

The NYISO has been a party to the NYSPSC EEPS proceeding from its inception and is a member of the Evaluation Advisory Group which is responsible for advising the NYDPS on the methods to be used to track program participation and measure the program costs, benefits, and impacts on electric energy usage. In conjunction with the input from market participants at the ESPWG, the NYISO developed energy forecasts for the potential impact of the EEPS over the 10-year planning period. The following factors were considered in developing the 2012 RNA Base Case forecast:

- NYSPSC-approved spending levels for the programs under its jurisdiction, including the Systems Benefit Charge and utility-specific programs
- Expectation of the fulfillment of the investor-owned EEPS program goals by 2018, and continued spending for NYSERDA programs through 2022
- Expected realization rates, participation rates and timing of planned energy efficiency programs
- Degree to which energy efficiency is already included in the NYISO's econometric energy forecast
- Impacts of new appliance efficiency standards, and building codes and standards
- Specific energy efficiency plans proposed by LIPA, NYPA and Consolidated Edison Company of New York, Inc. (Con Edison)
- The actual rates of implementation of EEPS, based on data received from Department of Public Service staff.

Table 3-1 below summarizes the 2012 RNA econometric forecast, the 2012 RNA Base Case forecast and the 2012 RNA 15 x 15 scenario forecast. Table 3-2 shows a comparison of the Base Case forecasts and energy efficiency program impacts contained in the 2010 RNA and the 2012 RNA. The 2012 RNA 15x15 scenario forecast is based on achievement of the full statewide energy efficiency goal of 26,880 GWh by 2015, as deducted from the 2015 forecast prepared in 2008, after allowances for certain energy efficiency programs already put in place by state utilities. The NYISO set this 2015 forecast level at 157,380 GWh in prior RNAs.

The 2012 projection of these energy efficiency program impacts was discussed with all market participants during multiple meetings of the Electric System Planning Working Group (ESPWG) during the first quarter of 2012. The ESPWG accepted the projection of impacts used in the 2012 RNA Base Case forecast in accordance with procedures established for the RNA.

Figures 3-1 and 3-2 present actual and weather-normalized historical data and forecasts of annual energy and summer peak demand for the 2012 RNA.

Table 3-1: 2012 RNA Forecast and Scenarios

Annual GWh	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
2012 High Load Scenario	165,578	168,089	170,480	172,675	174,818	176,146	178,087	180,079	182,406	184,269	185,813
2012 RNA Base Case	163,659	164,627	165,340	166,030	166,915	166,997	168,021	169,409	171,176	172,514	173,569
2012 15x15 Scenario	161,332	160,004	158,687	157,380	158,219	158,297	159,267	160,583	162,258	163,526	164,526

Energy Impacts of EE Programs

Cumulative GWh	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
2012 RNA Base Case	1,919	3,462	5,140	6,645	7,903	9,149	10,066	10,670	11,230	11,755	12,244
2012 15x15 Scenario	4,246	8,085	11,793	15,295	16,599	17,849	18,820	19,496	20,148	20,743	21,287

Annual MW	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
2012 High Load Scenario	33,638	34,320	34,846	35,361	35,791	36,224	36,729	37,187	37,627	38,130	38,554
2012 RNA Base Case	33,295	33,696	33,914	34,151	34,345	34,550	34,868	35,204	35,526	35,913	36,230
2012 15x15 Scenario	32,822	32,750	32,549	32,372	32,556	32,750	33,051	33,370	33,675	34,042	34,342

Summer Peak Demand Impacts of EE Programs

Cumulative MW	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
2012 RNA Base Case	343	624	932	1,210	1,446	1,674	1,861	1,983	2,101	2,217	2,324
2012 15x15 Scenario	816	1,570	2,297	2,989	3,235	3,474	3,678	3,817	3,952	4,088	4,212

Table 3-2: Comparison of 2010 & 2012 RNA Base Case Forecasts

Comparison of Base Case Energy Forecasts - 2010 & 2012 RNA (GWh)

Annual GWh	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
2010 RNA Base Case	160,358	160,446	161,618	163,594	164,556	165,372	166,472	167,517	169,132	171,161	173,332		
2012 RNA Base Case			163,659	164,627	165,340	166,030	166,915	166,997	168,021	169,409	171,176	172,514	173,569
Change from 2010 RNA			2,041	1,033	784	658	443	-520	-1,111	-1,752	-2,156	NA	NA

Comparison of Base Case Peak Forecasts - 2010 & 2012 RNA (MW)

Annual MW	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
2010 RNA Base Case	33,025	33,160	33,367	33,737	33,897	34,021	34,193	34,414	34,672	34,986	35,334		
2012 RNA Base Case			33,295	33,696	33,914	34,151	34,345	34,550	34,868	35,204	35,526	35,913	36,230
Change from 2010 RNA			-72	-41	17	130	152	136	196	218	192	NA	NA

Comparison of Energy Impacts from Statewide Energy Efficiency Programs - 2010 RNA & 2012 RNA (GWh)

Cumulative GWh	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
2010 RNA Base Case	976	2,860	4,997	6,765	8,413	9,914	11,355	12,327	13,040	13,379	13,684		
2012 RNA Base Case	976	2,860	4,779	6,322	8,000	9,505	10,763	12,009	12,926	13,530	14,090	14,615	15,104
Change from 2010 RNA			-219	-444	-413	-409	-592	-318	-114	151	406	NA	NA

Comparison of Peak Impacts from Statewide Energy Efficiency - 2010 RNA & 2012 RNA (MW)

Cumulative MW	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
2010 RNA Base Case	174	491	825	1,107	1,388	1,675	1,954	2,151	2,311	2,415	2,510		
2012 RNA Base Case	174	491	834	1,115	1,423	1,701	1,937	2,165	2,352	2,474	2,592	2,708	2,815
Change from 2010 RNA			9	8	35	25	-17	14	41	59	82	NA	NA

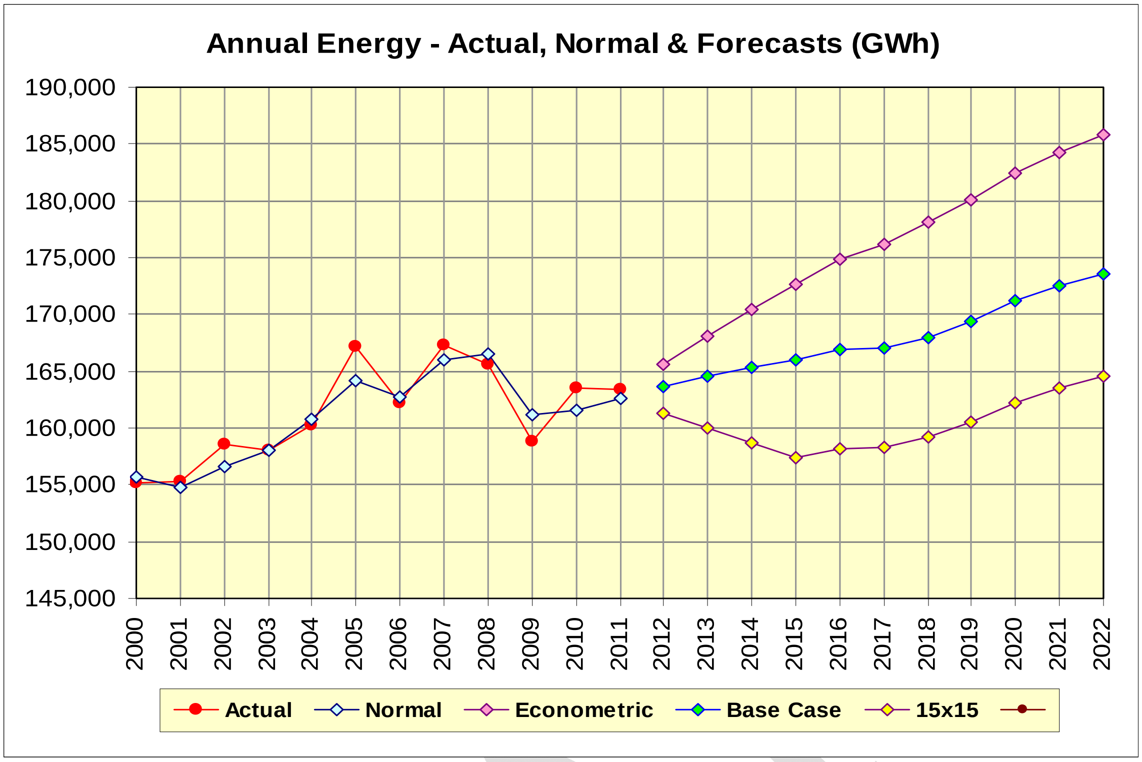

Figure 3-1(a): 2012 Base Case Forecast and Scenarios – Annual Energy

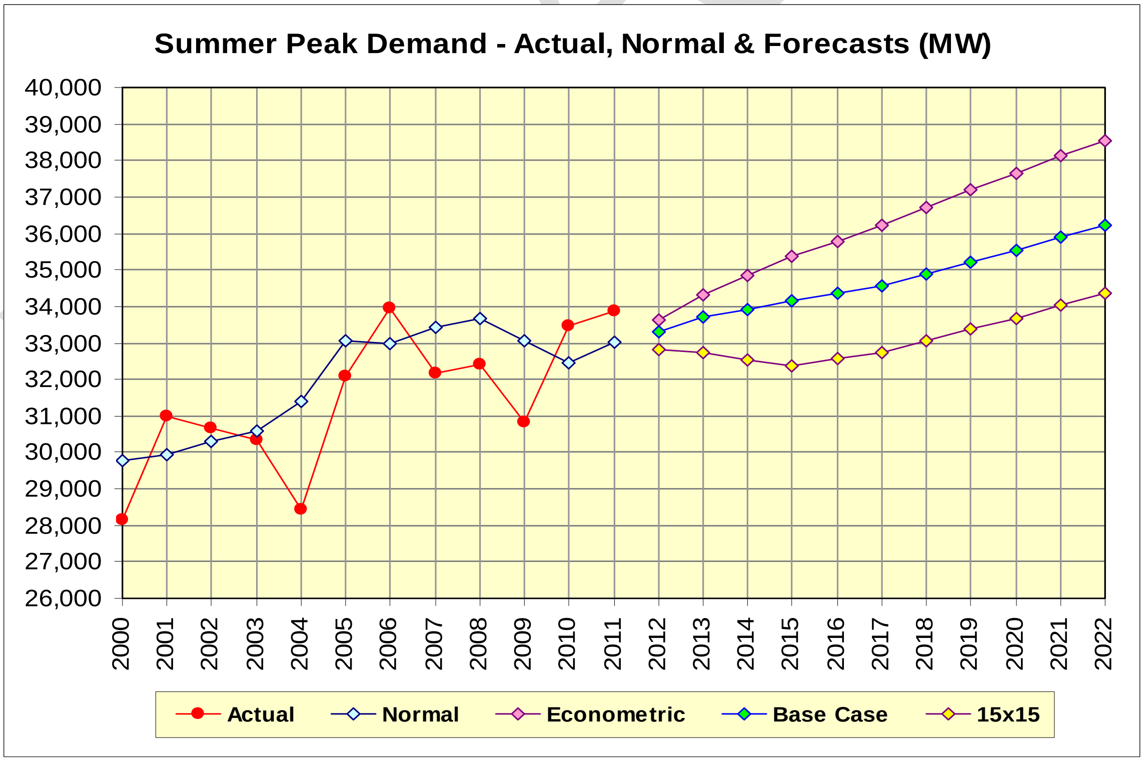

Figure 3-1(b): 2012 Base Case Forecast and Scenarios – Summer Peak Demand

3.2. Forecast of Special Case Resources

The 2012 RNA special case resource levels are based on the 2012 Gold Book value of 2165 MW. Unlike the 2010 RNA, the 2012 RNA models the same projected zonal levels of SCR resources totaling 2165 MW for each of the ten years 2013 – 2022.[3] The MARS program calculates the SCR values for each hour based on the ratio of hourly load to peak load.

3.3. Resource Additions

Table 3-3 presents the unit additions and uprates represented in the RNA Base Case.

Table 3-3: Unit Additions

	Queue #	Unit Name	2012	2013	2014	Total MW
New Thermal Units	232	Bayonne Energy (May 2012)	500			500
		New Thermal Units Sub-Total	**500**	**0**	**0**	**500**
New Wind	161	Marble River Wind I (Oct 2012)		83		83
	171	Marble River Wind II (Oct 2012)		132		132
		New Wind Sub-Total	**0**	**215**	**0**	**215**
Unit Uprates	216	Nine Mile Point II (June 2012)	96			96
	127A	Munnsville Wind Power (Dec 2013)			6	6
		Unit Uprates Sub-Total	**96**	**0**	**6**	**102**
		Grand Total	**596**	**215**	**6**	**818**

Note: MW values represent the lesser of Capacity Resource Integration Service (CRIS) and Dependable Maximum Net Capability (DMNC) values.

3.4. Local Transmission Plans

As part of the LTPP, Transmission Owners presented their Local Transmission Plans (LTPs) to the NYISO and Stakeholders in the fall of 2011.[4] In April 2012, the NYISO reviewed the LTPs and included them in the 2012 Gold Book. Table 3-4 presents the list of 2012 Gold Book firm transmission plans that were included in the RNA Base Case.

[3] In the 2010 RNA, the 2010 Gold Book projected SCR MWs for 2011 were assigned to 2020 and then scaled back to 2011 based on the projected peak load ratios.

[4] Consolidated Edison presented an update to their LTP in February 2012 to accommodate the announced mothballing of Astoria Units 2 & 4.

LTPs can be found at http://www.nyiso.com/public/markets_operations/services/planning/process/ltpp/index.jsp

Table 3-4: Firm Transmission Plans included in 2012 RNA Base Case (from 2012 Gold Book)

Queue Pos.	Transmission Owner	Terminals		Line Length miles (1)	Expected Service Date/Yr Prior to (2)	Year	Nominal Voltage in kV Operating	Design	# of ckts	Thermal Ratings * Summer	Winter	Project Description / Conductor Size	Class Year / Type of Construction
	Merchant												
206	Hudson Transmission Partners	Bergen 230 kV (New Jersey)	West 49th Street 345kV			2013	345	345		660 MW	660 MW	back- to- back AC/DC/AC converter, 345 kV AC cable	2008
351	Linden VFT, LLC (3)	PSE&G 230kV	Goethals 345kV via Linden Cogen 345kV			TBD	345	345		15 MW	15 MW	Variable Frequency Transformer (Uprate)	2011
	Firm Plans (included in 2012 Base Cases)												
	CHGE	E. Fishkill	E. Fishkill	xfmr #2	S	2012	345/115	345/115	1	439 MVA	558 MVA	Transformer #2 (Standby)	
	ConEd	Astoria Annex	Astoria East	xfmr/Phase shifter	S	2012	345/138	345/138	1	241 MVA	288 MVA	xfmr/Phase shifter	-
	NYSEG	Meyer	Meyer	Cap Bank	S	2012	115	115	1	15 MVAR	15 MVAR	Capacitor Bank Installation	-
	NYSEG (4)	Wood Street	Carmel	1.34	S	2012	115	115	1	775	945	477 ACSR	OH
	NYSEG (4)	Wood Street	Katonah	11.70	S	2012	115	115	1	775	945	477 ACSR	OH
	NGRID (5)	Greenbush	Hudson	-26.43	S	2012	115	115	1	648	800	605 ACSR, 350 CU	OH
	NGRID (5)	Greenbush	Klinekill Tap	20.30	S	2012	115	115	1	648	800	605 ACSR, 350 CU	OH
	NGRID (5)	Klinekill Tap	Hudson	6.13	S	2012	115	115	1	648	800	605 ACSR, 350 CU	OH
	O & R	Harriman	-	-	S	2012	69	69	1	16 MVAR	16 MVAR	Capacitor Bank (DOE)	-
	O & R	Snake Hill	-	-	S	2012	138	138	1	32 MVAR	32 MVAR	Capacitor Bank (DOE)	-
	O & R	Bowline	Bowline	-	S	2012	345	345	1	-	-	By-pass switch	OH
	RGE	Station 180	Station 180	Cap Bank	S	2012	115	115	1	10 MVAR	10 MVAR	Capacitor Bank Installation	-
	RGE	Station 128	Station 128	Cap Bank	S	2012	115	115	1	20 MVAR	20 MVAR	Capacitor Bank Installation	-
	NYPA (5)	Willis	Duley	-24.38	W	2012	230	230	1	996	1200	1-795 ACSR	OH
	NYPA (5)	Willis	Patnode	9.11	W	2012	230	230	1	996	1200	1-795 ACSR	OH
	NYPA (5)	Patnode	Duley	15.27	W	2012	230	230	1	996	1200	1-795 ACSR	OH
	O & R	Ramapo	Sugarloaf	16.00	W	2012	138	345	1	1089	1298	2-1590 ACSR	OH
	RGE	Station 42	Station 124	Phase Shifter	W	2012	115	115	1	230 MVA	230 MVA	Phase Shifter	
	RGE	Station 67	Station 418	3.50	W	2012	115	115	1	245 MVA	299 MVA	New 115kV Line	OH
	ConEd (6)	Vernon	Vernon	Phase Shifter	S	2013	138	138	1	300 MVA	300 MVA	Phase Shifter	-
	LIPA	Shore Road	Lake Success	8.72	S	2013	138	138	2	1045	1203	3500 AL	UG
	LIPA (5)	Shoreham	Brookhaven	-7.30	S	2013	138	138	1	1851	2373	2300AL	OH
	LIPA (5)	Shoreham	Wildwood	1.00	S	2013	138	138	1	1851	2373	2300AL	OH
	LIPA (5)	Wildwood	Brookhaven	6.30	S	2013	138	138	1	1851	2373	2300AL	OH
	LIPA (5)	Holbrook	Holtsville GT	-0.32	S	2013	138	138	1	3124	3996	2-1750 AL	OH
	LIPA (5)	Holbrook	West Bus	0.20	S	2013	138	138	1	3124	3996	2-1750 AL	OH
	LIPA (5)	West Bus	Holtsville GT	0.12	S	2013	138	138	1	3124	3996	2-1750 AL	OH
	LIPA (5)	Sill Rd	Holtsville GT	-9.47	S	2013	138	138	1	3124	3996	2-1750 AL	OH
	LIPA (5)	Sill Rd	West Bus	9.35	S	2013	138	138	1	3124	3996	2-1750 AL	OH
	LIPA (5)	West Bus	Holtsville GT	0.12	S	2013	138	138	1	3124	3996	2-1750 AL	OH
	LIPA (5)	Pilgrim	Holtsville GT	-11.86	S	2013	138	138	1	2087	2565	2493 ACAR	OH
	LIPA (5)	Pilgrim	West Bus	11.74	S	2013	138	138	1	2087	2565	2493 ACAR	OH
	NYSEG	Watercure Road	Watercure Road	xfmr	S	2013	345/230	345/230	1	426 MVA	494 MVA	Transformer	
	O & R	New Hempstead	-	-	S	2013	138	138	1	32 MVAR	32 MVAR	Capacitor bank	-
	RGE	Station 124	Station 124	Phase Shifter	S	2013	115	115	2	230 MVA	230 MVA	Phase Shifter	
	RGE	Station 124	Station 124	SVC	S	2013	115	115	1	200 MVAR	200 MVAR	SVC	

Queue Pos.	Transmission Owner	Terminals		Line Length miles (1)	Expected Service Date/Yr Prior to (2)	Year	Nominal Voltage in kV Operating	Design	# of ckts	Thermal Ratings * Summer	Winter	Project Description / Conductor Size	Class Year / Type of Construction
	NYPA (7)	Moses	Willis	-37.11	W	2013	230	230	2	876	1121	795 ACSR	OH
	NYPA (7)	Moses	Willis	37.11	W	2013	230	230	1	876	1121	795 ACSR	OH
	NYPA (7)	Moses	Willis	37.11	W	2013	230	230	1	876	1121	795 ACSR	OH
	LIPA (8)	Riverhead	Wildwood	10.63	S	2014	138	138	1	1399	1709	1192ACSR	OH
	NYSEG	Klinekill Tap	Klinekill	<10	S	2014	115	115	1	>=124 MVA	>+150 MVA	477 ACSR	OH
	NGRID	Lockport	Mortimer	56.18	S	2014	115	115	1	TBD	TBD	115 kV line Replacement	-
	O & R	Little Tor	-	-	S	2014	138	138	1	32 MVARS	32 MVARS	Capacitor bank	-
	O & R	O&R's Line 26	Sterling Forest	xfmr	S	2014	138/69	138/69	1	175 MVA	175 MVA	Transformer	
	O & R	Burns	Nanuet	2.6	S	2014	69	69	1	1604	1723	795 ACSS	OH
	O & R	Burns	Corporate Drive	4	S	2014	138	138	1	1604	1723	795 ACSS	OH
	NYSEG	Coopers Corners 345 kV Sub	Coopers Corners 345 kV Sub	Shunt Reactor	W	2014	345	345	1	150 MVAR	150 MVAR	Shunt Reactor Installation	-
	O & R	Hartley	-	-	W	2014	69	69	1	32 MVAR	32 MVAR	Capacitor bank	-
	O & R	Summit (PJM)	-	-	W	2014	69	69	1	32 MVARS	32 MVARS	Capacitor bank	-
	LIPA	Riverhead	Canal	16.40	S	2015	138	138	1	846	973	2368 KCMIL (1200 mm²) Copper XLPE	UG
	NGRID	Spier	Rotterdam	32.70	S	2015	115	115	1	TBD	TBD	New/Separate Circuit w/Twin-795 ACSR south end	OH
	O & R	Tappan	-	-	S	2015	69	69	1	32 MVAR	32 MVAR	Capacitor bank	-
	CHGE (9)	Pleasant Valley	Todd Hill	5.60	W	2015	115	115	1	1280	1563	Rebuild line with 1033 ACSR	OH
	CHGE (9)	Todd Hill	Fishkill Plains	5.23	W	2015	115	115	1	1280	1563	Rebuild line with 1033 ACSR	OH
	NYSEG	Elbridge	State Street	14.50	W	2016	115	115	1	250 MVA	305 MVA	1033 ACSR	OH
	CHGE	Hurley Ave	Saugerties	11.11	S	2018	115	115	1	1114	1359	1-795 ACSR	OH
	CHGE	Saugerties	North Catskill	12.25	S	2018	115	115	1	1114	1359	1-795 ACSR	OH
	O & R	Sugarloaf	Shoemaker	7.00	W	2018	69	138	2	1062	1141	397 ACSS	OH
	CHGE (10)	St. Pool	High Falls	5.63	S	2020	115	115	1	1114	1359	1-795 ACSR	OH
	CHGE (10)	High Falls	Kerhonkson	10.03	S	2020	115	115	1	1114	1359	1-795 ACSR	OH
	CHGE (10)	Kerhonkson	Honk Falls	4.97	S	2020	115	115	2	1114	1359	1-795 ACSR	OH
	CHGE (10)	Modena	Galeville	4.62	S	2020	115	115	1	1114	1359	1-795 ACSR	OH
	CHGE (10)	Galeville	Kerhonkson	8.96	S	2020	115	115	1	1114	1359	1-795 ACSR	OH

(1) Line Length Miles - negative values indicate removal of Existing Circuit being tapped

(2) S = Summer Peak Period W = Winter Peak Period

(3) This reconfiguration is associated with the Linden VFT project that was Queue Position 125 and is the responsibility of the Developer, Linden VFT, LLC.

(4) 115 kv operation as opposed to previous 46 kV operation

(5) Segmentation of Existing Circuit

(6) The Facility is partially in Service pending total upgrade. The last outage for the Vernon East 138 kV ring upgrade will occur in Fall 2012

(7) Project involves tower separation which results in the elimination of the double circuit tower contingency

(8) Upgrade of existing 69 kV to 138 kV operation

(9) Reconductoring of Existing Line

(10) Upgrade of existing 69 kV to 115 kV operation

* Thermal Ratings in Amperes, except where labeled otherwise.

3.5. Resource Retirements

Table 3-5 below presents the retired and proposed unit retirements as of April 15, 2012 which were represented in the 2012 RNA Base Case. The MW values represent the lesser of CRIS and DMNC MW values as shown in the 2010 and 2012 Gold Books.

Table 3-5: Retired and Proposed Units Retirements

	2010	2012		
Unit	Gold Book	Retired Units	Proposed Retirements	
Barrett 07	17	0		
Beebee GT	14	15		
Binghamton Cogen	41	41		
Ravenswood GT 3-4	33	32		
Astoria 2*	177	177		
Astoria 4*	376		376	
Gowanus 1*	117		134	
Gowanus 4*	122		134	
Far Rockaway ST 04*	107		107	
Glenwood ST 04*	117		115	
Glenwood ST 05*	116		109	
Astoria GT 10*	17		18	
Astoria GT 11*	17		16	
Dunkirk 1*	77		75	
Dunkirk 2*	76		75	
Dunkirk 3*	187		185	
Dunkirk 4*	187		185	
Total MW		**265**	**1527****	**1792**

* Units provided notice prior to April 15 of mothballing or intent to mothball (units providing notice after April15 of intent to mothball or withdraw notice will be modeled as appropriate in the CRP). Since April 15, Cayuga 1&2 filed notice of intent to mothball and Gowanus 1&4 rescinded notice of intent to mothball.

** Capacity values do not add exactly due to rounding.

3.6. Base Case Peak Load and Resource Ratios

The announced unit retirements as of April 15, 2012 along with the new resource additions that met the base case inclusion rules, when combined with the existing generation in the 2012 Gold Book, resulted in the 2012 RNA Base Case Peak Load and Resource Ratios found in Table 3-6 below.

Table 3-6: NYCA Peak Load and Resource Ratios 2013 through 2022

	Year	2013	2014	2015	2016	2017	2018	2019	2020	202	202
Peak Load (MW)											
	NYCA*	33,696	33,914	34,151	34,345	34,550	34,868	35,204	35,526	35,91	36,230
	Zone J*	11,680	11,830	11,985	12,095	12,200	12,400	12,570	12,725	12,92	13,050
	Zone K*	5,643	5,667	5,710	5,723	5,756	5,797	5,843	5,900	5,965	6,038
Resources (MW)											
NYCA	Capacity**	40,240	40,196	40,196	40,196	40,196	40,196	40,196	40,196	40,19	40,196
	SCR	2,165	2,165	2,165	2,165	2,165	2,165	2,165	2,165	2,165	2,165
	Total	**42,405**	**42,361**	**42,361**	**42,361**	**42,361**	**42,361**	**42,361**	**42,361**	**42,36**	**42,361**
	Res./Load Ratio	125.8%	124.9%	124.0%	123.3%	122.6%	121.5%	120.3	119.2%	118.0%	116.9%
Zone J	Capacity**	9,269	9,269	9,269	9,269	9,269	9,269	9,269	9,269	9,269	9,269
	SCR	540	540	540	540	540	540	540	540	540	540
	Total	**9,809**	**9,809**	**9,809**	**9,809**	**9,809**	**9,809**	**9,809**	**9,809**	**9,809**	**9,809**
	Res./Load Ratio ***	84.0%	82.9%	81.8%	81.1%	80.4%	79.1%	78.0%	77.1%	75.9%	75.2%
	Res.& UDR/Load Ratio****	92.2%	91.0%	89.9%	89.0%	88.3%	86.8%	85.7%	84.6%	83.4%	82.5%
Zone K	Capacity**	5,208	5,208	5,208	5,208	5,208	5,208	5,208	5,208	5,208	5,208
	SCR	158	158	158	158	158	158	158	158	158	158
	Total	**5,366**	**5,366**	**5,366**	**5,366**	**5,366**	**5,366**	**5,366**	**5,366**	**5,366**	**5,366**
	Res./Load Ratio ***	95.1%	94.7%	94.0%	93.8%	93.2%	92.6%	91.8%	91.0%	90.0%	88.9%
	Res.& UDR/Load Ratio****	112.6%	112.2%	111.3%	111.1%	110.4%	109.6%	108.8	107.7%	106.6%	105.3%

* NYCA load values represent Baseline Coincident Summer Peak Demand. Zones J & K load values represent Summer Non-Coincident Peak Demand.

** NYCA Capacity values include resources electrically internal to NY, Additions, Reratings, Retirements, and Net Purchases and Sales. Zones J and K Capacity values do not include Net Purchases and Sales or the use of UDRs for confidentiality reasons. Capacity values include the lesser of CRIS and DMNC values

*** The Res/Load Ratio (without net purchases and sales) is not representative of the locational capacity available for meeting the Locational Minimum Installed Capacity Requirements (LCR) as described in the NYISO Installed Capacity Manual.

**** The Res+UDR/Load Ratio includes the UDR capacity associated with modeled facilities for the zone without regard to elections made for contract usage on those UDRs.

Table 3-7 below presents the comparison between the 2010 RNA and 2012 RNA in NYCA Peak Load forecast, SCRs, capacity and retirements. For 2020, the 2012 RNA Peak Load forecast increased by 192 MW, while the overall NYCA capacity and SCRs decreased by 1,043 MW and 86 MW respectively.

Table 3-7: 2010 RNA to 2012 RNA Load and Capacity Comparison

	2010 RNA Horizon Year 2020	2012 RNA Year 2020	Year 2020 Delta MW	2012 RNA Horizon Year 2022
Load	35,334	35,526	192	36,230
SCR	2,251	2,165	-86	2,165
Capacity without SCRs	41,239	40,196	-1,043	40,196

3.7. Methodology for the Determination of Needs

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

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

Resource adequacy is the ability of the electric systems to supply and deliver the total quantity of electricity demanded at any given time taking into account scheduled and unscheduled outages of system elements. Resource adequacy considers the transmission systems, generation resources, and other capacity resources, such as demand response. Resource adequacy assessments are performed on a probabilistic basis to capture the randomness of system element outages. A system is adequate if the probability of having sufficient transmission and generation to meet expected demand is equal to or less than the system's standard, which is expressed as a Loss of Load Expectation (LOLE). The New York State bulk power system is planned to meet a LOLE that, at any given point in time, is less than or equal to an involuntary load disconnection that is not more frequent than once in every 10 years, or 0.1 events per year[5]. This requirement forms the basis of New York's Installed Reserve Margin (IRM) requirement.

If Reliability Needs are identified, the amount of compensatory MW required for the New York Control Area (NYCA), in appropriate locations to resolve the

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

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

The procedure to quantify compensatory MWs is to address potential bulk system transmission security violations that were identified. This translation is performed by first calculating transfer distribution factors (TDF) on the overloaded facilities. The transfer used for this calculation is created by injecting power at possible locations that will unload the facility, and reducing power at an aggregate of existing generators outside of the area. The amount of MW for the best location resulting in the lowest amount of MW needed will be reported for this RNA. In instances where generic building blocks are utilized in the base case to address local violations that also mitigate bulk violations, compensatory MWs were not quantified.

4. Reliability Needs Assessment

4.1. Overview

Reliability is defined and measured through the use of the concepts of security and adequacy. Security is assessed through a power flow analysis that checks for Transmission Security design criteria violations. Transmission Adequacy and Resource Adequacy are assessed with the use of General Electric's Multi Area Reliability Simulation (MARS) software package. This is done through the application of interface transfer limits and a probabilistic simulation of the outages of capacity and transmission resources.

4.2. Reliability Needs for Base Case

Below are the principal findings of the 2012 RNA for the 2013-2022 Study Period including: transmission security assessment; short circuit assessment; resource and transmission adequacy assessment; system stability assessments; and scenario analyses.

4.2.1. Transmission Security Assessment

A Reliability Needs Assessment requires analysis of the security of the Bulk Power Transmission Facilities (BPTFs). For this 2012 RNA, NYISO used a BPTF list that included all facilities classified as a part of the Bulk Power System (BPS) in accordance with NPCC A-10 criteria. The NYISO performed AC contingency analysis of the BPTFs to test for thermal and voltage violations under pre- and post- contingency conditions (per NERC Standards TPL-001, -002, and -003, NPCC Directory #1, and NYSRC Reliability Rules) using Siemens PTI PSS®E, PSS®MUST and PowerGEM TARA programs. More extensive analysis was performed for critical contingency evaluation and transfer limit evaluation using the power-voltage (P-V) curve approach as described in NYISO Transmission Planning Guideline #2-0 using the Siemens PTI PSS®E (Rev. 32) software package. The impact of the status of critical generators on transfer limits was also quantified and utilized in the MARS analysis. To assist in its assessment, the NYISO also reviewed many previously completed transmission security assessments.

Transmission security assessments that were performed in response to the announced intent to mothball Dunkirk and as part of this RNA found that certain N-1 and N-1-1 BPTF contingency outages in Zone A prevented the power flow from solving and other contingencies produced thermal and voltage violations on BPTF and non-BPTF in that zone for each year of the study period. In order to solve the power flow cases as part of this RNA, various generic solution types, sizes, and interconnection points could have been employed. While an actual solution may include only transmission or a combination of transmission, generation at various interconnection points, demand response, and reactive compensation, for ease of study and without attempting to optimize or predict what the actual solution should be, two 250 MW blocks (500 MW total) of generic generation facilities were assumed to be interconnected to the BPTF and non-BPTF in Zone A. With the generic generation facilities modeled, the power flow solved for each contingency evaluated and no BPTF violations were found in Zone A. National Grid has finished studying transmission security implications due to the Dunkirk Generating Plant mothballing however, National Grid has not completed its examination of all potential solutions that would address the mothballing of Dunkirk. The results from that examination are not expected before this RNA is completed.

Methodology

The NYISO performed the transmission security testing required for the RNA Base Case throughout the study period (2013 – 2022). The testing was performed according to NPCC and NYSRC criteria and included the ability of the BPTF to meet transmission design criteria following the design criteria contingency (N-1). The same contingency analysis was also performed with critical facility outages (N-1-1). N-1 testing was performed as part of base case review, thermal and voltage criteria testing, and the identification of critical facilities and critical contingencies. Each of the first contingencies were further studied as critical facility outages as part of the N-1-1 analysis.

As part of the N-1-1 analysis, individual N-1 cases were created by removing a critical generator, transmission circuit, transformer, series or shunt compensating device, or HVdc pole from the base case. Using the automated process from PowerGEM's TARA, a set of corrective actions was developed with the objective of eliminating violations in the post-contingency cases for each N-1 case, such that when design contingencies (NERC Category B or C contingencies; NPCC Design Criteria; NYSRC Table A design contingencies) were tested on the N-1 case, there would be no post-contingency thermal or voltage violations on the BPTF.

Next, N-1-1 contingency analysis was performed by modeling critical facility outages followed by testing of NPCC and NYSRC Design Criteria contingencies (consistent with NERC Categories B and C). NYISO monitored applicable limits of the New York State BPTF in accordance with NYSRC Reliability Rules. All results assume that all necessary existing generation resources, and where available, phase angle regulator and HVDC controls have been called upon to mitigate potential violations.

Results

The transmission security analysis identified thermal violations in five locations on the BPTF for which sufficient corrective actions could not be identified: RG&E Station 80 345 kV (Zone B); RG&E Pannell 345 kV (Zone B); National Grid Clay 115 kV (Zone C); National Grid Leeds – Pleasant Valley 345 kV corridor (Zones F & G); and O&R 345/138 kV transformers at Ramapo 345 kV Substation (Zone G). The results are shown in Table 4-1.

Several of the violations, listed above and described below, result from the modification made in late 2010 to the NYISO's BPTF list to include all BPS facilities, rather than due to any significant system changes since the 2010 RNA.

Table 4-1: 2012 RNA Transmission Security Violations

Zone	*Owner*	*Monitored Facility*	*LTE Rating (MVA)*	*STE Rating (MVA)*	*2013 MVA Flow*	*2017 MVA Flow*	*2022 MVA Flow*	*1st Contingency*	*2nd Contingency*
B	RG&E	Sta.80 345/115 #T1	276	300	365	346	353	L/O Sta.80 Transformer	Sta.80 stuck breaker
B	RG&E	Sta.80 345/115 #T3	276	300	357	343	350	L/O Sta.80 Transformer	Sta.80 stuck breaker
B	RG&E	Pannell 345/115 #T3	265	275	284	280	274	L/O Ginna	Sta.80 stuck breaker
C	NatGrid	Clay-Teall 115 #10	120	145	123	123	128	L/O Clay-Dewitt 345	Oswego stuck breaker
F	NatGrid	Leeds-PV 345	1538	1724	N/A	N/A	1576	L/O Roseton-E.Fishkill 345	L/O Athens-PV 345
F	NatGrid	Athens-PV 345	1538	1724	N/A	N/A	1560	L/O Roseton-E.Fishkill 345	L/O Leeds-PV 345
G	O&R	Ramapo 345/138 #1300	607	688	806	825	872	L/O CoopCorner-Mid-RockTav 345	Ramapo stuck breaker
G	O&R	Ramapo 345/138 #1300	607	688	664	676	727	L/O W.Haverstraw 345/138	Ramapo stuck breaker
G	O&R	Ramapo 345/138 #1300	607	688	659	650	704	L/O CoopCorner-Mid-RockTav 345	Tower 67/68
G	O&R	Ramapo 345/138 #2300	607	688	806	825	872	L/O CoopCorner-Mid-RockTav 345	Ramapo stuck breaker
G	O&R	Ramapo 345/138 #2300	607	688	664	676	727	L/O W.Haverstraw 345/138	Ramapo stuck breaker
G	O&R	Ramapo 345/138 #2300	607	688	659	650	704	L/O CoopCorner-Mid-RockTav 345	Tower 67/68

RG&E's Station 80 includes four 345 kV transmission connections and four 345/115 kV transformers that serve the Rochester area. Starting in 2013, the T1 345/115 kV transformer would be loaded at 132% of its long term emergency (LTE) rating for loss of the T5 transformer followed by a stuck breaker that results in the loss of transformers T2 and T3. Similarly, the T3 345/115 kV transformer would be loaded at 129% of its LTE rating starting in 2013 for loss of the T1 transformer followed by a stuck breaker that results in the loss of transformers T2 and T5. The overloads on T1 and T3 are caused by the loss of three sources (i.e., transformers) to the 115 kV system.

RG&E's Pannell station includes four 345 kV transmission connections and three 345/115 kV transformers that serve the Rochester area. Similar to the violations identified at Station 80, starting in 2013 the Pannell T3 transformer would be loaded at 107% of its LTE rating for loss of the Ginna generating unit followed by a stuck breaker at Station 80 that results in the loss of Station 80 transformers T2 and T5. The overload of the Pannell T3 transformer is caused by the loss of three sources (i.e., generator and two transformers) to the 115 kV system.

National Grid's Clay 115 kV station includes eight 115 kV transmission connections and two 345/115 kV transformers that serve the Oswego and Syracuse areas. Starting in 2013, the Clay-Teall #10 115 kV line would be loaded at 103% of its LTE rating for loss of Clay-Dewitt 345 kV followed by a stuck breaker at Oswego 345 kV that results in the loss of Oswego-Elbridge-Lafayette 345 kV line (including Elbridge 345/115 kV transformer) and Oswego T7 345/115 kV transformer. This overload is due to power flowing from north to south on the 115 kV system after the loss of the two north-to-south 345 kV paths in that area.

National Grid's Leeds – Pleasant Valley 345 kV corridor includes two 345 kV lines from north to south: Leeds – Pleasant Valley and Leeds – Athens – Pleasant Valley. Starting in 2022, each of these lines would be over LTE ratings for two combinations of N-1-1 contingencies. The most severe contingency pair would cause the Leeds – Pleasant Valley 345 kV line to be loaded at 102% of it LTE rating for loss of the Roseton – East Fishkill 345 kV line followed by the loss of the Athens – Pleasant Valley 345 kV line. Similarly, the Athens – Pleasant Valley 345 kV line would be loaded at 101% of it LTE rating for loss of the Roseton – East Fishkill 345 kV line followed by the loss of the Leeds – Pleasant Valley 345 kV line. These overloads are due to load growth and a reduction in generation in the Lower Hudson Valley and New York City areas. As noted in Section 3.5, 1,218 MW of generation is considered retired in Zones J and K, and as noted in Appendix C, peak load growth in Zones G through K is 2,514 MW from 2012 to 2022. These two factors have also resulted in an LOLE deficiency in 2020. The root cause of both the LOLE and N-1-1 deficiencies are accordingly the same and addressing the LOLE deficiency in 2020 would also address the transmission overloads in 2022. Therefore, there is no need to separately address this transmission security deficiency at this time.

ConEdison's Ramapo substation includes six 345 kV transmission connections and two O&R 345/138 kV transformers that serve the O&R service area. Starting in 2013 the NYISO observed that post-contingency flows on either of the 345/138 kV O&R transformers could reach 132% of the LTE thermal limit for three combinations of NYSRC N-1-1 design criteria contingencies. The most severe contingency combines the loss of a 345/138kV transformer supply into the O&R system, and the subsequent loss of two additional sources due to a stuck breaker. O&R has indicated that it is reviewing its LTP to ensure that it addresses these overloads by 2016.[6]

For all other N-1-1 contingency combinations that were evaluated, corrective actions were identified for each N-1 outage condition such that there were no other post-contingency thermal or voltage violations on the BPTF.

4.2.2. Short Circuit Assessment

Performance of a transmission security assessment includes the calculation of symmetrical short circuit current to ascertain whether the circuit breakers in the system would be subject to fault current levels in excess of their rated interrupting capability. The analysis was performed for the year 2017 reflecting the study conditions outlined in Sections 3.4, 3.5 and 3.6. The calculated fault levels would be constant over the second five years because no new generation or transmission is modeled in the RNA for second five years, and the methodology for fault duty calculation is not sensitive to load growth. The detailed results are presented in Appendix D of this report.

In general, fault current levels in the NYCA system decreased compared to the 2010 RNA due to major system changes including generator retirements and additional series reactors in service. However , there are three stations owned by National Grid which could experience over-duty breakers. These results are due to re-ratings of circuit breakers that have resulted in lower interrupting capabilities. Table 4-2 summarizes over-duty breakers at each station. National Grid reports that plans to make the necessary facility upgrades are in place. For Scriba 345 kV, breaker replacements will be completed by the end of 2012. For Porter 115 kV, breaker replacements will be completed in 2015. For Porter 230 kV, the breaker replacements will be completed in 2016.

[6] O&R intends to discuss with the NYISO a reevaluation of the BPS classification of the Ramapo 345/138 kV transformers at the NPCC.

Table 4-2: 2012 RNA Over-duty Breaker Summary Table

Station	kV	Number of Over-duty Breaker(s)	Breaker ID
Scriba	345	8	R90,R100,R200,R210,R250,R915,R935,R945
Porter	230	9	R110,R120,R15,R170,R25,R320,R825,R835,R845
Porter	115	10	R10,R130,R20,R30,R40,R50,R60,R70,R80, R90

4.2.3 Transmission and Resource Adequacy Assessment

The 2012 RNA Base Case Peak Load forecast was utilized in the analysis to determine transmission system transfer limits. Tables 4-3, 4-4 and 4-5 below provide the thermal and voltage transfer limits for the major NYCA interfaces. For comparison purposes, the 2010 RNA transfer limits are presented. Relatively small differences occur as the result of load increases and generator retirements in NYCA and external systems.

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

Interface	2012 RNA study						2010 RNA study		
	2013	2014	2015	2016	2017	2022	2013	2014	2015
Dysinger East	2925	2975	2975	2975	2975	Same as 2017	3200	3175	3175
West Central	1600	1675	1675	1675	1675	Same as 2017	1850	1900	1900
Central East less PV-20 plus Fraser-Gilboa	3375	3425	3425	3425	3475	Same as 2017	3475	3475	3400
F to G	3475	3475	3475	3475	3475	Same as 2017	3475	3475	3525
UPNY-SENY (MARS)	5150	5150	5150	5150	5150	Same as 2017	5400	5400	5475
I to J	4350	4400	4400	4400	4400	Same as 2017	4350	4350	4400
I to K	1290	1290	1290	1290	1290	Same as 2017	1290	1290	1290

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

Interface	2012 RNA study						2010 RNA study		
	2013	2014	2015	2016	2017	2022	2013	2014	2015
Dysinger East	2725	2900	2875	2900	2875	Same as 2017	2725	2725	2875
West Central	1500	1575	1575	1550	1575	Same as 2017	1475	1475	1575
Central East less PV-20 plus Fraser-Gilboa	3250	3350	3350	3350	3350	Same as 2017	3375	3350	3350
UPNY-ConEd	5150	5210	5210	5210	5210	Same as 2017	5475	5475	5605
I to J & K	5210	5160	5160	5160	5160	Same as 2017	5290	5290	5470

Table 4-5: Transmission System Base Case Transfer Limits for Key Interfaces in MW

Interface	2012 RNA study											2010 RNA study					
	2013		2014		2015		2016		2017		2022	2013		2014		2015	
Dysinger East	2725	V	2900	V	2875	V	2900	V	2875	V	Same as 2017	2725	V	2725	V	2875	V
West Central	1500	V	1575	V	1575	V	1550	V	1575	V	Same as 2017	1475	V	1475	V	1575	V
Central East less PV-20 plus Fraser-Gilboa	3250	V	3350	V	3350	V	3350	V	3350	V	Same as 2017	3375	V	3350	V	3350	V
F to G	3475	T	3475	T	3475	T	3475	T	3475	T	Same as 2017	3475	T	3475	T	3525	T
UPNY-SENY (MARS)	5150	T	5150	T	5150	T	5150	T	5150	T	Same as 2017	5400	T	5400	T	5475	T
I to J	4350	T	4400	T	4400	T	4400	T	4400	T	Same as 2017	4350	T	4350	T	4400	T
I to K	1290	T	1290	T	1290	T	1290	T	1290	T	Same as 2017	1290	T	1290	T	1290	T
I to J & K	5210	C	5160	C	5160	C	5160	C	5160	C	Same as 2017	5290	C	5290	C	5470	C

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

The results of the 2012 RNA Base Case studies show that the LOLE for the NYCA does not exceed 0.1 until the year 2020 and the LOLE continues to increase through 2022. The LOLE results for the entire 10-year RNA Base Case are presented in Table 4-6. All results are rounded to two decimal places.

Table 4-6: NYCA LOLE for the 2012 RNA Study Base Case*

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Area A	0	0	0	0	0	0	0	0	0	0
Area B	0	0	0	0	0	0	0	0	0	0.01
Area C	0	0	0	0	0	0	0	0	0	0
Area D	0	0	0	0	0	0	0	0	0	0
Area E	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Area F	0	0	0	0	0	0	0	0	0	0
Area G	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.03
Area H	0	0	0	0	0	0	0	0	0.00	0.00
Area I	0.01	0.01	0.02	0.02	0.03	0.04	0.06	0.10	0.16	0.22
Area J	0.01	0.01	0.02	0.02	0.03	0.04	0.07	0.10	0.16	0.23
Area K	0.00	0.00	0.01	0.01	0.01	0.02	0.03	0.05	0.10	0.15
NYCA	**0.01**	**0.01**	**0.02**	**0.02**	**0.03**	**0.05**	**0.07**	**0.11**	**0.17**	**0.24**

*Note: "0" represents an LOLE less than 0.001. An LOLE value of 0.00 represents a rounded value such as 0.001 through 0.004.

In order to avoid over-dependence on emergency assistance from external areas, emergency operating procedures in the external areas are not modeled. Capacity of the external systems is further adjusted so that the interconnected LOLE value of the external areas (Ontario, New England, Hydro Quebec, and PJM) is not less than 0.10 and not greater than 0.15 through the year 2014 and then the load and generation are frozen in the remaining years. The external area LOLE values for the Base Case are illustrated in Table 4-7. The modifications required to establish these LOLE values are described in Appendix D.

Table 4-7: External Area LOLE for the 2012 RNA Study Base Case

Area/Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
NE	0.14	0.14	0.14	0.14	0.15	0.15	0.16	0.17	0.18	0.19
ONT	0.12	0.13	0.13	0.13	0.13	0.13	0.14	0.14	0.15	0.15
HQ	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
PJM	0.11	0.11	0.11	0.12	0.12	0.13	0.14	0.15	0.16	0.17

Table 4-8 illustrates the NYCA LOLEs from the 2010 RNA Study.

Table 4-8: NYCA LOLE from the 2010 RNA Study Base Case

Area/Year	2013	2014	2015	2016	2017	2018	2019	2020
NYCA	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01

4.2.4 System Stability Assessment

The 2010 NYISO Comprehensive Area Transmission Review (CATR), which was completed in June 2011, is the most recent CATR. An Interim Review was performed in 2011 and will be performed in 2012. The 2010 CATR was performed for the study year 2015 and included the required RNA stability assessments. The BPTF includes all the facilities designated by the NYISO to be part of the bulk power system as defined by the NPCC and additional non-BPS facilities.

The CATR found that the planned New York State BPTFs are in conformance with the applicable North American Electric Reliability Corporation (NERC) Reliability Standards, NPCC Transmission Design Criteria and NYSRC Reliability Rules. The stability analyses were conducted as required in the NPCC and the NYSRC reliability criteria and rules and show no stability issues for summer peak load or light load conditions.

4.2.5 Reliability Needs Summary

After determining that the LOLE criterion would be exceeded beginning in 2020, the LOLE for the bulk power system for those years was calculated with two additional parameters. The first additional parameter is NYCA Thermal with all NYCA internal transfer limits set at thermal (not voltage) limits to determine whether the system was adequate to deliver generation to the loads. The second parameter, the NYCA Free Flow, was performed with all NYCA internal transfer limits removed. Table 4-9 presents a summary of the results.

Table 4-9: Summary of the LOLE Results – Base, Thermal and "Free Flowing" Sensitivities

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
NYCA	0.01	0.01	0.02	0.02	0.03	0.05	0.07	0.11	0.17	0.24
NYCA Thermal								0.11	0.17	0.24
NYCA FreeFlow									0.04	0.05

In general, an LOLE result above 0.1 days per year indicates that additional resources are required to maintain reliability and identifies that there are Reliability Needs. The results indicate the first year of need for resource adequacy is 2020 for the RNA base case. The Reliability Needs can be resolved by adding capacity resources downstream of the transmission constraints or by adding transmission reinforcement. The first year of need for the free flowing sensitivity case is beyond 2022, and therefore there is no statewide deficiency.

Table 4-10 below presents a summary of the transmission security violations expressed as an overload amount in relation to a facility rating. Since there are violations starting in 2013 in zones B,C, and G, there are Reliability Needs in the First Five year Period.

Table 4-10: Summary of Transmission Security Violations

Zone	***Owner***	***Monitored Facility***	***LTE Rating (MVA)***	***2013 Loading***	***2017 Loading***	***2022 Loading***
B	RG&E	Sta.80 345/115 #T1	276	132%	125%	128%
B	RG&E	Sta.80 345/115 #T3	276	129%	124%	127%
B	RG&E	Pannell 345/115 #T3	265	107%	106%	103%
C	NatGrid	Clay-Teall 115 #10	120	103%	103%	107%
F	NatGrid	Leeds-PV 345	1538	N/A	N/A	102%
F	NatGrid	Athens-PV 345	1538	N/A	N/A	101%
G	O&R	Ramapo 345/138 #1300	607	133%	136%	144%
G	O&R	Ramapo 345/138 #1300	607	109%	111%	119%
G	O&R	Ramapo 345/138 #1300	607	109%	107%	116%
G	O&R	Ramapo 345/138 #2300	607	133%	136%	144%
G	O&R	Ramapo 345/138 #2300	607	109%	111%	119%
G	O&R	Ramapo 345/138 #2300	607	109%	107%	116%

Compensatory MWs

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

Needs solutions. Accordingly, compensatory MWs may reflect either generation capacity, demand response or transmission additions.

As explained in Section 3.7, the minimum compensatory MWs were developed for the violation identified in Table 4-10. Table 4-11 summarizes the results.

Table 4-11: Compensatory MW Additions

Zone	***Monitored Facility***	***2013 MVA Overload***	***Minimum Compensatory MW***	***2017 MVA Overload***	***Minimum Compensatory MW***	***2022 MVA Overload***	***Minimum Compensatory MW***
B	Sta.80 345/115 #T1	89	245	70	193	77	212
B	Sta.80 345/115 #T3	81	223	67	185	75	204
B	Pannell 345/115 #T3	19	46	15	36	9	22
C	Clay-Teall 115 #10	3	4	3	4	8	
F	Leeds-PV 345	N/A		N/A		38	89
F	Athens-PV 345	N/A		N/A		22	52
G	Ramapo 345/138 #1300	199	304	218	334	265	405
G	Ramapo 345/138 #1300	57		69		117	
G	Ramapo 345/138 #1300	52		43		98	
G	Ramapo 345/138 #2300	199	304	218	334	265	405
G	Ramapo 345/138 #2300	57		69		117	
G	Ramapo 345/138 #2300	52		43		98	

For resource adequacy deficiencies, the amount and location of the compensatory MWs 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 MWs was chosen because this unit size is consistent with nominal power rating of combined cycle unit power blocks that have been observed in practice and provides reasonable step sizes for simulation purposes. If an LOLE violation is, to some extent, caused by a frequently constrained interface, locating compensatory MWs upstream of that load zone will result in a higher level of required compensatory MWs to meet resource adequacy. It is also recognized that solutions such as combustion turbine generating units and demand-side management (DSM) solutions can be added in much smaller increments.

The results of the MARS simulations for the RNA study case and scenarios provide information that can be used to guide the compensatory MW analyses. It should be noted that there may be other combinations of compensatory MWs that would also meet the statewide reliability criteria. It is not the intent of this analysis to identify preferred locations or combinations for potential solutions.

The purpose of the analyses is not only to show the level of compensatory MWs needed to meet the LOLE criterion but also the importance of the location of the compensatory MWs. Not all alternatives tested were able to achieve an LOLE of less than or equal to 0.1 days per year. By 2022, a total of 750 MWs are required to compensate for retiring units and load growth. Also included in the table is the amount of compensatory MWs needed for the transmission security needs, implemented in blocks of 250 MW generic generation for comparative purposes. The security compensatory MWs are presented in conjunction with the adequacy compensatory MWs to determine if there are synergistic benefits for mitigating both deficiencies with capacity additions.

Table 4-12: Compensatory MW Additions for 2013 through 2022

Alternative	Year	A	B	G	J	K	NYCA	LOLE
2013 A1	2013		250				250	N/A
2013 A2	2013		500				500	N/A
2013 A3	2013	500					500	N/A
2013 A4	2013	500	500				1000	N/A
2013 A5	2013			500			500	N/A
2017 A1	2017			500			500	N/A
2020 A1	2020				250		250	0.08
2020 A2	2020				500		500	0.06
2020 A3	2020				250	250	500	0.05
2020 A4	2020			250	250		500	0.06
2020 A5	2020			500	0		500	0.06
2020 A6	2020			250	0		250	0.08
2020 A7	2020		100				100	0.11
2021 A1	2021				500		500	0.09
2021 A2	2021			250	250		500	0.09
2021 A3	2021				250	250	500	0.09
2021 A4	2021		250		250		500	0.12
2021 A5	2021			500	0		500	0.09
2022 A1	2022				750		750	0.09
2022 A2	2022			250	500		750	0.10
2022 A3	2022				500	250	750	0.09
2022 A4	2022		250	250	250		750	0.13
2022 A5	2022			500	250		750	0.10

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

It should be noted that the above findings are based upon the bulk power transmission system as modeled in the RNA Base Case. The NYISO will evaluate any proposed solutions to increase transfer capability during the development of the 2012 CRP.

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

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

4.3. Scenarios

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

1. High Load (Econometric) Forecast
2. Low Load (full 15 x 15 achievement) Forecast
3. Indian Point Plant Retirement
4. Zonal Capacity at Risk
5. All Coal Generation Retirement

4.3.1 Forecast Scenarios

4.3.1.1 High Load (Econometric) Forecast

The RNA Base Case forecast includes energy reduction impacts associated with statewide energy efficiency programs. The Econometric Forecast Scenario excludes these energy efficiency program impacts from the peak forecast and is shown in Table 3-1 (a). It projects a higher peak load in 2022 than the Base Case forecast by 2324 MW. Since the peak load in the econometric forecast is higher than the Base Case, the probability of violating the LOLE criterion increases.

The results indicate the LOLE would be 0.09 in 2016 and would increase to 0.16 by 2017 under the high load scenario. If the high load forecast were to materialize, the year of need for resource adequacy would be advanced by three years from 2020 in the base case to 2017 in the high load scenario.

Transmission security analysis (N-1 and N-1-1) was performed for the 2022 econometric forecast using a linear powerflow solution. The results show that the increased load growth across the state aggravates the violations identified in the RNA Base Case and causes new overloads throughout the state. The most significant effect of the increased load is on the transmission paths that make up the UPNY-SENY interface, with marginal overloads on Marcy South and loading on Leeds – Pleasant Valley and Athens – Pleasant Valley increased by 33%. New Scotland – Leeds, Leeds – Hurley, and Leeds – Athens 345 kV lines were also overloaded by 4% to 12%. In addition, increased load levels in Long Island caused marginal overloads on Dunwoodie – Shore Rd 345 kV (Y50) and certain 138 kV transmission lines.

4.3.1.2 Low Load (full 15 x 15 achievement) Forecast

The low load forecast for this scenario is the 2012 RNA 15 x 15 forecast, as shown in Table 3-1. The low load forecast projects a peak demand 1851 MW lower than the 2012 RNA Base Case in the year 2020, and by 2022, the peak demand is 1888 MW lower than the base forecast.

This low load scenario shows that the LOLE for 2020 would be 0.01 and the 2022 LOLE would be 0.04, thus avoiding the LOLE violations noted in the base case and avoiding the projected overloads in 2022 on the Leeds/Athens – Pleasant Valley circuits.

4.3.2. Indian Point Plant Retirement Scenario

Reliability violations of transmission security and resource adequacy criteria would occur in 2016 if the Indian Point Plant were to be retired by the end of 2015 (the latter of the current license expiration dates) using the Base Case load forecast assumptions.

The Indian Point Plant has two base-load units (2060 MW) located in Zone H in Southeastern New York, an area of the State that is subject to transmission constraints that limit transfers in that area as demonstrated by the reliability violations in the Base Case and Econometric Forecast Scenario. Southeastern New York, with the Indian Point Plant in service, currently relies on transfers to augment existing capacity, and load growth or loss of generation capacity in this area would aggravate those transfer limits.

Transmission security analysis (N-1 and N-1-1) was performed for the 2016 and 2022 Base Case load forecasts using a linear powerflow solution. The results show that the shutdown of the Indian Point Plant exacerbates the loading across the UPNY-SENY interface, with Leeds – Pleasant Valley and Athens – Pleasant Valley 345 kV lines loaded to 124% of their LTE rating in 2016 and 158% in 2022 following N-1-1 transmission contingencies. Along the parallel Marcy South corridor, the Fraser – Coopers Corners and Rock Tavern – Ramapo 345 kV lines are each loaded to over 110% of their LTE ratings in 2022 following N-1-1 transmission contingencies. Additionally, the Roseton – East Fishkill 345 kV line, which can impact UPNY-SENY, is loaded to 107% of its normal rating in 2022 due to lack of available system adjustments necessary to reduce flow following a single contingency. Compensatory megawatts would be necessary in Zones G, H, I, J, or the western portion of K to mitigate these overloads. For example, compensatory megawatts amounting to 1000 MW in 2016 and 2425 MW in 2022 located at Dunwoodie/Sprain Brook or points south would alleviate these overloads.[7]

[7] The amount of compensatory megawatts in Zones G, H, or I necessary to alleviate the transmission security overloads may increase depending on the specific location of the compensatory resource.

Transfer limit analysis was performed with both Indian Point units out-of–service (i.e. beginning 2016), and it was assumed all other generation capacity in Zones G through I would be fully dispatched, supporting Southeastern New York load. The analysis shows that, under typical load conditions, the ability to transfer power to Zone J and Zone K would be limited by the upstream UPNY-SENY interface. If the Indian Point Plant were to be retired and new generation interconnected below the UPNY-SENY interface without proper system reinforcement, the UPNY-ConEd and I to J and K interface may be constrained by voltage or thermal limits.

Furthermore, as reported in the 2010 RNA, under stress conditions the voltage performance on the system without the Indian Point Plant would be degraded. In all cases, power flows replacing the Indian Point generation cause increased reactive power losses in addition to the loss of the reactive output from the plant. It would be necessary to take emergency operations measures, including load relief[8] to eliminate the transmission security violations in Southeastern New York.

For the Base Case load forecast, LOLE was 0.48 in 2016, a significant violation of the 0.1 days per year criterion. Beyond 2016, due to annual load growth the LOLE continues to escalate for the remainder of the Study Period reaching an LOLE of 3.63 days per year in 2022. As shown in Table 4-13, the low load forecast causes the LOLE violation to be deferred to 2018, while the high (econometric) load forecast results in significantly higher LOLE violations in 2016 and 2022.

Table 4-13: Indian Point Plant Retirement LOLE Results

Sensitivity	***Year 2016 LOLE***	***Year 2022 LOLE***
Base Case load forecast	0.48	3.63
Low (15 x 15) load forecast	0.07	0.80
High (Econometric) load forecast	1.50	9.37

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

4.3.3 Zonal Capacity at Risk

The Base Case LOLE does not exceed 0.10 until 2020. Scenario analyses were performed to determine the reduction in zonal capacity which would cause the NYCA LOLE to exceed 0.10 in 2017 and 2022. Since the base case LOLE for 2022 exceeded the LOLE limit, compensatory MW were added in Zone J to bring the NYCA LOLE to within 0.1. Capacity was then removed from Zones A-F to determine how many MW could be removed without exceeding the 0.1 LOLE for NYCA.

For study purposes, nine of the eleven zones comprising the NYCA were aggregated as A-F and G-H-I, but the scenario considered Zones J and K separately. The overall capacity in these groupings was de-rated in increments of 250 MW until the NYCA LOLE exceeded 0.10. The NYISO did not model the potential impacts within those zones or superzones. Therefore no internal transmission problems were evaluated. The results do not indicate whether or not the transmission system could support some or all of the capacity de-rates nor does it indicate whether even a single generating unit can be removed without violating transmission system security. Transmission security analyses would need to be performed for any contemplated unit shutdown to avoid transmission security violations.

In separate studies for 2017, the levels of capacity removed in those zones without violating NYCA LOLE are: Zone J at 750 MW, or Zone K at 500 MW, or Zones G-I at 750 MW total. These capacities cannot be removed simultaneously. For superzone A-F, up to 3000 MW of capacity could be removed in 2017 without an LOLE violation.

For 2022, after adding 750 compensatory MW to Zone J, it was determined that between 500 and 750 MW of capacity could be removed from superzone A-F without an LOLE violation.

While the zones at risk analysis may suggest a maximum level of capacity that can be removed without LOLE violations, in reality lower amounts of capacity removal are likely to result in reliability issues at specific transmission locations. The removal of capacity and its impact on the reliability of the transmission system and the transmission system's transfer capability are highly location dependent. The study did not attempt to assess a comprehensive set of potential scenarios that might arise from specific unit retirements. Therefore, capacity removal from any of these zones should be further studied and verified according to the specific capacity locations in the transmission network. Additional transmission security analysis such as N-1-1 analysis would need to be performed for any contemplated plant retirement in any zone.

4.3.4 All Coal Generation Retirement

After extensive discussion with stakeholders, the decision was made by the NYISO to perform a resource adequacy scenario which models the retirement of all NYCA coal generation by year-end 2015. While the performance of any scenario in the RNA does not indicate that it will occur, stakeholders agreed that coal units have been under economic pressure due to the reduction in natural gas prices and the resulting impact on market prices. Other factors such as higher operating costs and additional costs anticipated due to future environmental regulations may contribute to coal plant retirements.

No transmission security analyses were performed for this scenario since reliability studies for plant retirement would have to be performed on a plant by plant basis.

The coal plant retirement studies show that the NYCA LOLE would exceed 0.1 in 2019, at least one year earlier than in the base case. Other results included 0.06 LOLE in 2016, 0.10 LOLE in 2018, 0.17 LOLE in 2020, and 0.44 LOLE in 2022. As with the base case, individual zone LOLE exceedances occurred in the latter years in Zones I, J, and K for the coal retirement scenario.

Table 4-14 below summarizes the LOLE results for the Base Case and for the studied years in Scenarios 1, 2, and 5.

Table 4-14: Base Case and Scenario Case LOLEs

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
NYCA BASE	0.01	0.01	0.02	0.02	0.03	0.05	0.07	0.11	0.17	0.24
High Load			0.06	0.09	0.16					
Low Load									0.01	0.04
Coal Retired				0.06		0.10	0.15	0.17		0.44

5. Impacts of Environmental Program Initiatives

5.1. Environmental Regulations

New York has a long history in the active development of environmental policies and regulations that govern the permitting, construction and operation of power generation and transmission facilities. Currently New York's standards for permitting new generating facilities are among the most stringent in the nation. The combination of tighter environmental standards, coupled with competitive markets administered by the NYISO since 1999, has resulted in the retirement of older plants equaling approximately 4000 MW of capacity, and the addition of over 9,300 MW of new efficient generating capacity. In turn, these changes have led to marked reduction of power plant emissions and a significant improvement in the efficiency of the generation fleet. Figures 5-1 and 5-2 show the New York State power plant emissions and heat rates from 1999 through 2011.

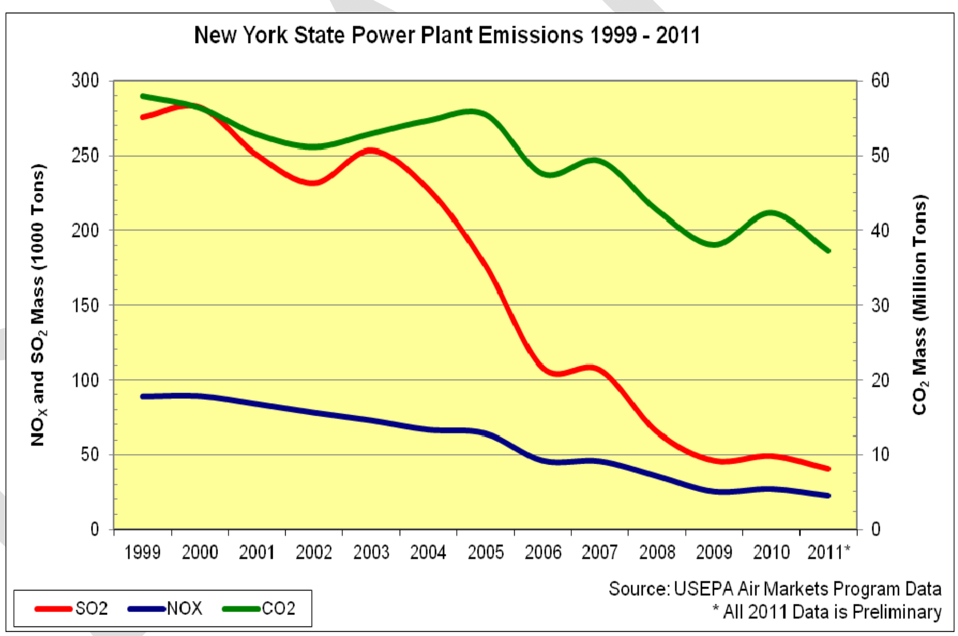

Figure 5-1: New York Power Plant Emissions 1999-2011

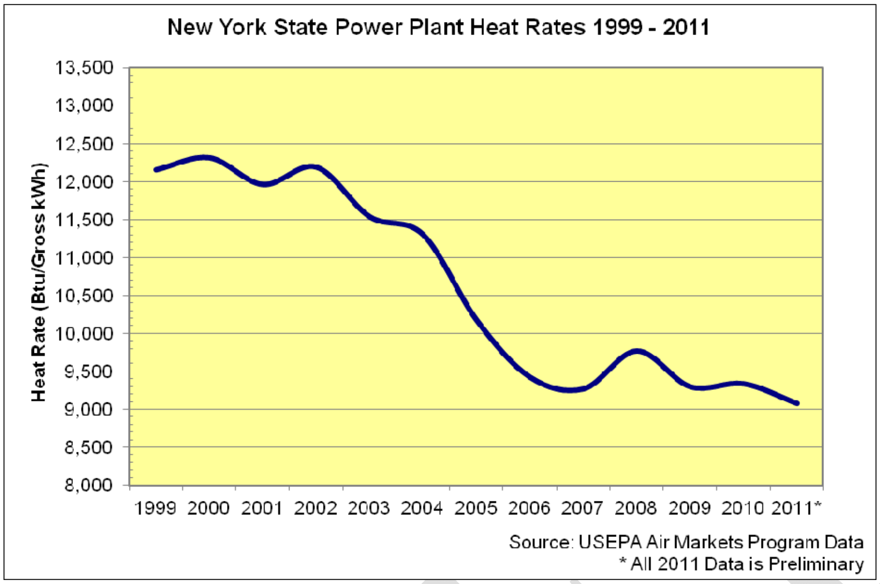

Figure 5-2: New York Power Plant Heat Rates 1999-2011

Notwithstanding the progress towards achieving New York's clean energy and environmental goals, various environmental initiatives are either in place or pending that will affect the operation of the existing fleet. Environmental initiatives that may affect generation resources may be driven by either or both of the State and Federal programs. Since the prior RNA, the USEPA has promulgated several regulations that will affect most of the thermal fleet of generators in NYCA. Similarly, NYSDEC has undertaken the development of several regulations that will apply to most of the thermal fleet in New York.

One of the purposes of the RNA is to identify possible future outcomes that could lead to insufficient resources in the NYS Power System to satisfy applicable Reliability Criteria. Such a situation may result from the previously unplanned retirement of a significant amount of capacity provided by existing resources. The purpose of the development of this "Environmental Scenario" is to gain insight into the population of resources that are likely to be faced with major capital investment decisions in order to achieve compliance with several evolving environmental program initiatives. The premise of this analysis is that the risk of previously unplanned retirements is related to two factors: first, the capital investment decisions resource owners need to make in order to achieve compliance with the new regulatory program requirements, and second, the recent change in the relative attractiveness of gas versus coal has challenged the viability of some former baseload units. The goal of this analysis is to identify when and where these risks could occur on the New York Power System.

This analysis estimates levels of capacity that will need to undertake retrofits to achieve compliance with the selected suite of environmental initiatives. The identification and timing of these potential risks will help to inform the NYISO and State policy makers of the potential impacts to system reliability caused by the newly adopted and/or proposed environmental regulations. Of equal importance, the results will also provide useful information about future opportunities to developers of new clean efficient generation resources or aggregators of special case resources.

5.1.1 Selection of Major Environmental Program Initiatives

Five environmental initiatives are sufficiently broad in application and have requirements that potentially may require retrofitting environmental control technologies to an extent that generator owners will likely need to address the retirement versus retrofit question. These environmental initiatives are: (i) NYSDEC's Reasonably Available Control Technology for Oxides of Nitrogen (NOx RACT);, (ii) Best Available Retrofit Technology (BART) to address regional haze; (iii) Best Technology Available (BTA) for cooling water intake structures;,(iv) the USEPA's Mercury and Air Toxics Standards (MATS), and (v) the Cross State Air Pollution Rule (CSAPR) addressing interstate transport of criteria air pollutants.

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

NYS DEC finalized new regulations for the control of emissions of nitrogen oxides (NOx) from fossil fueled power plants (Part 227-2). The regulations establish presumptive emission limits for each type of fossil fueled generator and each fuel used in an electric generator in New York that has a capacity greater than 25MW. Compliance options include averaging emissions with lower emitting units, fuel switching, and installing emission reduction equipment such as low NOx burners or combustors, selective catalytic reduction units, or retirement. Generators were required to file permit applications and a RACT analysis with NYSDEC by January 1, 2012. Compliance with approved plans is required by July 1, 2014.

5.1.1.2 Best Available Retrofit Technology (BART)

NYS DEC recently promulgated a new regulation Part 249, Requirements for the Applicability, Analysis, and Installation of Best Available Retrofit Technology (BART) Controls. The regulation applies to fossil fueled electric generating units built between August 7, 1962 and August 7, 1977 and is necessary for New York State to comply with provisions of the federal Clean Air Act that are designed to improve visibility in National Parks. The regulation requires an analysis to determine the impact of an affected unit's emissions on visibility in national parks. If the impacts are greater than a prescribed minimum, then emission reductions must be made at the affected unit. Emissions control of sulfur dioxide (SO2), nitrogen oxides (NOx) and particulate matter (PM) may be necessary. Compliance Plans were filed with NYSDEC in October 2011. The compliance deadline is January 2014. USEPA recently announced that several of the submitted plans required additional reductions.

5.1.1.3 Mercury Air Toxics Standard (MATS)

USEPA announced the final rule in December, 2011. (The proposed rule had been known as the Maximum Achievable Control Technology –MACT Rule for Hazardous Air Pollutants.(HAPS)) The rule establishes limits for acid gases, Hydrogen Chloride (HCl), Hydrogen Fluoride (HF), Mercury (Hg), and Particulate Matter. Alternative limits were also established. MATS limits will apply to coal and/or oil-fired generators. The compliance date is March 2015. NYSDEC may provide an additional year to comply if necessary. Further, reliability critical units can qualify for another year to achieve compliance if retrofitting emissions control technology is required or if the reliability improvement project will take an additional year to comply.

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

5.1.1.4 Best Technology Available (BTA)

NYS DEC has finalized its policy document “Best Technology Available (BTA) for Cooling Water Intake Structures.” The policy applies to plants with design intake capacity greater than 20 million gallons/day and prescribes reductions in fish mortality. The proposed policy establishes performance goals for new and existing cooling water intake structures. The performance goals call for the use of wet, closed-cycle cooling systems at existing generating facilities. The policy provides some limited relief for plants with historical capacity factors less than 15%. The policy is applied at the time that the State Pollution Discharge Elimination System Permit is renewed which is theoretically a five year period.

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

5.1.1.5 Cross State Air Pollution Rule (CSAPR)

The USEPA finalized the rule in December. The rule is designed to reduce emissions of SO2, Annual NOx and Ozone Season NOx from fossil fueled power plants in 28 central and eastern states. The regulation is implemented through the use of emission allowances and limited trading programs. The regulation establishes emission budgets for each affected state. The emission budget is then divided on a pro-rata basis determined by historic heat input for existing facilities. There are set asides to provide allowances to new fossil generators. The use of emission allowances is expected to increase offering prices for generation from affected facilities. The final rule was placed under a stay by a federal District Court. But for the action of the courts, the rule would be in effect currently with another reduction in the SO2 cap scheduled for 2014. While this rule is currently the subject of litigation, we have chosen to include it in our analysis. CSAPR is USEPA’s revision of the Clean Air Interstate Rule (CAIR) which was vacated by the US Supreme Court. In doing so, the Court ordered that CAIR remain in effect until such time as replacement rule is implemented. In December when the District Court stayed the CSAPR rule, it ordered that CAIR be reinstated. CAIR as promulgated requires significant reductions in allowable emissions scheduled for 2015. Because the federal Clean Air Act provides for reductions in interstate air pollutant transport, it is reasonable to assume that a national interstate program will be in effect for limiting emissions of SO2 and NOx via a cap and trade program in the early part of the ten-year planning horizon. The CSAPR rule will be used to evaluate the potential impacts of that program.

5.1.2 Reliability Impact Assessment Methodology

Several of the evolving environmental initiatives described above have sufficient definition of potential requirements, are generally widespread in effect, and are expected to require compliance actions in the earlier portion of the planning period. Some of these programs either individually or taken together could require substantial additional capital investment. The programs are estimated to impact 31,710 MW of capacity in the NYCA or 81% of the installed generating capacity listed in the 2012 NYISO Gold Book and used to meet the electricity needs of New York consumers.

Each of the four programs has been examined to estimate the amount and location of capacity that will need to retrofit environmental control technology to comply with the new regulation.

5.1.2.1 NOx RACT Impact Assessment

The NYISO retained GE to conduct a detailed study about the types and costs of control technology necessary to comply with the proposed regulation. The study found that “[a] total of 72 units or 9515 MW of capacity was identified as needing some type of control mechanism or equipment modification to comply with the proposed standard.” Capital costs of compliance were estimated to be approximately in the range of $100-300 million. The study concluded that the costs to comply with this regulation would reduce operating margin for affected generators but taken alone would not generally lead to situations where those margins would become negative.

Generators were required to file permit applications and a RACT analysis with NYSDEC by January 1, 2012. Compliance with approved plans is required by July 1, 2014. The available plans have been reviewed. Several generators have requested that their submittals be considered Competitive Business Information. NYSDEC has denied these requests. The resolution of this issue may extend beyond the time of this study.

Reviewing the plans that are public, it is seen that approximately 27,000 MW of capacity is subject to this rule of which generating units of approximately 6000 MW of capacity are involved in emission reduction projects. Some of these projects are underway and the balance should be able to be accomplished prior to the July 2014 compliance date.

5.1.2.2 BART Impact Assessment

The results of the visibility analysis are used to determine the emission reductions that may be necessary for SO2, NOx, and PM. USEPA has established a presumptive set of emission limits for 8600 MW of affected units. Appendix E contains a detailed listing of affected units, the majority of which are located in SENY. The majority of these units are large oil fired units that have gas as an alternate fuel. Many of these units do not have state of the art emission control systems.

The NOx control measures for BART generally were consistent with the results of the NOx RACT study. NYS DEC has established a reasonableness test of $5500/ton reduced. Capital expenditures for this program would be of the same order of magnitude as the NOx RACT program.

BART compliance plans were filed with NYSDEC in October 2010. NYSDEC has reviewed these plans and is in the process of issuing amended Title V stationary source permits. USEPA must also review and approve these plans. It has announced that two of the proposed plans will need to be revised based on alternative limits that EPA has proposed as being more appropriate.

Historic emissions and inventories of installed emission control equipment have been reviewed to estimate the level of additional emission reductions required. Most of the affected capacity can with optimum operation of existing environmental control equipment and/or fuel switching, comply with the emission limits. Several small units have chosen to retire representing a capacity loss of less than 50 MW. Other plants will achieve the required emission reductions through the use of cleaner fuels, while others are undertaking retrofit projects. Approximately 1800 MW of capacity may be required to undertake a major emissions reduction project or switch to cleaner fuels. Five units may be required to retrofit environmental control technology. According to the Federal Register (April 25, 2012 pages 24794 to 24827), they are Northport 1, 2, 3, & 4 and Danskammer 4.

5.1.2.3 MATS Impact Assessment

USEPA announced the final rule for MATS for fossil fired electric generators in December. The regulations apply to coal and oil fueled electric generators greater than 25 MW. Units with 10,300 MW of capacity in NY will be affected by this regulation.

USEPA established a subcategory for limited use oil-fired generators. Units that maintain a capacity factor on oil that is less than 8% will be more lightly regulated. As shown in Figure 5-3, no oil fired EGUs exceeded the 8% Capacity Factor, while firing oil in 2009 and 2010. While these units will remain subject to MATS, it is not expected that significant emission control retrofit projects will be required at these units.

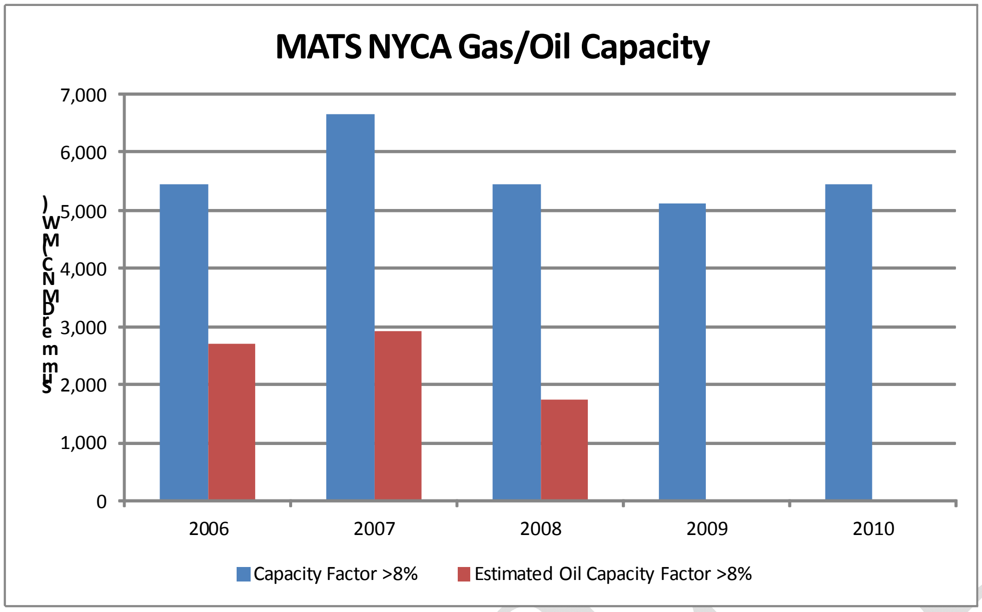

Figure 5-3: MATS NYCA Gas/Oil Capacity

The coal fired generators subject to MATS are also subject to NYS DEC Part 246 Phase 2 regulations for limitations on mercury emission. These regulations are more stringent than USEPA's MATS. The review of potential impacts for coal units focused on emissions of particulate matter (PM) and acid gases in the form of HCL. Alternative emission limits are also provided for Non-Hg Metals and SO2. Historic emissions and inventories of installed emission control equipment have been reviewed to estimate the level of additional emission reductions required. With optimum operation of existing environmental control equipment and/or fuel switching, most of the affected coal capacity can comply with the emission limits.

5.1.2.4 BTA Impact Assessment

NYS DEC's BTA policy will require the use of closed cycle cooling systems at plants that currently have open cycle cooling systems with some limited relief for sites that cannot physically accommodate cooling towers, generators with historical capacity factors below 15%, and where the expense of a closed cooling water system is "wholly disproportionate" compared to the environmental benefits to be gained. Several sites have gained limited relief.

NYS DEC has made twelve BTA determinations of which two determinations required the use of closed cycle cooling systems. Although the number of impacted MWs is unknown, for study purposes the NYISO shows a range from 4000 MW to 7000 MW. This program will require capital investments that are one to two orders of magnitude greater than the cumulative costs for the other environmental initiatives examined. Consequently, the BTA program has the greatest potential to lead to previously unplanned retirements.

5.1.2.5 CSAPR Impact Assessment

The CSAPR rule applies to most of the fossil fueled fleet with nameplate capacity greater than 25 MW. The rule will require the use of allowances in numbers equivalent to actual emissions for SO_2, Annual NOx, and for Ozone Season NOx. The budget for each of the states in the program has been established by USEPA through the use of long range transport models to identify sources and sinks for impact of emissions on areas in other states. The budget of allowances for each of the three categories is distributed on a pro-rata basis developed on historic heat input at affected units. A small set-aside is established for new units and recently retired units to continue to receive allowances for a limited time period. The rule calls for a two phase reduction of SO_2 while the limits for Annual NOx and Ozone Season NOx are fixed. The program limits the amount of allowances that can be obtained through trading with generator owners in other states. The total of the budget plus traded allowances is known as the "Assurance Level." Should a state's emissions exceed the Assurance Level then two additional allowances would need to be surrendered for the excess emissions. This penalty would be prorated across all emitters.

Historic emissions and inventories of installed emission control equipment have been reviewed to estimate the level of additional emission reductions required. As detailed in Table 5-1 below, with optimum operation of existing environmental control equipment and/or fuel switching, New York State should be able to operate within the Assurance Level.

Table 5-1: New York Sate Emission Allocations under the Cross State Air Pollution Rule

New York State [1] Emission Allocations under the Cross State Air Pollution Rule						
		2012 SO2	2014 SO2	Annual NOX	Ozone Season NOX
A	**Allocation for Units Proposed to be In-Service**	**28,395**	**21,301**	**17,342**	**8,318**
B	**Retired Unit [2] + Non-EGU Allocations [3] + Miscellaneous [4]**	**7,175**	**5,704**	**3,946**	**1,844**
C	**New Unit Set-Aside [5]**	**726**	**551**	**434**	**207**
D	**Total Allocation (A+B+C)**	**36,296**	**27,556**	**21,722**	**10,369**
E	**Trading Variablility for 2014** 18% Annual, 21% Ozone Season	**N/A**	**4,960**	**3,910**	**2,177**
F	**2014 Assurance Level (D+E)**	**N/A**	**32,516**	**25,632**	**12,546**
	Historic Emissions				
G	**2011 Emissions from Units Proposed to be In-Service**	**34,512**		**18,980**	**9,379**
H	**Estimated 2011 In-Service Unit Emissions - Best Demonstrated Performance** 2011 Actual Heat Input * Lowest Annual Emission Rate from 2006-2011	**15,660**		**14,172**	**7,313**
I	**2011 "New Unit" Emissions [5]**	**11**		**134**	**58**

[1] Linden Cogeneration Facility is not included.

[2] Retired Units Include: Poletti, Project Orange, Greenidge, Westover, Ogdensburg Cogen, Astoria Generating ST2 and 4, Glenwood ST 4 and 5, Far Rockaway ST4, and Dunkirk 1-4

[3] Three (3) Consolidated Edison Steam System Boilers were given allocations.

[4] EPA calculation and rounding error.

[5] New Unit allocations will be given to: Empire Generating and SCS Astoria II. Any remaining new unit set-aside will be reallocated among existing generators.

5.2. Summary of Impact Assessment

Table 5.2 below identifies the new environmental requirements that will become effective in the near term and the amounts of capacity that will be affected by each of these regulations. In addition, the quantities of capacity and number of units that have announced or are expected to undertake environmental control projects to achieve compliance are also tabulated.

Table 5-2: Summary of NYCA Impact Assessment by Program

Program	Description	Goal	Status	Compliance Deadline	Approximate Capacity Affected	Potential Retrofits
NOx RACT Reasonably Available Control Technology for Oxides of Nitrogen	Limits emissions of nitrogen oxides (NOx) from fossil-fueled power plants by establishing presumptive limits for each type of fossil fueled generator and fuel used.	To reduce emissions from the affected generators by 50%, from 58,000 Tons per Year (TPY) to 29,000 TPY	In effect	July 2014	26,700 MW (238 Units)	6,000 MW (23 Units)
BART Best Available Retrofit Technology	Requires an analysis to determine the impact of certain affected unit's emissions. If the impacts are greater than a prescribed minimum, then emission reductions must be made at the affected unit.	To limit emissions that may impact visibility in national parks. Emissions control of sulfur dioxide (SO2), nitrogen oxides (NOx) and particulate matter (PM) may be necessary.	In effect	January 2014	8,600 MW (19 Units)	1,800 MW (5 Units)
MATS Mercury and Air Toxics Standard	Establishes limits for Hazardous Air Pollutants (HAP). Will apply to coal and oil-fired generators.	To limit emissions, under the federal Clean Air Act, of certain substances classified as hazardous air pollutants.	In effect	March 2015	10,300 MW (28 Units)	400 MW (2 Units)
BTA Best Technology Available for Cooling Water Intake Structures	Would apply to power plants with design intake capacity greater than 20 million gallons/day and prescribes reductions in fish mortality.	To establish performance goals for new and existing cooling water intake structures, and the use of wet, closed-cycle cooling systems.	In effect	Upon Permit Renewal	16,900 MW (39 Units)	4,400 to 7,300 MW
CSAPR Cross State Air Pollution Rule	Limits Emissions of SO2 and NOx From Power Plants Greater Than 25 MW in 28 Eastern States through the use of emission allowances with limited trading.	Attain and maintain air quality consistent with Nation Ambient Air Quality Standards.	Implementation is stayed while the rule is in litigation	Jan. 2012 and Jan. 2014	25,000 MW (156 Units)	2,400 MW (11 Units)

6. Observations and Recommendations

The 2012 Reliability Needs Assessment for the New York State Bulk Power System indicates that the system as modeled violates the 0.1 days per year reliability criterion starting in 2020 and extending through 2022. In addition, there are transmission security violations that are identified throughout the study period with some violations occurring in 2013. The NYISO's analysis of the 2012 RNA Base Case, scenarios, and the compensatory MW identified for the resource adequacy deficiencies and transmission security violations indicate that there are various combinations of proposed resource additions and system expansions that could locate in different NYISO Load Zones to address the Reliability Needs (listed in Section 4.2.5). Following Board approval and release of the 2012 RNA, the NYISO will seek market-based solutions and request Regulated Backstop Solutions and alternative regulated solutions to the identified Reliability Needs in accordance with Section 31.2.3.2 Attachment Y.

Since there are Reliability Needs in Zones B, C, and G within the first five years of the study period (2013-2017) as a result of identified transmission security violations, the TOs in those zones are the Responsible TOs (i.e., National Grid, RGE, and Orange & Rockland). Some of these Reliability Needs have been identified for the first time as the result of the recent additions to the BPTF list, and detailed Regulated Backstop Solutions will be required from these Responsible TOs for evaluation in the 2012 CRP. Given the limited time between the identification of the Reliability Needs in this RNA Report and their occurrence in 2013, it is uncertain as to when the near term solutions can be put in place. It is also expected that National Grid will present an updated Local Transmission Plan for Zone A for consideration in the 2012 Comprehensive Reliability Plan to address underlying transmission security issues that were observed by National Grid in its studies and by the NYISO when developing the RNA Base Case.

The Reliability Needs for resource adequacy in 2020 through 2022 can be satisfied through the addition of compensatory MWs in Zones G through K below the transmission constraint on the UPNY/SENY interface. Because there is a resource adequacy need in 2020 in Zones G through K, the TOs in these zones are designated as Responsible TOs (i.e., Orange & Rockland, Central Hudson, New York State Electric and Gas, Con Edison, and LIPA) for purposes of proposing Regulated Backstop Solutions for the second five years (2018-2022). Although NYISO does not designate NYPA as a Responsible TO, the NYISO expects that NYPA will work with the other TOs on resolving the identified needs on a voluntary basis.

The NYISO will continue monitoring and evaluating the progress of new market based projects interconnecting to the bulk power system, the development and installation of local transmission facilities, additional notices of intent to mothball or rescinding of intent to mothball facilities, the status of mothballed facilities, the continued implementation of State energy efficiency programs, participation in the NYISO demand response programs, and the impact of new and proposed environmental regulations on the existing generation fleet as part of the NYISO's reliability planning processes and in light of the determinations that will be made in the CRP. Should the NYISO determine that conditions have changed during its preparation of the CRP or later in its planning cycle, it will conduct analyses to determine if a Reliability Need has arisen in accordance with the parameters and conditions of the prior RNA, or if an imminent threat to reliability is presented. The NYISO would address any newly identified Reliability Need and would, if necessary, issue a request for Gap Solutions.

7. Historic Congestion

Appendix A of Attachment Y of the NYISO OATT states: "As part of its Comprehensive System Planning Process, the NYISO will prepare summaries and detailed analysis of historic congestion across the New York Transmission System. This will include analysis to identify the significant causes of historic congestion in an effort to help Market Participants and other stakeholders distinguish persistent and addressable congestion from congestion that results from onetime events or transient adjustments in operating procedures that may or may not recur. This information will assist Market Participants and other stakeholders to make appropriately informed decisions." The detailed analysis of historic congestion can be found on the NYISO Web site.[9]

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

Appendices A-D

Appendix A - Reliability Needs Assessment Glossary

Term	Definition
10-year Study Period:	10-year period starting with the year after the study is dated and projecting forward 10 years. For example, the 2012 RNA covers the 10-year Study Period of 2013 through 2022.
Adequacy:	Encompassing both generation and transmission, adequacy refers to the ability of the bulk power system to supply the aggregate requirements of consumers at all times, accounting for scheduled and unscheduled outages of system components.
Alternative Regulated Responses:	Regulated solutions submitted by a TO or other developer in response to a solicitation by the NYISO, if the NYISO determines that it has not received adequate market-based solutions to satisfy the Reliability Need.
Annual Transmission Reliability Assessment (ATRA):	An assessment, conducted by the NYISO staff in cooperation with Market Participants, to determine the System Upgrade Facilities required for each generation and merchant transmission project included in the Assessment to interconnect to the New York State Transmission System in compliance with Applicable Reliability Requirements and the NYISO Minimum Interconnection Standard.
Annual Transmission Review (ATR):	The NYISO, in its role as Planning Coordinator, is responsible for providing an annual report to the NPCC Compliance Committee in regard to its Area Transmission Review in accordance with the NPCC Reliability Compliance and Enforcement Program and in conformance with the NPCC Design and Operation of the Bulk Power System (Directory #1).
Best Available Retrofit Technology (BART):	NYS DEC regulation, required for compliance with the federal Clean Air Act, applying to fossil fueled electric generating units built between August 7, 1962 and August 7, 1977. Emissions control of SO_2, NOx and PM may be necessary for compliance. Compliance deadline is January 2014.
Best Technology Available (BTA):	Proposed NYS DEC policy establishing performance goals for new and existing electricity generating plants for Cooling Water Intake Structures. The policy would apply to plants with design intake capacity greater than 20 million gallons/day and prescribes reductions in fish mortality. The performance goals call for the use of wet, closed-cycle cooling systems at existing generating plants.

Term	Definition
Bulk Power Transmission Facility (BPTF):	Transmission facilities that are system elements of the bulk power system which is the interconnected electrical system within northeastern North America comprised of system elements on which faults or disturbances can have a significant adverse impact outside of the local area.
Capability Period:	The Summer Capability Period lasts six months, from May 1 through October 31. The Winter Capability Period runs from November 1 through April 30 of the following year.
Capacity:	The capability to generate or transmit electrical power, or the ability to reduce demand at the direction of the NYISO.
Capacity Resource Integration Service (CRIS):	CRIS is the service provided by NYISO to interconnect the Developer's Large Generating Facility or Merchant Transmission Facility to the New York State Transmission System in accordance with the NYISO Deliverability Interconnection Standard, to enable the New York State Transmission System to deliver electric capacity from the Large Generating Facility or Merchant Transmission Facility, pursuant to the terms of the NYISO OATT.
Class Year:	The group of generation and merchant transmission projects included in any particular Annual Transmission Reliability Assessment [ATRA], in accordance with the criteria specified for including such projects in the assessment.
Clean Air Interstate Rule (CAIR):	Rule proposed by the U.S. EPA to reduce Interstate Transport of Fine Particulate Matter (PM) and Ozone. CAIR provides a federal framework to limit the emission of SO_2 and CO_2.
Comprehensive Reliability Planning Process (CRPP):	The biennial process that includes evaluation of resource adequacy and transmission system security of the state's bulk electricity grid over a 10-year period and evaluates solutions to meet those needs. The CRPP consists of two studies: the RNA, which identifies potential problems, and the CRP, which evaluates specific solutions to those problems.
Comprehensive Reliability Plan (CRP):	A biennial 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 the need date. It is the second step in the Comprehensive Reliability Planning Process (CRPP).

Term	Definition
Comprehensive System Planning Process (CSPP):	A transmission system planning process that is comprised of three components: 1) Local transmission planning; 2) Compilation of local plans into the Comprehensive Reliability Planning Process (CRPP), which includes developing a Comprehensive Reliability Plan (CRP); 3) Channeling the CRP data into the Congestion Assessment and Resource Integration Study (CARIS)
Congestion Assessment and Resource Integration Study (CARIS):	The third component of the Comprehensive System Planning Process (CSPP). The CARIS is based on the Comprehensive Reliability Plan (CRP).
Congestion:	Congestion on the transmission system results from physical limits on how much power transmission equipment can carry without exceeding thermal, voltage and/or stability limits determined to maintain system reliability. If a lower cost generator cannot transmit its available power to a customer because of a physical transmission constraint, the cost of dispatching a more expensive generator is the congestion cost.
Contingencies:	Contingencies are individual electrical system events (including disturbances and equipment failures) that are likely to happen.
Dependable Maximum Net Capability (DMNC):	The sustained maximum net output of a generator, as demonstrated by the performance of a test or through actual operation, averaged over a continuous time period as defined in the ISO Procedures. The DMNC test determines the amount of Installed Capacity used to calculate the Unforced Capacity that the Resource is permitted to supply to the NYCA.
Electric System Planning Work Group (ESPWG):	A NYISO governance working group for Market Participants designated to fulfill the planning functions assigned to it. The ESPWG is a working group that provides a forum for stakeholders and Market Participants to provide input into the NYISO's Comprehensive System Planning Process (CSPP), the NYISO's response to FERC reliability-related Orders and other directives, other system planning activities, policies regarding cost allocation and recovery for regulated reliability and/or economic projects, and related matters.

Term	Definition
Energy Efficiency Portfolio Standard (EEPS):	A statewide program ordered by the NYSPSC in response to the Governor's call to reduce New Yorkers' electricity usage by 15% of 2007 forecast levels by the year 2015, with comparable results in natural gas conservation.
Federal Energy Regulatory Commission (FERC):	The federal energy regulatory agency within the U.S. Department of Energy that approves the NYISO's tariffs and regulates its operation of the bulk electricity grid, wholesale power markets, and planning and interconnection processes.
FERC 715:	Annual report that is required by transmitting utilities operating grid facilities that are rated at or above 100 kilovolts. The report consists of transmission systems maps, a detailed description of transmission planning Reliability Criteria, detailed descriptions of transmission planning assessment practices, and detailed evaluation of anticipated system performance as measured against Reliability Criteria.
Five Year Base Case:	The model representing the New York State power system over the first five years of the Study Period.
Forced Outage:	An unanticipated loss of capacity, due to the breakdown of a power plant or transmission line. It can also mean the intentional shutdown of a generating unit or transmission line for emergency reasons.
Gap Solution:	A solution to a Reliability Need that is designed to be temporary and to strive to be compatible with permanent market-based proposals. A permanent regulated solution, if appropriate, may proceed in parallel with a Gap Solution.
Gold Book:	Annual NYISO publication of its Load and Capacity Data Report.
Market Monitoring Unit:	A consulting or other professional services firm, or other similar entity, retained by the NYISO Board pursuant to Market Service Tariff Section 30.4, Attachment O - Market Monitoring Plan.
Installed Capacity (ICAP):	A generator or load facility that complies with the requirements in the Reliability Rules and is capable of supplying and/or reducing the demand for energy in the NYCA for the purpose of ensuring that sufficient energy and capacity are available to meet the Reliability Rules.
Installed Reserve Margin (IRM):	The amount of installed electric generation capacity above 100% of the forecasted peak electric consumption that is required to meet New York State Reliability Council (NYSRC) resource adequacy criteria. Most studies in recent years have indicated a need for a 15-20% reserve margin for adequate

Term	Definition
	reliability in New York.
Interconnection Queue:	A queue of transmission and generation projects (greater than 20 MW) that have submitted an Interconnection Request to the NYISO to be interconnected to the state's bulk electricity grid. All projects must undergo three studies – a Feasibility Study (unless parties agree to forgo it), a System Reliability Impact Study (SRIS) and a Facilities Study – before interconnecting to the grid.
Load Pocket:	Areas that have a limited ability to import generation resources from outside their areas in order to meet reliability requirements.
Local Transmission Plan (LTP):	The Local Transmission Owner Plan, developed by each Transmission Owner, which describes its respective plans that may be under consideration or finalized for its own Transmission District.
Local Transmission Owner Planning Process (LTPP):	The first step in the Comprehensive System Planning Process (CSPP), under which transmission owners in New York's electricity markets provide their local transmission plans for consideration and comment by interested parties.
Loss of load expectation (LOLE):	LOLE establishes the amount of generation and demand-side resources needed - subject to the level of the availability of those resources, load uncertainty, available transmission system transfer capability and emergency operating procedures - to minimize the probability of an involuntary loss of firm electric load on the bulk electricity grid. The state's bulk electricity grid is designed to meet an LOLE that is not greater than one occurrence of an involuntary load disconnection in 10 years, expressed mathematically as 0.1 days per year.
Lower Hudson Valley:	The southeastern section of New York, comprising New York Control Area Load Zones G (lower portion), H and I. Greene, Ulster, Orange, Dutchess, Putnam, Rockland and Westchester counties are located in those Load Zones.
Market-Based Solutions:	Investor-proposed projects that are driven by market needs to meet future reliability requirements of the bulk electricity grid as outlined in the RNA. Those solutions can include generation, transmission and Demand Response Programs.
Market Participant:	An entity, excluding the NYISO, that produces, transmits sells, and/or purchases for resale capacity, energy and ancillary services in the wholesale market. Market Participants include: customers under the NYISO's tariffs, power exchanges, TOs, primary holders, load serving entities, generating companies and other suppliers, and entities buying or selling transmission congestion contracts.

Term	Definition
Mercury and Air Toxics Standards (MATS):	In December, 2011 USEPA announced the final rule (previously known as the MACT rule). The rule applies to oil and coal fired generators and establishes limits for HAPs, acid gases, Mercury (Hg), and Particulate Matter (PM). Compliance is required by March 2015.
National Ambient Air Quality Standards (NAAQS):	Limits, set by the EPA, on pollutants considered harmful to public health and the environment.
New York Control Area (NYCA):	The area under the electrical control of the NYISO. It includes the entire state of New York, and is divided into 11 zones.
New York State Department of Environmental Conservation (NYSDEC):	The agency that implements New York State environmental conservation law, with some programs also governed by federal law.
New York Independent System Operator (NYISO):	Formed in 1997 and commencing operations in 1999, the NYISO is a not-for-profit organization that manages New York's bulk electricity grid – an 11,016-mile network of high voltage lines that carry electricity throughout the state. The NYISO also oversees the state's wholesale electricity markets. The organization is governed by an independent Board of Directors and a governance structure made up of committees with Market Participants and stakeholders as members.
New York State Department of Public Service (DPS):	The New York State Department of Public Service, as defined in the New York Public Service Law, which serves as the staff for the New York State Public Service Commission.
New York State Public Service Commission (NYSPSC):	The New York State Public Service Commission, as defined in the New York Public Service Law.
New York State Energy Research and Development Authority (NYSERDA):	A corporation created under the New York State Public Authorities law and funded by the System Benefits Charge (SBC) and other sources. Among other responsibilities, NYSERDA is charged with conducting a multifaceted energy and environmental research and development program to meet New York State's diverse economic needs, and administering state System Benefits Charge, Renewable Portfolio Standard, and Energy Efficiency Portfolio Standard programs.

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

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

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

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

Appendix B - The Reliability Planning Process

This section presents an overview of the NYISO's reliability planning process followed by a summary of the 2005, 2007, 2008, 2009 and 2010 CRPs and their current status[10]. A detailed discussion of the reliability planning process, including applicable Reliability Criteria, is contained in NYISO Manual 26 entitled: "Comprehensive Reliability Planning Process Manual,"[11] which is posted on the NYISO's website.

The NYISO's reliability planning process, also known as Comprehensive Reliability Planning Process (CRPP) is an integral part of the NYISO's overall Comprehensive System Planning Process (CSPP). The CSPP planning process is comprised of the Local Transmission Planning Process (LTPP), the CRPP, and the Congestion Assessment and Resource Integration Study (CARIS). Each CSPP cycle begins with the LTPP. As part of the LTPP, local Transmission Owners perform transmission studies for their BPTFs in their transmission areas according to all applicable criteria. Links to the Transmission Owner's LTPs can be found on the NYISO's website [12]. The LTPP provides inputs for the NYISO's reliability planning process. During the CRPP process, the NYISO conducts the Reliability Needs Assessment (RNA) and Comprehensive Reliability Plan (CRP). The RNA evaluates the adequacy and security of the bulk power system over a 10-year Study Period. In identifying resource adequacy needs, the NYISO identifies the amount of resources in megawatts (known as "compensatory megawatts") and the locations in which they are needed to meet those needs. After the RNA is complete, the NYISO requests and evaluates first market-based solutions, then Regulated Backstop Solutions and alternative regulated responses that address the identified Reliability Needs. This step results in the development of the NYISO's CRP for the 10-year Study Period. The CRPP provides inputs for the NYISO's economic planning process known as CARIS. CARIS Phase 1 examines congestion on the New York bulk power system and the costs and benefits of alternatives to alleviate that congestion. During CARIS Phase 2, the NYISO will evaluate specific transmission project proposals for regulated cost recovery.

[10] The first CRP was entitled the "2005 Comprehensive Reliability Plan," while the second CRP, released the following year, was entitled the "2007 Comprehensive Reliability Plan." A year was skipped in the naming convention because the title of the first CRP, which covered the Study Period 2006-2015, designated the year the study assumptions were derived, or 2005, but for the second CRP a different year designation convention was adopted, which identified the first year of the Study Period. The latter naming convention continues to be applied to the 2008, 2009 and 2010 CRP documents. However, the original naming convention is used for the 2012 CRP and subsequent CRP documents. Thus, the study period for the 2012 RNA is 2013 – 2022.

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

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

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

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

The CRPP is anchored in the market-based philosophy of the NYISO and its Market Participants, which posits that market solutions should be the preferred choice to meet the identified Reliability Needs reported in the RNA. In the CRP, the reliability of the bulk power system is assessed and solutions to Reliability Needs evaluated in accordance with existing Reliability Criteria of the North American Electric Reliability Corporation (NERC), the Northeast Power Coordinating Council, Inc. (NPCC), and the New York State Reliability Council (NYSRC) as they may change from time to time. These criteria and a description of the nature of long-term bulk power system planning are described in detail in the applicable planning manual, and are briefly summarized below. In the event that market-based solutions do not materialize to meet a Reliability Need in a timely manner, the NYISO designates the Responsible TO or Responsible TOs to proceed with a Regulated Backstop Solution in order to maintain system reliability. Market Participants can offer and promote alternative regulated responses which, if determined by NYISO to help satisfy the identified Reliability Needs and by regulators to be more desirable, may displace some or all of the Responsible TOs Regulated Backstop Solutions[13]. Under the

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

CRPP, the NYISO also has an affirmative obligation to report historic congestion across the transmission system. In addition, the draft RNA is provided to the Market Monitoring Unit for review and consideration of whether market rules changes are necessary to address an identified failure, if any, in one of the NYISO's competitive markets. If market failure is identified as the reason for the lack of market-based solutions, the NYISO will explore appropriate changes in its market rules with its stakeholders and Independent Market Advisor. The 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 license or construct projects to respond to identified Reliability Needs reported in the RNA. The ultimate approval of those projects lies with regulatory agencies such as the FERC, the NYS PSC, environmental permitting agencies, and local governments. The NYISO monitors the progress and continued viability of proposed market and regulated projects to meet identified needs, and reports its findings in annual plans. Figure B-1 below summarizes the CRPP and Figure B-2 summarizes the CARIS which collectively comprise the CSPP process.

The 2012 CRP will form the basis for the next cycle of the NYISO's economic planning process. That process will examine congestion on the New York bulk power system and the costs and benefits of alternatives to alleviate that congestion.

NYISO Reliability Planning Process

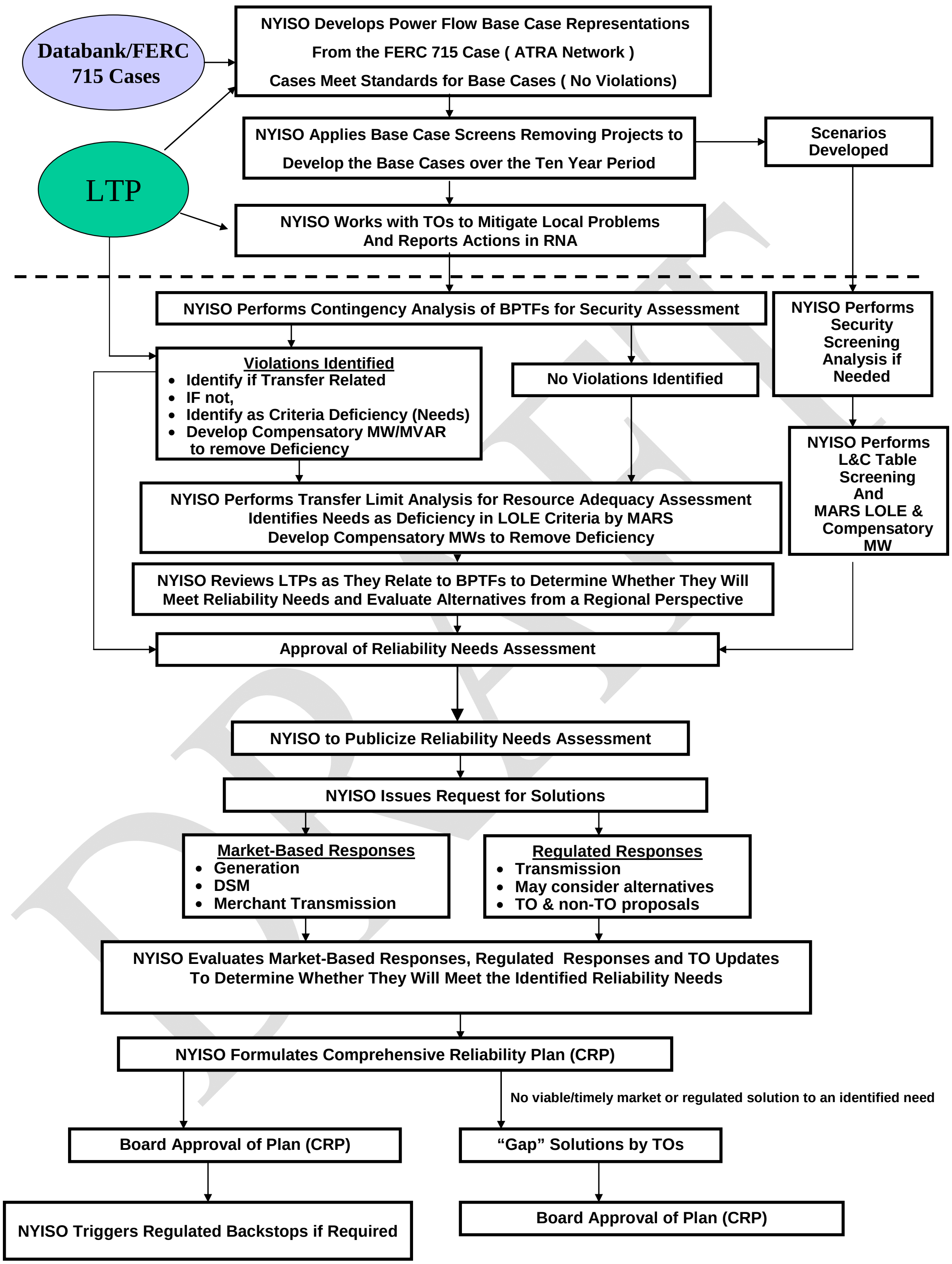

Figure B-1: NYISO Reliability Planning Process

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

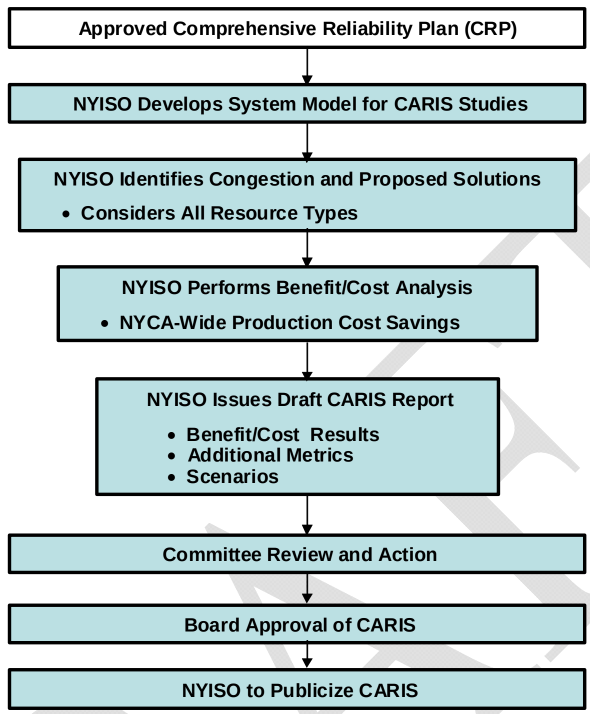

Figure B-2: Economic Planning Process

Appendix C - Load and Energy Forecast 2013-2022

C-1. Summary

In order to perform the 2012 RNA, a forecast of summer and winter peak demands and annual energy requirements was produced for the years 2013 - 2022. The electricity forecast is based on projections of New York's economy performed by Moody's Analytics in January 2012. The forecast includes detailed projections of employment, output, income and other factors for twenty three regions in New York State. This appendix provides a summary of the electric energy and peak demand forecasts and the key economic input variables used to produce the forecasts. Table C-1 provides a summary of key economic and electric system growth rates from 2001 to 2022.

In June 2008, the New York Public Service Commission issued its Order regarding the Energy Efficiency Portfolio Standard. This proceeding set forth a statewide goal of a cumulative energy reduction of about 26,900 GWh. The NYISO estimates the peak demand impacts to be about 5500 MW. This goal is expected to be achieved by contributions from a number of state agencies, power authorities and utilities, as well as from federal codes and building standards. The NYISO included fifty-six percent of the goal by the year 2022 in the 2012 RNA Base Case, including achievements obtained during the years 2009 through 2011.

Table C-1: Summary of Econometric & Electric System Growth Rates – Actual & Forecast

	Average Annual Growth			
Economic Indicators	2001-2006	2006-2011	2012-2017	2017-2022
Total Employment	0.44%	0.04%	1.82%	0.58%
Gross State Product	2.83%	0.85%	2.73%	2.25%
Population	0.18%	0.21%	0.30%	0.27%
Total Real Income	3.19%	0.10%	2.75%	1.91%
Weather Normalized Summer Peak	2.06%	0.02%	0.74%	0.95%
Weather Normalized Annual Energy	1.00%	0.00%	0.40%	0.77%

	Shares of Total Employment			
Employment Trends	2006	2011	2017	2022
Business, Services & Retail	53.6%	53.3%	53.3%	53.0%
Health, Education, Government	35.5%	37.4%	37.8%	38.3%
Manufacturing, Agriculture & Construction	10.9%	9.2%	9.0%	8.7%

C-2. Historic Overview

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

Table C-2 shows the NYCA historic seasonal peaks and annual energy growth since 2001. The table provides both actual results and weather-normalized results, together with annual average growth rates for each table entry. The growth rates are averaged over the period 2001 to 2011.

Table C-2: Historic Energy and Seasonal Peak Demand - Actual and Weather-Normalized

	Annual Energy - GWh		Summer Peak - MW		Winter Peak - MW		
Year	Actual	Weather Normalized	Actual	Weather Normalized	Years	Actual	Weather Normalized
2001	155,241	154,780	30,982	30,000	2001-02	22,798	NA
2002	158,508	156,613	30,664	30,302	2002-03	24,454	24,294
2003	158,012	158,030	30,333	30,576	2003-04	25,262	24,849
2004	160,211	160,772	28,433	31,401	2004-05	25,541	25,006
2005	167,208	164,139	32,075	33,068	2005-06	24,947	24,770
2006	162,238	162,703	33,939	32,992	2006-07	25,057	25,030
2007	167,341	166,047	32,169	33,444	2007-08	25,021	25,490
2008	165,612	166,471	32,432	33,670	2008-09	24,673	25,016
2009	158,780	161,234	30,844	33,063	2009-10	24,074	24,537
2010	163,505	161,570	33,452	32,458	2010-11	24,652	24,452
2011	163,330	162,672	33,865	33,019	2011-12	23,901	24,630
	0.51%	0.50%	0.89%	0.96%		0.47%	0.15%

C-3. Forecast Overview

Table C-3 shows historic and forecast growth rates of annual energy for the different regions in New York. The Upstate region includes Zones A – I. The NYCA's two locality zones, Zones J (New York City) and K (Long Island) are shown individually.

Table C-3: Annual Energy and Summer Peak Demand - Actual & Forecast

	Annual Energy - GWh				Summer Coincident Peak - MW			
Year	Upstate Region	New York City	Long Island	NYCA	Upstate Region	New York City	Long Island	NYCA
2001	84,241	50,277	20,723	155,241	15,146	10,602	4,900	30,648
2002	85,608	51,356	21,544	158,508	15,271	10,321	5,072	30,664
2003	85,223	50,829	21,960	158,012	15,100	10,240	4,993	30,333
2004	85,935	52,073	22,203	160,211	14,271	9,742	4,420	28,433
2005	90,253	54,007	22,948	167,208	16,029	10,810	5,236	32,075
2006	86,957	53,096	22,185	162,238	17,054	11,300	5,585	33,939
2007	89,843	54,750	22,748	167,341	15,824	10,970	5,375	32,169
2008	88,316	54,835	22,461	165,612	16,222	10,979	5,231	32,432
2009	83,788	53,100	21,892	158,780	15,415	10,366	5,063	30,844
2010	85,469	55,114	22,922	163,505	16,407	11,213	5,832	33,452
2011	86,566	54,060	22,704	163,330	16,557	11,373	5,935	33,865
2012	86,991	53,663	23,005	163,659	16,355	11,500	5,440	33,295
2013	87,194	54,094	23,339	164,627	16,461	11,680	5,555	33,696
2014	87,167	54,753	23,420	165,340	16,505	11,830	5,579	33,914
2015	87,174	55,234	23,622	166,030	16,544	11,985	5,622	34,151
2016	87,385	55,756	23,774	166,915	16,616	12,095	5,634	34,345
2017	87,439	55,725	23,833	166,997	16,684	12,200	5,666	34,550
2018	87,676	56,306	24,039	168,021	16,762	12,400	5,706	34,868
2019	88,053	57,096	24,260	169,409	16,882	12,570	5,752	35,204
2020	88,483	58,086	24,607	171,176	16,993	12,725	5,808	35,526
2021	88,887	58,772	24,855	172,514	17,121	12,920	5,872	35,913
2022	89,234	59,118	25,217	173,569	17,236	13,050	5,944	36,230
2001-11	0.3%	0.7%	0.9%	0.5%	0.9%	0.7%	1.9%	1.0%
2012-22	0.3%	1.0%	0.9%	0.6%	0.5%	1.3%	0.9%	0.8%
2001-06	0.6%	1.1%	1.4%	0.9%	2.4%	1.3%	2.7%	2.1%
2006-11	-0.1%	0.4%	0.5%	0.1%	-0.6%	0.1%	1.2%	0.0%
2012-17	0.1%	0.8%	0.7%	0.4%	0.4%	1.2%	0.8%	0.7%
2017-22	0.4%	1.2%	1.1%	0.8%	0.7%	1.4%	1.0%	1.0%

C-4. Trends Affecting Electricity in New York

C-4.1. *2012 Employment Forecast*

The 2012 employment forecast projects modest growth through 2013, higher growth through 2016, then reduced growth rates through 2022.

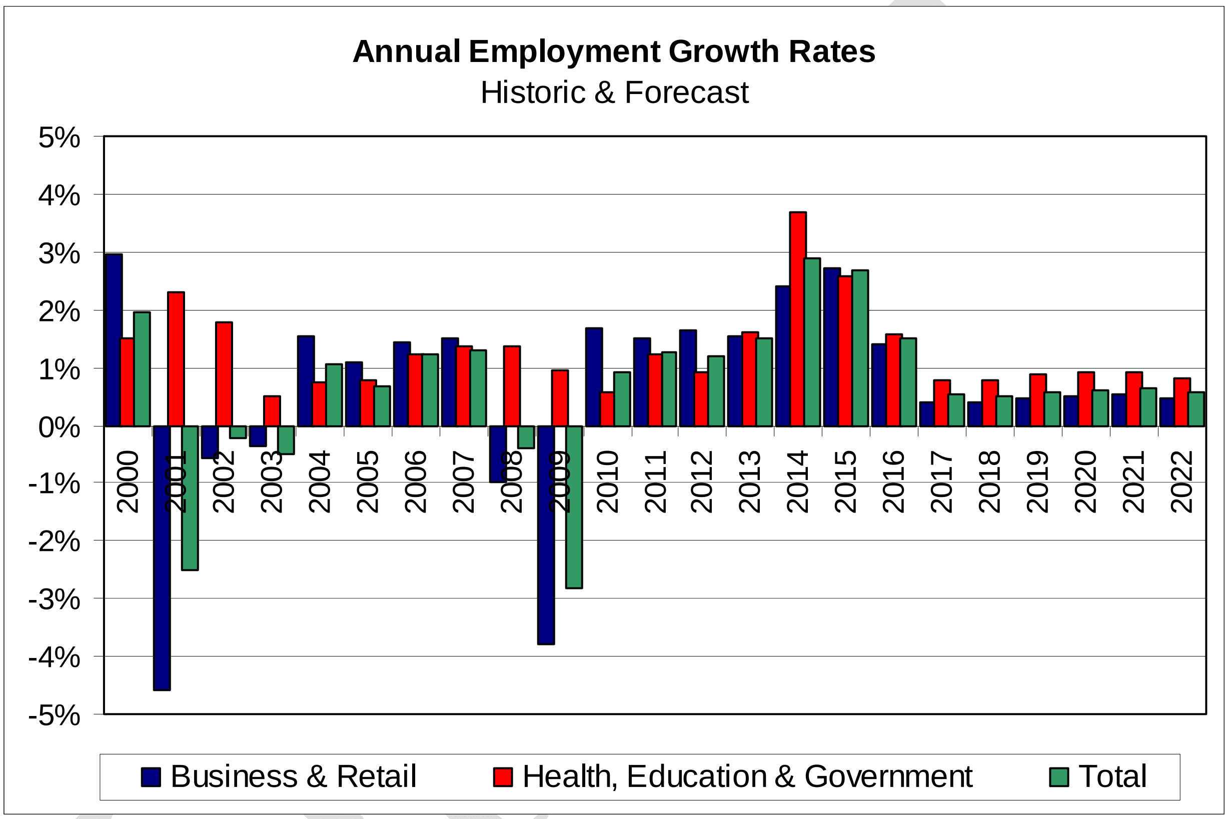

Figure C-1: Annual Employment Growth Rates

C-4.2. *2012 Population Forecast*

The 2012 population forecast projects slower population growth in every region of the state than during the period from 2000 to 2010. While all growth rates remain positive throughout the forecast horizon, population growth from 2013 onward is slower than in the period from 2009 to 2012.

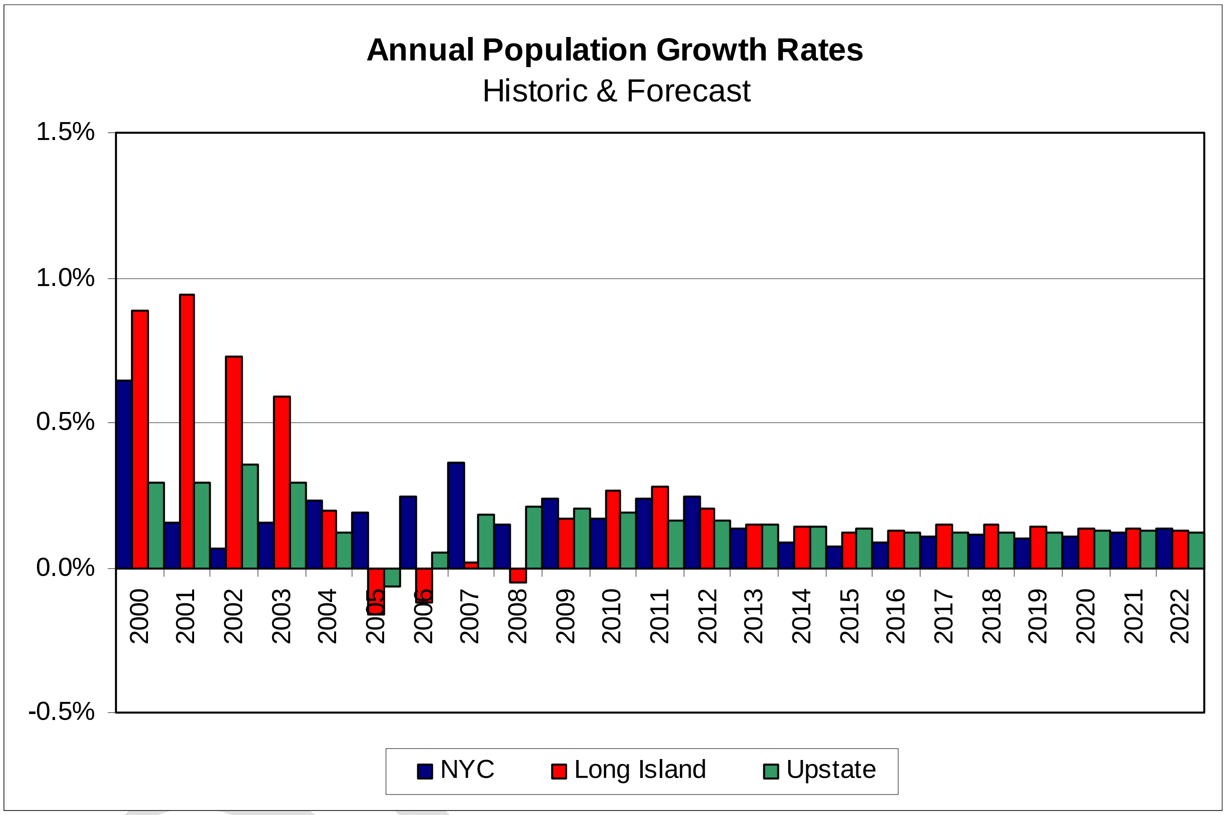

Figure C-2: Annual Change in Population by Region

C-4.3. *2012 Forecasts of Real Output, Real Income, Employment*

Three key economic trends in the state are measured by real gross domestic output, total income, and employment. Real gross domestic output measures the prosperity of business, while real income and employment are indicative of the prosperity of households and wage-earners. The period from 2004 to 2007 showed significant growth in all these metrics. The recession caused them to decline substantially through 2009, and to only begin to recover in 2010.

The 2012 forecast projects real economic output growth in the range of 2% through 2022. Real income growth has a similar pattern to output. Employment turns positive but is only growing at a rate of about 0.3%. All indices are characterized by faster growth in the near term followed by slower growth in the long term.

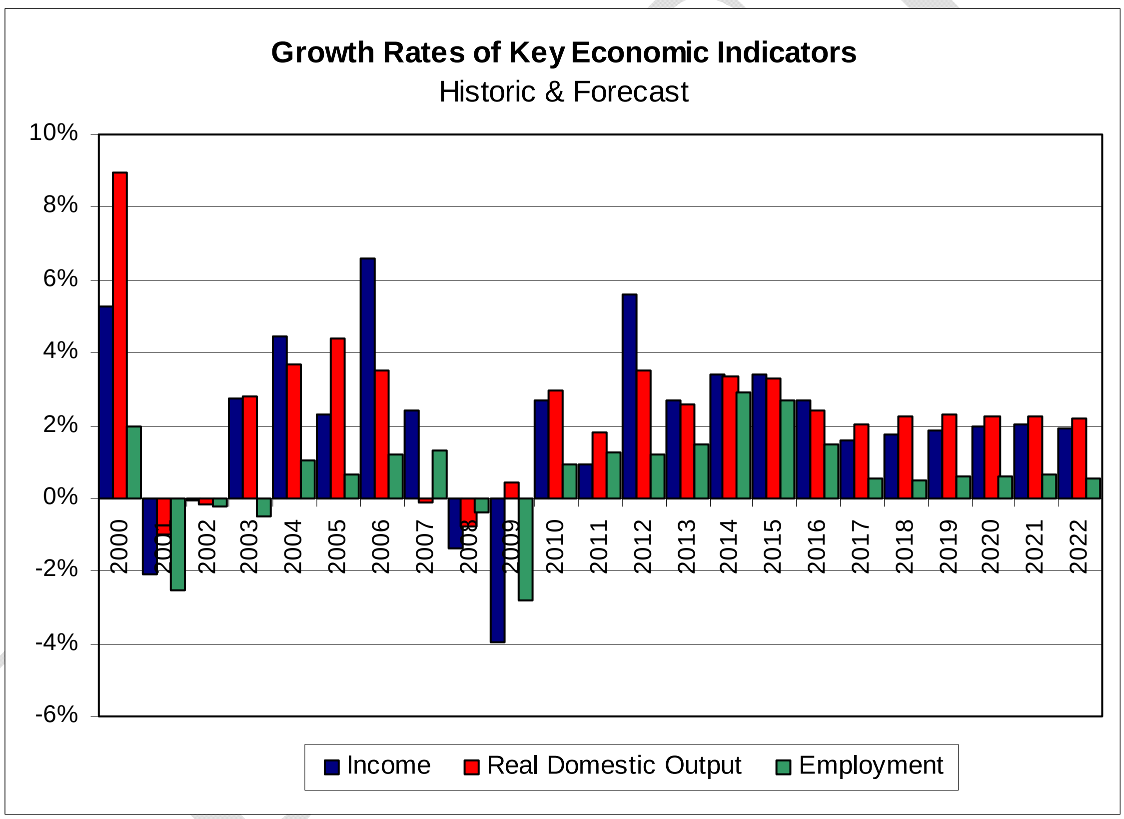

Figure C-3: Annual Growth Rates of Income, Real Domestic Output and Employment

C-4.4. Regional Economic Trends

Table C-4 provides a summary of historic and forecast growth rates of economic and demographic data for the state and for the Upstate and Downstate regions. Economic drivers for Long Island and New York City are somewhat higher than for the Upstate region, typical of forecast trends in prior Reliability Needs Assessments.

Table C-4: Regional Economic Growth Rates of Key Economic Indicators

New York State

	Average Annual Growth	
Economic Indicators	2001-2011	2012-2022
Total Employment	0.2%	1.2%
Gross Product	1.8%	2.5%
Population	0.2%	0.3%
Real Income	1.6%	2.3%

New York City

	Average Annual Growth	
Economic Indicators	2001-2011	2012-2022
Total Employment	0.3%	1.3%
Gross Product	1.8%	2.9%
Population	0.2%	0.3%
Real Income	1.8%	3.1%

Upstate Regions

	Average Annual Growth	
Economic Indicators	2001-2011	2012-2022
Total Employment	0.3%	1.1%
Gross Product	1.8%	1.8%
Population	0.2%	0.3%
Real Income	1.5%	1.2%

Long Island

	Average Annual Growth	
Economic Indicators	2001-2011	2012-2022
Total Employment	0.0%	1.1%
Gross Product	2.2%	2.5%
Population	0.2%	0.3%
Real Income	1.4%	2.8%

C-5. Forecast Methodology

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

Econometric forecasts were developed for zonal energy using monthly data from 2000 through 2011. For each zone, the NYISO estimated an ensemble of econometric models using population, households, economic output, employment, cooling degree days and heating degree days. Each member of the ensemble was evaluated and compared to historic data. The zonal model chosen for the forecast was the one which best represented recent history and the regional growth for that zone. The NYISO also received and evaluated forecasts from Con Edison and LIPA, which were used in combination with the forecasts we developed for Zones H, I, J and K.

The summer & winter non-coincident and coincident peak forecasts for Zones H, I, J and K were derived from the forecasts submitted to the NYISO by Con Edison and LIPA. For the remaining zones, the NYISO derived the summer and winter coincident peak demands from the zonal energy forecasts by using average zonal weather-normalized load factors from 2000 through 2011. The 2012 summer peak forecast was matched to coincide with the 2012 ICAP forecast.

C-5.1. Energy Efficiency Initiatives

The Energy Efficiency Portfolio Standard (EEPS) is an initiative of the Governor of New York and implemented by the state's Public Service Commission. The goal of the initiative is to reduce electric energy usage by 15 percent from 2007 forecasted energy usage levels in the year 2015 (the 15x15 initiative), for a reduction of 26,880 GWh in 2015.

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

The NYISO has been a party to the EEPS proceeding from its inception. As part of the development of the 2012 RNA forecast, the NYISO developed an adjustment to the 2012 econometric model that incorporated a portion of the EEPS goal. This was based upon discussion with market participants in the Electric System Planning Working Group. The NYISO considered the following factors in developing the 2012 RNA Base Case:

- NYS PSC-approved spending levels for the programs under its jurisdiction, including the Systems Benefit Charge and utility-specific programs
- Expectation of the fulfillment of the investor-owned EEPS program goals by 2018, and continued spending for NYSERDA programs through 2022
- Expected realization rates, participation rates and timing of planned energy efficiency programs
- Degree to which energy efficiency is already included in the NYISO's econometric energy forecast
- Impacts of new appliance efficiency standards, and building codes and standards
- Specific energy efficiency plans proposed by LIPA, NYPA and Consolidated Edison Company of New York, Inc. (Con Edison)
- The actual rates of implementation of EEPS based on data received from Department of Public Service staff

The resulting adjusted econometric forecast included approximately 56% of the entire EEPS goal by the year 2022. Once the statewide energy and demand impacts were developed, zonal level forecasts were produced for the econometric forecast and for the Base Case.

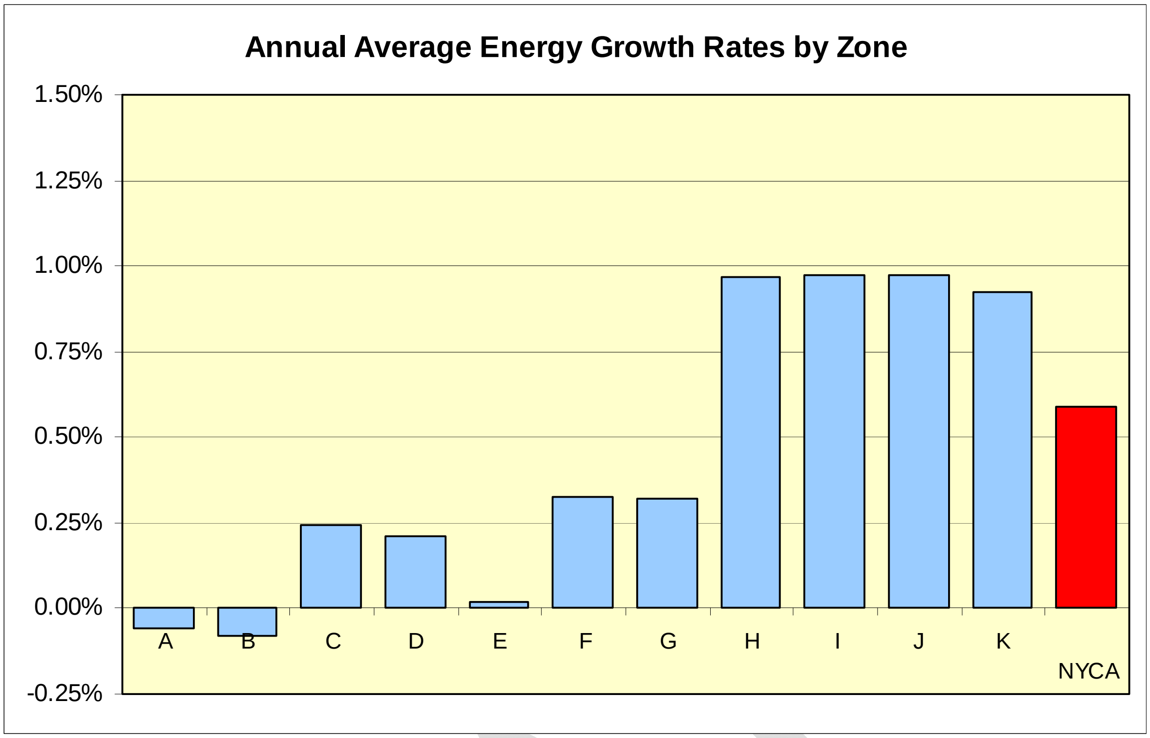

Figure C-4: Zonal Energy Forecast Growth Rates - 2012 to 2022

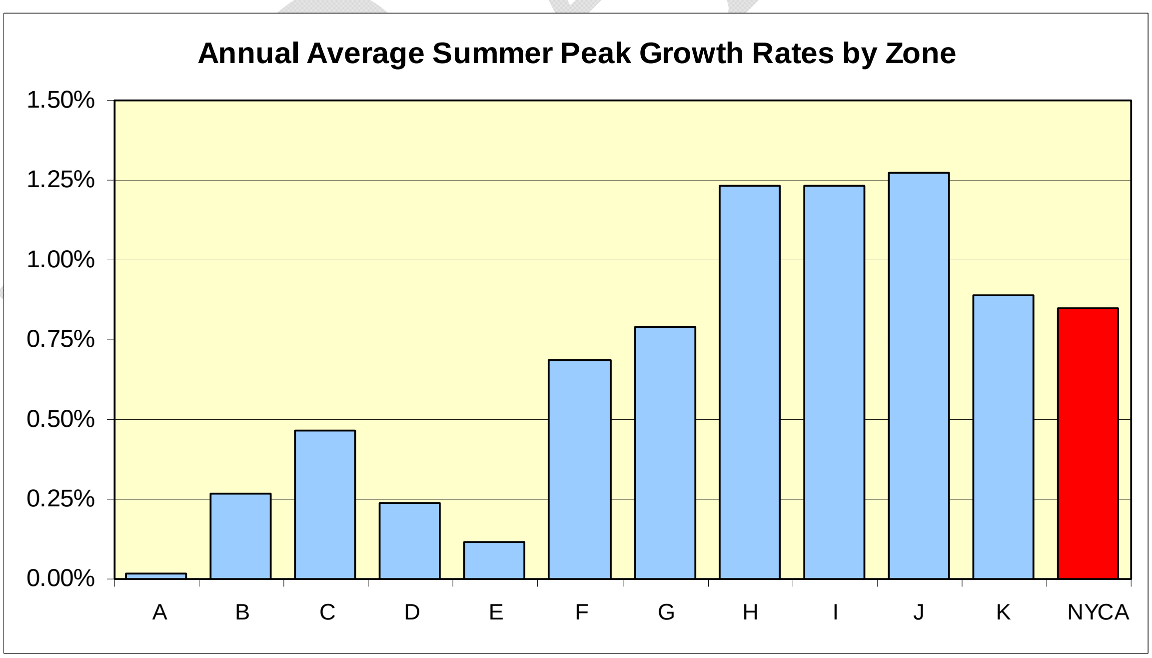

Figure C-5: Zonal Summer Peak Demand Forecast Growth Rates - 2012 to 2022

Table C-5: Annual Energy by Zone – Actual & Forecast (GWh)

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2002	16,355	9,935	16,356	6,450	7,116	11,302	9,970	2,162	5,962	51,356	21,544	158,508
2003	15,942	9,719	16,794	5,912	6,950	11,115	10,451	2,219	6,121	50,829	21,960	158,012
2004	16,102	9,888	16,825	5,758	7,101	11,161	10,696	2,188	6,216	52,073	22,203	160,211
2005	16,498	10,227	17,568	6,593	7,594	11,789	10,924	2,625	6,435	54,007	22,948	167,208
2006	15,998	10,003	16,839	6,289	7,339	11,337	10,417	2,461	6,274	53,096	22,185	162,238
2007	16,258	10,207	17,028	6,641	7,837	11,917	10,909	2,702	6,344	54,750	22,748	167,341
2008	15,835	10,089	16,721	6,734	7,856	11,595	10,607	2,935	5,944	54,835	22,461	165,612
2009	15,149	9,860	15,949	5,140	7,893	10,991	10,189	2,917	5,700	53,100	21,892	158,780
2010	15,903	10,128	16,209	4,312	7,906	11,394	10,384	2,969	6,264	55,114	22,922	163,505
2011	16,017	10,040	16,167	5,903	7,752	11,435	10,066	2,978	6,208	54,060	22,704	163,330
2012	15,902	10,032	16,146	6,561	7,796	11,458	10,105	2,917	6,074	53,663	23,005	163,659
2013	15,892	10,037	16,126	6,612	7,816	11,466	10,181	2,941	6,123	54,094	23,339	164,627
2014	15,859	9,995	16,116	6,631	7,799	11,453	10,142	2,975	6,197	54,753	23,420	165,340
2015	15,815	9,949	16,114	6,667	7,779	11,456	10,143	2,998	6,253	55,234	23,622	166,030
2016	15,794	9,935	16,165	6,691	7,785	11,487	10,186	3,031	6,311	55,756	23,774	166,915
2017	15,770	9,922	16,194	6,736	7,792	11,498	10,192	3,027	6,308	55,725	23,833	166,997
2018	15,765	9,919	16,235	6,766	7,806	11,534	10,218	3,060	6,373	56,306	24,039	168,021
2019	15,780	9,918	16,307	6,815	7,805	11,597	10,265	3,102	6,464	57,096	24,260	169,409
2020	15,790	9,923	16,387	6,866	7,805	11,665	10,317	3,154	6,576	58,086	24,607	171,176
2021	15,802	9,936	16,471	6,901	7,808	11,746	10,376	3,193	6,654	58,772	24,855	172,514
2022	15,809	9,954	16,548	6,936	7,812	11,834	10,436	3,212	6,693	59,118	25,217	173,569

Table C-6: Summer Coincident Peak Demand by Zone – Actual & Forecast (MW)

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2002	2,631	1,842	2,787	777	1,252	2,073	2,076	498	1,335	10,321	5,072	30,664
2003	2,510	1,782	2,727	671	1,208	2,163	2,146	498	1,395	10,240	4,993	30,333
2004	2,493	1,743	2,585	644	1,057	1,953	2,041	475	1,280	9,742	4,420	28,433
2005	2,726	1,923	2,897	768	1,314	2,164	2,236	592	1,409	10,810	5,236	32,075
2006	2,735	2,110	3,128	767	1,435	2,380	2,436	596	1,467	11,300	5,585	33,939
2007	2,592	1,860	2,786	795	1,257	2,185	2,316	595	1,438	10,970	5,375	32,169
2008	2,611	2,001	2,939	801	1,268	2,270	2,277	657	1,399	10,979	5,231	32,432
2009	2,595	1,939	2,780	536	1,351	2,181	2,159	596	1,279	10,366	5,063	30,844
2010	2,663	1,985	2,846	552	1,437	2,339	2,399	700	1,487	11,213	5,832	33,452
2011	2,556	2,019	2,872	776	1,446	2,233	2,415	730	1,510	11,373	5,935	33,865
2012	2,691	2,003	2,853	780	1,365	2,295	2,268	682	1,418	11,500	5,440	33,295
2013	2,694	2,016	2,859	788	1,371	2,308	2,301	689	1,435	11,680	5,555	33,696
2014	2,689	2,017	2,864	791	1,369	2,314	2,306	700	1,455	11,830	5,579	33,914
2015	2,680	2,015	2,868	794	1,366	2,323	2,319	707	1,472	11,985	5,622	34,151
2016	2,677	2,018	2,883	797	1,367	2,337	2,340	713	1,484	12,095	5,634	34,345
2017	2,674	2,022	2,894	803	1,370	2,348	2,352	720	1,501	12,200	5,666	34,550
2018	2,674	2,027	2,906	807	1,373	2,362	2,366	722	1,525	12,400	5,706	34,868
2019	2,680	2,032	2,925	813	1,375	2,383	2,386	742	1,546	12,570	5,752	35,204
2020	2,685	2,039	2,946	819	1,377	2,406	2,408	751	1,562	12,725	5,808	35,526
2021	2,691	2,048	2,968	824	1,379	2,431	2,431	762	1,587	12,920	5,872	35,913
2022	2,696	2,057	2,988	828	1,381	2,458	2,454	771	1,603	13,050	5,944	36,230

Table C-7: Winter Coincident Peak Demand by Zone – Actual & Forecast (MW)

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2002-03	2,418	1,507	2,679	925	1,223	1,903	1,590	437	927	7,373	3,472	24,454
2003-04	2,433	1,576	2,755	857	1,344	1,944	1,720	478	981	7,527	3,647	25,262
2004-05	2,446	1,609	2,747	918	1,281	1,937	1,766	474	939	7,695	3,729	25,541
2005-06	2,450	1,544	2,700	890	1,266	1,886	1,663	515	955	7,497	3,581	24,947
2006-07	2,382	1,566	2,755	921	1,274	1,888	1,638	504	944	7,680	3,505	25,057
2007-08	2,336	1,536	2,621	936	1,312	1,886	1,727	524	904	7,643	3,596	25,021
2008-09	2,274	1,567	2,533	930	1,289	1,771	1,634	529	884	7,692	3,570	24,673
2009-10	2,330	1,555	2,558	648	1,289	1,788	1,527	561	813	7,562	3,443	24,074
2010-11	2,413	1,606	2,657	645	1,296	1,825	1,586	526	927	7,661	3,512	24,652
2011-12	2,220	1,535	2,532	904	1,243	1,765	1,618	490	893	7,323	3,378	23,901
2012-13	2,369	1,556	2,568	913	1,276	1,826	1,603	545	929	7,613	3,634	24,832
2013-14	2,364	1,556	2,564	919	1,275	1,823	1,616	551	941	7,691	3,629	24,929
2014-15	2,356	1,548	2,562	920	1,267	1,817	1,610	558	955	7,798	3,608	24,999
2015-16	2,347	1,541	2,561	925	1,261	1,814	1,611	564	966	7,881	3,582	25,053
2016-17	2,341	1,538	2,569	927	1,257	1,816	1,618	570	978	7,968	3,567	25,149
2017-18	2,335	1,536	2,572	933	1,254	1,815	1,618	571	981	7,981	3,557	25,153
2018-19	2,332	1,535	2,578	936	1,253	1,817	1,623	577	993	8,069	3,552	25,265
2019-20	2,332	1,534	2,589	942	1,249	1,824	1,631	585	1,007	8,174	3,555	25,422
2020-21	2,332	1,534	2,601	949	1,246	1,833	1,639	594	1,024	8,307	3,568	25,627
2021-22	2,332	1,536	2,613	953	1,244	1,843	1,648	601	1,035	8,399	3,590	25,794
2022-23	2,331	1,538	2,625	957	1,242	1,854	1,658	604	1,041	8,442	3,616	25,908

Appendix D - Transmission System Security and Resource Adequacy Assessment

The analysis performed during the Reliability Needs Assessment requires the development of Base Cases for power flow analysis and for resource adequacy analysis. The power flow system model is used for transmission security assessment and the development of the transfer limits to be implemented in the Multi-Area Reliability Simulation (MARS) model. A comprehensive assessment of the transmission system is conducted through a series of steady-state power flow, transient stability and short circuit studies.

In general, the RNA analyses indicated that the bulk power transmission system can be secured under N-1 conditions, but that transfer limits for certain key interfaces must be reduced below their thermal limits, in order to respect voltage criteria. However, a reduction in transfer limits on a limiting interface can result in higher LOLE, and/or needs occurring earlier than they otherwise would. To quantify this potential impact, LOLE analysis was conducted for the RNA Base Case, a case modeling voltage limited interfaces using the higher thermal limits, and also a case without any internal NYCA transmission limits. These cases were simulated to demonstrate the impact that transmission limits have on the LOLE results. The results from this analysis are reported in Table 4-9.

The MARS model was used to determine whether adequate resources would be available to meet the NYSRC and NPCC reliability criteria of one day in ten years (0.1 days/year). The results showed a deficiency in years 2020 – 2022 (See Section 4.2.3 of this report.) The MARS model was also used to evaluate selected scenarios (Section 4.3) and it was used to determine compensatory MW requirements for identified Reliability Needs (See Section 4.2.5).

D-1 RNA Power Flow Base Case Development and Thermal Transfer Limit Results

D- 1.1 Development of RNA Power Flow Base Cases

The base cases used in analyzing the performance of the transmission system were developed from the 2012 FERC 715 filing power flow case library. The load representation in for the power flow model is the summer peak load forecast reported in the 2012 Gold Book Table 1-2a baseline forecast of coincident peak demand. The system representation for the NPCC Areas in the base cases is from the 2011 Base Case Development (BCD) libraries compiled by the NPCC SS-37 Base Case Development working group. The PJM system representation was derived from the PJM Regional Transmission Expansion Plan (RTEP) planning process models. The remaining models are from the Eastern Interconnection

Reliability Assessment Group (ERAG) Multiregional Modeling Working Group (MMWG) 2011 power flow model library.

The 2012 RNA Base Case model of the New York system representation includes the following new and proposed facilities:

- TO projects on non-bulk power facilities included in the FERC 715 Cases and reported in the 2012 Gold Book as firm plans
- TO projects impacting bulk power facilities that are expected to be in-service by summer 2015
- Facilities that have accepted their Attachment S cost allocations and are in service or under construction as of April 1, 2012
- Facilities that have obtained a NYS PSC Certificate (or other regulatory approvals and SEQRA review) and an approved System Reliability Impact Study ("SRIS") and an executed contract with a credit-worthy entity.
- Facility reratings and uprates
- Scheduled retirements/mothball

The RNA Base Case does not include all projects currently listed on the NYISO's interconnection queue or those shown in the 2012 Gold Book. It includes only those which meet the screening requirements for inclusion.

D-1.2 Emergency Thermal Transfer Limit Analysis

The NYISO performed analyses of the RNA Base Case to determine emergency thermal transfer limits for the key interfaces to be used in the MARS resource adequacy analysis. Table D-1 reports the emergency thermal transfer limits for the RNA base system conditions:

Table D-1: Emergency Thermal Transfer Limits

	2013		**2014**		**2015**		**2016**		**2017**	
Dysinger East	2925	1	2975	1	2975	1	2975	1	2975	1
West Central	1600	1	1675	1	1675	1	1675	1	1675	1
Moses South	2650	2	2625	3	2625	3	2625	3	2625	3
Volney East	5675	4	5650	4	5650	4	5650	4	5650	4
Total East MARS	5900	5	5900	6	5900	6	5900	6	5950	6
Central East less PV-20 plus Fraser-Gilboa	3375	5	3425	5	3425	5	3425	5	3475	5
F to G	3475	7	3475	7	3475	7	3475	7	3475	7
UPNY-SENY MARS	5150	7	5150	7	5150	7	5150	7	5150	7
I to J	4350	8	4400	8	4400	8	4400	8	4400	8
I to K	1290	9	1290	9	1290	9	1290	9	1290	9

	Limiting Facility	Rating	Contingency
1	Wethersfield-Meyer 230 kV	430	Pre-disturbance

2	Moses-Adirondack 230 kV	440	Chateauguay-Massena and Massena-Marcy 765 kV
3	Marcy 765/345 T2 transformer	1971	Marcy 765/345 T1 transformer
4	Oakdale-Fraser 345kV	1380	Edic-Fraser 345kV
5	New Scotland-Leeds 345kV	1724	New Scotland-Leeds 345kV
6	Fraser-Coopers Corners 345 kV	1207	Pre-disturbance
7	Leeds-Pleasant Valley 345 kV	1725	Athens-Pleasant Valley 345 kV
8	Mott Haven-Rainey 345 kV	1196	Mott Haven-Rainey 345 kV

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6	Fraser-Coopers Corners 345 kV	1207	Pre-disturbance
7	Leeds-Pleasant Valley 345 kV	1725	Athens-Pleasant Valley 345 kV
8	Mott Haven-Rainey 345 kV	1196	Mott Haven-Rainey 345 kV
9	Dunwoodie-Shore Rd 345 kV	653	Pre-disturbance

D-2 2012 RNA MARS Model Base Case Development

The system representation for PJM, Ontario, New England, and Hydro Quebec modeled in the 2012 RNA Base Case was developed from the NPCC CP-8 2012 Summer Assessment. In order to avoid overdependence on emergency assistance from the external areas, the emergency operating procedure data was removed from the model for each External Area. In addition, the capacity of the external areas was further modified for modeling consistency by implementing the NYSRC's Policy 5 such that the LOLE value of each Area was a minimum value of 0.10 and capped at a value of 0.15 through the year 2014. The external area model was then frozen for the remaining study years (2015 – 2022). Because the load forecast in the NYCA continues to increase for the years 2015 – 2022, the LOLE for each of the external areas can experience increases despite the freeze of external loads and capacity.

The topology used in the MARS model is represented in Figures D-1 and D-2. The internal transfer limits modeled are the summer emergency ratings derived from the RNA Power Flow cases discussed above. The external transfer limits are developed from the NPCC CP-8 Summer Assessment MARS database with changes based upon the RNA Base Case assumptions.

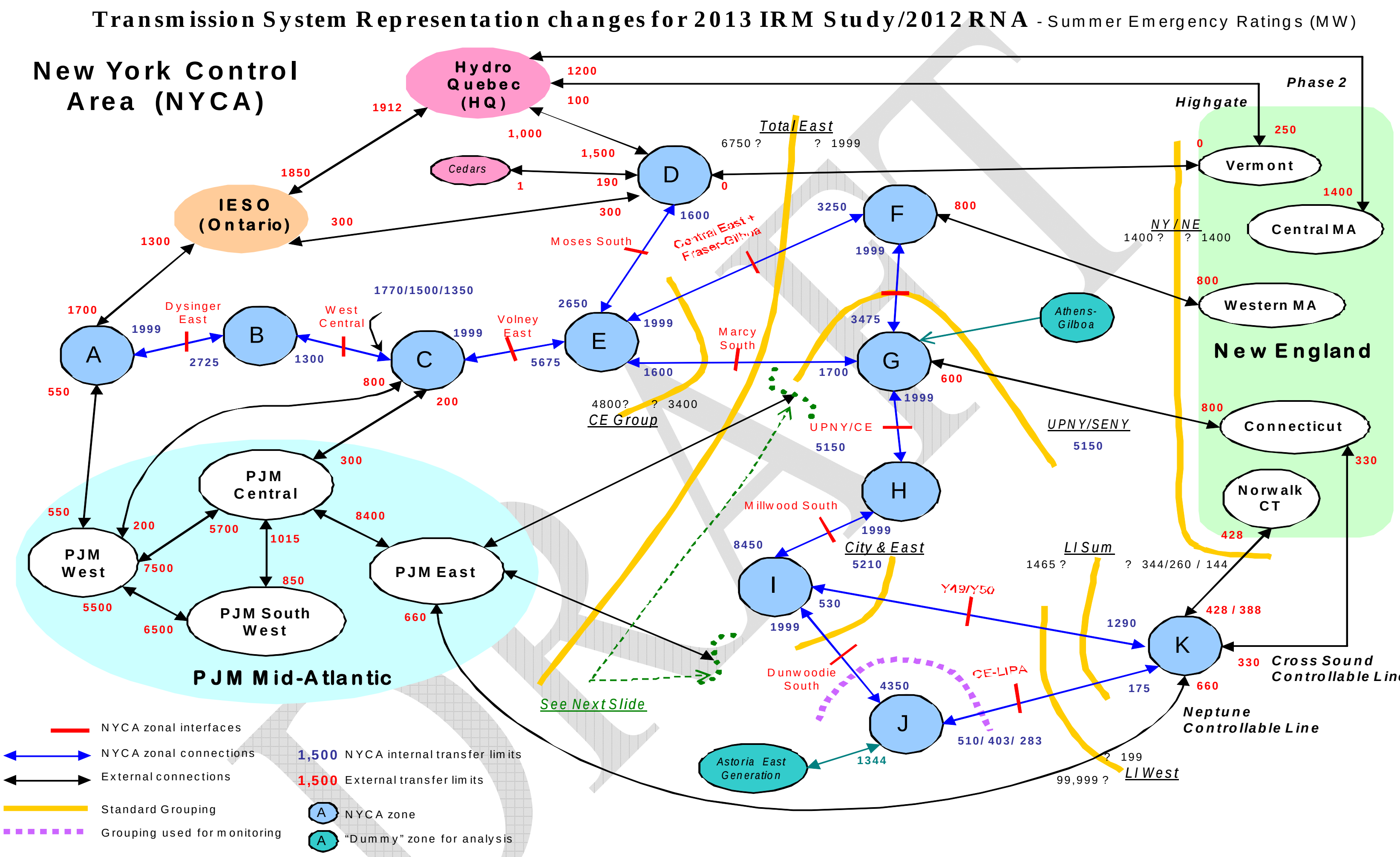
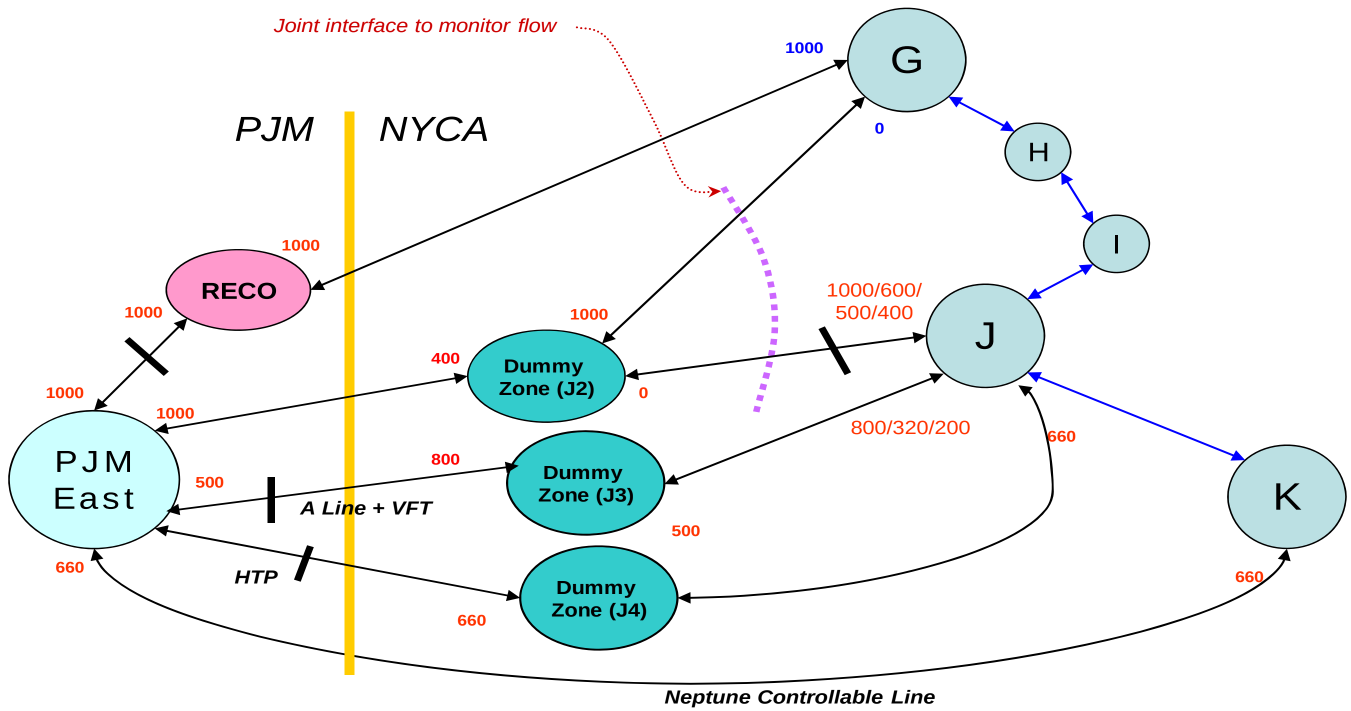


Figure D-1: Development of the 2012 MARS Topology

Transmission System Representation changes for 2013 IRM Study/2012 RNA - Summer Emergency Ratings (MW)

2012 PJM-SENY MARS Model



(PJM East to RECO) + (J2 to J) + (PJM East to J3) + (PJM East to J4) = 2000 MW

With the retirement of Hudson 1 and other changes in 2011 PJM RTEP, it was determined that this total interface can be supported to a flow of 2000 MW. This interface grouping contains those interfaces with the Bold hash mark. MARS will distribute this flow accordingly. This will change when additional transmission and generation comes into service in 2014 and 2015 up to 2340.

Figure D-2: 2012 PJM-SENY MARS Model

D-3 Short Circuit Assessment

Table D-2 provides the results of NYISO's short circuit screening test. Individual Breaker Assessment (IBA) is required for any breakers whose rating is exceeded by the maximum fault current. Results of the IBA performed by the NYISO or the Transmission Owner are shown in Table D-4.

Table D-2: 2012 RNA Fault Current Analysis Summary Table

Substation Name	Nominal kV	Lowest Rated Circuit Breaker (kA)	Maximum Phase Current (kA)	IBA Required (Y/N)
Marcy	765	**63**	**9.7**	**N**
Massena	765	**63**	**7.8**	**N**
Academy	345	**63**	**32.4**	**N**
AES Somerset	345	**32**	**17.9**	**N**
Alps	345	**40**	**17.5**	**N**
AstoriaAnnex	345	**63**	**45.1**	**N**
Athens	345	**48.8**	**34.1**	**N**
Bowline 1	345	**40**	**26.9**	**N**
Bowline 2	345	**40**	**26.7**	**N**
Buchanan N.	345	**63**	**28.8**	**N**
Buchanan S.	345	**40**	**38.5**	**N**
Clay	345	**49**	**32.9**	**N**
Coopers Corners	345	**32**	**15.6**	**N**
Dewitt	345	**40**	**18.9**	**N**
Dunwoodie	345	**63**	**50.4**	**N**
East Fishkill	345	**63**	**39.4**	**N**
East Garden City	345	**63**	**25.3**	**N**
Edic	345	**40**	**32.2**	**N**
Elbridge	345	**40**	**16.1**	**N**
Farragut	345	**63**	**57.7**	**N**
Fitzpatrick	345	**37**	**41.4**	**Y**
Fraser	345	**29.6**	**17.3**	**N**
Fresh Kills	345	**63**	**26.6**	**N**
Gilboa	345	**40**	**25.3**	**N**
Goethals N.	345	**63**	**26.4**	**N**
Goethals S.	345	**63**	**27.3**	**N**
Gowanus N.	345	**63**	**27.7**	**N**
Gowanus S.	345	**63**	**27.7**	**N**
Hurley Avenue	345	**40**	**17.2**	**N**
Independence	345	**41.9**	**38.5**	**N**
Ladentown	345	**63**	**38.9**	**N**
Lafayette	345	**40**	**17.9**	**N**
Leeds	345	**36.6**	**34.7**	**N**

Marcy	345	**63**	**31.4**	**N**
Middletown Tap	345	**63**	**17.1**	**N**
Millwood	345	**63**	**44.6**	**N**
Mott Haven	345	**63**	**48.5**	**N**
New Scotland	345	**32.4**	**31.4**	**N**
Niagara	345	**63**	**34**	**N**
Nine Mile Point 1	345	**50**	**43.5**	**N**
Oakdale	345	**29.6**	**12.2**	**N**
Oswego	345	**40.6**	**32.5**	**N**
Pleasant Valley	345	**63**	**41.2**	**N**
Pleasantville	345	**63**	**21.9**	**N**
Rainey	345	**63**	**54.7**	**N**
Ramapo	345	**63**	**42.2**	**N**
Reynolds Road	345	**40**	**14.8**	**N**
Rock Tavern	345	**50**	**26.4**	**N**
Roseton	345	**63**	**34.7**	**N**
Scriba	345	**38.4**	**46.9**	**Y**
Shore Road	345	**63**	**27.7**	**N**
South Mahwah- B	345	**40**	**33.5**	**N**
South Mahwah-A	345	**40**	**33.1**	**N**
Sprain Brook	345	**63**	**51.7**	**N**
Station 122	345	**32**	**16.8**	**N**
Station 80	345	**32**	**16.9**	**N**
Stolle Road	345	**32**	**3.9**	**N**
Volney	345	**44.8**	**36.6**	**N**
Watercure	345	**29.6**	**8.2**	**N**
West 49th Street	345	**63**	**49.8**	**N**
West Haverstraw	345	**none**	**28.2**	**n/a**
Adirondack	230	**25**	**9.6**	**N**
Chases Lake	230	**40**	**9.1**	**N**
Dunkirk	230	**28**	**15.2**	**N**
Gardenville	230	**31.8**	**22.7**	**N**
Hillside	230	**28.6**	**12.2**	**N**
Huntley	230	**30.6**	**27.1**	**N**
Meyer	230	**28.6**	**6.6**	**N**
Niagara	230	**63**	**57.3**	**N**
Oakdale	230	**none**	**6.2**	**n/a**
Packard	230	**47.1**	**43.9**	**N**
Porter	230	**18**	**19.5**	**Y**
Robinson Road	230	**34.4**	**14.5**	**N**
Rotterdam	230	**23.5**	**12.7**	**N**
South Ripley	230	**39.9**	**9.1**	**N**
St. Lawrence	230	**37**	**33.2**	**N**
Stolle Road	230	**28.6**	**13.9**	**N**
Watercure	230	**26.4**	**12.2**	**N**
Willis	230	**37**	**12.2**	**N**
Astoria East	138	**63**	**48.4**	**N**
Astoria West	138	**45**	**45.3**	**Y**

Barrett	138	**59.2**	**48.3**	**N**
Brookhaven	138	**35.4**	**26.5**	**N**
Buchanan	138	**40**	**15.8**	**N**
Corona	138	**63**	**48.1**	**N**
Dunwoodie No.	138	**40**	**34.2**	**N**
Dunwoodie So.	138	**40**	**30.5**	**N**
East 13th	138	**63**	**47**	**N**
East 75t ST	138	**63**	**10.9**	**N**
East 179th	138	**63**	**48.3**	**N**
East Garden City	138	**80**	**70.9**	**N**
Eastview	138	**63**	**36.7**	**N**
Fox Hills	138	**40**	**31.7**	**N**
Freeport	138	**63**	**34.4**	**N**
Fresh Kills	138	**40**	**35.7**	**N**
Greenwood	138	**63**	**44.2**	**N**
HG	138	**63**	**41.7**	**N**
Holbrook	138	**52.2**	**48.2**	**N**
Hudson E	138	**63**	**38.1**	**N**
Jamaica	138	**63**	**46.7**	**N**
Lake Success	138	**57.8**	**38.4**	**N**
Millwood W	138	**20**	**19.3**	**N**
Motthaven	138	**50**	**13.3**	**N**
Newbridge Road	138	**80**	**72**	**N**
Northport	138	**56.2**	**59.9**	**Y**
Pilgrim	138	**63**	**59.3**	**N**
Port Jefferson	138	**63**	**32.2**	**N**
Queensbridge	138	**63**	**43.5**	**N**
Riverhead	138	**63**	**17.8**	**N**
Ruland	138	**63**	**45.2**	**N**
SB TR N7	138	**63**	**26.8**	**N**
SB TR S6	138	**63**	**28.9**	**N**
Sherman Creek	138	**63**	**45.3**	**N**
Shore Road	138	**57.8**	**47.8**	**N**
Shoreham	138	**52.2**	**25.4**	**N**
Tremont	138	**63**	**42.5**	**N**
Valley Stream	138	**57.8**	**52.1**	**N**
Vernon East	138	**63**	**42.7**	**N**
Vernon West	138	**63**	**34.5**	**N**
Clay	115	**44.8**	**36.4**	**N**
Porter	115	**37.9**	**41.2**	**Y**
E River	69	**50**	**49.7**	**N**

Tables D-3 provides the results of NYISO's IBA for Farragut 345kV, Fitzpatrick 345kV, Astoria West 138kV, Northport 138 kV, and National Grid's IBA for Porter 115kV, Porter 230 kV, and Scriba 345kV.

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Table D-3: IBA for 2012 RNA Study

ASTORIA WEST 138 KV

Breaker ID	Rating (kA)	1LG (kA)	2LG (kA)	3LG (kA)	Overduty
G1N	45	42.81	41.11	37.84	N
G2N	45	42.81	41.11	37.84	N

FITZPATRICK 345 kV

Breaker ID	Rating (kA)	1LG (kA)	2LG (kA)	3LG (kA)	Overduty
10042	37	34.06	34.39	32.52	N

NORTHPORT 138 kV

Breaker ID	Rating (kA)	1LG (kA)	2LG (kA)	3LG (kA)	Overduty
1310	56.2	50.074	50.309	51.515	N
1320	56.2	50.051	50.314	51.53	N
1450	56.2	50.98	50.002	48.552	N
1460	56.2	30.745	29.545	26.863	N
1470	56.2	32.377	32.142.	31.681	N

PORTER 115 kV

Breaker ID	Rating (kA)	Phase Current (kA)	Overduty
R10 LN1	43.0	44.7	Y
R100 TB3	43.0	37.2	N
R115 TB1	63.0	44.8	N
R125 TB2	63.0	44.8	N
R130 LN13	43.0	45.0	Y
R20 LN2	43.0	44.7	Y
R200 TB4	43.0	35.9	N
R30 LN3	43.0	44.5	Y
R40 LN4	43.0	44.4	Y
R50 LN5	43.0	44.4	Y
R60 LN6	43.0	45.0	Y
R70 LN7	43.0	44.2	Y
R80 LN8	43.0	44.6	Y
R8105 BUSTIE	47.7	42.6	N
R90 LN9	43.0	45.0	Y

PORTER 230 kV

Breaker ID	Rating (kA)	Phase Current (kA)	Overduty
R110 B-11	23.9	26.4	Y
R120 B-12	23.9	26.4	Y
R15 B-TB1	23.9	26.4	Y
R170 B-17	23.9	26.4	Y
R25 B-TB2	23.9	26.4	Y
R300 B-30	40.0	22.0	N
R310 B-31	40.0	22.0	N
R320 B-30	23.9	26.4	Y
R825 31-TB2	23.9	25.2	Y
R835 12-TB1	23.9	25.4	Y
R845 11-17	23.9	25.2	Y

SCRIBA 345 kV

Breaker ID	Rating (kA)	Phase Current (kA)	Overduty
R100 B-10	50.0	56.0	Y
R200 B-20	50.0	56.0	Y
R210 B-21	50.0	56.0	Y
R230 B-23	63.0	56.0	N
R250 B-25	50.0	56.0	Y
R90 B-9	50.0	56.0	Y
R915 9-20	50.0	54.7	Y
R925 B-23	63.0	56.0	N
R935 10-21	50.0	53.9	Y
R945 B-25	50.0	56.0	Y