Appendices

for

The Comprehensive Reliability Plan 2007

A Long-Term Reliability Assessment
of
New York's Bulk Power System

FINAL REPORT

September 18, 2007

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1 Introduction

A. Historical Context and Current Policy Setting

Prior to the NYISO's formation in 1999, the electric utilities operated their systems cooperatively for decades, in an effort to provide reliable, economic electric supplies for customers in New York State. In the wake of the Northeast blackout of 1965, the integrated electric utilities, together with the Power Authority of the State of New York, established a state-wide wholesale power coordinating institution, the New York Power Pool "NYPP", which operated for several decades as the predecessor of the NYISO. The NYPP carried out many of the reliability functions of a control area operator and provided a forum for short-term trades among the electric utilities and for allocating the benefits of these trades based upon a "split-savings" price formula. The NYPP also assisted the integrated electric utilities with their planning efforts, which conducted an integrated evaluation of their customers' electric supply and delivery needs.

The advent of competition in the electric industry in New York State, and in many parts of the Northeast separated the costs of utilities' services into distinct products and markets, and led to the unbundling of power generation and transmission development. In New York, the integrated utilities have divested nearly all of their generation assets to private entities who compete to sell capacity, energy and ancillary services in the NYISO's markets. At the same time, the Federal Energy Regulatory Commission ("FERC") required transmission providers to provide open and non-discriminatory access to their transmission systems under its landmark Order 888. The NYISO was created, under a FERC-approved Open Access Transmission Tariff ("OATT"), as part of an overall restructuring of the electric industry in New York. Key elements of the industry were redesigned to rely more on market forces for greater efficiency in operations of and investment in the bulk power system. The NYISO formally took over from the NYPP the operational control of the bulk power transmission system and the dispatch of generation on December 1, 1999.

Bulk power markets for capacity, energy and ancillary services were formed at the same time as state and federal policy makers recognized that the discipline and efficiency of market forces in providing these commodities would promote the public good through cost savings. Under this market-based philosophy, bulk power system needs should be provided for through markets that send economically efficient price signals for investment in needed resources. Approximately 5,000 MW of new power plants have come into operation in New York since the formation of competitive wholesale markets—most of these have been located in the downstate region where both the price signals and reliability needs are the greatest. Electric system needs are increasingly provided in response to market forces. As a result, the State's electric utilities no longer conduct vertically-integrated planning through which generation and transmission plans were tightly coordinated.

During the pendency of the 2007 CRPP, several state and federal policy initiatives have begun to examine the manner in which long-term electric system planning is conducted, and whether changes to the current procedures should be adopted. The New York Public Service Commission (PSC) has initiated a proceeding to examine whether long-term contracts should be encouraged and how they could be utilized to provide for future resource and infrastructure needs of the bulk power system. The PSC is also examining whether a planning process overseen by the State is needed as a supplement the CRPP in order to incorporate state energy policy goals into planning for New York's energy future. Such goals may include fuel diversity, environmental priorities, energy efficiency, demand side management, renewable resources and economic efficiency. In addition, the PSC has commenced proceedings evaluating how to encourage more demand side management (DSM) programs, and to examine whether an energy efficiency portfolio standard should be established to assist in reducing forecasted electric consumption levels by 15 percent by 2015.

Also during this time, the FERC issued a final rule in its OATT reform proceeding. Following on FERC's Orders 888 and 889, which first established transmission open access and competitive market mechanisms for the wholesale electric industry, Order 890 directed improvements to the Open Access Transmission Tariffs of all Transmission Owners and Operators, including the ISOs and RTOs. . Among other things, Order 890 listed nine principles that all Transmission Providers should adhere to in conducting their planning processes. In accordance with this Order, the NYISO has posted a Straw Proposal on its website (www.nyiso.com) addressing how it plans to comply with these nine principles, and will make a compliance filing to modify the CRPP accordingly in October of this year. Among other things, Order 890 will require the NYISO to expand its economic planning process to include additional studies of transmission system congestion at the request of transmission customers. This will require modifications to the NYISO's existing economic planning process. Presently, this process is informational only, and provides for the calculation and posting of historic congestion information on the New York transmission system. For example, historic congestion data is reported in the 2007 Reliability Needs Assessment (RNA) to inform the marketplace in evaluating what proposals to make in response to identified reliability needs. In its Straw Proposal, the NYISO has proposed enhancements to its planning process that will enable it to conduct a series of economic planning analyses building upon the reliability planning process under the CRPP.

The NYISO looks forward to continuing to participate in both the PSC and the FERC planning proceedings to share its technical expertise and experience in conducting reliability planning and transmission system congestion analyses. The NYISO believes that this 2007 Comprehensive Reliability Plan will help inform these state and federal processes.

B. The Nature of Planning Under the CRPP

Electric system planning is a continuous process of evaluating, monitoring and updating, which makes the annual publication of the CRPP an invaluable resource. In addition to addressing reliability issues, the CRPP offers valuable information to the state's wholesale electricity marketplace.

As set forth in NYISO OATT, Attachment Y, the objectives of the CRPP are to:

1. Evaluate the reliability needs of the Bulk Power Transmission Facilities (BPTF);
2. Identify factors and issues that could adversely impact the reliability of the BPTF;

3. Provide an opportunity a process whereby solutions to identified needs are proposed, evaluated, and enacted in a timely manner to maintain the reliability of the system;
4. Provide for the development of market-based solutions, while maintaining the reliability of the BPTF through backstop regulated solutions as needed; and
5. Coordinate the NYISO's reliability assessments with Neighboring Control Areas.

The CRPP is an ongoing process that produces two annual reports. The first is the Reliability Needs Assessment (RNA), which evaluates generation adequacy and transmission reliability over a 10-year span, and identifies future needs for maintaining reliability. Identifying potential and existing reliability issues concerning New York's bulk power system is the first step necessary to maintain the system's integrity for today and the future. The 2007 RNA was issued in March 2007. .

The second step is the development of the Comprehensive Reliability Plan (CRP), which identifies and evaluates proposed solutions to maintain power system reliability. Those solutions may include market-based, regulated backstop and/or alternative regulated solutions that may result in new generation additions, transmission upgrades and additions, and/or improved demand response programs.

This is the second CRP study produced by the NYISO and its stakeholders. This report constitutes the supporting documentation for the second CRP prepared by the New York Independent System Operator. This documentation starts with the RNA supporting document and incorporates updates where appropriate.

2 The Comprehensive Reliability Planning Process

The following presents an overview and summary of the CRPP, the CRPP stakeholder process, and the reliability policies and criteria that are the foundation of the CRPP.

2.1 Summary of the CRPP

The CRPP is a long-range assessment of both resource adequacy and transmission reliability of the New York bulk power system conducted over a 10-year planning horizon. It is conducted in accordance with the existing reliability criteria of the North American Electric Reliability Council (NERC), the Northeast Power Coordinating Council (NPCC), and the New York State Reliability Council (NYSRC) as they may change from time to time. This process is anchored in the NYISO's philosophy in which market-based solutions are the first choice to meet identified reliability needs. However, in the event that market-based solutions do not appear to meet a reliability need in a timely manner, the NYISO will designate the Responsible Transmission Owner to proceed with a regulated backstop solution in order to maintain reliability. Under the CRPP, the NYISO also investigates whether market failure is the reason for the lack of a market-based solution, and explores changes in its market rules if that is found to be the case.

As the first step in the CRPP, the NYISO conducts a Reliability Needs Assessment (RNA) to determine whether there are any violations of existing reliability rules governing resource adequacy and transmission security. Following the review of the RNA by the NYISO committees and final approval by the NYISO Board of Directors, the NYISO will request solutions to the identified reliability needs from the marketplace. At the same time, the responsible Transmission Owners are obligated to prepare regulated backstop solutions for each identified need over the planning horizon, which will serve as the benchmark to establish the time by which a market-based solution must appear. Both market-based and regulated solutions are open to all types of resources: transmission, generation, and demand response. Non-transmission owner developers also have the ability to submit proposals for regulated solutions in the event that no valid market based solution is proposed. The NYISO evaluates all proposed solutions to determine whether they are viable and will meet the identified reliability needs in a timely manner. The NYISO does not conduct an economic evaluation of the proposed solutions.

Following its analysis of all proposed solutions, the NYISO prepares a Comprehensive Reliability Plan (CRP or Plan). The CRP identifies all proposed solutions that the NYISO determines are capable of meeting the identified reliability needs. If a viable market-based project or projects can satisfy the identified needs in a timely manner, the CRP will so state. If developers do not present viable market-based proposals and the NYISO determines that a regulated backstop solution must be implemented, the CRP will so state, and the NYISO will request the appropriate Responsible Transmission Owner(s) to proceed with regulatory approval and development of the backstop solution. The NYISO also monitors the continued viability of proposed projects to meet identified needs and reports its findings in subsequent Plans.

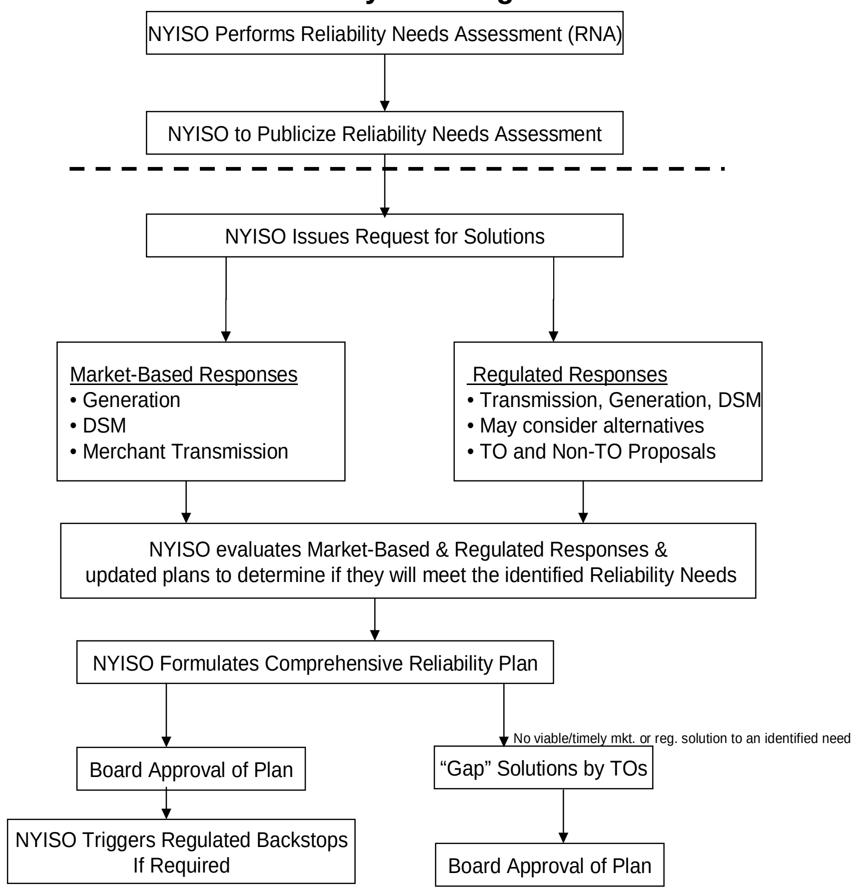
The CRPP also allows the NYISO Board to address the appearance of a reliability need on an emergency basis, whether during or in-between the normal CRPP cycle. In the event that there is an immediate threat to reliability, the NYISO will request the appropriate Transmission Owner(s) to develop a "gap solution" and to pursue its regulatory approval and completion in conjunction with the New York State Public Service Commission (NYSPSC). Gap solutions are intended to be temporary and not to interfere with pending market-based projects.

The CRPP also addresses the issues of cost allocation and cost recovery for regulatory backstop solutions to reliability needs. The Tariff contains a set of principles for cost allocation based upon the principle that beneficiaries should pay. The NYISO continues to be engaged in a stakeholder process to develop procedures for cost allocation. Cost recovery for regulated transmission solutions will be addressed through a separate rate schedule in the NYISO's Services Tariff, while cost recovery for non-transmission solutions will be subject to the NYSPSC's procedures.

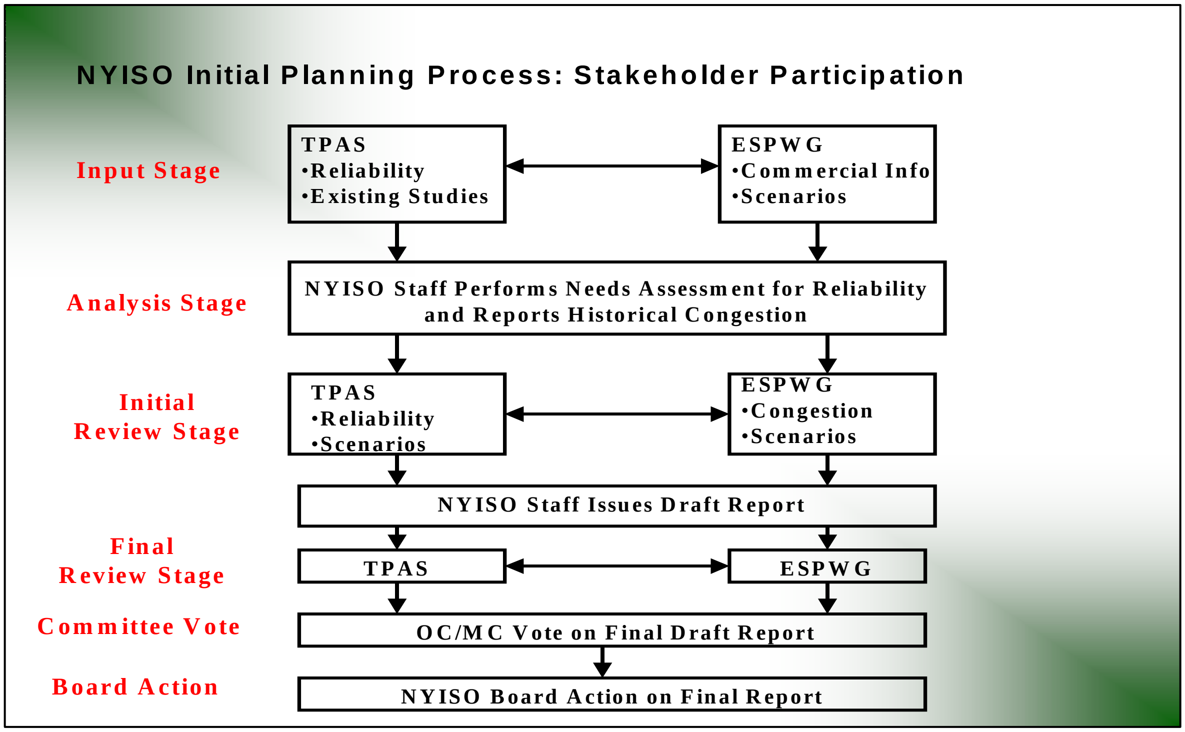
The CRPP also addresses the respective roles of the NYISO, the FERC and the NYSPSC with regard to the NYISO planning process. In the event of a dispute regarding the NYISO's findings in the RNA or the CRP that cannot be resolved through the normal NYISO governance procedures, the Tariff provides for disputes to be brought to either the FERC or the NYSPSC—depending upon the nature of the dispute. In the event that a Transmission Owner is unable to license or complete a regulated backstop solution that has been found necessary during the course of the CRPP, the NYISO is required to report this to the FERC. Upon request, the NYSPSC will review proposed regulated solutions from either a Transmission Owner or another developer prior to their submission to the NYISO.

A separate, FERC-approved agreement between the NYISO and the New York Transmission Owners addresses the Transmission Owner's rights and obligations for performance under the CRPP. This agreement also envisions the establishment of a separate rate recovery mechanism, to be approved by FERC, for the recovery of costs associated with the development and construction of a regulated transmission backstop solution required by the CRP. The process flow diagram below summarizes the CRPP Stakeholder Process.

NYISO Reliability Planning Process



Given that the CRPP addresses both reliability and business issues, it has been agreed that both the TPAS and the ESPWG participate in the implementation process. This participation consisted of parallel input and review stages as shown in the diagram below.



TPAS has primary responsibility for the reliability analyses, while the ESPWG has primary responsibility for providing commercial input and assumptions utilized in the development of reliability assessment scenarios and the reporting and analysis of historic congestion costs. Coordination between these two groups and NYISO Staff was established during each stage of the initial planning process.

The intent of this process is to achieve consensus at both TPAS and the ESPWG. While no formal voting process is established at this level, which is typical for NYISO working groups, an opportunity for reporting majority and minority views is provided in the absence of a consensus.

Following TPAS and ESPWG review, the draft RNA and CRP reports are forwarded to the Operating Committee for discussion and action, and subsequently to the Management Committee for discussion and action. Finally, the NYISO's Board of Directors reviews and approves the RNA and the CRP.

2.2 Summary of Reliability Policies and Criteria Applicable to the NYISO

The foundation of the CRPP and the RNA is the reliability policies and criteria applicable to the NYISO. The phrase "reliability policy and criteria" is used broadly to include standards, requirements, guidelines, practices, and compliance. The following presents an overview of these policies and criteria in the context of basic reliability concepts and the organizations that develop, promulgate, implement, and enforce the related policies and criteria.

2.2.1 Basic Reliability Concepts

The standard industry definition of bulk power system reliability is the degree to which the performance of the elements of that system (*i.e.*, generation and transmission) results in power being delivered to consumers within accepted standards and in the amount desired. It may be measured by the frequency, duration, and magnitude of adverse effects on consumer service.

Reliability consists of adequacy and security. Adequacy, which encompasses 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. Security refers to the ability of the bulk power system to withstand disturbances such as electric short circuits or unanticipated loss of system components.

There are two different approaches to analyzing a bulk power system's security and adequacy. Adequacy is a planning and probability concept. A system is adequate if the probability of not having sufficient transmission and generation to meet expected demand is equal to or less than the system's standard, which is expressed as a loss of load expectation (LOLE). The New York State Power System is planned to meet a LOLE representative of an involuntary load disconnection event not more than once in every 10 years, or 0.1 days per year. This requirement forms the basis of New York's resource adequacy and installed capacity requirements.

Security is an operating and deterministic concept. This means that possible events are identified as having significant adverse reliability consequences and the bulk power 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 minus 1" (N-1) or "N minus 2" (N-2). In this definition, "N" is the number of system components. An N-1 requirement means that the system can withstand the loss of any one component without affecting service to consumers.

2.2.2 Organizational Structure

Reliability policies are developed, promulgated, implemented, and enforced by various organizations at different levels. These include federal and state regulators, industry-created organizations such as the North American Electric Reliability Council (NERC) and its member organizations, transmission owners, and energy market participants.

NERC was formed as a voluntary, not-for-profit organization in 1968 in response to the blackout of 1965. A ten-member Board of Trustees governs NERC with input from an industry Stakeholder Committee. NERC has formulated planning standards and operating policies. Pursuant to the Energy Policy Act of 2005, the Federal Energy Regulatory Commission approved NERC as the Electric Reliability Organization for North America in 2006. FERC is in the process of approving the governance structure and funding of NERC, as well as mandatory electric reliability standards that will be enforced by NERC.

Ten Regional Reliability Councils currently comprise NERCO's membership; and members of these councils come from all segments of the industry. New York State is an Area within the Northeast Power Coordinating Council (NPCC), which includes New England and northeastern Canada. NPCC implements broad-based, industry wide reliability standards tailored to its region. NERC and NPCC have requested FERC's approval of a delegation agreement by which NPCC will oversee and enforce compliance with NERC and NPCC standards in the northeastern regions of the United States and Canada.

New York State also has its own electric reliability organization, which is the New York State Reliability Council (NYSRC). The NYSRC is a not-for-profit organization that promulgates reliability rules and monitors compliance on the New York State Power System. The NYISO, and all organizations engaging in electric transactions on the state's power system must comply with these rules. Thirteen members from different segments of the electric power industry govern the NYSRC. New York-specific reliability rules may be more detailed or stringent than NERC Standards and Policies and NPCC Criteria. Local reliability rules that apply to certain zones within New York may be even more stringent than statewide reliability rules.

2.2.3 Reliability Policies and Criteria

Similar to the national, regional and state levels of reliability organizations, there are national, regional and state levels of documents comprising the reliability standards, policies and criteria that govern the New York bulk power system. Presently, NERC has two major types of such documents: Operating and Planning Standards.

Planning Standards documents provide the fundamental planning requirements. The interconnected bulk electric system must be planned so that the aggregate electrical demand and energy requirements of customers are satisfied, taking into account scheduled and reasonably expected unscheduled outages of system elements, and capable of withstanding sudden disturbances. Regional Councils may develop planning criteria that are consistent with those of NERC.

NERC's Operating Standards provide the fundamental operating requirements. The interconnected bulk electric system must be operated in secure state such that the aggregate electrical demand and energy requirements of customers are satisfied in real time. Primary responsibility for reliable operation is vested with the control area operators; for New York State, this is the NYISO. A "control area" is the basic operating unit of an exclusive portion of the interconnected power system. The thrust of these Operating Standards is to promote reliable interconnection operations within each of the three interconnections in North America without burdening other entities within the interconnection. The NYISO is within the Eastern Interconnection.

NPCC has three basic categories of documents: Criteria, Guidelines, and Procedures, respectively referred to as Type A, B, and C documents. The foundational NPCC document is A-2, Basic Criteria for Design and Operation of Interconnected Power Systems, which establishes the principles of interconnected planning and operations.

The NYSRC Reliability Rules for Planning and Operating the New York State Power System includes the required rules and defines the performance that constitutes compliance. These rules include NERC Planning Standards and Operating Policies; NPCC Criteria, Guidelines and Procedures; New York-specific reliability rules; and local transmission owner reliability rules. The NYISO's implementation and compliance with NYSRC Reliability Rules are codified in its Operations, Planning, and Administrative manuals and other written procedures.

The NYSRC establishes the annual statewide installed capacity requirement (ICR) to maintain resource adequacy. Factors that are considered in establishing the ICR include the characteristics of loads, uncertainty in load forecast, outages and deratings of generation units, the effects of interconnections to other control areas, and transfer capabilities of the state's transmission system. The NYISO determines installed capacity (ICAP) requirements for load serving entities (LSEs), including any locational ICAP requirements.

3 Reliability Needs Summary

The 2007 RNA indicated that the forecasted system first exceeds the Loss of Load Expectation (LOLE) criterion in the year 2011, with 2010 just meeting that criterion. The need in 2011 is driven primarily by load growth exceeding two percent per year, generator retirements, and voltage-driven transmission constraints in the Lower Hudson Valley into the New York City Metropolitan Area. Accordingly, the RNA designated the Transmission Owners (TOs) in those areas, namely Con Edison, Orange and Rockland and Central Hudson, as the Responsible TOs required to identify a regulatory backstop solution to the reliability need, which may be called upon by the NYISO should no timely market-based solution be available.

Based upon continuing load growth throughout the New York Control Area from 2012 to 2016, the RNA determined that the LOLE criterion will be violated in these years as well. The RNA characterized the reliability needs for 2012-2016 as statewide resource adequacy needs. That is, there are multiple combinations of generation, transmission and demand-side resources that could satisfy those needs during this period. Consequently, the RNA identified all of the TOs, except for the New York Power Authority (NYPA), as Responsible TOs to identify regulatory backstop solutions for the reliability needs in 2012 to 2016. NYPA was not identified as a Responsible TO because it serves its government, authority and private sector customers by contractual agreement rather than as the utility provider of last resort, which would be required to service those customers should they refuse service from NYPA. Nevertheless, the RNA stated the NYISO’s expectation that NYPA will work cooperatively with the Responsible TOs to identify regulated backstop solutions to the reliability needs identified in the RNA.

The RNA reported the results of two sensitivity analyses, with the following results:

- The reliability need in 2011 could be deferred to 2012 if the voltage constraints in the Lower Hudson Valley were to be resolved;
- Assuming unlimited transmission system capability would also defer the first year of reliability need from 2011 to 2012;

The RNA also examined the reliability needs under a number of alternative scenarios, with the following results:

- If an unusually high load were to occur, the reliability need in 2011 would advance to 2009;
- If increasingly stringent environmental controls were to force the retirement of all of the coal-based generation in New York except for the two most modern units, the reliability needs in some zones in New York would advance to 2009 or 2010;
- If the retirement of the older NYPA Charles Poletti unit were deferred until the end of 2009, both statewide and downstate reliability would improve;
- If non-utility generators that have older, regulatory power purchase agreements were to retire in the years when their contracts expire, the need date NYCA-wide would advance to 2009 and would increase dramatically in 2010;

- If NYPA proceeds with its agreement to purchase 500 MW from New Jersey to serve its customers in New York City via a new direct current transmission tie, the first year of need would be 2013;
- If NYPA proceeds with a 680 MW clean coal facility near Buffalo in 2013, there would still be reliability needs in the Lower Hudson Valley and the New York City Metropolitan Area in that year.

Finally, the RNA conducted a short-circuit analysis and informed the market about historic congestion costs.

Dr. David Patton, the NYISO's Independent Market Advisor, reviewed the RNA. With regard to the locational needs identified in the RNA, Dr. Patton indicated that the ongoing work of the NYISO and its Market Participants to identify when new capacity zones and associated local capacity requirements are appropriate should improve the economic signals needed to allow the market to resolve these needs.

4 The Comprehensive Plan (CRP)

The CRP begins with a request for solutions followed by a review of transmission security and then an evaluation of the solutions and concludes with the plan itself.

4-A Request for Solutions

The CRP evaluates the market-based solutions offered by developers, the regulated backstop solutions offered by the Responsible TOs, and the alternative regulated solutions offered by other developers to satisfy the RNA's outlined reliability needs. Proposals can be large or small generation projects – including distributed generation – demand-side programs, transmission projects, market rule changes, operating procedure changes, and other actions to answer outstanding RNA issues. While market solutions are preferred, the Responsible TOs named in the RNA are required to submit regulated backstop solutions to meet the identified needs.

The needs outlined in the RNA for 2011 are located downstate, from the lower Hudson Valley through New York City. Three TOs – Central Hudson Gas and Electric Corporation, Consolidated Edison Company of New York, Inc., and Orange and Rockland Utilities, Inc. – have been identified as the Responsible TOs for addressing the reliability concerns in the RNA. From 2012 through 2016, the needs are statewide, resulting in the designation of all TOs, except for the New York Power Authority, as Responsible TOs.

On March 2, 2007, the NYISO Board of Directors approved the draft Reliability Needs Assessment submitted to it by the NYISO Management Committee. The Board's action became final on March 16, 2007. Because the tariff calls for the NYISO to encourage market-based solutions to RNA reliability needs, the NYISO issued its initial request for those solutions on March 8, 2007. The NYISO requested that developers submit market-based solutions and that the Responsible TOs submit regulated backstop solutions to the identified Reliability Needs by May 1, 2007. If the market-based responses received by the NYISO will not, or based upon the amount of information provided at that time, may not, fulfill all of the RNA's identified reliability needs, the NYISO shall solicit alternative regulated responses. Developers and TOs (including those other than the Responsible TOs) may submit alternative regulated responses. Like market-based solutions and regulated backstop solutions, these proposals may consist of transmission, generation or DSM projects.

Given the information that had been received through May 14, the NYISO could not determine with certainty that sufficient market-based solutions would qualify to meet the Reliability Needs identified in the RNA. Therefore, in order to fulfill the requirements of CRPP and to provide an opportunity for all options for meeting the Reliability Needs to be identified and evaluated in time for the NYISO Board of Directors to consider and approve a Comprehensive Reliability Plan this summer, the NYISO issued a request for Alternative Regulated Responses on May 15, 2007. The NYISO requested that alternative regulated solutions be submitted by June 8, 2007.

Market-based solutions primarily differ from regulated backstop and alternative regulated responses because their costs are not recoverable under Attachment Y of the NYISO's OATT. Market-based project developers obtain revenues through the NYISO's energy, capacity, and ancillary services markets, as well as through bilateral contracting arrangements. In contrast, all regulated solutions, once selected and triggered, recover their costs either though the NYISO tariff or in accordance with the provisions of the New York Public Service Law—depending upon the nature of the solution.

The following timeline represents the milestones in the NYISO's process for requesting solutions to the Reliability Needs:

March 2, 2007	RNA approved by the NYISO Board of Directors and issued by the NYISO.
March 8, 2007	NYISO issued formal request for Regulated Backstop Solutions and Market Solutions to be submitted by May 1, 2007.
May 1, 2007	The TOs submitted regulated backstop solutions as well as updated plans. Eight market solutions were received. Five were generation projects and three were transmission projects.
May 15, 2007	Alternative Regulated Solutions requested by the NYISO to be submitted by June 8, 2007.
June 8, 2007	Three Alternative Regulated Solutions were received: one transmission proposal, one generation proposal, and one demand-side management proposal.

The NYISO received market-based solutions totaling a potential of 3,012 MW of resources, and received 1,800 MW of resources as backstop regulatory solutions from the Responsible TOs. Three alternative regulatory solutions were received totaling approximately 600 MW of generation and demand response resources, as well as a 1,200 MW HVDC transmission proposal. The NYISO evaluated the various solutions it received according to the criteria approved by the Operating Committee for evaluating the viability of market based, regulated backstop, and alternative regulated backstop solutions.[1] The NYISO conducted an iterative process with the project proponents, and is reporting the results of its evaluation in this CRP.

4.1 Responsible Transmission Owner Solutions

4.1.1 First Five Year Base Case – 2007 to 2011

The 2007 RNA determined that the first year of need was 2011, and that needs increased throughout the rest of the Study Period through 2016[2]. The year 2011 need was the result of a binding transmission constraint and was not the result of a statewide resource deficiency. The Responsible Transmission Owners (TOs) identified for meeting this need for the First Five Year period of the 2007 Reliability Needs Assessment (RNA) are:

- Central Hudson,
- Orange & Rockland, and
- Con Edison.

The RNA identified a statewide resource adequacy need for the period 2012 through 2016, and identified all TOs, except for NYPA, as the Responsible TOs for that period. The Responsible TOs for the First Five Year period originally

[1] The NYISO's determination that a solution is viable under the approved criteria does not predict the outcome of regulatory approval processes, or the application of governmental policies. The NYISO does not itself select specific projects to meet reliability needs, nor does it construct any projects.
[2] In the NYISO RNA study, load growth is modeled for each of the 10 years, but generally, most market-based solutions are not developed far enough to meet the criteria for inclusion in the RNA study case.

submitted the following projects to be considered by the NYISO to solve the reliability needs identified by the 2007 RNA for the year 2011:

- Capacitor banks totaling 240 MVar at the Millwood substation in the Con Edison service territory to be in-service by the end of 2007. This project is offered as a TO Updated Plan, and consists of the capacitor portion of the Athens Special Protection System and Capacitor Banks (SPS/CAP) project, as approved by the NYISO Operating Committee, which Con Edison will own and operate when in-service.
- Replacement of Breaker 14 in the Gowanus 345 kV station in the Con Edison service territory. This project was initially offered as a Regulated Backstop solution with a scheduled in-service date of 2011 and a start date in 2010. This breaker replacement will allow Con Edison to by-pass the series reactors in the Farragut-Gowanus feeders. In an addendum submitted to the NYISO on June 7, 2007, Con Edison changed its designation of this item to a TO Updated Plan, since it now has firm plans to complete the replacement of this breaker by the end of 2007.

4.1.2 Second Five Years – 2012 to 2016

The Responsible Transmission Owners (TOs) identified for providing regulated backstops to meet the needs for the second five year period of the 2007 Reliability Needs Assessment (RNA) are:

- Central Hudson Gas and Electric Company (Central Hudson)
- Consolidated Edison Company of New York, Inc. (Con Edison)
- Long Island Power Authority (LIPA)
- New York State Electric & Gas Corporation (NYSEG)
- Niagara Mohawk Power Corporation d/b/a National Grid (National Grid)
- Orange & Rockland Utilities, Inc. (O&R), and
- Rochester Gas and Electric Corporation (RG&E).

The response includes detailed solutions developed to meet the needs identified in 2012 – 2016 time period. The NYISO may trigger reliability backstop solutions if it determines that the market-based solutions are not likely to be available to meet the reliability needs in a timely manner. The proposed solutions are comprised of the following:

- 1,000 MW of new generation and DSM in Zone J, with 500 MW to be added by 2012 with a trigger date of 2008, an additional 250 MW to be added by 2014 with a trigger date of 2010, and an additional 250 MW to be added by 2015 with a trigger date of 2011. Implementation of each of these additions will take between 3 and 4 years.
- 300 MW of new generation in conjunction with DSM in Zone B in 2013. Implementation will take between 3 and 5 years.
- 500 MW of new generation and DSM in Zone G, with 100 MW added in 2015 and an additional 400 MW added in 2016. Implementation of each of

these additions will take between 3 and 4 years. This project would need to be triggered by 2011.

- A 345 kV line between Zones F and G that would permit the location of generation and DSM in upstate zones, rather than Zone G as indicated above. Implementation will take between 5 and 7 years.[3] The 345 kV transmission line between Zones F and G was developed by National Grid and consisted of two alternative proposals. The first proposal (A1) consisted of a new 44-mile 345 kV transmission line between Leeds and Pleasant Valley. The second proposal (A2) consisted of a 64 mile 345 kV transmission line between Schodack and Pleasant Valley. Schodack is near Alps and the intersection of the existing 115 kV line, which runs south towards Pleasant Valley and the existing 345 kV New Scotland line.
- In addition to the response provided by the Responsible Transmission Owners as a group for the second five years, Rochester Gas and Electric (RG&E) submitted separately supporting documentation for a specific 300 MW generation proposal in Zone B. Their submittal included conceptual design information, licensing, and a construction schedule for a 300 MW fluid bed combustor clean coal plant, or, alternatively a 300 MW natural gas combined cycle plant. RG&E stated that completion of this project would take 5 – 7 years.[4]

4.2 Market Solutions

The NYISO reviewed solutions that were submitted to the NYISO and concluded that the following are viable market solutions based upon the information received to date. Two of the solutions were included in the 2005 CRP and were re-submitted for the 2007 CRP. Six of the solutions are new. The market solutions include:

1. 250 MW proposal in Zone K (Long Island) which was also a proposed solution included in the 2005 CRP,
2. generation in Zone J (New York City) totaling 1,100 MW or approximately 975 MW net when accounting for associated retirements,
3. 500 MW of existing generation in PJM to be delivered via a 660 MW back-to-back HVDC transmission project,
4. two additional controllable transmission projects into Zone J totaling 850 MW**,** and
5. 300 to 330 MW of generation in Zone H.

In total, the NYISO received 3,012 MW of market-based solutions.

[3] Although the trigger date for this solution is 2007, the NYISO has determined that, based upon the 3,012 MW of market solutions it received in response to the 2007 RNA, it is likely that sufficient market solutions will be present to fulfill the needs identified in the 2007 RNA. Accordingly, the NYISO does not need to trigger a reliability backstop solution at this time.
[4] As stated previously, the NYISO does not need to trigger a reliability backstop solution at this time.

Table 4.2.1 below is a summary of the solutions that have been submitted. Chart 4.2.1 presents the cumulative MW by in-service dates for the market solutions versus the cumulative MW need by year of need:

Table 4.2.1: Summary of Proposed Market Solutions

Project Type	Size of Resource(MW)	Zone	In-service Date
Generation Proposals			
Combined Cycle Spagnoli Rd	222	K	6/2009
Gas Turbine NRG Astoria Re-powering	200 (Phase I) 300 (Phase II) (375MW Net)	J J	6/2009 6/2011
Simple Cycle GT Indian Point	300	H	5/2011
Combined Cycle NRG Arthur kill	600	J	7/2012
Transmission Proposals			
Controllable AC Transmission –VFT Linden VFT	300 (No ICAP)	PJM-J	4th quarter 2009 PJM Queue G22
Back-to-Back HVDC, AC Line HTS/FPL	660 (500MW ICAP)	PJM-J	Late 2010 PJM Queue O66
Back-to-Back HVDC, AC Line Harbor Cable	550 (550MW ICAP)	PJM-J	6/2011

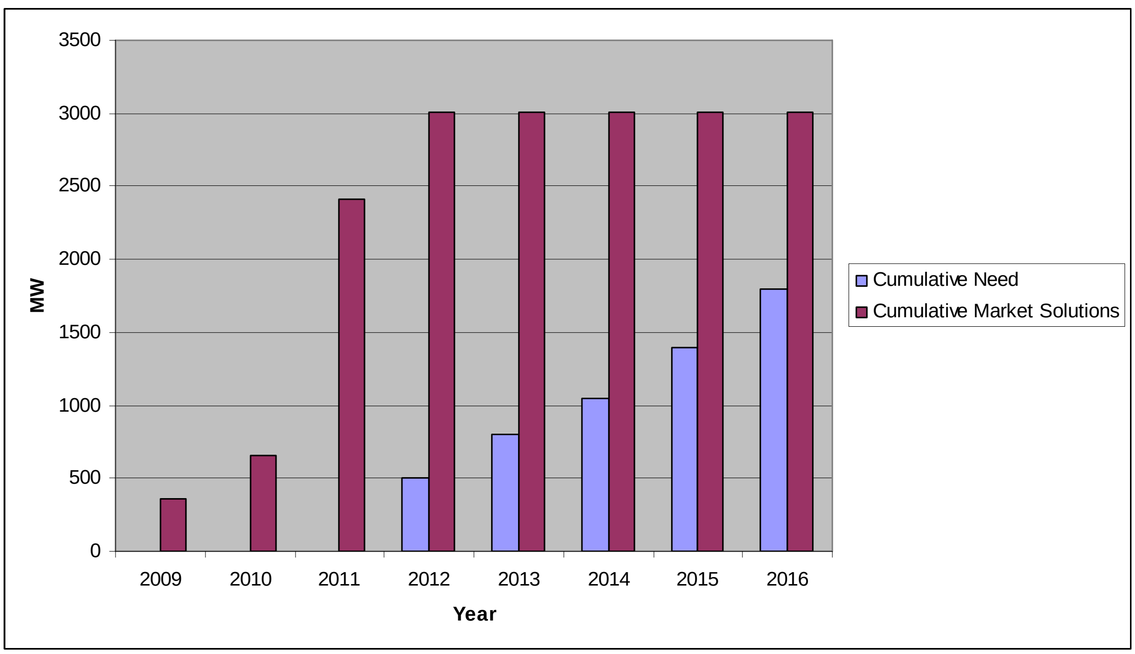


Chart 4.2.1: Cumulative Needs Compared to Market Solutions in MW

More specifically, the NYISO received the following projects:

The 250 MW Spagnoli Energy Center

This solution was initially submitted by KeySpan Ravenswood, LLC for Long Island in response to the 2005 RNA and is identified as the Spagnoli Road Energy Center. It is Project No. 20 in the NYISO interconnection queue, and is scheduled to be in-service and available for the summer of 2009. The project will be a nominal 250MW combined cycle plant consisting of one GE Frame 7FA gas turbine generator, one steam turbine generator, a heat recovery steam generator (HRSG) with Selective Catalytic Reduction for control of nitrogen oxides (NOx), an oxidation catalyst for control of carbon monoxide (CO) and volatile organic compounds (VOC), and an exhaust stack. The steam from the HRSG will be used to run the steam turbine, with a closed loop air-cooled system acting as a direct heat sink for the condenser. The summer and winter (at 92ºF and 25ºF) net output ratings will be approximately 222 MW and 262 MW, respectively. An additional output of approximately 8 MW may be realized at 92ºF with air inlet evaporative cooling.

The 500 MW Astoria Repowering Project [375MW Net]

This solution was submitted by NRG Power Marketing, Inc. and is identified as the Astoria repowering project. This project is scheduled to be phased in with 200 MW in-service in 2009 (project #201 in the NYISO interconnection queue) and the remaining 300 MW (project #224 in the NYISO interconnection queue) in-service by 2011. It was also included in the 2005 CRP. The project location is Zone J into the Astoria West 138kV substation and is Project No. 201 in the NYISO interconnection queue. The facility is designed to maximize use of existing infrastructure, including existing property and interconnections. It will utilize GE LMS 100 aero-derivative gas turbines. Moreover, the repowering project will result in the retirement of 126 MW of existing simple cycle combustion turbines for a net increase in capacity of approximately 375 MW.

The 600 MW Arthur Kill Combined Cycle Unit

This solution was submitted by NRG Power Marketing, Inc. and is identified as the Arthur Kill combined cycle project. The facility is scheduled to be in-service by July of 2012. The project location is Zone J. The facility is designed to maximize use of existing infrastructure, including existing property and interconnections but has identified that additional transmission capability will be required to deliver the full output of the plant. This project has not yet submitted a request for interconnection to the NYISO.

The 660 MW Hudson Transmission Project (HTP)

This solution has been submitted by Hudson Transmission Partners ("Hudson"). The HTP is a high-voltage direct current (HVDC) project that will provide a new controllable transmission line into Zone J that is rated at 660 MW. This is Project No. 206 in the NYISO interconnection queue. The HTP consist of back-to-back HVDC system ("converter-circuit-converter") in a single building (the Converter

Station) located in Ridgefield, New Jersey near PSE&G Bergen substation, which is part of the PJM transmission system. A high-voltage 345kV alternating-current (AC) transmission line will connect the Converter Station to Con Edison's transmission system at the West 49th St. substation. The HTP is being developed in response to the Request for Proposals, "Long-Term Supply of In-City Unforced Capacity and Optional Energy" issued by NYPA dated March 11, 2005 (the "NYPA RFP"). The project was selected by NYPA's Board of Trustees for further negotiation and review. The project has a proposed in-service date of late 2010. The System Impact Study in the PJM interconnection process has been posted.

The Red Oak, NJ Combined Cycle Generating Unit (500 MW)

This solution was submitted by FPL Energy. The Red Oak project is an existing 817 MW three on one (3x1) combined cycle, natural gas fired power generation project, located in Sayreville, New Jersey. Red Oak began commercial operation in 2002. Red Oak's major equipment includes three Westinghouse 501F combustion turbines ("CTs"), one Toshiba Steam Turbine ("ST"), and three Foster Wheeler heat recovery steam generators ("HRSGs"), each with selective catalyst reduction. FPL Energy proposed the Red Oak project to NYPA as a supplement to Hudson's response to the NYPA RFP. The Red Oak project would provide reliable capacity to NYPA's New York City customers via the HTP. The project was selected by NYPA's Board of Trustees for further negotiation and review of a 500MW capacity contract.

The 550 MW Harbor Cable Project (HCP) and Generating Portfolio

This solution was submitted by Brookfield Energy Marketing. The HCP will provide a 550 MW fully controllable electric transmission pathway from generation sources located in New Jersey to New York City (Zone J). The HCP will consist of a back-to-back HVDC converter station located in Linden, New Jersey with 200 MW going to the Goethals substation on Staten Island via a single circuit 345 kV AC transmission cable and 350 MW going to Manhattan near the new World Trade Center substation via double-circuit 138 kV AC transmission cables. This is Project No.195 in the NYISO interconnection queue. The developer proposes to bundle the transmission project with up to 550 MW of capacity and energy from existing and/or new capacity located in New Jersey to be available in June 2011. To date, the developer has not applied for interconnection in PJM.

The 300 MW Linden Variable Frequency Transformers (VFT)

This solution was submitted by GE Energy Financial Services. The Project is a 300 MW bi-directional controllable AC transmission tie between the PJM and NYISO systems. It will be physically located adjacent to Linden Cogen plant. Three (3) 100 MW Variable Frequency Transformer (VFT) "channels" will tie an existing PJM 230 kV transmission line to existing 345 kV cables connecting Linden Cogen into Con Edison's Goethals substation. This will result in a continuously variable 300 MW tie between the northern New Jersey PJM system and New York City (Zone J). This proposal does not contain any associated capacity but would rely on existing resources in PJM. This project is # 125 on the NYISO's interconnection queue and is scheduled to be in-service in late 2009. The developer has entered into an Interconnection Services Agreement and a Construction Services Agreement in PJM, and is under construction.

The 300 MW Indian Point Peaking Facility

This solution was submitted by Entergy Nuclear Power Marketing. The Entergy Buchanan Generation Project will consist of 300 to 330 MWs of simple cycle gas turbine peaking capacity to be located on the site of the Indian Point Generating Facility in Zone H. The facility will be interconnected to Consolidated Edison Company's existing Buchanan substation at 138 kV. This project is scheduled to be in-service in mid-2011. This project has not yet submitted a request for interconnection to the NYISO.

4.3 Alternative Regulated Solutions

Three alternative regulated solutions were submitted. One consists of existing generation projects currently retired or scheduled to be retired, the second proposes a new transmission facility located wholly within New York, and the third constitutes a demand response proposal. Developers proposed the following alternative regulated responses:

Mirant Lovett

This alternative regulated solution was submitted by Mirant New York. Mirant is proposing to keep Lovett Unit #5 operational (either by firing on natural gas or firing on coal with acceptable control measures) and to restart operations of Unit #4 (firing on natural gas) for a transitional period of time beginning no later than May 1, 2008 and continuing as needed. The proposal would keep two of the three units on site in operation beyond the current May 1, 2008 retirement date for a total of 365 MW of capacity. The purpose of the transitional period for Unit #4 is to provide a bridge to allow for the installation of new generating capacity to replace Unit #4 at either the Mirant Bowline and/or the Lovett facility.

New York Regional Interconnect

This alternative regulated solution was previously submitted by the New York Regional Interconnect (NYRI) in response to the NYISO's 2005 RNA. The NYRI transmission proposal is to construct a new high voltage direct current ("HVDC") transmission line between the Edic Substation in the Town of Marcy, Oneida County, to the Rock Tavern Substation in the Town of New Windsor, Orange County. It is Project No. 96 in the NYISO interconnection queue. The HVDC transmission system would function as a bipolar, bi-directional facility operated at a rated power flow of 1,200 MW at a nominal voltage of ± 400 kV DC. The developer plans to place the project in commercial operation for the summer of 2011. The system reliability impact study (SRIS) or interconnection study has been submitted to the NYISO and is under review.

EnerNOC Demand Response

This alternative regulated solution was submitted by EnerNOC, Inc. EnerNOC offers 250 MW of demand response resources to the NYISO. The EnerNOC Demand Response Network^{SM} – is a long-term Special Case Resources ("SCR") demand response product. EnerNOC will provide and maintain 250 MW of reliable unforced capacity on a schedule that allows NYISO to meet approximately half of its identified resource needs in the downstate region by 2012. The EnerNOC Demand Response NetworkSM may either consist of:

- new capacity that is incremental to existing SCR capacity; or
- existing SCR capacity that would otherwise no longer participate in the SCR program in 2012. EnerNOC proposes to use a customer baseline methodology as per the current terms of the EDRP program for demand reduction verification.

4-B Transmission Security and Adequacy

Figure 4.1 below displays the bulk power transmission system for the NYCA, which is generally facilities 230 kV and above, but does include certain 138 kV facilities and very small number of 115 kV facilities. The balance of the facilities 138 kV and lower are considered non-bulk or sub-transmission facilities. The figure also displays key transmission interfaces for New York.

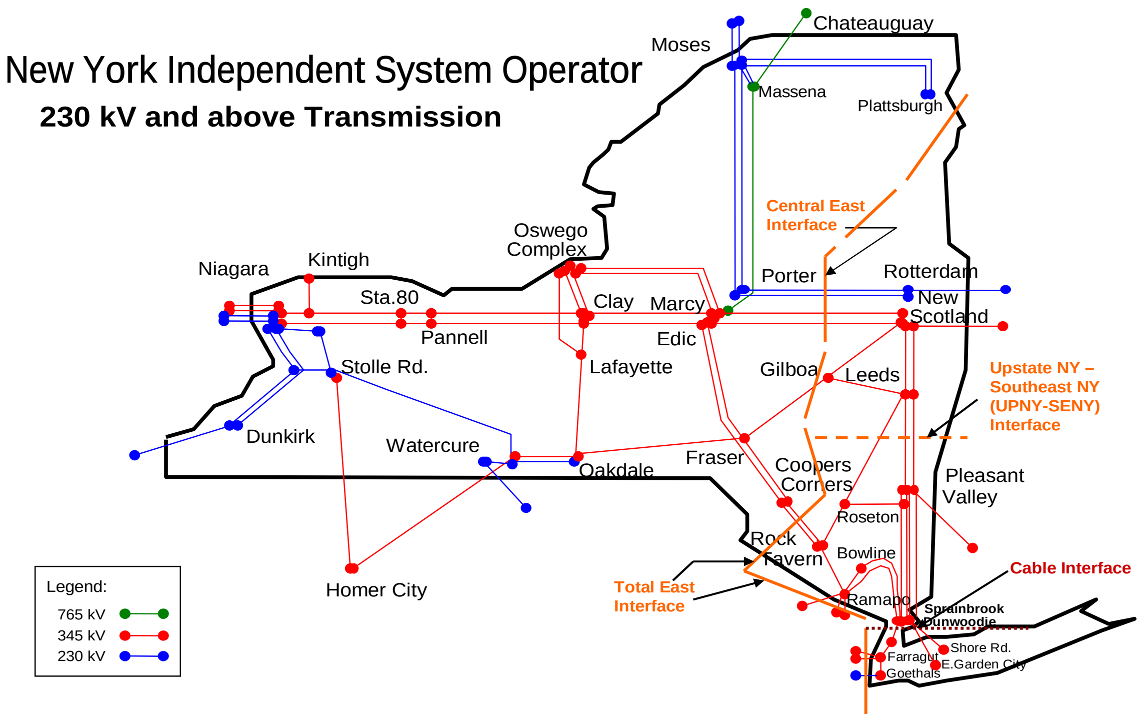


Figure 4.1: NYISO 230 kV and above Transmission Map

Transmission interfaces are groupings of transmission circuits that measure the transfer capability between regions. The lines connecting Leeds to Pleasant Valley and the lines into Coopers Corners are the critical components of the UPNY/SENY interface. By comparison, the lines running south from Pleasant Valley and those from Ramapo to the Buchanan river crossing are known as the UPNY/ConEd interface. The cables feeding into the New York City 345 kV and 138 kV systems from Sprainbrook and Dunwoodie are known as the I to J interface, which is a component of the Dunwoodie South and Cable Interface. The cables from Sprain Brook and Dunwoodie into Long Island are known as the I to K interface. These are the key transmission interfaces that experience limitations to power transfers into and through the Hudson Valley.

Based upon the assumption that sufficient resources exist, transmission adequacy can be defined as the ability of the transmission system to deliver the aggregate of the generation to the aggregate load such that LOLE criteria are maintained. A loss-of-load event can occur because sufficient resources are not available or, even if available, sufficient resources cannot be delivered. The latter would be a transmission adequacy deficiency and the former a resource adequacy deficiency. Standard industry practice has been to address transmission adequacy (*i.e.,* load deliverability) and resource adequacy independent of each other. These assessments are conducted simultaneously through use of the GE MARS model as was briefly described in the

Section III of this report, and the iterative solution process evaluating both transfer capability and LOLE.

A key input into the MARS model is the emergency[5] transfer limit of key interfaces. The ability of the transmission system to deliver capacity and energy is a function of available generation and system security constraints. The inability of the system to deliver capacity is a reliability issue, while the inability to deliver energy is a congestion or economic concern. System security is evaluated through contingency analysis, which involves the assessment of the loss of one or more system elements to determine the performance of the system and specific elements of the system with respect to the reliability criteria. The performance of the system and its elements are evaluated with respect to the thermal, voltage and stability reliability criteria. The most limiting of the criteria establishes the transfer limit for a group of lines that make up an interface.

Historically, the transmission interfaces in the Hudson Valley have been limited by thermal criteria. However, as indicated by the study results, robust load growth, modest resource additions, planned retirements, changes in neighboring systems, and changes in the transmission system network such as the addition of the series reactors in the New York City cable system together will result in reduced transfer limits. Increases in power transfer limits through the Lower Hudson Valley are required to remain compliant with voltage reliability criteria. The study results show that voltage-based emergency transfer limits were more limiting than either limits based on thermal or stability criteria.

The use of stringent screening criteria for including future resources in the baseline resulted in generation additions only in New York City early in the Study Period, and none later in the period. Planned generation retirements occur during the Study Period. As a result of additional load and a projected net decrease in resources in the Hudson Valley, voltage criteria become binding for the transmission facilities in the Lower Hudson Valley. Transfer limits into New York City are 3,700 MW (thermally limited) in the beginning of the Study Period, declining to 3,648 MW by 2011, as a result of voltage constraints negating the improvements in thermal transfer limits[6]. Similar, but not as severe reductions were observed for the UPNY/SENY and UPNY/CONED interface limits. In recognizing that transfer limits into the Hudson Valley also limit transfers through the Hudson Valley and into New York City and Long Island (because of the reduced generating capacity and increased load) a new interface grouping was created to capture this phenomenon. This interface grouping consists of the two interfaces from the Lower Hudson Valley to New York City and Long Island. This allows for the sharing of the limited net resources downstream of UPNY/SENY between New York City and Long Island during the capacity shortages simulated under emergency transfer and operating conditions in the MARS model. Transfer limits into New York City increase greatly with reduced transfers onto Long Island, and as a result, the limit from Zones I to J was increased. Even after these adjustments and the implementation of solutions, transfer limits were reduced over time.

The continued presence of voltage-based transfer limits in the Hudson Valley serves to increase resource adequacy requirements because of the reduced capability of the transmission system to deliver capacity to the loads downstream of the constraints. Although not nearly as severe as

[5] The LOLE study utilizes emergency transfers because a loss of load event is executed only after available emergency measures are invoked.
[6]The addition of the M29 Cable will increased the thermal transfer limit to 4,400 MW.

observed in the past because of the system upgrades being implemented by the TO, these voltage constraints result in an approximate decrease of 700 MW in transfer limits into New York City as compared to the thermal limit. As will be seen later in the Evaluation of Solutions section, the ability of solutions to increase transfer limits is an important aspect of the effectiveness of these solutions. The reduced transfer limit is necessary to secure the system from voltage collapse. The NYISO also observed degradation in the underlying (non-bulk) power system voltage performance, and the overall load power factor. With the updated TO plans, the reduction in transfer limits was mitigated to 300 MW. The reduced transfer limit is necessary to secure the system from voltage collapse. In the RNA, the NYISO also observed degradation in the underlying (non-bulk) power system voltage performance, and the overall load power factor. After the planned retirement of the Lovett generating units and the Charles A. Poletti generating unit in Zone J, the subzone most affected by the updated TO plans was the Orange and Rockland's non-bulk system. The retirement of generating capacity not only results in the loss of MW capability between constraining interfaces, but also the loss of dynamic reactive capability to support voltages both pre- and post-contingency.

4-C Evaluation of Solutions

Evaluation of solutions is covered by Section 7 of Attachment Y of the OATT. Section 7.1 describes the process for the evaluation of the regulated backstop solutions submitted by the Responsible Transmission Owners. Section 7.2 states how market-based solutions are evaluated. Section 7.3 lays out the process for the evaluation of alternative regulated solutions.

4.4 Responsible Transmission Owners Updated Plans and Regulated Backstop Solutions

The solutions submitted by the Responsible Transmission Owners consisted of updated plans for the first Five Year Base Case and backstop solutions for the second five year period. One of these solutions consisted of a commitment to new resources to satisfy the needs, and a variation that reduced the amount of new resources required by adding new transmission. The updated TO plans were not included in the NYISO's Five-Year Base Case in the 2007 RNA because they did not become available by the cutoff date for inclusion. As noted above, the TOs subsequently informed the NYISO that they are undertaking these projects, to be in-service by the end of 2007.

The evaluation of the Responsible TO Solutions is divided into two separate five year periods.

4.4.1 First Five-Year Base Case:

The first step in evaluating the effectiveness of the proposed solutions is determining their impact on the transfer capability of the transmission system. As identified in the 2007 RNA and discussed in the transmission security and adequacy section, load growth in SENY, planned generator retirements, and changes to neighboring systems, and the resulting impacts on the voltage performance of the transmission system, resulted in a significant reduction in the transfer capability of the bulk power transmission system to reliably deliver power into and through the Lower Hudson Valley. This impact manifested itself as increased needs in Zones G through J.

The Responsible TOs' Updated Plans included the installation of 240 MVars of capacitor banks at the 345 kV Millwood substation which, in addition to the other non bulk power system capacitor banks already planned, will help to further improve the voltage performance of the transmission system. Another TO plan is the replacement of a circuit breaker that will allow a series reactor in the cables between the Gowanus and Farragut substations to be bypassed. This bypass allows for more reactive support to be available to the 345 kV system in Manhattan. The other major change was the deferred retirement for one year of the Charles A. Poletti generating unit from 2009 until 2010. Incorporating these changes and network upgrades in New York and neighboring control areas improved the transmission capability in the Lower Hudson Valley. Table 4.4.1-a below presents the key transmission interface transfer limits based on thermal limits, 4.4.1-b below presents the key transmission interface transfer limits based on voltage limits while 4.4.1-c presents the transfer limits employed in the MARS analysis.

Table 4.4.1-a: Transmission System Thermal Transfer Limits for Key Interfaces in MW

Interface	Year				
	2007	2008	2009	2010	2011
Central East	3800	3800	3800	3800	3800
F-G	3450	3450	3450	3450	3450
UPNY/SENY	5150	5150	5150	5150	5150
I-J	3700	3900	4200	4400	4400
I-K	1290	1290	1290	1290	1290

Table 4.4.1-b: Transmission System Voltage Transfer Limits for Key Interfaces in MW

Interface	Year				
	2007	2008	2009	2010	2011
Central East	3150	3150	3150	3150	3150
F-G	3625	3625	3625	3625	3625
UPNY/SENY	5400	5400	5400	5400	5400
I-J	3700	3864	3791	3741	4100
I-K	1350	1350	1350	1350	1350

Table 4.4.1-c: Transmission System Transfer Limits for Key Interfaces in MW

Interface	Year				
	2007	2008	2009	2010	2011
Central East	3150 V	3150 V	3150 V	3150 V	3150 V
F-G	3450 T	3450 T	3450 T	3450 T	3450 T
UPNY/SENY	5150 T	5150 T	5150 T	5150 T	5150 T
I-J	3700 V	3864 V	3791 V	3741 V	4100 V
I-K	1290 T	1290 T	1290 T	1290 T	1290 T

T = Thermal Limit V = Voltage Limit

The primary observation is that the voltage-based transfer limit has improved significantly from the baseline. As an example, the Zone I to Zone J transfer limit for the year 2011 has improved from 3,648 MW to 4,100 MW in the solution case.

These updated transfer limits were incorporated into the MARS model along with the proposed additions. The LOLE results are presented in the Table 4.4.2-a entitled: “RNA Study Case Load and Resource Table with TO Updated Plans”. The table shows that the TO Updated Plans meet resource adequacy requirement through 2011. Table 4.4.2-b presents the LOLE results by zone and for the NYCA.

Table 4.4.2-a: RNA Study Case Load and Resource Table with TO Updated Plans (First Five Year Base Case)

Year	2007	2008	2009	2010	2011
Peak Load					
NYCA	33,831	34,314	34,688	35,042	35,348
Zone J	11,800	11,970	12,140	12,290	12,440
Zone K	5,549	5,628	5,738	5,840	5,936
Resources					
NYCA					
"-Capacity"	38,911	38,513	38,938	38,057	38,057
"-SCR"	1080	1080	1080	1080	1080
"-UDR"	990	990	990	990	990
Total	40,981	40,583	41,008	40,127	40,127
Zone J					
"-Capacity"	9,996	9,996	9,996	9,108	9,108
"-SCR"	325	325	325	325	325
"-UDR"	0	0	0	0	0
Total	10,321	10,321	10,321	9,433	9,433
Zone K					
"-Capacity"	5,291	5,291	5,741	5,741	5,741
"-SCR"	150	150	150	150	150
"-UDR"	990	990	990	990	990
Total	6,431	6,431	6,881	6,881	6,881
NYCA Resource to Load Ratio[7]	121.1%	118.3%	118.2%	114.5%	113.5%
Zone J Res./Load Ratio[8]	87.5%	86.2%	85.0%	76.8%	75.8%
Zone K Res./Load Ratio	115.9%	114.3%	119.9%	117.8%	115.9%
NYCA LOLE (day/year)	0.00	0.01	0.06	0.10	0.09

Table 4.4.2-b: NYCA LOLE Table for the First Five-Year Base Case with TO Updated Plans LOLE (First Five Year Base Case)[9]

AREA	2007	2008	2009	2010	2011
Zone B (Upstate NY)	0.00	0.01	0.03	0.04	0.05
Zone E (Upstate NY)	0.00	0.00	0.01	0.02	0.02
Zone G (Hudson Valley or SENY)			0.00	0.00	0.00
Zone I (Hudson Valley or SENY)	0.00	0.01	0.04	0.06	0.07
Zone J (Hudson Valley or SENY)	0.00	0.01	0.05	0.10	0.09
Zone K (Long Island or SENY)		0.00	0.00	0.01	0.01
NYCA	0.00	0.01	0.06	0.10	0.09

[7] The statewide and local resource to load ratios result from the existing system under the conditions studied and should not be interpreted as the IRM or LCR that would be established for the NYCA capacity markets.
[8] A ratio less than the current location capacity requirement is the result of the "as found system" being at a point on the LCR/IRM curve that meets reliability criteria with LCRs different from current requirements.
[9] Probability of occurrences in days per year.

4.4.2 Second five years

As previously discussed in Section IV, the Responsible TOs offered backstop solutions for the second five years. They consisted of 1,800 MW of new resources by 2016. These include 300 MW of new generation or DSM in Zone B, a commitment to 1,000 MW of new resources consisting of generation and demand response in Zone J, as well as another 500 MW in Zone G. Also included was a proposal to add new transmission between Zones F and Zone G, which would increase the transfer capability of the UPNY-SENY interface. This proposal allowed for the resource commitment in Zone G to be reduced by 250 MW[10], resulting in a reduction of the total resources required to 1,550 MW. It can also allow for 250 MW of resources to be either in Zones G or F, depending on the level of additional reactive support needed in Zone G.

Table 4.4.2-c presents the phase in of the regulated solutions by year and zone with the new transmission line in-service by 2013 for the 1,550 MW transmission alternative.

Table 4.4.2-c: Regulated Backstop Resource Additions by Year and Zone

MW level	1,800		1,550	
Year	**MW**	**Zone**	**MW**	**Zone**
2012	500	J	500	J
2013	300	B	300	B
2014	250	J		
2015	250 100	J G	500 100	J F
2016	400	G	150	G

Transfer limits were assumed to be constant from the end of the First Five Years and confirmed by analysis for the year 2016. The staging of the solutions throughout the second five year period would maintain this constant level. The impacts of the Leeds to Pleasant Valley alternatives were evaluated by power flow analysis to determine their impacts on thermal and voltage limits. Both alternatives result in approximately the same increase in the UPNY/SENY interface of approximately 875 MW. However, the New Scotland to Leeds circuit becomes more limiting for the third Leeds to Pleasant Valley circuit alternative. This impact can be mitigated when Athens and Gilboa are fully dispatched. In other words, the Schodak to Pleasant Valley alternative mitigates the New Scotland to Leeds limit regardless of dispatch, thus allowing more generation upstream to participate, subject to the Central East Interface limit. Voltage limit impacts in the Hudson Valley were approximately the same for both alternatives, but to achieve the same level increase as the thermal limit, additional reactive compensation in the Hudson Valley would be required, either through transmission enhancements (capacitor banks, static var compensators, etc.) or generation solutions similar to the 250 MW generator solution in Zone G. Table

[10] The 250 MW reduction was primarily the result of emergency assistance that was “bottled” upstream of the UPNY/SENY interface in the MARS modeling, and that would be made available to Southeastern New York.

4.4.2-d summarizes the transfer limits used in the LOLE analysis for the transmission alternatives.

Table 4.4.2-d: Transfer Limits for Transmission Alternatives

Interface	Existing System	Leeds-PV	Schodack-PV
F-G	3450	3450	4450
UPNY-SENY	5150	6025	6025

Table 4.4.2-e below presents the total level of MW needed to maintain compliance with resource adequacy criteria for the all-resource approach. Table 4.4.2-f presents the results with the transmission upgrades. The LOLE results by zone are presented in Tables 4.4.2-g and 4.4.2-h, respectively. Resource additions would need to be located primarily in load Zones G through J in order to fulfill the reliability needs. Although these results indicate the level of the MW of solutions that would be required, these amounts could change depending on the specific solutions that are proposed.

Table 4.4.2-e: RNA Study Case Load and Resource Table
(TO Plans with 1,800 MW of Resources, Second Five Years)

Year	2012	2013	2014	2015	2016
Peak Load					
NYCA	35,593	35,803	36,077	36,380	36,623
Zone J	12,570	12,705	12,815	12,925	13,003
Zone K	6,037	6,141	6,249	6,372	6,511
Resources					
NYCA					
"-Capacity"	38,557	38,857	39,107	39,457	39,857
"-SCR"	1080	1080	1080	1080	1080
"-UDR"	990	990	990	990	990
Total	40,627	40,927	41,177	41,527	41,927
Zone J					
"-Capacity"	9,608	9,608	9,858	10,108	10,108
"-SCR"	325	325	325	325	325
"-UDR"	0	0	0	0	0
Total	9,933	9,933	10,183	10,433	10,433
Zone K					
"-Capacity"	5,741	5,741	5,741	5,741	5,741
"-SCR"	150	150	150	150	150
"-UDR"	990	990	990	990	990
Total	6,881	6,881	6,881	6,881	6,881
NYCA Resource to Load Ratio	114.1%	114.3%	114.1%	114.1%	114.5%
Zone J Res./Load Ratio	79.0%	78.2%	79.5%	80.7%	80.2%
Zone K Res./Load Ratio	114.0%	112.1%	110.1%	108.0%	105.7%
NYCA LOLE (day/year)	0.08	0.09	0.10	0.10	0.10

Table 4.4.2-f: RNA Study Case Load and Resource Table
(TO Plans with 1,550 MW of Resources and Transmission Upgrade Second Five Years)

Year	2012	2013	2014	2015	2016
Peak Load					
NYCA	35,593	35,803	36,077	36,380	36,623
Zone J	12,570	12,705	12,815	12,925	13,003
Zone K	6,037	6,141	6,249	6,372	6,511
Resources					
NYCA					
"-Capacity"	38,557	38,707	38,857	39,457	39,607
"-SCR"	1080	1080	1080	1080	1080
"-UDR"	990	990	990	990	990
Total	40,627	40,777	40,927	41,527	41,677
Zone J					
"-Capacity"	9,608	9,608	9,858	10,108	10,108
"-SCR"	325	325	325	325	325
"-UDR"	0	0	0	0	0
Total	9,933	9,933	10,183	10,433	10,433
Zone K					
"-Capacity"	5,741	5,741	5,741	5,741	5,741
"-SCR"	150	150	150	150	150
"-UDR"	990	990	990	990	990
Total	6,881	6,881	6,881	6,881	6,881
NYCA Resource to Load Ratio	114.1%	113.9%	113.4%	114.1%	113.8%
Zone J Res./Load	79.0%	78.2%	79.5%	80.7%	80.2%
Zone K Res./Load	114.0%	112.1%	110.1%	108.0%	105.7%
NYCA LOLE (day/year)	0.08	0.09	0.09	0.10	0.10

Table 4.4.2-g: NYCA LOLE Table for the Second Five Years with TO Regulated Backstops Totaling 1,800 MW of Resources

AREA	2012	2013	2014	2015	2016
Zone B (Upstate NY)	0.05	0.04	0.04	0.04	0.04
Zone E (Upstate NY)	0.02	0.02	0.02	0.02	0.01
Zone G (Hudson Valley or SENY)	0.00	0.01	0.01	0.01	0.00
Zone I (Hudson Valley or SENY)	0.07	0.08	0.09	0.08	0.07
Zone J (Hudson Valley or SENY)	0.08	0.08	0.09	0.08	0.07
Zone K (Long Island or SENY)	0.02	0.02	0.03	0.05	0.06
NYCA	0.08	0.09	0.10	0.10	0.10

Table 4.4.2-h: NYCA LOLE Table for the Second Five Years with TO Regulated Backstops Totaling 1,550 MW of Resources and Transmission Upgrades

AREA	2012	2013	2014	2015	2016
Zone B (Upstate NY)	0.05	0.07	0.07	0.07	0.06
Zone E (Upstate NY)	0.02	0.03	0.03	0.03	0.02
Zone G (Hudson Valley or SENY)	0.00	0.00	0.00	0.01	0.01
Zone I (Hudson Valley or SENY)	0.07	0.08	0.08	0.08	0.07
Zone J (Hudson Valley or SENY)	0.08	0.08	0.09	0.09	0.07
Zone K (Long Island or SENY)	0.02	0.03	0.03	0.05	0.06
NYCA	0.08	0.09	0.09	0.10	0.10

4.4.3 Assessment of Responsible TO Updated Plans and Regulated Backstop Solutions

The updated TO plans and proposed regulated backstop solutions will meet the needs through 2016. Charts 1 and 2 below present the resource mix that results from the TOs' Updated Plans, the deferred retirement of the Poletti unit, and the regulated backstop solutions for both the all-resource proposal of 1,800 MW and the 1,550 MW resource proposal that includes the Leeds-PV transmission upgrade. The transmission upgrade reduces the NYCA resources that are needed to meet criteria because it allows for better utilization of resources within NYCA and neighboring control areas.

NYCA resources are presented as the percentage of the forecasted annual peak load. The sum of the resources stated as a percentage of the forecasted peak load equals the installed reserve margin, which is a generally accepted measure of the level of resources needed to maintain reliability. Expressed as the percentage of annual peak load, the resources are divided into five categories:

- in-NYCA generating capacity,
- unforced capacity deliverability rights (UDRs), which are supported by external capacity,
- special case resources/demand response,
- regulated backstop resources needed to maintain the 0.1 days per year criterion, and;
- external capacity of 2,755 MW currently eligible to participate in the NYISO markets. While updated annually, the statewide installed capacity requirement is currently 116.5 percent.

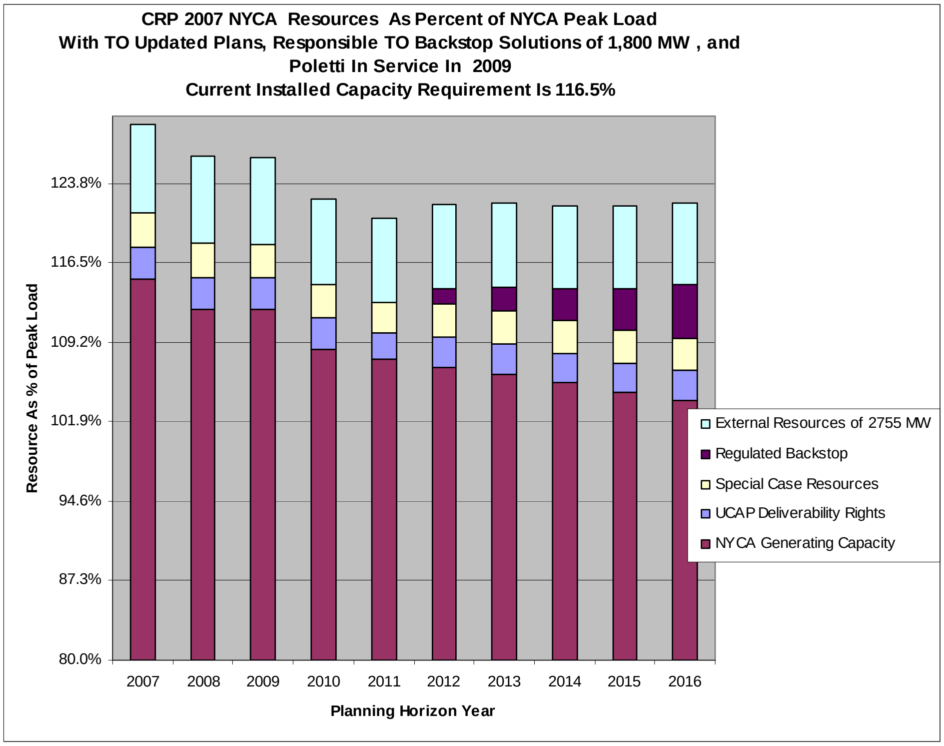


Chart 4.5-1: TO Regulated Backstop Solutions – 1,800 MW

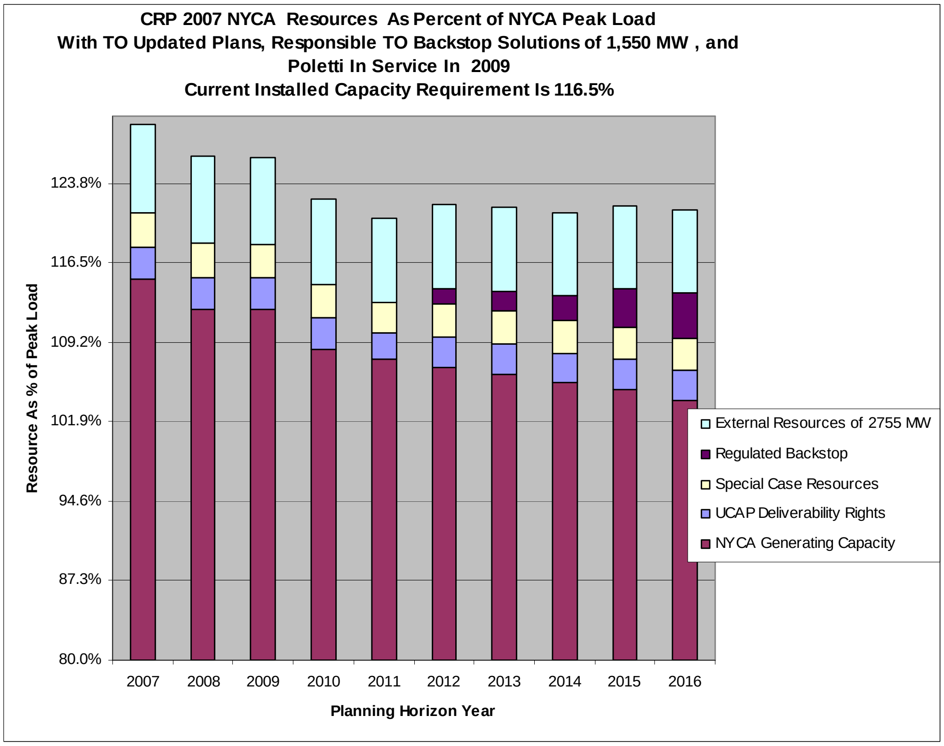


Chart 4.5-2: TO Regulated Backstop Solutions – 1,550 MW

4.5 Market-based Solutions

As previously discussed, the NYISO received eight market-based proposals to its request for market solutions. The LOLE analysis only modeled seven of the proposals, because the capacity associated with the FPL Energy proposal was modeled together with the transmission proposal submitted by HTP.

Because the HVDC proposals provided evidence of the availability or potential availability of capacity and energy, the HVDC projects from PJM to Zone J were modeled as unforced capacity delivery rights (UDR) or equivalent to generators located in Zone J. The VFT was modeled as a tie line between NYCA and PJM and available to provide emergency assistance. The transfer limits utilized to evaluate the Market Proposals are the same as those used to evaluate the TO Updated Plans from the First Five Years. Since the proposed market solutions provide for generation additions in excess of the TO backstop solutions, as well as additional transmission capability, for the second five years, it was assumed that at least the same level of reactive support would be available as the assumed backstop solutions. Therefore, the transfer limits would be at least those used for the evaluation of the backstop solution. Recognizing that many of the proposed market solutions were DC and AC ties from PJM, additional zones and interfaces were added to the transmission topology utilized for the MARS Resource Adequacy Analysis. This topology change was employed to capture potential internal PJM or Zone J constraints not otherwise specifically modeled when there is only one transmission interface modeled for the PJM to Zone J interface[11].

4.5.1 First Five Year Base Case

Table 4.5.1-a below presents the Load and Resource table with the Five Year Base Case with the TO updated plans, the deferred retirement of the Charles A. Poletti generating unit, and the market proposals for the First Five Year Base Case. The market solutions improve the LOLE results for 2009 through 2010 when compared to the first Five Year Base Case. Table 4.6.1-b presents the zonal and NYCA LOLE results with the market proposals in-service.

[11] Of the three proposed transmission solutions, one has not initiated the Interconnection Process with PJM, one has completed its impact study, and one has proceeded to construction with an Interconnection Service Agreement and Construction Service Agreement. Since these projects would have significant impacts on both the PJM and New York systems, their status will be closely monitored in Interconnection Processes, the CRPP and the Regional Planning Process through the Northeast Coordinated System Plan.

Table 4.5.1-a: Base Case Load and Resource Table With TO Updated Plans, Deferred Retirement of Poletti and Market Solutions

Year	2007	2008	2009	2010	2011
Peak Load					
NYCA	33,831	34,314	34,688	35,042	35,348
Zone J	11,800	11,970	12,140	12,290	12,440
Zone K	5,549	5,628	5,738	5,840	5,936
Resources					
NYCA					
"-Capacity"	38,911	38,513	39,367	38,479	38,479
"-SCR"	1080	1080	1080	1080	1080
"-UDR"	990	990	990	990	2040
Total	40,981	40,583	41,437	40,549	41,599
Zone J					
"-Capacity"	9,996	9,996	10,196	9,308	9,308
"-SCR"	325	325	325	325	325
"-UDR"	0	0	0	0	1050
Total	10,321	10,321	10,521	9,633	10,683
Zone K					
"-Capacity"	5,291	5,291	5,963	5,963	5,963
"-SCR"	150	150	150	150	150
"-UDR"	990	990	990	990	990
Total	6,431	6,431	7,103	7,103	7,103
NYCA Resource to /Load Ratio	121.1%	118.3%	119.5%	115.7%	117.7%
Zone J Res./Load	87.5%	86.2%	86.7%	78.4%	85.9%
Zone K Res./Load	115.9%	114.3%	123.8%	121.6%	119.7%
NYCA LOLE (day/year)	0.00	0.01	0.02	0.04	0.00

Table 4.5.1-b: NYCA LOLE Table for the First Five-Year Base Case with TO Updated Plans and Market Solutions LOLE (probability of occurrences in days per year)

AREA	2007	2008	2009	2010	2011
Zone B (Upstate NY)	0.00	0.01	0.02	0.03	0.00
Zone E (Upstate NY)	0.00	0.00	0.01	0.01	0.00
Zone G (Hudson Valley or SENY)			0.00	0.00	
Zone I (Hudson Valley or SENY)	0.00	0.01	0.02	0.03	0.00
Zone J (Hudson Valley or SENY)	0.00	0.01	0.02	0.04	0.00
Zone K (Long Island or SENY)		0.00	0.00	0.00	0.00
NYCA	0.00	0.01	0.02	0.04	0.00

4.5.2 Second Five Years

Table 4.5.2-a presents the Load and Resource table that incorporates the updated TO plans and market proposals for the second five years. Table 4.6.2-b presents the zonal and LOLE results for the second five years with the market proposals in-service.

Table 4.5.2-a: Base Case Load and Resource Table with TO Updated Plans and Market Solutions Second Five Years

Year	2012	2013	2014	2015	2016
Peak Load					
NYCA	35,593	35,803	36,077	36,380	36,623
Zone J	12,570	12,705	12,815	12,925	13,003
Zone K	6,037	6,141	6,249	6,372	6,511
Resources					
NYCA					
"-Capacity"	38,953	39,553	39,553	39,553	39,553
"-SCR"	1080	1080	1080	1080	1080
"-UDR"	2040	2040	2040	2040	2040
Total	42,073	42,673	42,673	42,673	42,673
Zone J					
"-Capacity"	9,482	10,082	10,082	10,082	10,082
"-SCR"	325	325	325	325	325
"-UDR"	1050	1050	1050	1050	1050
Total	10,857	11,457	11,457	11,457	11,457
Zone K					
"-Capacity"	5,963	5,963	5,963	5,963	5,963
"-SCR"	150	150	150	150	150
"-UDR"	990	990	990	990	990
Total	7,103	7,103	7,103	7,103	7,103
NYCA Resource to Load Ratio	118.2%	119.2%	118.3%	117.3%	116.5%
Zone J Res./Load Res.	86.4%	90.2%	89.4%	88.6%	88.1%
Zone K Res./Load Res.	117.7%	115.7%	113.7%	111.5%	109.1%
NYCA LOLE (day/year)	0.01	0.01	0.01	0.02	0.03

Table 4.5.2-b: NYCA LOLE Table for the Second Five Years with TO Updated Plans and Market Solutions LOLE (probability of occurrences in days per year)

AREA	2012	2013	2014	2015	2016
Zone B (Upstate NY)	0.00	0.01	0.01	0.01	0.02
Zone E (Upstate NY)	0.00	0.00	0.00	0.00	0.01
Zone G (Hudson Valley or SENY)					0.00
Zone I (Hudson Valley or SENY)	0.00	0.01	0.01	0.01	0.02
Zone J (Hudson Valley or SENY)	0.00	0.01	0.01	0.01	0.02
Zone K (Long Island or SENY)	0.00	0.00	0.00	0.01	0.02
NYCA	0.01	0.01	0.01	0.02	0.03

4.5.3 Assessment of the Market Proposals

Given the updated TO plans and the current load forecast, the market proposals are not needed to meet criteria for the First Five Year Base Case. However, if they are constructed, the market proposals are sufficient to maintain the LOLE criteria for the second five year period. Because of planning uncertainties and the identified needs in the second five years, sufficient projects should proceed to meet resource adequacy requirements. At least 500 MW of resources should be added to New York City by 2012. Alternatively, 750 MW of resources should be added to the Lower Hudson Valley by 2012. A total of 1,800 MW of resources should be added statewide by 2016. Projects in quantities and locations noted above will need to maintain their schedules for permitting, construction, and entering into service. In evaluating the viability of the market proposals, the NYISO has identified a concern with respect to these projects going forward and their potential overall reliability benefits being realized. Although each of these developers have significant financial resources available to them, the proponents of market-based generation and transmission solutions stated that their viability may depend upon entry into long-term contracts for the sale of at least a portion of their output or use of their transmission facility. The developers indicated that the NYISO administered markets do not provide sufficient certainty with respect to revenue streams to fully support the significant investment these products will require. Accordingly, while the NYISO has determined that these projects appear viable at this time to meet their projected in-service dates, there is at least some level of uncertainty as to whether these projects will proceed.

Chart 1 below presents the installed reserve margin that results from the TO Updated Plans for the First Five Year Base Case, the deferred retirement of the Charles A. Poletti generating unit and the market proposals for the full 10-year Study Period. The resources are presented as a percentage of the annual peak load. The sum of the resources equal the NYCA Installed Reserve Margin (IRM), which is a generally accepted measure of the level of resources needed to maintain reliability. While updated annually, the statewide IRM is currently 16.5 percent.

Expressed as a percentage of annual peak, the resources are divided into six categories: (1) in-NYCA existing generating capacity, (2) UDRs supported by external capacity, (3) special case resources/demand response, (4) market proposals that are additions to NYCA generating capacity, (5) market proposals that are additions to NYCA UDRs supported by external capacity, and (6) external capacity of 2,755 MW currently eligible to participate in the NYISO markets.

Charts 2 and 3 below present the resources for New York City and Long Island as a percentage of their respective peak loads. The sum of the resources is equal to the amount of installed locational resources expressed as a percentage of the forecasted zonal peak load. Because New York City and Long Island are defined as localities in the NYISO Tariff, they have minimum installed Locational Capacity Requirements. The current minimum Locational Capacity Requirements are 80 percent for New York City and 99 percent for Long Island, respectively.

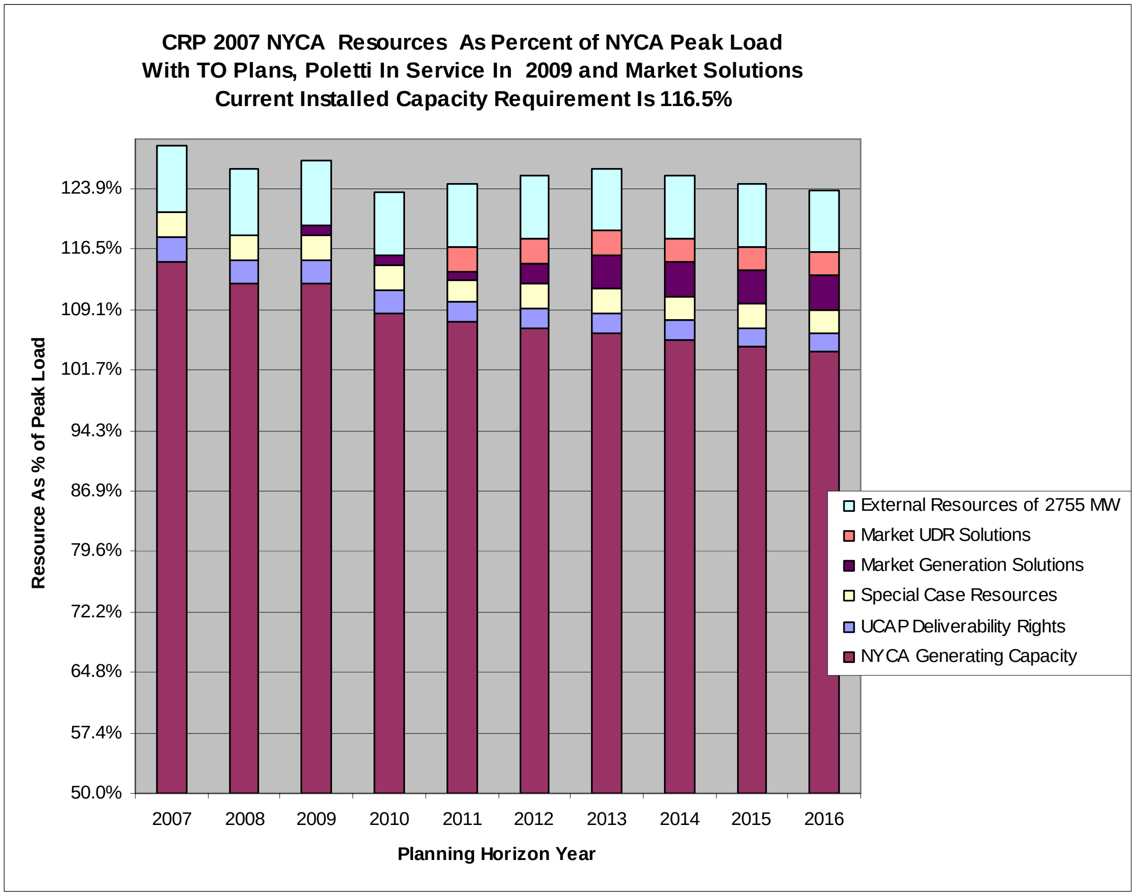


Chart 4.5.3-1: CRP 2007 NYCA Resources As Percent of NYCA Peak Load With TO Plans, Poletti In-service **in 2009 and Market Solutions**

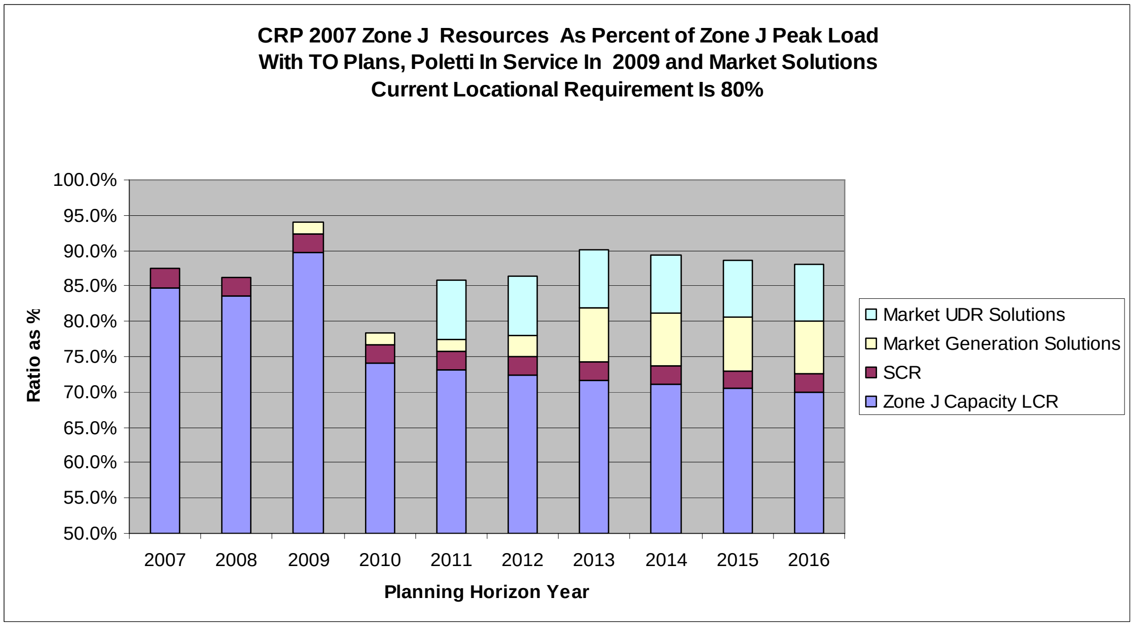


Chart 4.5.3-2: CRP 2007 Zone J Resources As Percent of Zone J Peak Load With TO Plans, Poletti In-service **In 2009 and Market Solutions**

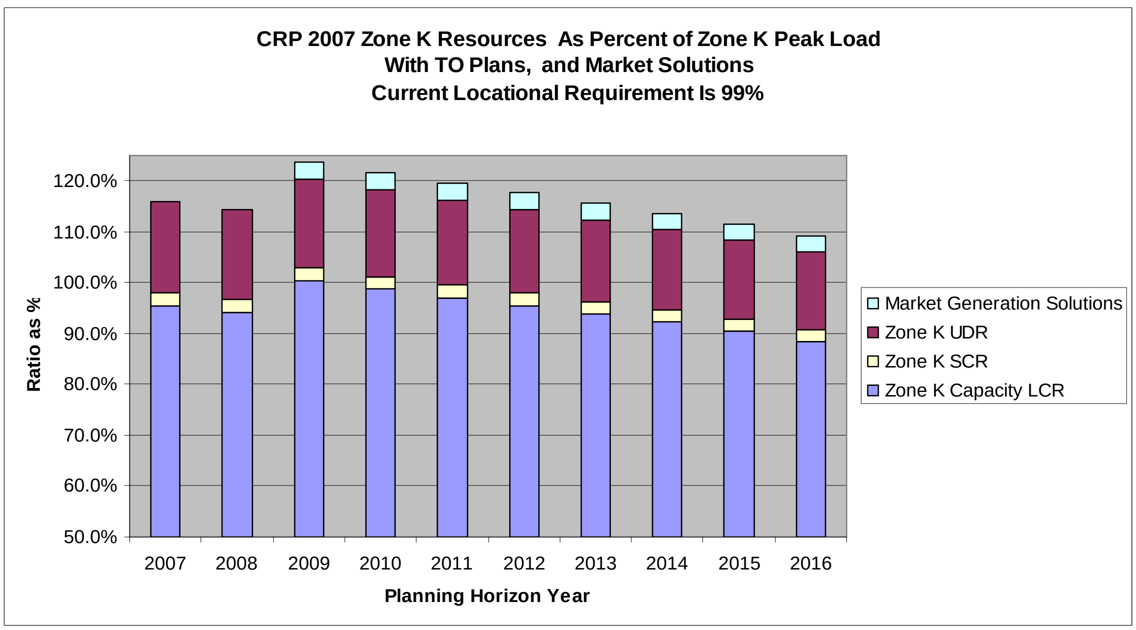


Chart 4.5.3-3: CRP 2007 Zone K Resources As Percent of Zone K Peak Load With TO Plans, and Market Solutions

4.6 Alternative Regulated Responses

The NYISO initiated a request for alternative regulated responses to meet the needs identified in the second five-year period. As discussed previously, three alternative regulated responses were submitted. The responses consisted of one generation proposal, one DSM proposal and one transmission proposal. An in-depth review of each of the proposals at this time was not undertaken at this time because, as noted above, the NYISO determined that none of these alternatives are required at this time.

4.6.1 Regulated Generation Alternative

This alternative regulated solution was submitted by Mirant New York. Mirant is proposing to keep Lovett Unit #5 operational (either by firing on natural gas or firing on coal with acceptable control measures) and to restart operations of Unit #4 (firing on natural gas) for a transitional period of time beginning no later than May 1, 2008 and continuing as needed. The proposal would keep two of the three units on site in operation beyond the current May 1, 2008 retirement date for a total of 365 MW of capacity. The impact of this proposal on LOLE is presented in Table 4.6.1-a.

Table 4.6.1-a: Impact Lovett Units 4&5 Remaining In-service on NYCA LOLE[12]

	2011	2012	2013	2014	2015	2016
Zone B (Upstate NY)	0.04	0.07	0.08	0.11	0.15	0.16
Zone E (Upstate NY)	0.01	0.03	0.03	0.04	0.06	0.08
Zone G (Hudson Valley or SENY)	0.00	0.00	0.00	0.00	0.01	0.01
Zone I (Hudson Valley or SENY)	0.05	0.10	0.13	0.19	0.29	0.37
Zone J (Hudson Valley or SENY)	0.06	0.11	0.16	0.22	0.33	0.45
Zone K (Long Island or SENY)	0.01	0.02	0.02	0.05	0.08	0.13
NYCA	0.07	0.12	0.17	0.24	0.35	0.47
NYCA Differences (W and W/O ARR)[13]	-0.03	-0.04	-0.06	-0.08	-0.11	-0.10

The generation alternative increases capacity in Zone G or SENY below the Leeds Pleasant Valley congestion point, and provides additional dynamic reactive power capability. The additional reactive capability increases the transfer limits across the UPNY/CE and Zone I to Zone J transmission interfaces by approximately 200 MW and improves the voltage performance of the transmission system in the Lower Hudson Valley. In addition, the alternative would improve the LOLE and help maintain a more diverse fuel mix.

4.6.2 Alternative Transmission Response

The alternative regulated solution was submitted by the New York Regional Interconnect (NYRI). The NYRI transmission proposal is to construct a new high voltage direct current (“HVDC”) transmission line between the Edic Substation in the Town of Marcy, Oneida County, to the Rock Tavern Substation in the Town of New Windsor, Orange County. It is Project No. 96 in the NYISO interconnection queue.

Based on updated information and modeling, the NYISO had determined that there is no need to require a regulated backstop solution at this time. As a result, the alternative regulated transmission proposal was not evaluated as a specific alternative to regulated backstop solutions. Rather, this proposal was evaluated as a generic increase to transfer capability.

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[12] Includes updated TO plans

[13] Negative LOLE difference in this and other tables indicate that the project improves reliability.

To evaluate the benefits of increased transfer capability associated with this transmission proposal, selected interfaces in the MARS model were increased to simulate the potential benefits of additional transmission capability.

Although this proposal would potentially increase the Zones E to G interface by 1,200 MW, there are simultaneous constraints that need to be recognized. To capture these simultaneous constraints, this project was evaluated using a reduced increase of only 1,000 MW for UPNY/SENY. The impact of this proposal on LOLE is presented in Table 4.6.2-a.

Table 4.6.2-a: Impact NYRI Transmission Proposal on NYCA LOLE[14]

	2011	2012	2013	2014	2015	2016
Zone B (Upstate NY)	0.06	0.10	0.12	0.18	0.24	0.29
Zone E (Upstate NY)	0.02	0.04	0.05	0.06	0.10	0.13
Zone G (Hudson Valley or SENY)	0.00	0.01	0.01	0.01	0.01	0.02
Zone I (Hudson Valley or SENY)	0.06	0.10	0.14	0.19	0.27	0.33
Zone J (Hudson Valley or SENY)	0.07	0.12	0.16	0.23	0.31	0.39
Zone K (Long Island or SENY)	0.01	0.02	0.03	0.05	0.09	0.14
NYCA	0.08	0.12	0.17	0.24	0.33	0.42
NYCA Differences (W and W/O ARR)	-0.02	-0.03	-0.05	-0.08	-0.13	-0.17

4.6.3 Alternative Demand Response Proposal

As discussed, the NYISO received one alternative regulated demand response proposal. This alternative regulated solution was submitted by EnerNOC, Inc. EnerNOC offers 250 MW of demand response resources to the NYISO. The impact of this proposal on NYCA LOLE is presented in Table 4.6.3-a.

Table 4.6.3-a: Impact of Demand Response on NYCA LOLE[15]

	2011	2012	2013	2014	2015	2016
Zone B (Upstate NY)	0.05	0.07	0.09	0.12	0.15	0.17
Zone E (Upstate NY)	0.02	0.21	0.03	0.05	0.07	0.09
Zone G (Hudson Valley or SENY)	0.00	0.01	0.01	0.01	0.01	0.02
Zone I (Hudson Valley or SENY)	0.06	0.10	0.14	0.20	0.29	0.37
Zone J (Hudson Valley or SENY)	0.07	0.12	0.16	0.23	0.33	0.42
Zone K (Long Island or SENY)	0.01	0.02	0.03	0.05	0.09	0.14
NYCA	0.08	0.12	0.17	0.24	0.35	0.45
NYCA Differences (W and W/O ARR)	-0.02	-0.03	-0.05	-0.08	-0.11	-0.13

4.6.4 Assessment of the Alternative Regulated Responses

The above analysis indicates that all of the alternative regulated responses would improve reliability and satisfy some portion of the need. The demand response proposal is the only alternative regulated solution proposal that has some MWs of resources located in Zone J.

[14] ibid
[15] ibid

Besides providing available capacity, the generation alternative regulated solution would provide voltage support, and increase transfer capability, which would be beneficial to the Lower Hudson Valley region.

The transmission alternative regulated solution would benefit resource adequacy only if there is additional capacity available to be delivered. Transmission projects also provide the flexibility to site additional resources in upstate New York, and can provide other benefits. For instance, the NYRI has included reactive power capability for the Rock Tavern terminal, which could provide additional reactive capability for the Lower Hudson Valley. The full impact of this transmission project will studied in the System Reliability Impact Study (SRIS), which is under review by the NYISO.

4.7 Summary of Evaluation of Proposed Solutions

In summary, the Updated TO Plans will satisfy New York's reliability needs for the first five years of the Study Period. If the market responses remain on schedule as proposed, the NYCA would well exceed LOLE criteria throughout the 10-year Study Period. Given that the total capacity of the market solutions[16] are nearly 1,000 MW in excess of resource requirements, and the planned in-service dates are well in advance of need, reliability needs will still be met if a portion of the market solutions come into service later than presently planned. Consequently, neither a regulated backstop solution nor an alternative regulated response needs to be implemented at this time. Going forward, the NYISO will monitor the progress of proposed solutions in the next cycle of CRPP to determine that these planned resources will be available in a timely manner.

4.8 Transmission System Short Circuit Assessment

The NYISO updated the short circuit assessment in the 2007 RNA to include the TO solutions that were evaluated for this CRP. The methodology employed was the same as used for the RNA. It is described in the "NYISO Guideline for Fault Current Assessment," contained in Appendix B of the RNA supporting document. The fault current levels arising from the implementation of the updated TO plans were assessed and compared against the most recent Annual Transmission Reliability Assessment 2006 (ATRA) fault levels to determine if breakers would become over-dutied. The market solutions were evaluated in aggregate. Assumptions were made as to the exact locations for the solutions in the second five years of the Study Period. The exact location of solutions can greatly impact the fault levels calculated. Based on the locations assumed for the solutions, fault duties did not indicate over-dutied breakers in addition to those identified in the 2006 ATRA.

[16] At the end of July, Besicorp-Empire Development Company, LLC (BEDCO) announced that it obtained sufficient funding to proceed with the construction of the Besicorp-Empire power project located in Rensselaer, NY. This project has met all the NYISO interconnection requirements and has an Article X certificate as well as an Article VII for the transmission lines to connect it to the bulk power system. The project was studied as a 660 MW combined cycle unit. At the time of the development of the 2007 RNA this facility did not meet the requirements for inclusion in the base line study period nor did the developers submit it as a market solution.

4-D The 2007 Reliability Plan[17]

The NYISO OATT Attachment Y in Section 8 states that:

> Following the NYISO's evaluation of the proposed market-based and regulated solutions to Reliability Needs, the NYISO will prepare a draft Comprehensive Reliability Plan ("CRP"). The draft CRP shall set forth the NYISO's findings and recommendations; including any determination, that implementation of a regulated solution (which may be a Gap Solution) is necessary to maintain system reliability.

After Committee review and vote as described in Attachment Y of the OATT, the draft CRP will become final once approved by the NYISO Board of Directors.

The 2007 RNA determined that additional resources would be needed over the 10-year study period in order for the NYCA to comply with applicable reliability criteria[18]. As a result, the NYISO requested market-based, regulated backstop, and alternative regulated solutions to the reliability needs. The preference is to provide an opportunity for market solutions to meet the future needs with regulated backstops and alternative regulated solutions available, if needed.

The NYISO designated the TOs responsible for developing regulated backstop solutions to address the reliability needs identified in the RNA. The Responsible Transmission Owners submitted their updated TO plans, which had the effect of meeting needs in the First Five Year Period. They also submitted regulated backstop solutions, which were sufficient to meet the identified reliability needs over the second five-year period.

In addition, a broad range of solutions, including market proposals, and alternative regulated responses were submitted. Based upon its evaluation of the Market Proposals, updated TO Plans, and continued operation of the Charles A. Poletti generating unit through January 2010, the NYISO has concluded that there are sufficient resource additions to the NYCA planned or under development to meet the reliability need for the next 10 years. Accordingly, the NYISO has determined that no action needs to be taken at this time to implement any regulated backstop solution or an alternative regulated solution to address the reliability needs identified in the 2007 RNA.

The plan consists of the following actions:

1. Deferring retirement of the New York Power Authority's Charles A. Poletti generating unit in New York City from 2009 until 2010. It is particularly important that the existing Poletti unit stay in-service until 2010 because the Consolidated Edison M29 transmission project will not be in-service until late 2009.
2. Implementing certain Responsible TO plans, which include transmission upgrades, such as the addition of capacitor banks at the Millwood Substation and a breaker replacement at the Gowanus Substation.

[17] All supporting databases and analysis utilized in developing this plan are available for inspection subject to confidentiality and critical energy infrastructure information requirements (CEII).

[18] Reliability needs are identified with respect to approved reliability criteria, including through MARS LOLE studies. These studies reflect realistic capabilities of the NYCA transmission system with appropriate interface limits in the presence of thermal, voltage or stability constraints.

3. Developing upwards of 1,800 MW of market-based resources from the 3,012 MW of the merchant generation and transmission projects that have been proposed for New York. At least 1,000 MW of these resources should be located in New York City or have unforced capacity delivery rights (UDRs) into New York City; 500 MW of resources in the Lower Hudson Valley; and the remaining 300 MW of additional resources in New York State as a whole, including Upstate New York. The NYISO has received market-based proposals for more than the minimum resources needed to meet resource adequacy criteria. The NYISO does not choose which of the market-based projects submitted to it will be built. Rather, it is up to the proponents to proceed with, and the relevant state siting and permitting agencies to approve, the specific resources that will be added in New York. The NYISO will continue to monitor the viability of these projects in accordance with established procedures and will report on its evaluation in the next CRP. As identified in section 5.3 of the 2007 RNA, there are other combinations of resources that would meet resource adequacy criteria on a statewide basis.
4. In summary, based upon the solutions submitted to the NYISO, the resource additions required for the next 10 years, by 2016, total approximately 1,800 MW.

5 The New York Power Grid in Context

On December 1, 1999, the NYISO assumed responsibility for the operation of New York State's bulk power system and of the newly established electric energy markets. New York's wholesale energy markets were established coincident with the establishment of the NYISO. Prior to December 1, operation of the bulk power system was the responsibility of the New York Power Pool. The NYISO is charged with two overriding responsibilities: first, maintain the safe and reliable operation of New York's bulk power system; and second, operate fair, non-discriminatory and effective wholesale electric markets.

Geographically, the New York Control Area (NYCA) is situated in the center of the Northeastern North America electrical grid, which includes the Mid-Atlantic and New England States in the US and the Canadian Provinces of Ontario, Quebec, and Maritimes. Figure 4.1 displays the major electricity markets operating in the region along with their most recent peak loads. This area includes a customer load greater than the entire Western Interconnection and provides electric service to the capital cities of two members of the G-7 nations as well as the financial capital of the world. It should be noted that the total nominal transfer capability between the control areas in the Northeast is less than 5% of the total peak load of the region.

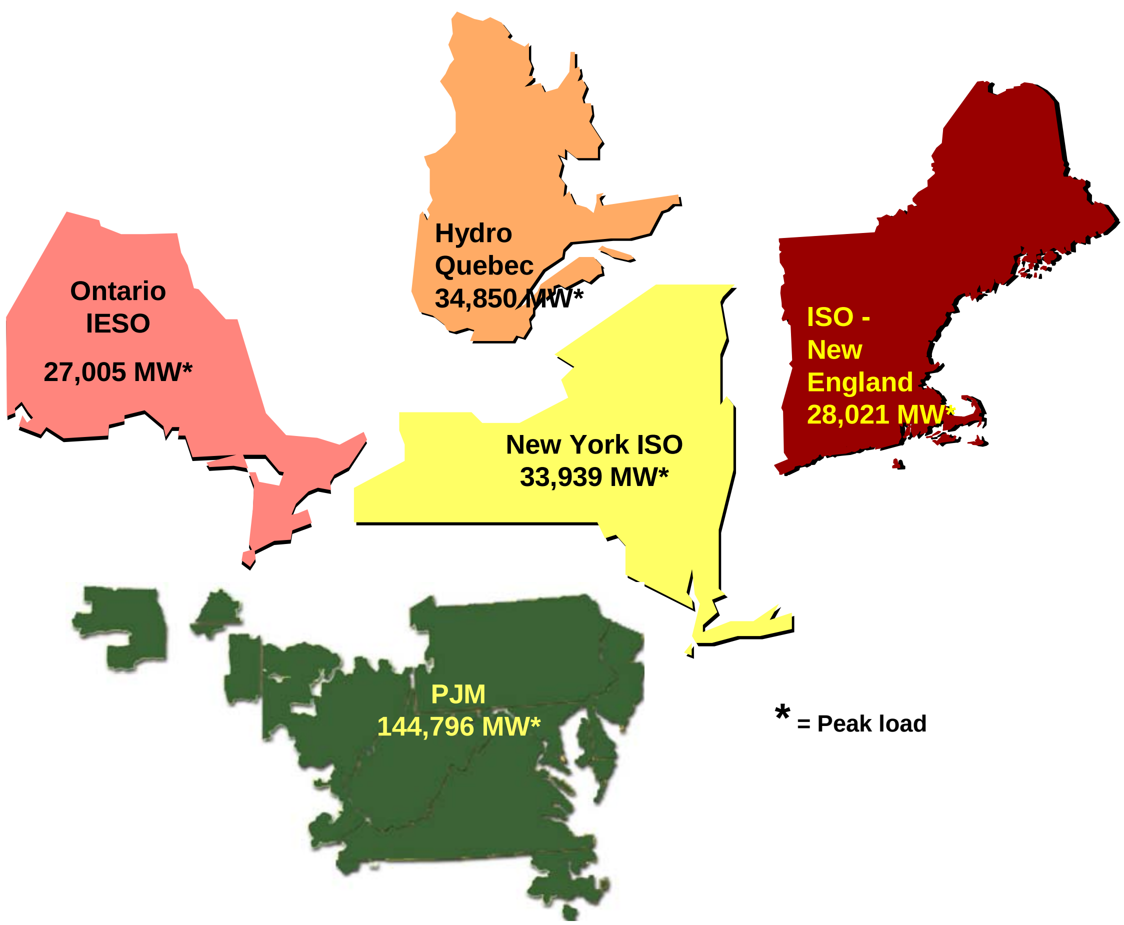

Figure 4.1: Northeast Grid in Context

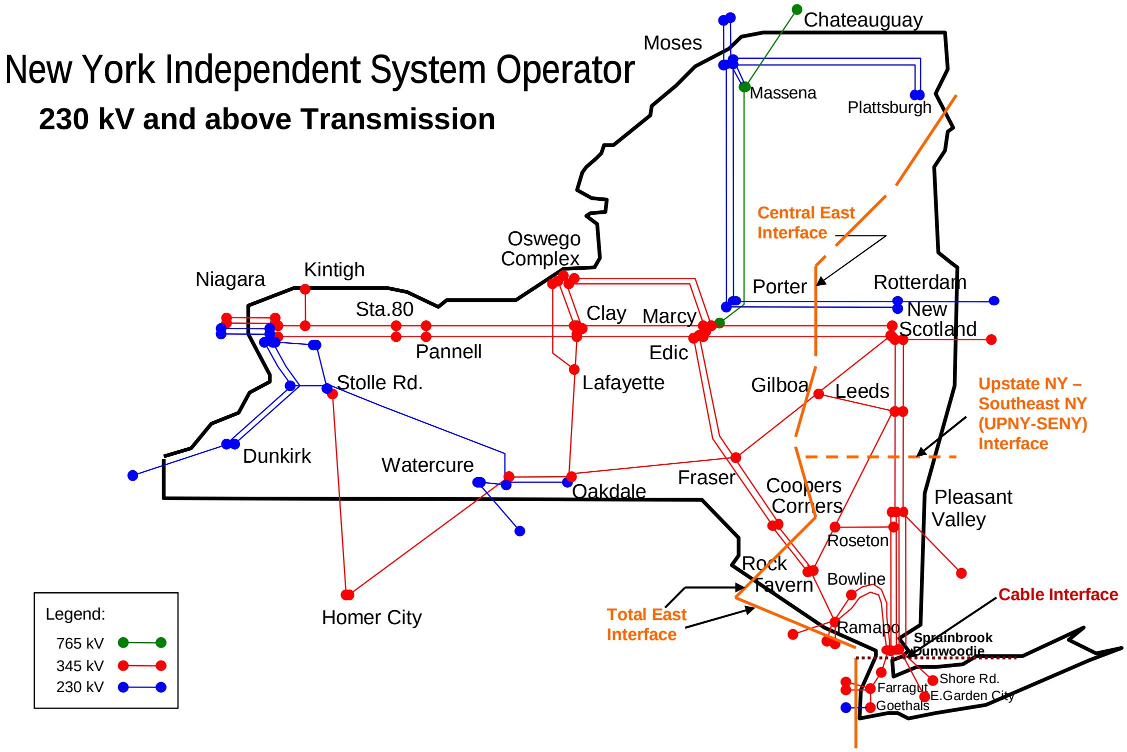

Figure 4.2: NYCA Bulk Transmission System

Figure 4.2 displays the bulk power transmission system for the NYCA. It shows facilities operating at 230 thousand volts (kV) and above. This represents more that 4,000 miles of high voltage transmission lines. If the underlying 138 and 115 kV transmission lines are included, the mileage exceeds 10,000 miles. Figure 4.2 also displays key NYCA transmission interfaces. Transmission interfaces are groupings of transmission lines which measure the transfer capability between regions.

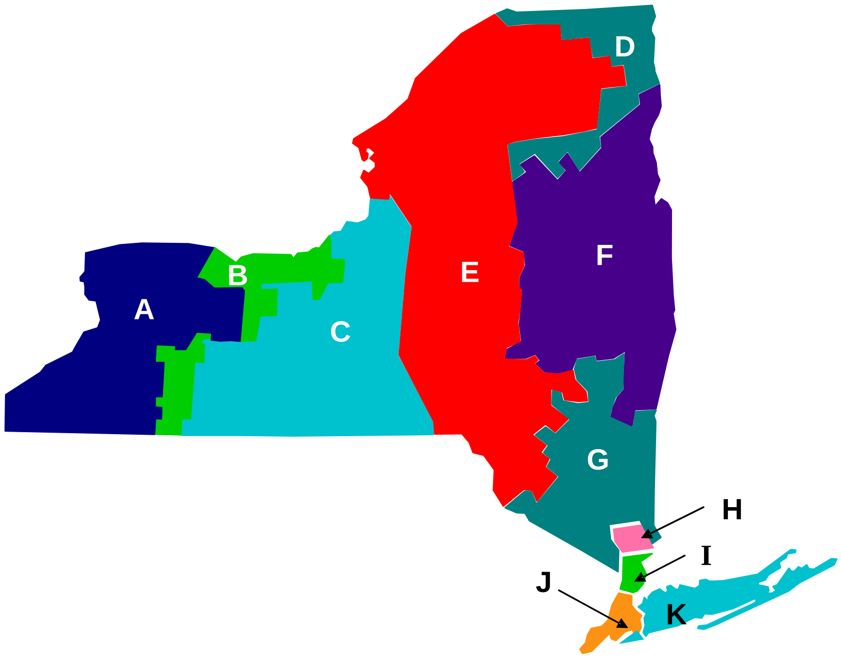

Figure 4.3: NYCA Load Zones or Area

The New York wholesale electricity market is divided into eleven pricing or load zones. Figure 4.3 presents the geographical boundaries for these pricing zones. The development of these load zones was driven primarily by the topology or configuration of the transmission system and secondarily by the franchise areas of the investor owned utilities. These load areas were initially developed by the New York Power Pool after the 1965 Northeast blackout as part of a process of identifying critical bulk power system transmission interfaces. Subsequently, these load zones were utilized to define pricing zones for the wholesale electricity market.

On a pricing basis, Zones A-E have relatively homogeneous prices and can be defined as one super zone called West NY, while the balance of the zones can be defined as East NY. Pricing is not homogeneous within the eastern zones. Zones F – I are defined as the Hudson Valley, Zone J as New York City and Zone K as Long Island. The boundary between West NY and East NY, including the boundary between PJM and the East zones, defines the Total East transmission interface. This interface is represented by the orange line on Figure 4.2. The upper half of the Total East interface is defined as the Central East interface while the lower half including the dotted part of the orange line is known as the interface between Upstate NY and Southeast NY or the UPNY – SENY interface. The dotted part of the line effectively divides the Hudson Valley into a lower and upper part electrically. Below the UPNY – SENY interface is the *cable interface* which includes the red dotted line on the transmission map and also the lower end of the total east interface. The cable interface contains all the major underground and/or submarine cables supplying New York City and Long Island.

Table 4.1 presents the approximate non-coincident peak loads and capacity contained in the super zones defined above for summer 2006. Table 4.2 below presents the nominal transfer capability across the major transmission interfaces defined above. The transmission facilities that make up the interfaces are the facilities that tie the zones together electrically.

Table 4.1: Approximate Summer Peak Load/Capacity

Zone	Peak Load (MW)	Capacity (MW)
West (A-E)	10,200	14,800
Upper Hudson Valley (F)	2,380	3,765
Lower Hudson Valley (G-I)	4,630	5,575
New York City (J)	11,350	10,000
Long Island (K)	5,750	5,290

Note: Numbers are approximate and based on the summer of 2006

Table 4.2: Nominal Transfer Capability[19]

Transmission Interface	Transfer Capability (MW)
Total East	6,100
Central East	2,850
UPNY – SENY	5,100
Cable Interface	
• New York City	4,970
• Long Island	1,290

As a result of the distribution of load and capacity on the NYCA power system, power flows are primarily west to east and then southeast or predominantly from the northwest to the southeast into the high load urban zones of New York City and Long Island. All power flows from the west including the transmission ties to the neighboring control areas of Ontario, Hydro Quebec and PJM must cross the Total East Interface with large portions flowing across the Central East portion of the interface and then across the UPNY – SENY interface to reach the cable interface.

[19] Nominal transfer limits are based on the thermal capability of the lines and cables for the interface.

6 NYCA Load and Energy Forecast: 2006 – 2016

Introduction

Overview

This section describes the annual energy and seasonal peak demand forecasts for the ten year period beginning with 2006 and extending through 2015. It begins with this Executive Summary, continues with an overview of historic electricity and economic trends in New York State, and concludes with the ten-year forecasts of summer and winter peak demands and annual energy requirements.

Executive Summary

The NYISO has initiated the CRPP to assess the adequacy of New York's electricity infrastructure for meeting reliability and market needs over the 2006 – 2016 horizon. As part of this assessment, a ten year forecast of summer and winter peak demands and annual energy requirements was performed.

The electricity forecast is based on projections of New York's economy performed by Economy.com in the Fall of 2005. The Economy.com forecast includes detailed projections of employment, output, income and other factors for twenty three regions in New York State.

A summary of the electricity forecast and the key economic variables that drive it follows:

Table 5.1.1: Summary of Econometric Forecasts

Economic Indicators	**Average Annual Growth**		
	85-95	**95-05**	**05-15**
Total Employment	0.16%	0.78%	0.85%
Gross State Product	1.66%	3.70%	2.74%
Population	0.41%	0.39%	0.20%
Total Income	2.02%	2.48%	2.49%
Average Electric Price	-1.33%	0.67%	-1.86%
Summer Peak (actual data through 2005)	1.73%	1.66%	1.27%
Winter Peak (actual data through 2005)	1.15%	0.75%	1.32%
Annual Energy (actual data through 2005)	1.61%	1.27%	0.91%
Employment Trends	**Shares of Total Employment**		
	1995	**2005**	**2015**
Business, Services & Retail	40.1%	39.8%	39.8%
Health, Education, Government, Agriculture	48.5%	52.4%	53.3%
Manufacturing	11.5%	7.8%	6.9%

6.1 Historical Overview

NYCA System

Table 5.2.1 shows the New York Control Area's (NYCA) historic peak and energy growth since 1985.

Table 5.2.1: 21-Year Historic Peak and Energy Data[20] and Growth Rates

Year	Annual GWh	Percent Growth	Summer Capability Period: Summer MW	Summer Capability Period: Pct Growth	Winter Capability Period	Winter Capability Period: Winter MW	Winter Capability Period: Pct Growth
1985	126,290		22,926		85 - 86	20,664	
1986	128,748	1.95%	22,942	0.07%	86 - 87	20,247	-2.02%
1987	133,531	3.71%	24,427	6.47%	87 - 88	22,593	11.59%
1988	140,048	4.88%	25,720	5.29%	88 - 89	23,227	2.81%
1989	141,883	1.31%	25,390	-1.28%	89 - 90	23,003	-0.96%
1990	140,919	-0.68%	24,985	-1.60%	90 - 91	22,579	-1.84%
1991	145,019	2.91%	26,839	7.42%	91 - 92	22,981	1.78%
1992	143,421	-1.10%	24,951	-7.03%	92 - 93	22,806	-0.76%
1993	146,915	2.44%	27,139	8.77%	93 - 94	23,809	4.40%
1994	147,777	0.59%	27,065	-0.27%	94 - 95	23,345	-1.95%
1995	148,429	0.44%	27,206	0.52%	95 - 96	23,394	0.21%
1996	148,527	0.07%	25,585	-5.96%	96 - 97	22,728	-2.85%
1997	148,896	0.25%	28,699	12.17%	97 - 98	22,445	-1.25%
1998	151,377	1.67%	28,161	-1.87%	98 - 99	23,878	6.38%
1999	156,356	3.29%	30,311	7.63%	99 - 00	24,041	0.68%
2000	156,636	0.18%	28,138	-7.17%	00 - 00	23,774	-1.11%
2001	156,787	0.10%	30,982	10.11%	01 - 01	23,713	-0.26%
2002	158,745	1.25%	30,664	-1.03%	02 - 02	24,454	3.12%
2003	158,014	-0.46%	30,333	-1.08%	03 - 03	25,262	3.30%
2004	160,209	1.39%	28,433	-6.26%	04 - 04	25,541	1.10%
2005	166,732	4.07%	32,075	12.81%	05 - 06	25,060	-1.88%
Annual Avg Growth:		1.40%		1.69%			0.97%

NYCA is a summer peaking system and its summer peak has grown faster than its winter peak or its annual energy over this period. Both summer and winter peaks show considerable year-to-year variability due to the influence of extreme weather conditions on the seasonal peaks. Annual energy is influenced by weather conditions over an entire year, which are much less variable.

[20] Note: Historic peaks do account for the impacts of demand-side programs

Table 5.2.2 shows trends in weather-normalized annual energy and seasonal peaks for the NYCA system. Summer peak is the fastest growing and winter peak the slowest. This pattern has two main causes. Air conditioning has become ubiquitous while electric space heating load has declined, and load has grown much more in NYCA zones G – K than in zones A – F (where it has actually declined). The former zones are in the southeastern part of the state where the climate is warmer and where peak demands have always occurred in summer.

Table 5.2.2: Weather Normalized Annual Energy and Seasonal Peak Loads

Year	Annual GWh	Percent Change	Summer MW	Percent Change	Winter MW	Percent Change
1993	145,595		26,204		23,685	
1994	147,073	1.0%	27,161	3.7%	23,654	-0.1%
1995	146,889	-0.1%	27,167	0.0%	23,554	-0.4%
1996	148,869	1.3%	27,938	2.8%	22,788	-3.2%
1997	149,797	0.6%	28,488	2.0%	22,762	-0.1%
1998	152,019	1.5%	28,999	1.8%	24,031	5.6%
1999	155,117	2.0%	28,925	-0.3%	23,909	-0.5%
2000	157,937	1.8%	28,974	0.2%	24,218	1.3%
2001	156,859	-0.7%	29,767	2.7%	25,045	3.4%
2002	157,159	0.2%	30,028	0.9%	24,294	-3.0%
2003	157,951	0.5%	30,450	1.4%	24,849	2.3%
2004	160,986	1.9%	29,901	-1.8%	25,006	0.6%
2005	163,368	1.5%	31,821	6.4%	24,770	-0.9%
Avg		1.0%		1.6%		0.4%

Regional Energy and Seasonal Peaks

Table 5.2.3 shows historic and forecast growth rates of annual energy for the different regions in New York. (Actual zonal energy is shown in Table 5.4.1 below.) The West region is NYCA Zones A – E. The East region is Zones F - I. Zones J and K, NYCA's most critical load centers, are shown individually. These groupings are meant to combine Zones that have similar economies. West is the part of the State that has historically been the most associated with manufacturing, particularly heavy manufacturing. The East region includes Albany, the State capitol, and comprises both the Upper and Lower Hudson Valley areas. The East economy is strongly influenced by state government employment and industries along the Hudson. It has also benefited from the spillover of New York City's economy, as suburban development has spread inexorably up the Hudson Valley, much as Long Island's economy benefited earlier.

These regions are also separated by the most important electrical interfaces in New York. West is separated from the East by the Central-East interface. Upper Hudson Valley (Zone F) and Lower Hudson Valley (Zones G, H and I) are separated by the UPNY/SENY interface. Lower Hudson Valley and J are separated by Dunwoodie South. Zones J and K are separated by the Con Ed – LIPA interface.

Table 5.2.3: Actual and Forecast Weather-Normalized Annual Energy

Year	West	East	Zone J	Zone K	NYCA
1993	56,392	29,968	41,658	17,577	145,595
1994	55,395	30,509	43,211	17,958	147,073
1995	54,739	30,974	43,306	17,870	146,889
1996	55,886	30,634	44,368	17,982	148,869
1997	57,076	29,659	44,898	18,164	149,797
1998	57,038	30,198	46,036	18,746	152,019
1999	57,437	30,371	47,965	19,344	155,117
2000	57,599	30,254	49,880	20,205	157,937
2001	55,891	30,236	50,047	20,684	156,859
2002	55,806	29,386	50,648	21,318	157,159
2003	55,326	29,752	51,070	21,804	157,951
2004	56,016	30,291	52,327	22,353	160,986
2005	57,588	30,724	52,736	22,320	163,368
2006	60,099	32,003	52,276	22,515	166,893
2007	61,422	32,685	53,230	22,796	170,133
2008	62,307	33,212	54,275	23,122	172,916
2009	62,474	33,437	55,179	23,544	174,634
2010	62,482	33,613	56,158	23,892	176,145
2011	62,249	33,695	57,136	24,261	177,341
2012	61,876	33,703	57,993	24,710	178,282
2013	61,637	33,766	58,863	25,036	179,302
2014	61,503	33,852	59,628	25,439	180,422
2015	62,069	34,212	60,403	25,904	182,588
95-05	0.5%	-0.1%	2.0%	2.2%	1.1%
05-15	0.3%	0.7%	1.5%	1.4%	0.9%

Since 2001, LHV has been New York's fastest growing region. While growth in the Lower Hudson Valley is expected to continue at a moderate pace, growth rates in NYC and on Long Island are slightly higher. Growth upstate continues to lag behind the downstate regions. Zone F annual energy use in 2005 is still less than was used in 1999. The Western zones have in 2005 nearly equaled the energy usage of 2000.

Table 5.2.4: Actual and Forecast Growth Rates of Annual Energy

	West	Upper Hudson Valley	Lower Hudson Valley	New York City	Long Island
	Zones A-E	Zone F	Zones G-H-I	Zone J	Zone K
95-05	0.6%	-1.2%	1.9%	2.1%	2.5%
05-15	0.6%	0.2%	1.0%	1.1%	1.2%

Table 5.2.5: Weather Normalized Zonal Summer Peaks and Forecast

	West	East	Zone J	Zone K	NYCA
1993	8,980	5,531	8,313	3,380	26,204
1994	9,314	5,735	8,594	3,518	27,161
1995	9,021	5,477	9,003	3,666	27,167
1996	9,429	5,913	8,809	3,787	27,938
1997	9,200	5,628	9,570	4,090	28,488
1998	9,045	5,966	9,708	4,280	28,999
1999	8,868	5,806	10,022	4,229	28,925
2000	8,886	5,782	9,878	4,428	28,974
2001	8,494	5,976	10,454	4,844	29,767
2002	9,105	5,808	10,224	4,892	30,028
2003	9,038	6,044	10,362	5,006	30,450
2004	8,798	5,896	10,192	5,015	29,901
2005	9,516	6,330	10,678	5,297	31,821
2006	9,662	6,655	11,630	5,348	33,295
2007	9,822	6,782	11,800	5,427	33,831
2008	9,951	6,889	11,970	5,504	34,314
2009	9,992	6,944	12,140	5,612	34,688
2010	10,043	6,998	12,290	5,711	35,042
2011	10,069	7,034	12,440	5,805	35,348
2012	10,068	7,051	12,570	5,904	35,593
2013	10,041	7,051	12,705	6,006	35,803
2014	10,069	7,082	12,815	6,111	36,077
2015	10,101	7,122	12,925	6,232	36,380
95-05	0.5%	1.5%	1.7%	3.7%	1.6%
05-15	0.4%	0.7%	1.1%	1.5%	0.9%

6.2 Trends Effecting Electricity in New York

6.2.1 Employment

2005 Forecast

The economic outlook for employment projects a growing economy through 2006 followed by slower growth in 2007. Employment growth picks up from 2008 to 2010 before declining again.

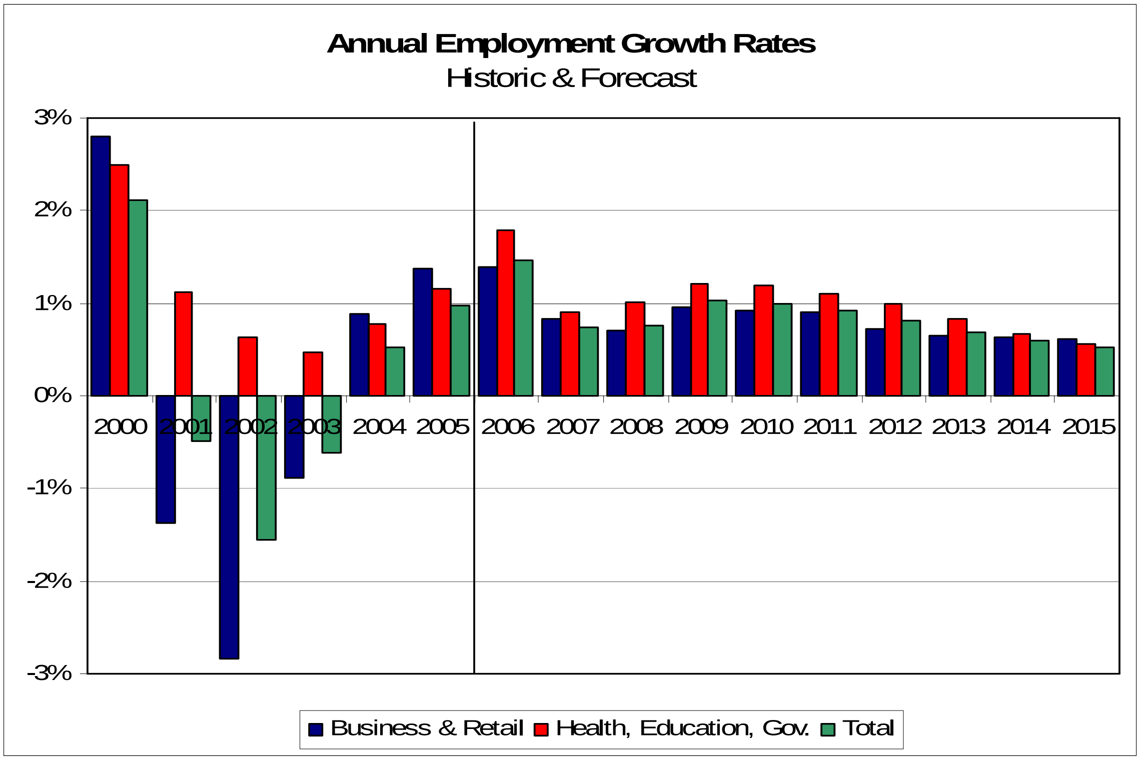

Figure 5.1: Annual Employment Growth Rates

6.2.2 Population

The economic trends the regions have experienced are reflected in their population growth. In the West, which it basically all of New York State west of Schenectady, population is 1.4% lower today than it was in 1975. The Lower Hudson Valley has seen the most population growth, increasing by 20% since 1975. Other regions fall in between. New York State's population base has grown over 8% since 1975. Prior to 2000, population grew in every part of the state except the western section. However, since 2000 forward, annual growth in population has slowed.

2005 Forecast

The 2006 population forecast projects slower population growth in every region. By 2014, the population in New York City is expected to decline. Population in Long Island is expected to decline by the year 2017.

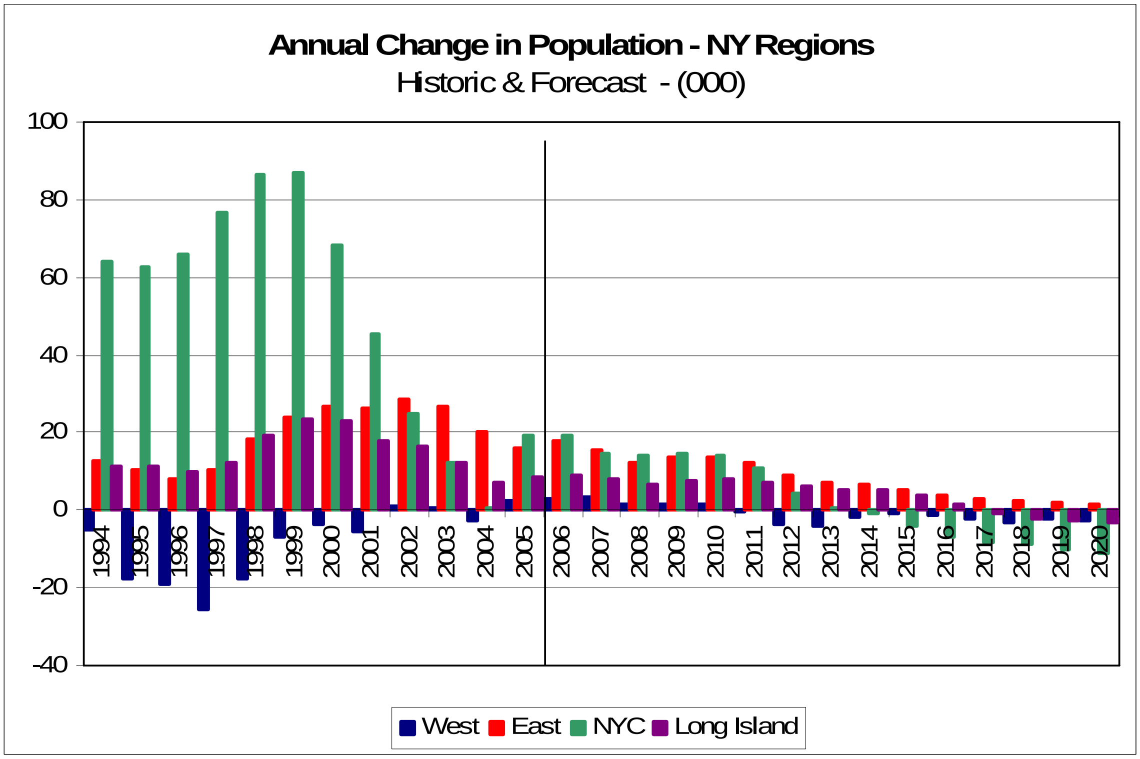

Figure 5.2: Annual Change in Population by Region

6.2.3 Real Output & Real Income

Two key economic indicators in the state are measured by real gross output and total income. One index measures the prosperity of business and the other the prosperity of households. The period from 2001 to 2002 showed erosion in buying power and economic output. Output recovered by 2003 but income did not recover until 2004.

2005 Forecast

The 2005 forecast projects economic growth in the range of 2.5% to 3.2% until 2008. Afterwards, economic output continues to grow, but at a gradually slowing rate. Real income growth decreases from 3% through 2005 to just 2% in 2006 and 2007. It increases again through 2009 to 3% but the growth gradually slows thereafter. Both indexes are characterized by faster growth in the near term followed by slower growth in the long term.

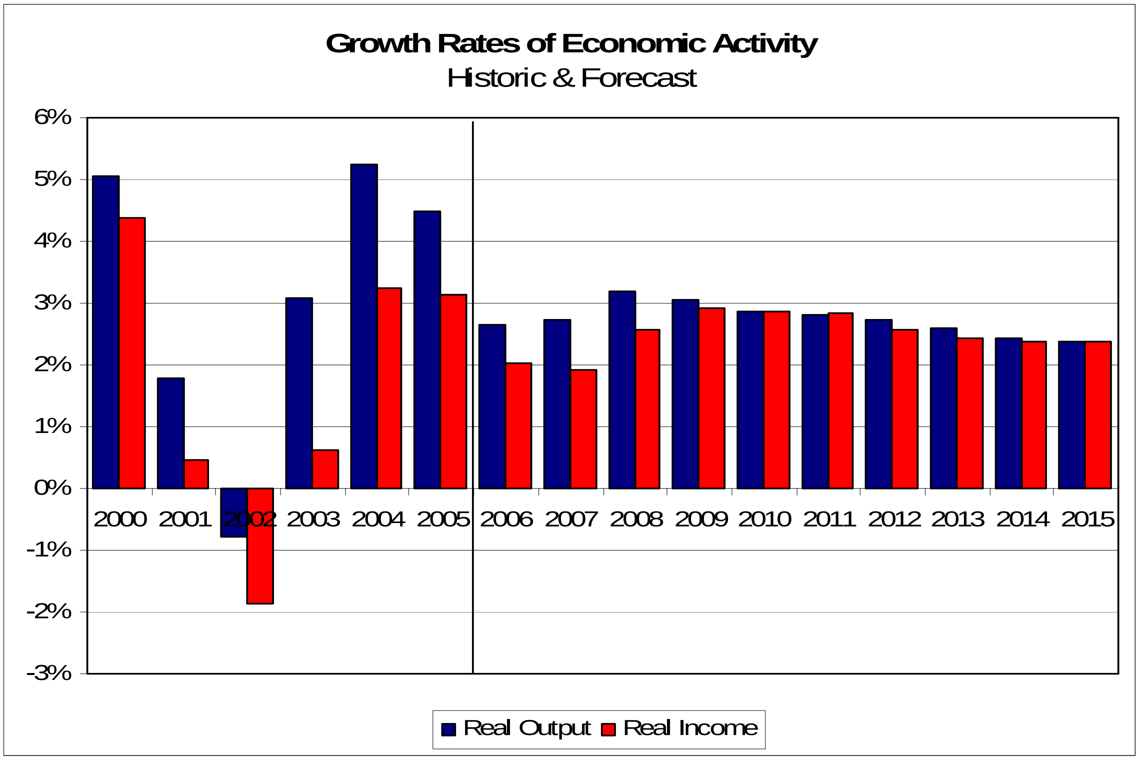

Figure 5.3: Annual Growth Rates in Real Output and Income

6.2.4 Electric and Natural Gas Prices

Electric prices in New York are expected to follow the trend predicted by the Energy Information Administration's "Annual Energy Outlook – 2006, Mid-Atlantic Region", modified to line up with New York actual data for 1990 – 2002. Prices for individual regions of the state are not available. The primary difference in the 2006 forecast compared to the previous is a more realistic projection of world oil prices, which are expected to remain above $50 per barrel until after 2008. This price forecast is approximately double that of the EIA's 2005 oil price forecast. Translating the EIA growth rates to the historic trends of New York energy prices results in the price forecasts for the state through 2020.

2006 Forecast

The real price of residential electricity has remained within the range of $140 to $150 per MWh since 1990. During this same period of time, the real price of residential natural gas has increased by 50% from $90/MMBtu to $140/MMBtu. Both commodities are expected by the EIA to decrease in real terms from 2005 through 2010. The EIA 2006 forecast, in comparison to 2005's, includes the following features:

- decreases in oil imports
- higher energy efficiency & slower economic growth
- decreased electricity consumption

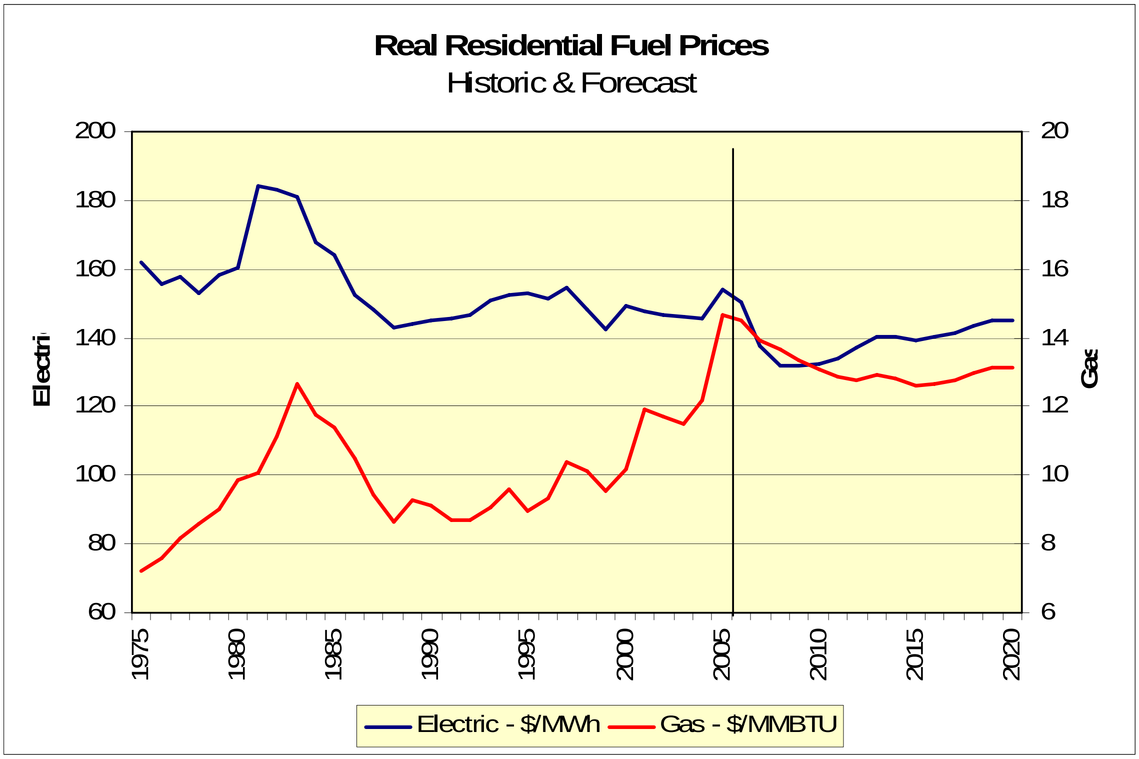

Figure 5.4: Real Electric and Natural Gas Prices

Given the assumptions embedded in the EIA forecast, the EIA considers it likely that real decreases in natural gas and electricity prices will occur. To the extent this does occur, then the effect of the real decrease in electricity price is to increase the state's annual electric consumption by a small amount. (A 1% decrease in the real price of electricity is expected to increase annual electricity usage by about 0.1%.)

6.2.5 Regional Economic Trends

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

Total Employment & Employment Shares

Total employment growth rates are the weakest in the West, with an annual average growth rate from 2005 to 2015 of just 0.1%. All other regions have growth rates of 0.8% for the same period. In every region, the employment growth is the most rapid in the early years of the forecast and declines thereafter. The relative shares of employment for business/retail/services and health/education/government remain essentially constant throughout the forecast horizon. While the share of manufacturing employment continues to decline over time, the decline is slow. Manufacturing as a share of total employment drops only by about 1% in each region.

Table 5.3.1: Regional Economic Growth Rates of Key Economic Indicators

West

	Average Annual Growth	
Economic Indicators	95-05	05-15
Total Employment	0.3%	0.1%
Gross Product	2.9%	1.3%
Population	-0.2%	0.0%
Total Income	1.8%	1.5%

	Employment Shares	
Employment Trends	2005	2015
Business/Services/Retail	37.0%	37.6%
Health/Educ/Gov/Ag.	49.5%	50.4%
Manufacturing	13.5%	12.0%

New York City

	Average Annual Growth	
Economic Indicators	95-05	05-15
Total Employment	0.7%	0.8%
Gross Product	3.8%	2.2%
Population	0.6%	0.1%
Total Income	2.5%	1.7%

	Employment Shares	
Employment Trends	2005	2015
Business/Services/Retail	42.1%	41.7%
Health/Educ/Gov/Ag.	53.3%	54.1%
Manufacturing	4.6%	4.2%

East

	Average Annual Growth	
Economic Indicators	95-05	05-15
Total Employment	1.2%	0.8%
Gross Product	3.8%	2.1%
Population	0.6%	0.3%
Total Income	3.0%	1.9%

	Employment Shares	
Employment Trends	2005	2015
Business/Services/Retail	38.9%	39.2%
Health/Educ/Gov/Ag.	53.4%	53.9%
Manufacturing	7.7%	6.8%

Long Island

	Average Annual Growth	
Economic Indicators	95-05	05-15
Total Employment	1.3%	0.8%
Gross Product	3.9%	2.2%
Population	0.5%	0.2%
Total Income	2.8%	1.6%

	Employment Shares	
Employment Trends	2005	2015
Business/Services/Retail	43.5%	42.8%
Health/Educ/Gov/Ag	48.8%	50.3%
Manufacturing	7.8%	7.0%

Real Gross Product

Real gross product is a measure of the economic value of all goods and services produced in a geographic region, after allowing for the effects of inflation. Gross product increases at an annual average rate of about 2.2% per year in every region except the West, where it is only 1.3%. The growth rate during the next ten years is 1% to 1.5% less than the annual average growth in the preceding 10 years. We find that economic growth is highest in the earliest years of the forecast and lowest in the furthest years.

Population

Population growth rates are slowing throughout the state except in the West. In the West, population growth is 0.0%, whereas it was negative during the preceding 10 years. Population growth rates are just 0.1 to 0.3% in other areas of the state. As with the other economic indicators, population growth is highest in the earliest years of the forecast and lower thereafter.

Real Total Income

Real total income is growing at approximately the same rate throughout all regions of the state, ranging from a low of 1.5% in the West to a high of 1.9% in the East. But this is a decline of about 1% per year in every region except the West compared to the period from 1995 to 2005. There is not as great a variation in the rate of income growth throughout the forecast. Instead, the forecast shows a drop in the rates of growth in 2006 and 2007 followed by an increase thereafter.

6.3 Forecast Methodology

The NYISO methodology for producing the long term forecasts for the Resource Needs Assessment consists of the following steps. Econometric forecasts were developed for system energy and seasonal peaks. (Model specifications are included in an appendix.) The summer coincident peak forecast was scaled up or down as appropriate to coincide with the most recent ICAP forecast. Zonal forecasts were developed independently consistent with historical trends and future expectations for regional growth. The zonal forecasts were then reconciled to the system forecasts to obtain zonal peaks coincident with the New York control area.

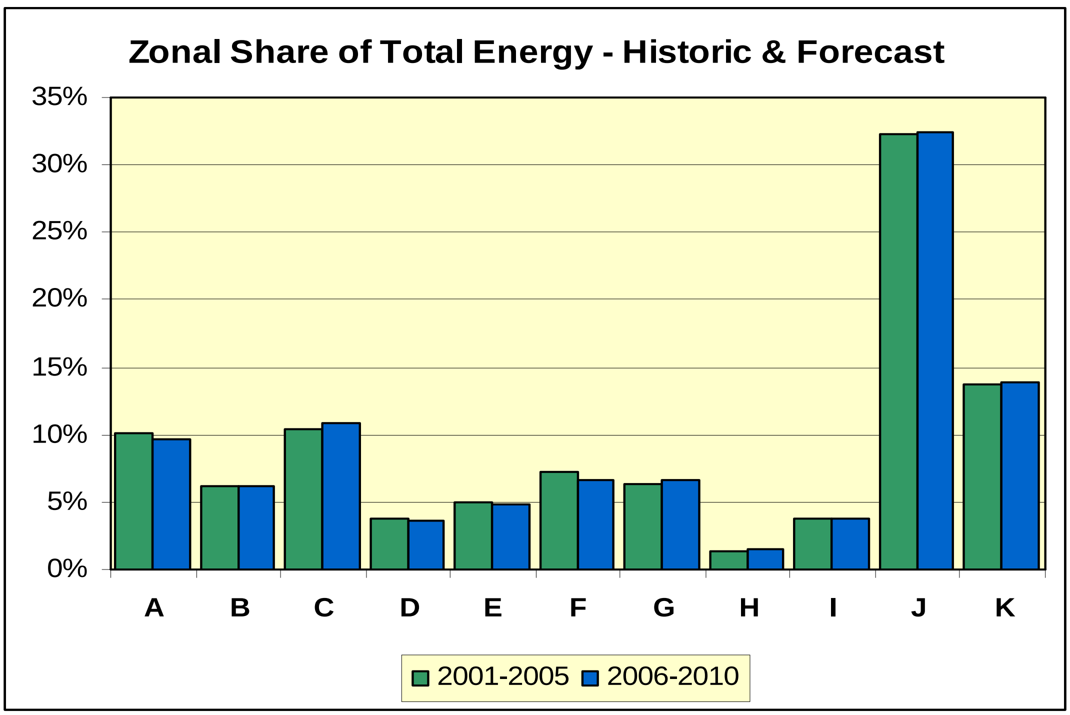

Figure 5.5: Zonal Energy Shares - Historic and Forecast

Zonal Energy Forecasts

For each zone, we produced an ensemble of forecasts driven by either a linear model, a log-log model, or a simple trend model. The forecast drivers were population, households, employment, cooling degree days and heating degree days. Each member of the ensemble was evaluated and the best forecast model chosen.

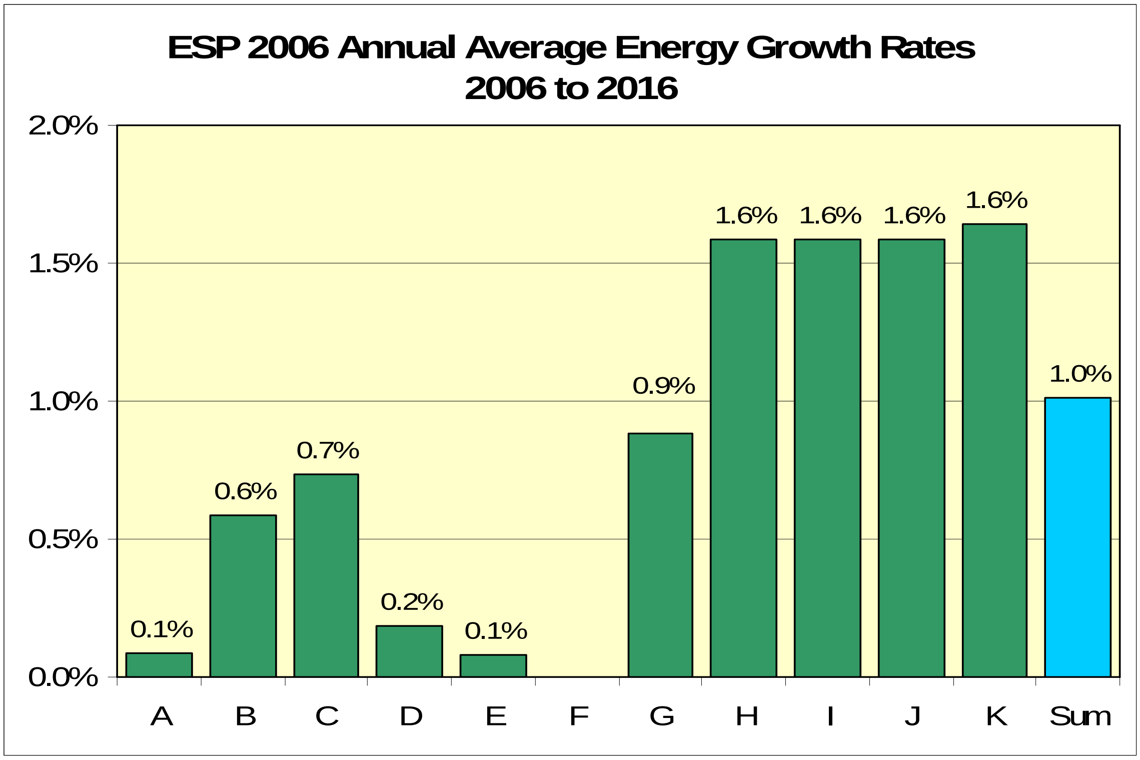

Figure 5.6: Zonal Energy Forecast Growth Rates - 2006 to 2016

Zonal Summer Coincident Peak Demand Forecasts

For each zone, we produced an ensemble of forecasts. One was based on just energy, another on energy and maximum temperature, while the third was a simple trend model. Each member of the ensemble was evaluated and the best forecast model chosen.

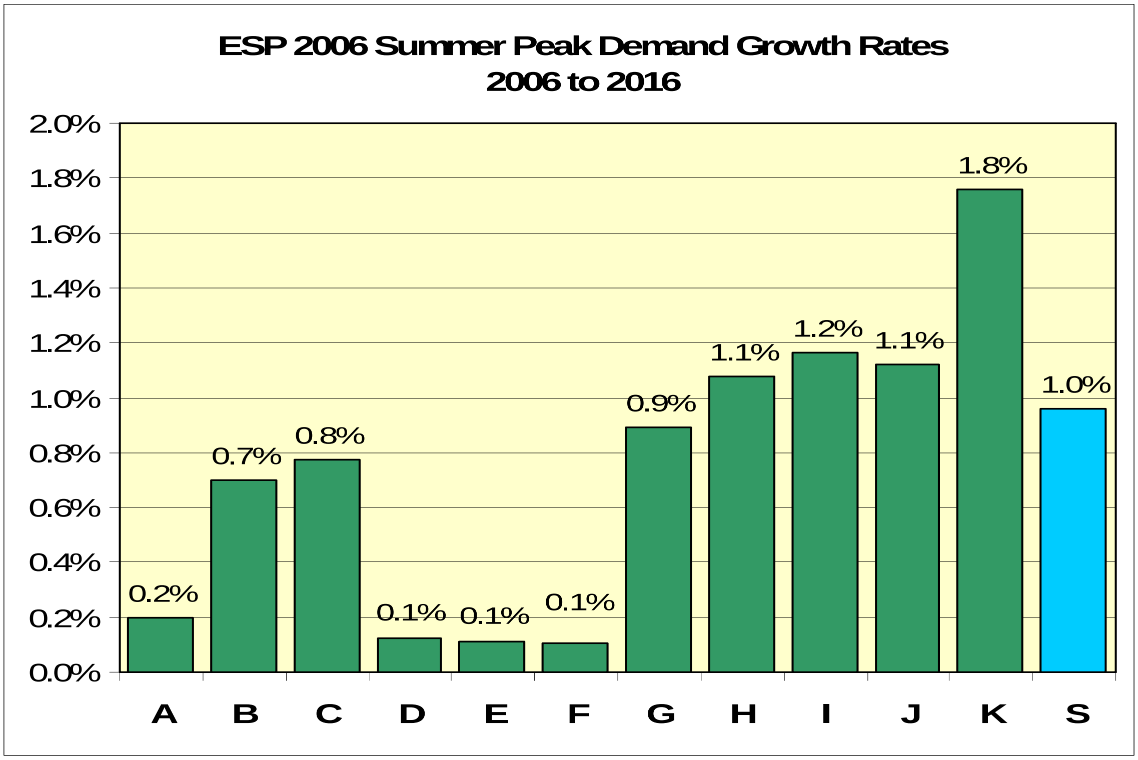

Figure 5.7: Zonal Summer Peak Demand Forecast Growth Rates - 2006 to 2016

Zonal Winter Coincident Peak Demand Forecasts

For each zone, we produced an ensemble of forecasts. One was based on just energy, another on energy and temperature, another on energy and heating degree days, and the last was a simple trend model. Each member ensemble was evaluated and the best forecast model chosen.

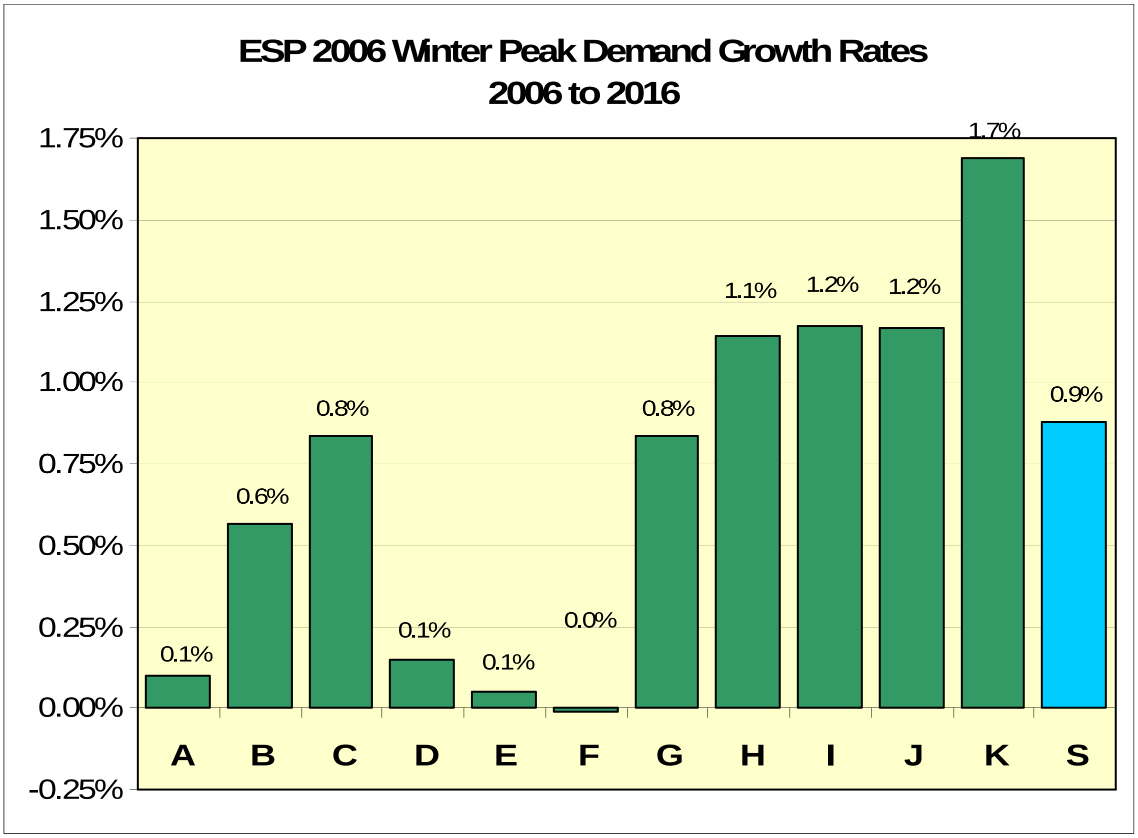

Figure 5.8: Zonal Winter Peak Demand Forecast Growth Rates - 2006 to 2016

Reconciliation of Zonal Forecasts to System Level Forecasts

The zonal forecasts are reconciled to the system forecasts by summing over the zones, finding the difference (high or low) and distributing the difference to each zonal in proportion to its share of energy or seasonal peak demand. The charts below show the results of the zonal forecasts.

Table 5.4.1: Actual and Forecast Annual Energy by Zone - GWh

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
1993	18,725	7,798	18,177	4,925	7,106	12,172	9,202	1,658	5,694	42,084	17,853	145,394
1994	18,528	7,864	17,264	4,484	7,477	12,554	9,040	1,796	5,812	43,386	18,050	146,255
1995	18,109	7,631	17,278	4,701	7,542	13,331	9,102	1,792	5,691	43,734	17,996	146,907
1996	18,383	8,003	16,541	4,670	8,437	12,819	9,032	1,820	5,514	43,853	17,931	147,003
1997	18,450	8,225	16,223	4,708	9,201	11,777	8,698	1,954	5,436	44,463	18,241	147,376
1998	18,207	8,408	14,878	5,488	9,545	11,781	8,957	1,958	5,702	46,076	18,856	149,856
1999	18,210	8,611	15,713	6,184	8,956	11,994	9,256	1,894	6,060	48,281	19,671	154,830
2000	16,785	9,635	16,182	6,527	8,182	11,398	9,270	1,942	5,929	49,183	20,072	155,105
2001	16,209	9,661	16,034	6,374	7,403	11,429	9,436	2,003	5,782	50,227	20,723	155,281
2002	16,355	9,935	16,356	6,450	7,116	11,302	9,978	2,162	5,962	51,356	21,544	158,516
2003	15,942	9,719	16,794	5,912	6,950	11,115	10,463	2,219	6,121	50,829	21,960	158,024
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	16,905	10,532	18,119	6,762	7,781	12,069	11,283	2,193	6,458	52,276	22,515	166,893
2007	17,227	10,786	18,583	6,897	7,929	12,287	11,589	2,233	6,576	53,230	22,796	170,133
2008	17,424	10,963	18,917	6,983	8,020	12,415	11,815	2,277	6,705	54,275	23,122	172,916
2009	17,419	11,015	19,034	6,989	8,017	12,399	11,906	2,315	6,817	55,179	23,544	174,634
2010	17,370	11,038	19,103	6,976	7,995	12,352	11,967	2,356	6,938	56,158	23,892	176,145
2011	17,254	11,019	19,098	6,937	7,941	12,257	11,982	2,397	7,059	57,136	24,261	177,341
2012	17,099	10,975	19,051	6,881	7,870	12,136	11,969	2,433	7,165	57,993	24,710	178,282
2013	16,982	10,955	19,043	6,841	7,816	12,041	11,983	2,470	7,272	58,863	25,036	179,302
2014	16,896	10,952	19,068	6,812	7,775	11,967	12,016	2,502	7,367	59,628	25,439	180,422
2015	17,000	11,075	19,310	6,861	7,823	12,029	12,187	2,534	7,462	60,403	25,904	182,588
2016	17,051	11,164	19,493	6,888	7,846	12,053	12,321	2,567	7,559	61,188	26,500	184,630

Table 5.4.2: Actual and Forecast Summer Coincident Peak Demand - MW

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
1993	3,203	1,438	2,768	760	1,113	2,334	1,736	353	1,086	8,602	3,528	26,921
1994	3,194	1,434	2,761	758	1,110	2,328	1,684	352	1,083	8,578	3,518	26,800
1995	2,809	1,342	2,575	662	1,216	2,340	1,684	354	1,088	9,024	3,837	26,931
1996	3,019	1,356	2,610	716	1,049	2,200	1,522	333	1,023	8,111	3,326	25,265
1997	2,837	1,529	2,718	559	1,411	2,188	1,886	349	1,198	9,596	4,205	28,476
1998	2,643	1,442	2,381	623	1,465	1,998	1,791	419	1,168	9,581	4,396	27,907
1999	2,769	1,564	2,615	669	1,273	2,169	2,027	429	1,277	10,467	4,758	30,017
2000	2,462	1,644	2,459	757	1,185	1,872	1,844	417	1,265	9,771	4,130	27,806
2001	2,519	1,889	2,719	780	1,260	2,068	2,027	537	1,347	10,602	4,900	30,648
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	2,823	1,953	2,771	805	1,310	2,257	2,247	636	1,515	11,630	5,348	33,295
2007	2,885	2,007	2,795	811	1,324	2,292	2,306	643	1,541	11,800	5,427	33,831
2008	2,929	2,048	2,822	816	1,336	2,317	2,354	652	1,566	11,970	5,504	34,314
2009	2,933	2,060	2,845	817	1,337	2,319	2,374	659	1,592	12,140	5,612	34,688
2010	2,936	2,073	2,875	819	1,340	2,322	2,394	668	1,614	12,290	5,711	35,042
2011	2,926	2,076	2,906	821	1,340	2,317	2,405	677	1,635	12,440	5,805	35,348
2012	2,906	2,072	2,932	821	1,337	2,306	2,408	685	1,652	12,570	5,904	35,593
2013	2,881	2,064	2,948	818	1,330	2,289	2,406	691	1,665	12,705	6,006	35,803
2014	2,874	2,069	2,977	819	1,330	2,285	2,419	700	1,678	12,815	6,111	36,077
2015	2,882	2,086	2,986	818	1,329	2,286	2,441	704	1,691	12,925	6,232	36,380
2016	2,880	2,094	2,993	815	1,325	2,281	2,455	708	1,701	13,003	6,368	36,623

Table 5.4.3: Actual and Forecast Winter Coincident Peak Demand

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
1993	2,726	1,205	2,863	821	1,377	2,097	1,612	364	966	6,563	3,008	23,602
1994	2,816	1,259	2,848	701	1,260	2,297	1,461	395	866	6,221	3,013	23,137
1995	2,785	1,240	2,687	680	1,259	2,012	1,452	404	836	6,766	3,041	23,162
1996	2,849	1,250	2,488	678	1,359	1,927	1,348	353	844	6,502	2,915	22,513
1997	2,752	1,289	2,337	651	1,516	1,816	1,322	401	787	6,491	2,866	22,228
1998	2,616	1,273	2,330	849	1,555	2,030	1,508	369	852	7,161	3,131	23,674
1999	2,454	1,499	2,497	870	1,443	1,906	1,505	420	976	7,072	3,177	23,819
2000	2,489	1,510	2,506	880	1,263	1,798	1,459	366	877	7,206	3,188	23,542
2001	2,248	1,455	2,340	843	1,129	1,742	1,417	344	860	7,013	3,198	22,589
2002	2,418	1,507	2,679	925	1,223	1,903	1,590	437	927	7,373	3,472	24,454
2003	2,433	1,576	2,755	857	1,344	1,944	1,720	478	981	7,527	3,647	25,262
2004	2,446	1,609	2,747	918	1,281	1,937	1,766	474	939	7,695	3,729	25,541
2005	2,450	1,544	2,700	890	1,266	1,886	1,663	515	955	7,497	3,581	24,947
2006	2,526	1,623	2,756	931	1,308	2,010	1,779	457	1052	8098	3771	26,311
2007	2,581	1,661	2,837	946	1,324	2,036	1,824	463	1069	8231	3811	26,783
2008	2,614	1,687	2,895	956	1,333	2,051	1,858	470	1087	8363	3883	27,197
2009	2,613	1,695	2,915	957	1,333	2,049	1,871	476	1104	8496	3944	27,453
2010	2,605	1,698	2,927	955	1,331	2,044	1,880	482	1115	8575	4004	27,615
2011	2,585	1,695	2,926	951	1,325	2,032	1,882	488	1128	8681	4065	27,759
2012	2,559	1,689	2,917	944	1,318	2,018	1,881	493	1140	8772	4129	27,860
2013	2,539	1,686	2,917	940	1,312	2,006	1,883	498	1151	8863	4195	27,990
2014	2,525	1,686	2,921	936	1,308	1,998	1,887	503	1162	8938	4277	28,140
2015	2,542	1,704	2,963	942	1,313	2,005	1,913	507	1171	9014	4364	28,438
2016	2,551	1,717	2,994	945	1,315	2,008	1,933	512	1182	9092	4459	28,708

7 Description of RNA study case System

The NYISO established procedures and a schedule for the collection and submission of data and the preparation of the models used in the underlying studies that were performed during the Comprehensive Reliability Planning Process (CRPP) as defined in Attachment Y of the NYISO OATT.

The NYISO's procedures were designed to allow the NYISO's planning activities associated with the CRPP to be aligned with and coordinated with the related activities of NERC, NPCC, and other regional reliability organizations. The assumptions underlying the RNA were reviewed both at TPAS and ESPWG. The RNA study case consists of the Five Year Base Case and the second five years of the Study Period. The Five Year Base Case was developed based on the 2005 Annual Transmission Reliability Assessment (ATRA) base case, input from Market Participants, and a project screening procedure.

The NYISO developed the system representation for the second five years of the Study Period starting with the First Five Year Base Case and using (1) the most recent Load and Capacity Data Report published by the NYISO on its web site; (2) the most recent versions of NYISO reliability analyses and assessments provided for or published by NERC, NPCC, NYSRC, and Neighboring Control Areas; (3) information reported by neighboring control areas such as power flow data, forecasted load, significant new or modified generation and transmission facilities, and anticipated system conditions that the NYISO determines may impact the bulk-power transmission facilities; and (4) Market Participant input. Based on this process, the network model for the second five-year period incorporates TO and neighboring system plans not incorporated in the Five Year Base Case. In addition, the changes in the MW and MVAR load model resulting from load growth are incorporated. The load model reflected the load forecast from the 2006 Load and Capacity Data Report, also known as the "Gold Book". The RNA study assumes that no additional market-based resources are added during the second five years of the Study Period.

7.1 Project Screening

NYISO RNA study case Screens

The NYISO reviewed the ATRA, the plans submitted by the TOs, and other information submitted as part of the input phase of the CRPP.

The following three categories of projects were considered for inclusion in the RNA study case:

6. All projects and plans that have completed the NYISO interconnection process (cost allocation accepted).
7. All other merchant projects and plans.
8. All projects and plans that are part of a Transmission Owner's plan.

Projects and plans falling in these categories will be included or excluded from the RNA RNA study case as follows:

A. TO projects on non-bulk power facilities;

.

B. Projects that are in service or under construction;.

C. For those projects and plans not already in-service or under construction:
   - Category 1 projects were included, and modeled at the contracted-for capacity, if they have a PSC certificate, or approval under SEQRA in a case where the PSC process is not applicable, and an executed contract with a credit worthy entity.
   - Category 2 projects were included, and modeled at the contracted-for capacity, if they have a PSC certificate (or SEQR approval) and an approved SRIS (if applicable), and an executed contract with a credit worthy entity.
   - Category 3 bulk power system projects were included if they satisfy one of the following conditions:
     1. The project is a Backstop Regulated Solution triggered in a prior year's Comprehensive Reliability Plan; or
     2. The project is related to any projects and plans that are included in the RNA study case; or
     3. The project is expected to be in service within 3 years, has an approved SRIS (if applicable), and has received PSC certification (or SEQRA approval), if required.

All other TO plans and projects on the bulk power system will be addressed in a scenario analysis. Table 6.1.1 presents the projects considered or modeled in the RNA study cases.

Table 6.1.1: Projects Considered or Modeled in the RNA study

Project	In-service Dates	MW CAP Summer	Status	ATBA	ATRA	RNA 2007	RNA 2008	RNA 2009	RNA 2010	RNA 2011
I. Generation Included in ATRA										
A. Additions										
SCS Energy-Astoria Energy	I/S	500	I/S	X	X	X	X	X	X	X
SCS Energy-Astoria Energy	2007/Q2	500		X	X					
NYC Energy-Kent Ave	2007/06	79.9		X	X	X	X	X	X	X
LMA-Lockport II	2007/Q2	79.9		X	X					
Calpine-JFK Expansion	2006/06	45		X	X	X	X	X	X	X
Entergy-Indian Point 2 Uprate	I/S	1078	I/S	X	X	X	X	X	X	X
Entergy-Indian Point 3 Uprate	I/S	1080	I/S	X	X	X	X	X	X	X
Besicorp-Empire State Newsprint	2007/Q2	603		X	X					
Flat Rock Windpower	I/S	198	I/S	X	X	X	X	X	X	X
Flat Rock Windpower	2006/12	123.75		X	X			X	X	X
Global Winds-Prattsburgh	2006/10	75		X	X	X	X	X	X	X
ECOGEN-Prattsburgh Wind Farm	2006/07	79		X	X	X	X	X	X	X
Constellation-Ginna Plant Uprate	2006/11	610		X	X	X	X	X	X	X
KeySpan Spagnoli Road	2008/2009	250			X					
Fortistar VP	2007/Q2	79.9			X					
Fortistar VAN	2007/Q2	79.9			X					
PSEG Cross Hudson Project	2008	550			X					
TransGas Energy	2008/2009	1100			X					
Caithness Bellport	2009/Q2	326			X			X	X	X
East Coast Power--Linden VFT Inter-Tie	2007/Q1	300			X					
Airtricity-Munnsville	2007/09	40			X					
UPC Wind-Canandaigua Wind Farm	2006/10	81			X					
Invenergy Wind-High Sheldon Windfarm	2006/08	129			X					
NY Windpower-West Hill Windfarm	2007/F	40			X					
Atlantic Renewable-Fairfield Wind Project	2006/09	120			X					
AES-EHN NY Windpower-Marble River Windfarm	2006/09	84			X					
Clinton County Wind Farm	2007/12	134			X					
Noble-Clinton Windfield	2006/10	80			X					
Noble-Bliss Windfield	2006/10	71			X					
Noble-Altona Windfield	2006/10	99			X					
Noble-Ellenburg Windfield	2006/10	79.5			X					
NYPA-Blenheim Gilboa Storage	2010	120			X					
Community Energy-Jordanville Wind	2007/10	150			X					

Table 6.1.1 Continued

Project	In-service Dates		Status	ATBA	ATRA	RNA				
						2007	2008	2009	2010	2011
II. Transmission Projects in ATRA		**Miles**								
AE Neptune PJM –LI DC Line (660 MW)	2007	65.00	UC	X	X	X	X	X	X	X
LIPA-Duffy Convrtr Sta-Newbridge Rd. 345kV	2007/S	1.70	UC	X	X		X	X	X	X
LIPA-Newbridge Rd. 345kV-138kV (2-Xfmrs)	2007/S	N/A	UC	X	X		X	X	X	X
LIPA-E. Garden City-Newbridge Rd. 138kV	2007/S	4.00	UC	X	X		X	X	X	X
LIPA-Ruland Rd.-Newbridge Rd. 138kV	2007/S	9.10	UC	X	X		X	X	X	X
LIPA-Northprt-Norwalk Hrbr. 138kV Replcmnt(2)	2008/S	11.00		X	X		X	X	X	X
LIPA-Riverhead-Canal 138 kV (ckt #2)	2008/S	16.40		X	X		X	X	X	X
LIPA-Great Neck-Shore Rd 138 kV (ckt #1)	2009/S	5.30		X	X					
LIPA-Great Neck-Lake Success 69kV (ckt #1) conversion to 138 kV	2009/S	-		X	X					
Rochester Transmission-Sta. 80 & various	2007/12	N/A	UC	X	X	X	X	X	X	X
ConEd-Mott Havn-Dunwoodie 345kV Reconfig.(2)	2007/S	9.99	UC	X	X	X	X	X	X	X
ConEd-Mott Havn-Rainey 345kV Reconfig. (2)	2007/S	4.08	UC	X	X	X	X	X	X	X
ConEd-Sherman Crk 345kV-138kV (2-Xfmrs)	2007/S	N/A	UC	X	X			X	X	X
ConEd-Sprn Brk-Sherman Crk 345kV (M29)	2007/S	10.00	UC	X	X			X	X	X
O&R-Ramapo-Tallman 138kV Reconfig.	I/S	3.24	I/S	X	X	X	X	X	X	X
O&R-Tallman-Burns 138kV	2007/S	6.08	UC	X	X	X	X	X	X	X
O & R Ramapo-Sugarloaf 138 kV 2nd Line	2009/S	16.71		X	X			X	X	X
O & R Shoemaker 138-69 kV Transformer	2009/S	N/A		X	X			X	X	X
CHG&E-East Fishkill 345/115 kV Xfmr	2007/S	N/A		X	X	X	X	X	X	X
CHG&E-East Fishkill-Wiccopee 115 kV	2009/S	3.32		X	X			X	X	X
Besicorp-Reynolds Rd. 345kV	2007/S	9.00		X	X					
PSEG-Bergen-W. 49th St. 345 kV Cable	2008	7.5			X					
Spagnoli Rd-Ruland Road	2008/S	1.0			X					
Fairfield windfarm to Fairfield 115 kV sub- 115 kV line	2006/09	5.5			X					

Table 6.1.1 Continued

III. Prior CRPP Solutions and Plans						
A. Capacity Additions		**MWs**				
DSM: LIPA Edge & Peak Reduction	2006	111				
DSM: NYSERDA	2009	90				
DSM: Con Ed Targeted	2009	30				
DSM: NYISO	2009	15				
DSM: NYSERDA	2010	135				
DSM: Con Ed Targeted	2010	45				
DSM: NYISO	2010	25				
B. Transmission Additions						
O&R CapacitorBanks	2006	64 MVAr				
LIPA Capacitor Banks	2006	133 MVAr				
O&R CapacitorBanks	2007	48 MVAr				
LIPA Capacitor Banks	2007	357 MVAr				
LIPA Other Reactive Resources	2007	75 MVAr				
LIPA Capacitor Banks	2008	39 MVAr				
O&R CapacitorBanks	2009	64 MVAr				
LIPA Capacitor Banks	2009	39 MVAr				
LIPA Other Reactive Resources	2009	17 MVAr				
LIPA Capacitor Banks	2010	39 MVAr				

IV. Additional TO Plans		**Miles/Capability**				
O & R Capacitor Banks	2008	112 MVAr				
O & R Capacitor Banks	2009	64 MVAr				
O & R Capacitor Banks	2010	64 MVAr				

<u>Notes</u>
UC: Under construction
I/S: In-Service

7.1.1 RNA study case Load & Resource Summary

The table 6.2.1 below presents a load and resource summary for the RNA study case for 2007 through 2016. The summary is consistent with the load and capacity table contained in the "2006 Load and Capacity Data" book or "Gold Book" except that it includes the Long Island HVDC ties to neighboring control areas as unforced delivery rights or UDRs, which are counted as resources in determining reserve margins and resource to zonal load ratios.

Table 6.2.1: RNA study case Load and Resource Summary for the NYCA, Zones J and K

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Peak Load										
NYCA	33,831	34,314	34,688	35,042	35,348	35,593	35,803	36,077	36,380	36,623
Zone J	11,800	11,970	12,140	12,290	12,440	12,570	12,705	12,815	12,925	13,003
Zone k	5,549	5,628	5,738	5,840	5,936	6,037	6,141	6,249	6,372	6,511
Resources										
NYCA										
"-Capacity"	38,894	38,496	38,057	38,057	38,057	38,057	38,057	38,057	38,057	38,057
"-SCR"	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080
"-UDR"	990	990	990	990	990	990	990	990	990	990
Total	40,964	40,566	40,127	40,127	40,127	40,127	40,127	40,127	40,127	40,127
Zone J										
"-Capacity"	9,996	9,996	9,108	9,108	9,108	9,108	9,108	9,108	9,108	9,108
"-SCR"	325	325	325	325	325	325	325	325	325	325
"-UDR"	0	0	0	0	0	0	0	0	0	0
Total	10,321	10,321	9,433	9,433	9,433	9,433	9,433	9,433	9,433	9,433
Zone K										
"-Capacity"	5,291	5,291	5,741	5,741	5,741	5,741	5,741	5,741	5,741	5,741
"-SCR"	150	150	150	150	150	150	150	150	150	150
"-UDR"	990	990	990	990	990	990	990	990	990	990
Total	6,431	6,431	6,881	6,881	6,881	6,881	6,881	6,881	6,881	6,881
NYCA Resource Margin % (1)	121.1%	118.2%	115.7%	114.5%	113.5%	112.7%	112.1%	111.2%	110.3%	109.6%
Resource Margin w/o UDR	118.2%	115.3%	112.8%	111.7%	110.7%	110.0%	109.3%	108.5%	107.6%	106.9%
Zons J Res/Load/ Ratio	87.5%	86.2%	77.7%	76.8%	75.8%	75.0%	74.2%	73.6%	73.0%	72.5%
Zons K Res/Load Ratio	115.9%	114.3%	119.9%	117.8%	115.9%	114.0%	112.1%	110.1%	108.0%	105.7%

Note (1): NYCA Resource Margin only Includes resources internal NY and does not include external resources of 2755 MW that have historically participated in the NYCA installed capacity market.

The table shows a steady decline in the NYCA reserve margin from 121.1% in 2007 to 109.6% by the end of the planning period. Likewise, the Zone J resource to load ratio declines throughout the planning horizon from 87.5% to 72.5%, while Zone K peaks at 119.9% with the addition of the Neptune project in 2007 but declines to 105.7% by the end of the planning horizon.

8 Analysis Methodology

The CRPP was performed in three stages, an Input Stage, an Analysis Stage, and a Review Stage. During the Input Stage information was gathered from various Stakeholder Groups, Neighboring Control Areas, existing reliability assessments, and NYISO publications and reports. Results from the Input Stage regarding methodology, identification of scenario drivers, and initial identification of scenarios were presented to ESPWG and TPAS. The findings from the Input Stage are summarized in the next three sections, which follow the same outline as the initial presentation of the Input Stage. These findings reflect the fact that, based on intermediate results in the Analysis Stage, modifications to the Input Stage were made as appropriate.

For the RNA study case System, reliability simulations were performed for each year from 2007 to 2016. Load and generation projections were determined from the 2006 NYISO Load & Capacity Report. The reliability simulation started from the latest Installed Reserve Margin (IRM) study and was updated as described in Section 11.1.4.2. NYISO Voltage and thermal emergency transfer limit analysis was performed to determine transfer limits used in the MARS transmission constraints model.

Short circuit analysis was performed to ensure that potential increases in future fault currents would not exceed available circuit breaker interruption capabilities.

8.1 Transmission System Screening Analysis

A comprehensive transmission reliability analysis would include steady-state voltage, thermal, and transfer limit analysis, as well as first-swing stability and short circuit analyses at a minimum. It could also include steady-state or dynamic voltage stability analysis, three-phase cycle-by-cycle electro-magnetic transients (EMT) analysis to investigate power quality, control and/or machine torsional interactions, as well as longer time-frame analyses of second-to-second voltage and frequency regulation. Many of these analyses (e.g., fundamental frequency steady-state, dynamic and short circuit analyses) may be performed annually to ensure a reliable transmission system. Others (e.g., sub-synchronous resonance analysis) may be performed only for specific situations (e.g., addition of significant series compensation to a radial transmission line connecting a large thermal plant to the rest of the power system).

Similarly, some analyses are more likely to uncover significant transmission constraints than others. For instance, a steady-state thermal or transfer limit analysis could identify the need for additional transmission lines between different regions of the state, while a first-swing stability analysis could identify the need for faster relaying on an existing transmission line. In general, additional transmission lines are capital intensive, require a longer construction time, and cross multiple administrative districts with each requiring its own permits. By contrast, a relay upgrade is frequently located at a single existing substation and can be installed relatively quickly and inexpensively. Therefore, any evaluation of the transmission reliability of an uncertain future system should focus on those analyses most likely to uncover significant problems.

Such a screening level evaluation should focus first on steady-state thermal and voltage analyses. Stability and short circuit analyses can be deferred until the future system configuration is more certain. Specialty EMT and other analysis can be ignored until required of individual developers or manufacturers for particular projects. A detailed description of this type of screening level analysis is contained in the following sections.

Objective

The objective of the screening analysis was to determine the emergency thermal and voltage transfer limitations of the RNA study case systems. These transfer limits were used in the MARS program to identify the reliability needs of the proposed RNA study case Systems.

8.1.1 RNA study case System Case Development

The power flow cases were developed to represent the RNA study case System assumptions for transmission system upgrades, generation additions and/or retirements, and load levels for each year from 2007 to 2016. Available generation was dispatched to mitigate any pre-contingency thermal, voltage, and/or interface transfer violations. For the cases where there was insufficient generation to achieve a power flow solution, the reactive power load was reduced in the Area of the voltage violations or power flow solution bus mismatch. Any remaining pre-contingency violations were flagged as potential components of a required transmission system upgrade to a particular region or corridor.

8.1.2 Emergency Thermal Transfer Analysis

Emergency thermal transfer analysis was performed using the Transfer Limit Table Generator (TLTG) linear power flow analysis software for the following transmission interfaces:

- Dysinger East Open
- West Central Open
- Moses South
- Volney East
- Total East
- Central East
- Central East + Fraser-Gilboa
- Central East Group
- F to G
- UPNY-SENY
- UPNY-ConEd
- Millwood South Closed
- Dunwoodie South (Planning Definition)
- Dunwoodie South (Operating Definition)
- I to J
- LIPA Imports

The monitored line, contingency data, and subsystem definitions was based on the thermal analysis data used in the Summer Operating Study and modified for the transmission configurations changes and study period. The transmission interface definitions are included in Appendix 5.1.

8.1.3 Voltage Transfer Limit Analysis

Emergency voltage and voltage collapse analysis was performed using the VCAP analysis software for the transmission interfaces identified in 7.1.2.

In order to determine transfer limits, it was necessary to increase the power flow across the interface(s) under study by adjusting generation on the system. The assumed location for adjusting generation for evaluating transfer limits was similar to the study assumptions for the 2006 ATRA.

8.1.4 Evaluation of Analytical Results

The results of the analysis described in 7.1.2 and 7.1.3 were evaluated to develop the transmission constraint model used in the MARS analysis.

8.1.5 Scenario Database Development

The RNA study case System power flow was modified to represent the scenario case assumptions for transmission system upgrades, generation additions and/or retirements, and load levels. The resulting power flows were reviewed to identify any pre-contingency thermal, voltage, and/or interface transfer violations. Available generation was dispatched to mitigate any pre-contingency thermal, voltage, and/or interface transfer violations. For the cases where there was insufficient generation to achieve a power flow solution, the reactive power load in the area of the voltage violations or power flow solution bus mismatch was reduced. Any remaining pre-contingency violations were flagged as potential components of a required transmission system upgrade to a particular region or corridor.

8.2 Resource Adequacy Analysis

Introduction

This task focused on evaluating the adequacy of the NYCA transmission system as it affects the generation system reliability and the determination of the state-wide installed reserve requirements. NYSRC Reliability Rule AR-1 states that the state-wide installed reserve requirements will provide that "Adequate resource capacity shall exist in the NYCA such that, after due allowance for scheduled outages and deratings, forced outages and deratings, assistance from neighboring systems, NYS Transmission System transfer capability, uncertainty of load forecasts, and capacity and/or load relief from available operating procedures, the probability of disconnecting firm load due to a resource deficiency will be, on the average, no more than once in ten years." (NYSRC Reliability Rules Manual (www.nysrc.org/documents.html)). This requirement is often stated in terms of maintaining an LOLE of 0.1 days per year.

MARS

The primary tool used for the performance of the resource adequacy analysis was GE's MARS program. MARS uses a Monte Carlo simulation to compute the reliability of a generation system comprised of any number of interconnected areas or zones. MARS is able to reflect in its reliability calculations each of the factors listed in NYSRC Reliability Rule AR-1, including the impacts of the transfer capability of the transmission system.

Data

A RNA study case System was developed that modeled the existing system including the generation and transmission system additions and upgrades that are projected to occur throughout the Study Period as well as unit retirements. Because emergency assistance from neighboring systems contributes to the reliability of the NYCA system, the load and generation of the neighboring systems was modeled. The source for the data on the existing system was the MARS database maintained by NYISO staff for use in determining the annual installed reserve requirements. The load and generation was updated through the Study Period based on data from the 2006 NYISO Load & Capacity Data report. Similar reports for the neighboring systems were referenced for updating the data in those regions.

Methodology

The first step in the analysis was to calculate the NYCA LOLE for the RNA study case assuming no transmission system transfer limitations within the NYCA system. This analysis indicated whether the installed generation is sufficient to satisfy the load demand.

The NYCA LOLE was then computed including the effects of the internal transfer limitations. This will indicate whether the NYCA transmission system was adequate to deliver the generation to the load.

If the system failed to meet the LOLE criterion of 0.1 days per year, additional combined cycle generation units with 250 MW capacities were added until the LOLE criterion was satisfied.

Underground cables generally have much longer repair times than overhead lines. Because of the potential impact of these extended cable outages on transfer capability, interfaces that include transmission circuits that are comprised of cables were modeled in the MARS simulation with discrete transition rates, based on historic forced outage rates. This captures the effect of reduced transfer capability across such interfaces when the cables are modeled as out-of -service.

8.3 Short Circuit Analysis

A fault duty study was performed using ASPEN OneLiner (Advanced Systems for Power Engineering) to determine the impact of the 2016 maximum generation scenario on local circuit breakers. Additional analyses of other generation scenarios were not necessary because excessive short circuit currents were only analyzed for the maximum generation scenario. The NYISO "Guideline for Fault Current Assessment" was used. Three-phase, single-phase and line-line-ground short-circuit currents were determined for the same substations as in the 2006 ATRA. A screening was performed to identify significant changes in fault levels.

9 System Planning Issues

9.1 Introduction

There are many issues that could impact the RNA study case assumptions over the 10-year study period. These issues could have positive or negative impacts on the existing NY power system. Below is a description of the many issues that NYISO has identified as potential impact on the RNA study case assumptions. These issues are reviewed not only for the development of future alternative scenarios but also as issues that need to be monitored on an ongoing basis for consideration in the next cycle of the CRPP.

9.2 Issues

Wind/Renewable Additions

Renewable Portfolio Standards (RPS) are state standards that establish requirements that a specific percent of the total retail electric energy consumption for the state be supplied each year by renewable forms of energy. New York has adopted a standard which requires that 25% of the State's energy requirements come from eligible renewable resources by 2013. The current, level which includes the State's hydroelectric resources, is 19.5%.

It is expected the majority of the additional requirement will be supplied by wind generators. The NYISO interconnection queue includes proposals for wind generation that now total in excess of 5,000 MW. Wind generators are intermittent resources and have unique electrical characteristics that pose challenges for planning and operations of the interconnected system. The NYISO has completed a study conducted with GE Energy which evaluated the reliability and operating implications of the large scale integration of wind generation. The study concluded that if state-of-the-art wind technology is utilized, wind generation can reliably interconnect with only minor adjustments to existing planning, operating, and reliability practices.

Environmental Compliance

There are a host of new air quality and water quality rules that will apply to power plants in New York State from the present to within the next decade. These initiatives could have a significant future impact on resource availability and, thus, the reliability of the interconnected system. These initiatives include the following:

1. NYS Acid Deposition Reduction Program (ADRP): ADRP, which is a New York-only power plant cap-and-trade program for nitrogen oxides (NOx) and sulfur dioxide (SO2), began October 1, 2004 for NOx and January 1, 2005, for SO2. The regulations require an approximate 40 percent reduction in NOx emissions from 2002 levels and a 50 percent reduction in SO2 emissions from current federal acid rain program levels.
2. Clean Water Act (CWA) Section 316(b) – Cooling Water Intake Structure Best Technology Available (BTA): This rule primarily applies to existing power plants (fossil fuel and nuclear) that rely on once-through cooling for steam condensers (about 20 plants in New York). The United States Environmental Protection Agency (EPA) had promulgated its 2004 final Phase II existing cooling water intake structures rule ("Phase II Rule"), which would have been

implemented by NYSDEC through their own rules and permitting actions. However, on January 25, 2007, the United States Court of Appeals for the Second Circuit issued its decision in Riverkeeper, Inc. v. EPA regarding the Phase II Rule EPA promulgated pursuant to section 316(b) of the Clean Water Act. The court remanded back to EPA for consideration many of the substantive parts of the rule. As such, compliance with 316(b) rules at this time appears to fall back on state rules pending further action on its Phase II Rule by the EPA. Though it would have been allowed by the EPA rule, the New York State Department of Environmental Conservation (NYSDEC) has indicated that they will not consider economic viability in the determination of BTA. This policy could force existing power plants to install cooling towers or retire.

3. New Source Review (NSR): NSR regulations require existing facilities that undergo a major modification to install modern air emission control equipment for air contaminants impacted by the modification. In the late 1990s, the EPA and the NYSDEC began enforcement actions against the coal-fired power plants in New York and several other states for allegedly violating NSR requirements. The basis for the enforcement actions was the interpretation of what constitutes routine maintenance, repair and replacement, which is exempt from the definition of major modification. Several companies have agreed to settle the enforcement actions. In New York, the settlements include power plants owned by Mirant, AES and NRG and have resulted in the commitment to install millions of dollars in emission controls or retirement of certain units. Enforcement actions are still outstanding for RG&E and Dynegy.
4. Clean Air Interstate Rules (CAIR): On March 10, 2005, EPA finalized new cap-and- trade programs for reducing emissions of SO2 and NOx by approximately 70 percent in 28 eastern states. Implementation of the rules will be in two phases. Phase I for NOx begins in 2009 and Phase II begins in 2015. Phase I for SO2 begins in 2010 and Phase II begins in 2015.
5. Clean Air Mercury Rule: On March 15, 2005, EPA finalized a rule for controlling mercury emissions from power plants through a new cap-and-trade program for mercury emissions. Although, EPA implements the cap by setting a mercury budget for each state, it is left up to each state to determine how they will meet that budget. NYSDEC has promulgated Part 246 with accelerated compliance dates and restrictions on trading. Phase I covers 2010 through 2014 with limits comparable to the Federal Rule. Phase II begins in 2015 and calls for the development of unit specific limits which will result in reductions of approximately 90%.
6. Regional Greenhouse Gas Initiative (RGGI): RGGI is a cooperative effort by seven Northeastern and Mid-Atlantic states which is designed to reduce carbon dioxide emissions through a regional cap-and-trade program. NYSDEC has issued a preproposal for public comment. The preproposal proposes to generally apply the regional model rule that calls for a cap of 64.3 million tons for New York State beginning in 2009. Under the preproposal, beginning in 2015, the cap would be reduced 2.5% annually for four years for a total reduction of 10%. NYSDEC has sought comment on a proposal to apply a

100% auction structure with all proceeds dedicated to energy efficiency and related initiatives. As proposed, generators would need to procure allowances equal to their annual emissions of CO_2. Offsets are proposed to be allowed but in a very limited fashion. Auction rules remain to be developed beginning in 2007.

7. Regional Haze Rule: To reduce haze in national parks and wilderness areas, EPA issued a regional haze rule requiring Best Available Retrofit Technology (BART) on certain facilities built between 1962 and 1977 that have the potential to emit more than 250 tons a year of visibility-impairing pollution (i.e., SO_2, NO_x and fine particulate matter). Those facilities fall into 26 categories, including fossil fuel-fired power plants. This rule could affect 13 New York power plants and could result in the addition of BART controls by 2013. The Regional Haze Rule will be implemented through a New York State implementation plan, which will not be submitted until 2007. Potential BART controls include SO_2 scrubbers, selective catalytic reduction of NO_x, and fabric filter particulate controls.

8. Part 222 Distributed Generation Sources. NYSDEC is drafting regulations that will limit the amount of distributed generation can that can be used in the NYISO's Special Case Resource (SCR) program and Emergency Demand Response Program (EDRP). This air emission program is a necessary component of New York's federally-approved State Implementation Plan (SIP) to achieve compliance with National Ambient Air Quality Standards (NAAQS) for ozone. The program will limit the amount of distributed generation that is not otherwise regulated, to 271.9 MW in the New York City Metropolitan Area (NYCMA) and 111.4 MW in the rest of New York State in 2007. The limits will be reduced over time to 50 MW in NYCMA and 50 MW in the rest of the State. The use of this resource will be limited to 30 hours/year and emission limits will be imposed.

9. Ozone Transport Commission OTC is evaluating what additional measures are needed to bring the region into attainment with National Ambient Air Quality Standards. If promulgated, such additional reductions would likely be required as early as the 2009 ozone season. Existing regulations and regulations that are scheduled to be implemented (e.g., CAIR) may not be deemed to be sufficient to achieve standards, especially for ozone. The following two OTC initiatives are under consideration with decisions anticipated at a March 2, 2007 OTC meeting:

   - CAIR Plus: OTC is evaluating additional NO_x and SO_2 reductions from existing generators beyond the CAIR requirements. While there have been a number of stakeholders meetings on this topic, none have been held for quite a few months. There is currently no communication as to what, if any, additional reductions will be required or how reductions that are determined to be needed will be implemented.

   - High Electric Demand Day (HEDD): A focus of the OTC has been NO_x emissions from uncontrolled peaking units during ozone episodes. There is a potential for a change to require approximately 25% reductions of NOx emissions from these units during ozone episodes.

Although there are a significant number of initiatives underway, the ultimate disposition and impact of which have yet to be determined, the NYISO's primary concern at this point is that impacts on electric system supply resources be determined with sufficient lead time that any adverse impact on system reliability can be mitigated within the NYISO's Comprehensive Reliability Planning Process. The NYISO will continue to monitor these issues for consideration in future cycles of the CRPP.

Generation Expansion

Approximately 9,500 MW of new generation has been proposed in New York State. The current economic climate across the country has caused a significant number of projects to be canceled or delayed. The same phenomena could occur in New York State. Cancellations or delays in load pockets, such as New York City, would require generation from other areas to help meet demand. This would cause heavier loading on the existing transmission system interfaces to New York City.

Retirement of Existing Generation

Competition from new, more efficient combined cycle plants, environmental regulations, and potential revenue shortfalls caused by the expiration of existing Power Purchase Agreements potentially could lead to the retirement of additional generating units. The loss of generation due to retirements in transmission-constrained areas would require the addition of transmission facilities or new generation within the area. Such additions would avoid more loading on the existing transmission system to meet demand in areas that experience retirements.

Regulatory issues could also lead to potential retirements. For example, the Indian Point Nuclear Power Plant's proximity to population centers has created pressure for the plant to be shut down. This plant is essential to New York City and the Lower Hudson Valley to meet electricity needs. Additional generation could be needed to replace this generation capacity to fill a potential void if the retirement occurred. Depending on its location, the replacement generation could change the loading on the existing transmission system, and could give rise to the need for transmission system upgrades.

Transmission Owner Plans

Transmission Owners in New York State could build new interconnections with neighboring systems. This would increase the import capability into New York State and allow more power to flow, and hence increase loading on the existing transmission system within New York. For example, the New York Power Authority recently announced plans to interconnect a new cable beneath the Hudson River between Northern New Jersey and the West 49th Street substation to deliver an additional 500 MW of capacity into New York City.

Fuel Availability/Diversity

There is a potential for a natural gas shortage in New York State. If this occurs, it could result in natural gas fired units having to burn other fuels or to curtail operation. If generator curtailments due to fuel unavailability occur in load pockets, generation from other areas would be needed to help meet demand, causing heavier loading on the existing transmission system. Many of the dual-fuel fired units are larger, older steam units located in load pockets and their retirement could impact reliability needs. The NYSRC's Minimum Oil Burn requirements in New York City and on Long Island should not be misconstrued as preventing natural gas shortages. Instead, the requirements are a mechanism to guard against the adverse effects to bulk power system reliability resulting from significant generation loss caused by a major gas transmission infrastructure failure on high electric load days. Assuming the continued availability of dual-fuel capability, the rules have the effect of lowering demands on the gas transmission system on days when local generation is particularly needed. Another challenge in the future will be to maintain the benefits that fuel diversity, in particular dual fuel capability, provides today. This will be more important in New York City and Long Island which are more dependent on oil and gas fired units, many of which have interruptible gas supply contracts.

An analysis of gas consumption for electric generation was conducted and reported in conjunction with the development of the RGGI. The analysis compares projections for gas consumption for electric generation under a reference case, without RGGI, and a case with RGGI. The analysis did not examine gas deliverability issues. Rather it, made the assumption that additional pipeline capacity would be added when economically warranted, and further that gas supply would be available in sufficient quantities throughout the planning horizon. The analysis examined the additional gas requirements and compared them to the historical maximum delivered gas quantities for the RGGI States. The study determined that significant increases in gas deliverability are required with and without RGGI. Questions of gas deliverability, its impact on electric system reliability, and the feasibility of environmental strategies need to be examined on an ongoing basis.

Recent events in the gas transmission capacity market indicate that new resources may be built when the market needs them. Examples of this phenomenon include: (1) the new Iroquois pipeline that connected to Con Edison's Bronx gate station and was placed in service in 2004, bringing additional supplies of natural gas to New York City; (2) the Millennium Pipeline, which will add new supplies to New York State and more specifically the New York City metropolitan area, received its FERC certificate to build in January 2007, has a projected in service date of Winter 2008-2009; and has firm customer commitments, and, (3) Transco's "Leidy-to-Long Island" project, which received its FERC approval to build in May 2006, and will bring additional supplies to Long Island when it is placed in service in Winter 2007-2008.

Impact of New Technologies

Many new technologies that are applicable to electricity generation and transmission are under research and development. Some examples are Carbon Filament Transmission Lines, distributed generation and new energy management systems. Carbon filament lines would allow transmission lines to operate with higher temperatures thus, increasing their loading capacity. Distributed generation would allow electricity generation at the location of growing loads. Finally, new energy management systems could reduce on-peak demand. New technologies such as these could help to alleviate loading on the existing transmission system.

Load Forecast Uncertainty

There is considerable uncertainty associated with any load forecast. Many events can cause actual loads to deviate from forecasted values. The existing transmission system may or may not benefit from a load forecast swing. Lower than forecasted load would cause less loading on the transmission system and reduce or delay identified needs. Higher than forecasted loads would likely result in more severe thermal and voltage criteria violations occurring earlier.

Neighboring System Plans

Neighboring systems could upgrade current transmission interconnections or build new interconnections into New York. These changes would cause more power to flow into New York. This additional power flow from neighboring regions could change the loading patterns on the existing transmission system within New York.

10 Scenario Definition

Following analysis of the RNA study case, test cases which combined variations in installed generation, load forecasts, transmission system transfer capabilities, and available assistance from neighboring systems were simulated to determine their impact on the reliability of the NYCA system, and hence the adequacy of the bulk power system.

Scenarios for consideration in this study include:

1. High load growth forecast.
2. Retirement of Older Coal Plants.
   a. All coal units in NY retire except Cayuga and Somerset remain in service. This results in a reduction of 1545 MW of summer capacity.
   b. 490 MW of coal units in Southeast NY retire in 2009.
   c. 681 MW of coal units in Upstate NY retire in 2009.
3. Changing Resource Mix.
   a. Poletti 1 Retirement Deferred to 2010.
   b. NUG retirement based upon contract termination dates.
   c. NYPA transmission project together with 500 MWs of capacity at West 49th Street.
   d. NYPA 680 MW Clean Coal Project.

Issues not specifically covered by the above scenarios include:

1. Wind/Renewable Additions – this issue has been covered in separate studies.
2. Infrastructure Aging – assumed to have no effect over the study period.
3. New Technologies – insufficiently defined to include as any different identifiable impact.
4. Neighboring System Plans – not assumed to change, but may merit additional investigation if dependence on external support is shown to increase significantly under any of the scenarios.
5. Demand response systems – effectively decreases load and would likely be accompanied by some form of generation reduction. Such changes could result in a variation in either upstate or downstate, generation reduction scenarios.

11 Transmission System Assessment

A key element underlying the determination of reliability needs is an assessment to determine if the transmission system meets reliability criteria, and to establish the transfer limits to be used in the Multi-Area Reliability Simulation (MARS) model. This assessment is conducted through a series of power flow, stability and short circuit studies.

In general, the RNA analyses indicated that the bulk power transmission system can be secured, but that transfer limits for certain key interfaces must be reduced in order to respect voltage collapse criteria. However, a reduction in transfer limits or a limiting interface can result in higher LOLE findings and/or needs occurring earlier than they otherwise would. As a result, LOLE analysis was conducted for the RNA study case, a case with thermal limits, and finally a case with no internal NYCA transmission limits. These cases were conducted to demonstrate the impact that transmission limits have on the LOLE results.

11.1 Development of RNA study case System Cases

Table 10.1.1 below summarizes the Area load plus losses.

Table 10.1.1: Area Load plus Losses (MW)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
LOAD+LOSS MW										
WEST	2909	2966	2982	2983	2990	2952	2928	2921	2929	2927
GENESSEE	2031	2078	2097	2110	2122	2104	2096	2103	2118	2125
CENTRAL	2959	3017	3054	3087	3128	3153	3171	3200	3208	3213
NORTH	806	809	810	811	830	822	819	820	819	815
MOHAWK	1286	1316	1333	1336	1314	1341	1338	1339	1336	1330
CAPITAL	2278	2320	2327	2330	2361	2313	2297	2294	2293	2288
HUDSON	2389	2450	2482	2504	2509	2513	2514	2526	2549	2562
MILLWOOD	733	749	757	761	765	761	763	768	771	777
DUNWOODIE	1537	1518	1544	1567	1587	1590	1603	1615	1623	1637
NYC	11801	11811	11972	12136	12274	12422	12557	12665	12770	12889
LISLAND	5425	5539	5641	5741	5870	5922	6028	6134	6258	6397
	34154	34575	35000	35364	35751	35894	36113	36384	36675	36959

Table 10.1.2 below summarizes the Area generation dispatched for the RNA study case system.

Table 10.1.2: Generation Dispatched (MW)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
GEN DISP MW										
WEST	4659	4900	5287	5296	5274	5236	5212	5204	5212	5210
GENESSEE	836	665	659	662	664	646	638	675	660	667
CENTRAL	5292	5542	5618	5650	5841	5866	5884	5913	5921	5927
NORTH	1208	1214	1180	1181	1200	1192	1189	1190	1189	1185
MOHAWK	459	600	603	620	605	622	629	630	627	621
CAPITAL	2848	2753	2838	2891	2973	2946	2929	2906	2947	2954
HUDSON	2940	2779	2926	2898	2903	2909	2908	2921	2942	2957
MILLWOOD	2212	2202	2159	2164	2167	2165	2166	2170	2176	2179
DUNWOODIE	3	3	3	3	3	3	3	3	3	3
NYC	7594	7684	7395	7560	7550	7694	7830	7937	8044	8164
LISLAND	3725	3524	3626	3726	3855	3907	4013	4120	4243	4383
	31776	31865	32294	32650	33036	33186	33400	33668	33964	34249

Appendix 5.3.1 contains the summary of significant system performance results of each of the RNA study cases.

11.1.1 Emergency Thermal Transfer Limit Analysis

RNA study case emergency thermal transfer limits analysis was performed according to the methodology described in Section 8.1.2. The definitions of the transmission interfaces are described in Appendix 5.1.

Table 10.1.3 illustrates the emergency thermal transfer limits for the RNA study case system conditions:

Table 10.1.3: Emergency Thermal Transfer Limits[21]

	2008		2009		2010		2011	
Dysinger East	3200	1	3200	1	3200	1	3200	1
West Central	1700	1	1700	1	1700	1	1700	1
Moses South	2550	2	2575	2	2575	2	2575	2
Volney East	4975	3	4950	3	4950	3	4950	3
Total East	6775	4	6625	4	6625	4	6625	4
Central East	3350	4	3325	4	3300	4	3275	4
Central East+Fras-gilb	4000	4	4000	4	3925	4	3900	5
CE Group	6025	4	6000	4	5950	4	5925	4
F to G	3450	6	3450	6	3475	6	3450	6
UPNY-SENY Open	6050	6	6050	6	6050	6	6050	6
UPNY-ConEd Open	6675	7	6550	7	6625	7	6600	7
Millwood South Closed	8600	7	8450	7	8450	7	8450	7
Dunwoodie-South Plan	5025	9	5425	9	5600	9	5600	9
I to J	3864	9	4200	9	4400	9	4400	9
LI Import	2110	8	2110	8	2110	8	2110	8

[21] The 2007 RNA MARS limits were derived from IRM base case.

Table 10.1.3 Continued

	Limiting Facility	Limiting Rating	Contingency
1	Niagara-Rochester 345	1685	L/O Somerset-Rochester 345
2	Moses - Adirondack- 230	440	L/O Massena-Marcy 765, Generation Reject Chataeuguay
3	Fraser - Coopers Corners-345	1792	Pre-disturbance
4	New Scotland-Leeds 345	1724	L/O New Scotland-Leeds 345
5	Fraser - Coopers Corners-345	1207	Pre-disturbance
6	Leeds - Pleasant Valley-345	1724	L/O Athens-Pleasant Valley 345
7	Roseton-Fishkill 345	1963	Pre-disturbance
8	Dunwoodie-Shore Rd 345	599	Pre-disturbance
9	S. Bronx-Rainey 345	1201	L/O Mott Haven Rainey 345

The reduction in West Central transfer capability between 2007 and 2008 results from the retirement of the Russell plant in 2008. The variations in through-time transfer limits are due to the differences in generation dispatch and other factors.

Appendix 5.3.2 contains the TLTG output reports for each interface through time.

11.1.2 Emergency Voltage Transfer Limit Analysis

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

Table 10.1.4 illustrates the initial RNA study case system voltage analysis. Appendix 5.3.3 illustrates the pre-disturbance and post-contingency voltage as a function of transfers.

Table 10.1.4: Emergency Voltage Transfer Limits[22]

	2008		2009		2010		2011	
Dysinger East	2600	1	2600	1	2600	1	2600	1
West Cent	1300	1	1300	1	1300	1	1300	1
Moses South	2050	2	2000	2	2000	2	2000	2
Volney East	3500	3	3500	3	3750	3	3750	3
Total East	6175	4	6100	4	6175	4	5925	4
Central East	2850	4	2600	4	2825	4	2800	4
Cent East+Fras-gilb	3400	4	3075	4	3325	4	3325	4
CE Group	4825	4	4450	4	4750	4	4725	4
F to G	3750	5	3525	5	3650	5	3800	5
UPNY-SENY Open	6150	5	6150	5	6150	5	6150	5
UPNY-ConEd Open	5000	7	5000	7	5000	7	5000	7
Millwood South Closed	8450	8	8450	7	8450	7	8450	7
Dunwoodie-South Plan	5154	8	5081	7	5031	7	4938	7
I to J	>3864 T	T	3791	9	3741	9	3648	9

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

[22] Ibid

11.2 Development of the MARS Topology

As described in Section 7.2, the MARS model was used to calculate and measure the NYCA LOLE. A key input into the MARS modeling process is the transmission network topology. The starting point for the CRPP is the most recently approved New York State Reliability Council installed reserve margin study topology. Figure 1 below is the most recently approved topology, which is the one that was used for the study entitled: "NEW YORK CONTROL AREA INSTALLED CAPACITY REQUIREMENTS FOR THE PERIOD MAY 2007 THROUGH APRIL 2008". This topology was the starting point for the RNA but was modified as dictated by assessment of future transmission system conditions. The topology was held constant over the ten year period for the RNA and the modifications were primarily to the transfer limits. However, in developing the CRP, the MARS topology was either modified or solutions developed to reflect potential constraints of the transmission system. The modifications were driven by the type of proposed solutions and updated TO plans and their locations.

The locations of the updated TO plans did not require the modeling of additional constraints but did result in significant improvement in the voltage constrained transfer limits. For the regulated backstop solutions in the second five year period, their locations were chosen to provide beneficial voltage support while not contributing to constraints. For the alternative regulated backstop solutions, potential transmission system constraints were modeled by reducing the absolute transfer limit increase.

Proposed market solutions were of a nature that required a topology modification to capture the increase in transmission system constraints that would arise from the proposed projects connecting from New Jersey into Zone J. Four of the market proposals, Astoria Repowering Project and Arthur Kill Combined Cycle Unit in Zone J, Spagnoli Energy Center in Zone K, and Indian Point Peaker Facility in Zone H were modeled without creating any additional interfaces (i.e., nodes/bubbles) because they either weren't required or their proposal indicated that it included any required transmission upgrades to remove potential constraints.

Figure 2 shows the topology modifications that were made to reflect potential constraints from PJM into Zone J as well as in Zone J arising from the remaining proposed projects. This Topology change was employed to capture potential internal PJM or Zone J constraints not otherwise specifically modeled when there is only one transmission interface modeled for the PJM to Zone J border. To simplify the model, Zone J was not split into subzones and the existing limit of 1200 MW on the PJM East to J interface was split into two intermediate interfaces. This represents a 300 MW decrease from the independent tie rating of 1500 MW. Because the HDVC proposals provided evidence of the availability or potential availability of capacity and energy, the HVDC projects from PJM to Zone J were modeled as unforced capacity delivery rights (UDR) similar to the existing Cross Sound Cable. The VFT was modeled as additional tie line capability between NY and PJM and available to provide emergency assistance**.**

The transfer limits utilized to evaluate the Market Proposals are otherwise the same as those used to evaluate the TO Updated Plans from the first Five Years. Since the proposed Market Solutions provide for generation additions in excess of the TO backstop solutions, as well as additional transmission capability, for the second five years, it was assumed that at least the same level of reactive support would be available as the assumed backstop solutions. Therefore, the transfer limits would be at least those used for the evaluation of the backstop solutions.

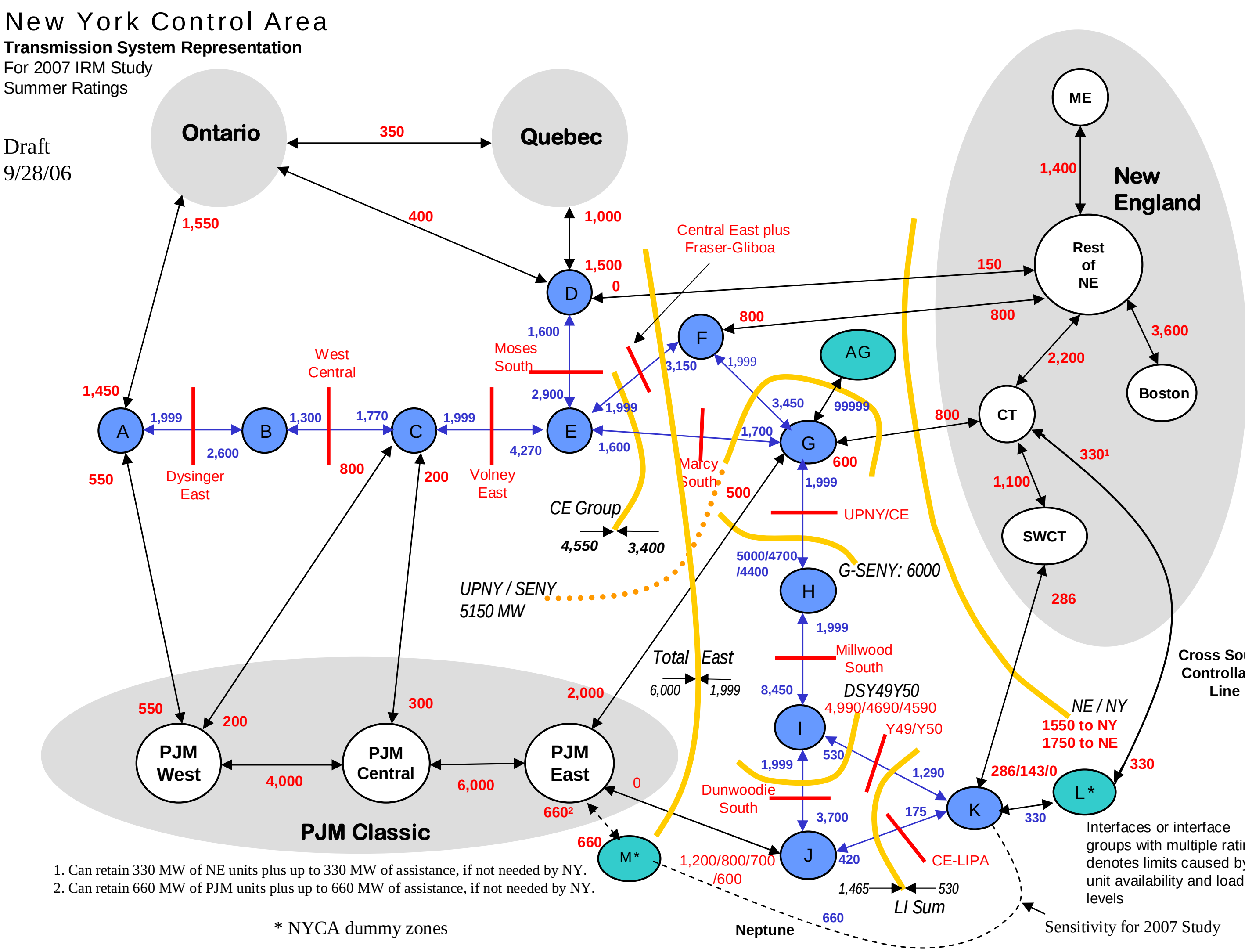

Figure 1: 2007 IRM Study MARS Topology

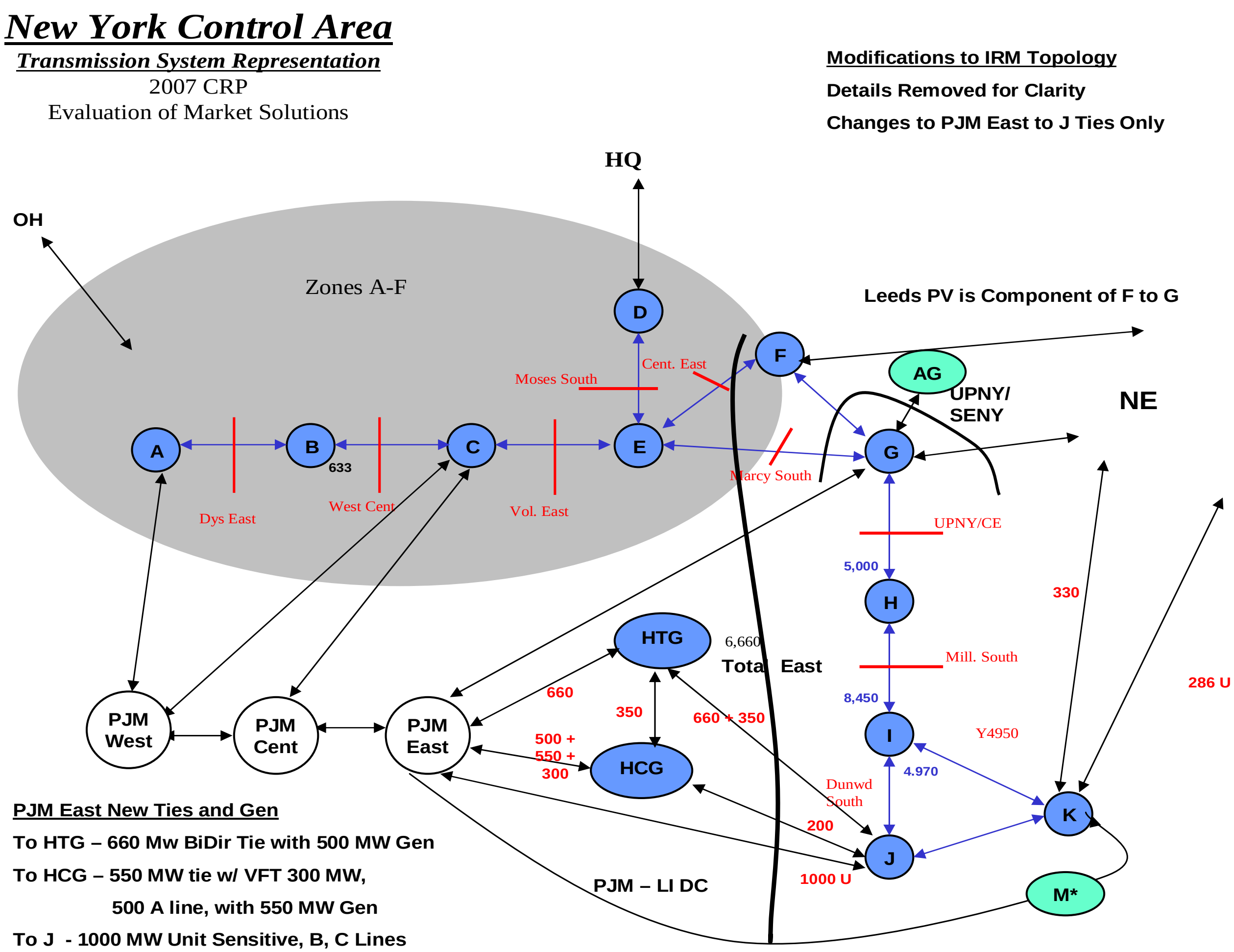

Figure 2: MARS Topology Changes for Evaluation of Market Solutions

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

11.2.1 Free Flow Transmission Model

Table 10.1.5 illustrates the NYCA LOLE for an unconstrained free-flowing transmission model. Initially, in 2007 the RNA study case System NYCA Capacity Reserve Margin initially is well above the 18% IRM and the Locational Requirements of 80% percent In City and 99% for Long Island. The continued growth in load in South East New York, generation retirements, and the limited number of new generating units that are presently under construction would reduce the NYCA Reserve Margin to below 114% and increase the NYCA LOLE to .12 by 2012.

Table 10.1.5 LOLE for the RNA study case System Based on Free Flowing Conditions

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
AREA-A										
AREA-B		0.01	0.03	0.04	0.06	0.10	0.12	0.17	0.24	0.29
AREA-C										
AREA-D										
AREA-E				0.02	0.02	0.04	0.04	0.07	0.10	0.13
AREA-F										
AREA-G					0.01	0.01	0.01	0.01	0.02	0.03
AREA-H										
AREA-I		0.01	0.03	0.05	0.07	0.11	0.13	0.19	0.26	0.32
AREA-J		0.01	0.03	0.05	0.07	0.12	0.14	0.21	0.29	0.36
AREA-K					0.01	0.01	0.02	0.03	0.05	0.09
NYCA		0.01	0.03	0.05	0.08	0.12	0.15	0.21	0.30	0.37

11.2.2 CRPP Transmission Constraint Model With Thermal Limits Only

Table 10.1.6 below illustrates the through-time thermal transfer limits used for the CRPP Transmission Constraint Model. These transfer limits were the basis of the thermal sensitivity case conducted for the RNA study case, which assumed that voltage constraints were eliminated.

Table 10.1.6 Through-Time Thermal Transfer For CRPP Transmission Constraint Model

```
&INF-TRLM-00     ITL
 *                            INTERFACE-TRANSFER-LIMITS
 *-----------------------------------------------------------------------------------------------
*                      INTERFACE     POSITIVE      NEGATIVE                            ZERO TIE
*                         OR         DIRECTION     DIRECTION     ZERO TIE LIMITS         FOR
*   EFFECTIVE         INTF. GROUP    TIE LIMIT     TIE LIMIT     BEFORE NON-FIRM       NON-FIRM
*     DATE               NAME          (MW)          (MW)         ASSISTANCE ?
*-----------------------------------------------------------------------------------------------
*    MMMYYYY           AAAAAAAA          #             #              Y/N               Y/N
*    -------           --------      -------       -------            ---               ---
 @  01JAN2000**          'DYSINGER'     3200          1999              N                 N
 @  01JAN2000**          'W.CENTRL'     1770          1300              N                 N
 @  01JAN2000**          'VOLNEY-E'     4270          1999              N                 N
 @  01JAN2000**          'MOSES SO'     2900          1600              N                 N
 @  01JAN2000**          'CEN EAST'     3800          1999              N                 N
 @  01JAN2000**          'MARCY-SO'     1700          1600              N                 N
 @  01JAN2000**          'F TO G  '     3450          1999              N                 N
 @  01JAN2000**          'UP-CONED'     6600          1999              N                 N
 @  01JAN2000**          'MILLWOOD'     8450          1999              N                 N
 @  01JAN2000**          'DUNWOOD.'     4400          1999              N                 N
 @  01JAN2000**          'CN-LILCO'      175           420              N                 N
 @  01JAN2000**          'Y49Y50  '     1290           530              N                 N
 @  01JAN2000**          'F - NE  '      800           600              N                 Y
 @  01JAN2000**          'G - NE  '      800           400              N                 Y
 @  01JAN2000**          'D - NE  '      150             0              N                 Y
 @  01JAN2000**          'K - NE  '      286           286              N                 Y
 @  01JAN2000**          'ME-ROP  '     1400          1400              N                 N
 @  01JAN2000**          'ROP-BSTN'     3600          3600              N                 N
 @  01JAN2000**          'ROP-ROCT'     2200          2200              N                 N
 @  01JAN2000**          'ROCTSWCT'     1100          1100              N                 N
 @  01JAN2000**           'A - PJMW'     550            89              N                 Y
 @  01JAN2000**           'C - PJMW'     200           129              N                 Y
 @  01JAN2000**           'C - PJMC'     300            32              N                 Y
 @  01JAN2000**           'G - PJME'    2000            30              N                 Y
 @  01JAN2000**           'J - PJME'       1          1200              N                 Y
 @  01JAN2000**           "C_TO_E"      6000          6000              N                 N
 @  01JAN2000**           "W_TO_C"      4000          4000              N                 N
 @  01JAN2000**           'D - HQ  '    1000           500              N                 Y
 @  01JAN2000**           'A - OH  '    1550          1395              N                 Y
 @  01JAN2000**           'D - OH  '     400           400              N                 Y
 @  01JAN2000**           'OH - HQ '     350           350              N                 N
 @  01JAN2000**           'NYD - NE'     660           330              N                 Y
 @  01JAN2000**           'NYD - K '     330           330              N                 N
 @  01JAN2000**           'AG - G '    99999         99999              N                 N
 @  01JAN2007**          'K - NY2 '      660           660              N                 N
 @  01JAN2007**          'NY2-EAST'     1320           660              N                 N
*****GROUPS
 @  01JAN2000**           'TOTAL-ES'    7200          1999              N                 N
 @  01JAN2000**           'UPNYSENY'    5150          1999              N                 N
 @  01JAN2000**           'UPSEBYPA'    5150          1999              N                 N
 @  01JAN2000**           'CE GRP  '    6000          3400              N                 N
 @  01JAN2000**           'NY-IMPTS'   99999         99999              N                 N
 @  01JAN2000**           'LI SUM  '    1465           530              N                 N
 @  01JAN2000**           'DSY49Y50'   99999          9999              N                 N
 @  01JAN2000**           'G-SENY  '    7600          2499              N                 N
 @  01JAN2000**           'NE-IMPTS'    1550          1750              N                 N
 @  01JAN2000**           'NE_F&F_G'   99999         99999              N                 N
 @  01JAN2000**           'HUDVALLY'   99999         99999              N                 N
;;;; END OF &INF-TRLM-00 ;;;;
```

Table 10.1.7 below illustrates the LOLE results utilizing the through-time thermal transfer limits for the CRPP Transmission Constraint Model.

Table 10.1.7 LOLE Results for the RNA study case System Based on Thermal Transfer Limits

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
AREA-A										
AREA-B		0.01	0.03	0.04	0.06	0.09	0.10	0.13	0.17	0.19
AREA-C										
AREA-D										
AREA-E			0.01	0.02	0.02	0.04	0.04	0.06	0.08	0.10
AREA-F										
AREA-G					0.01	0.01	0.01	0.02	0.02	0.03
AREA-H										

11.2.3 CRPP Transmission Constraint Model with Thermal and Voltage Limits Invoked

Table 10.1.8 below illustrates the through-time transfer limits utilizing both thermal and voltage transfer limits:

Table 10.1.8: Thru-Time Thermal And Voltage Transfer Limits For CRPP Transmission Constraint Model

```
&INF-TRLM-00     ITL
*                            INTERFACE-TRANSFER-LIMITS
 *------------------------------------------------------------------------------------------*
INTERFACE     POSITIVE      NEGATIVE                            ZERO TIE
*                         OR        DIRECTION     DIRECTION     ZERO TIE LIMITS       FOR
*   EFFECTIVE          INTF. GROUP    TIE LIMIT     TIE LIMIT     BEFORE NON-FIRM      NON-FIRM
*     DATE                NAME         (MW)          (MW)          ASSISTANCE ?
*-----------------------------------------------------------------------------------------
*------------------------------------------------------------------------------------------
*    MMMYYYY           AAAAAAAA         #             #              Y/N              Y/N
 *    -------          --------      -------       -------           ---                  ---
 @  01JAN2000**         'DYSINGER'     2600          1999            N               N
 @  01JAN2000**         'W.CENTRL'     1770          1300            N               N
 @  01JAN2000**         'VOLNEY-E'     4270          1999            N               N
 @  01JAN2000**         'MOSES SO'     2900          1600            N               N
 @  01JAN2000**         'CEN EAST'     3150          1999            N               N
 @  01JAN2000**         'MARCY-SO'     1700          1600            N               N
 @  01JAN2000**         'F TO G  '     3450          1999            N               N
 @  01JAN2000**         'UP-CONED'     5000          1999            N               N
 @  01JAN2000**         'MILLWOOD'     8450          1999            N               N
 @  01JAN2007**         'DUNWOOD.'     3700          1999            N               N
 @  01JAN2008**         'DUNWOOD.'     3864          1999            N               N
 @  01JAN2009**         'DUNWOOD.'     3791          1999            N               N
 @  01JAN2010**         'DUNWOOD.'     3741          1999            N               N
 @  01JAN2011**         'DUNWOOD.'     3648          1999            N               N
 @  01JAN2000**         'CN-LILCO'      175           420            N               N
 @  01JAN2000**         'Y49Y50  '     1290           530            N               N
 @  01JAN2000**         'F - NE  '      800           600            N               Y
 @  01JAN2000**         'G - NE  '      800           400            N               Y
 @  01JAN2000**         'D - NE  '      150             0            N               Y
 @  01JAN2000**         'K - NE  '      286           286            N               Y
 @  01JAN2000**         'ME-ROP  '     1400          1400            N               N
 @  01JAN2000**         'ROP-BSTN'     3600          3600            N               N
 @  01JAN2000**         'ROP-ROCT'     2200          2200            N               N
 @  01JAN2000**         'ROCTSWCT'     1100          1100            N               N
 @  01JAN2000**          'A - PJMW'     550            89            N               Y
 @  01JAN2000**          'C - PJMW'     200           129            N               Y
 @  01JAN2000**          'C - PJMC'     300            32            N               Y
 @  01JAN2000**          'G - PJME'    2000            30            N               Y
 @  01JAN2000**          'J - PJME'       1          1200            N               Y
 @  01JAN2000**          "C_TO_E"      6000          6000            N               N
 @  01JAN2000**          "W_TO_C"      4000          4000            N               N
 @  01JAN2000**          'D - HQ  '    1000           500            N               Y
 @  01JAN2000**          'A - OH  '    1550          1395            N               Y
 @  01JAN2000**          'D - OH  '     400           400            N               Y
 @  01JAN2000**          'OH - HQ '     350           350            N               N
 @  01JAN2000**          'NYD - NE'     660           330            N               Y
 @  01JAN2000**          'NYD - K '     330           330            N               N
 @  01JAN2000**          'AG - G '    99999         99999            N               N
 @  01JAN2007**         'K - NY2 '      660           660            N               N
 @  01JAN2007**         'NY2-EAST'     1320           660            N               N
*****GROUPS
 @  01JAN2000**          'TOTAL-ES'    6000          1999            N               N
 @  01JAN2000**          'UPNYSENY'    5150          1999            N               N
 @  01JAN2000**          'UPSEBYPA'    5150          1999            N               N
 @  01JAN2000**          'CE GRP  '    4550          3400            N               N
 @  01JAN2000**          'NY-IMPTS'   99999         99999            N               N
 @  01JAN2000**          'LI SUM  '    1465           530            N               N
 @  01JAN2007**          'DSY49Y50'   13680          2529            N               N
 @  01JAN2008**          'DSY49Y50'   14172          2529            N               N
 @  01JAN2009**          'DSY49Y50'   13953          2529            N               N
 @  01JAN2010**          'DSY49Y50'   13803          2529            N               N
 @  01JAN2011**          'DSY49Y50'   13524          2529            N               N
 @  01JAN2000**          'G-SENY  '    6000          2499            N               N
 @  01JAN2000**          'NE-IMPTS'    1550          1750            N               N
 @  01JAN2000**          'NE_F&F_G'   99999         99999            N               N
 @  01JAN2000**          'HUDVALLY'   99999         99999            N               N
;;;; END OF &INF-TRLM-00 ;;;;
```

Table 10.1.9 below illustrates the LOLE results utilizing the through-time thermal and voltage transfer limits for the CRPP Transmission Constraint Model.

Table 10.1.9 LOLE for the RNA study case Transfer Limits[23]Year

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
AREA-A										
AREA-B		0.01	0.03	0.04	0.06	0.09	0.10	0.13	0.17	0.19
AREA-C										
AREA-D										
AREA-E				0.02	0.02	0.04	0.04	0.06	0.08	0.10
AREA-F										
AREA-G							0.01	0.01	0.01	0.01
AREA-H										
AREA-I		0.01	0.04	0.06	0.08	0.14	0.18	0.27	0.37	0.46
AREA-J		0.01	0.05	0.010	0.14	0.25	0.32	0.44	0.59	0.74
AREA-K					0.01	0.02	0.02	0.05	0.08	0.12
NYCA		0.01	0.06	0.10	0.15	0.25	0.33	0.46	0.60	0.76

11.3 Short Circuit Assessment

As noted previously, a short circuit assessment was performed for this cycle of the Comprehensive Reliability Planning Process. The methodology employed was that described in the "NYSIO Guideline for Fault Current Assessment," contained in Appendix B. The ratings and bus monitored list was the same as that being used for the 2006 ATRA fault current assessment. The RNA study case included projects according to the CRPP project list. The 2011 Fault Levels were compared against the Class Year 2006 fault levels, and this comparison indicated no significant differences.

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

12 Appendices *(Appendices available on request[*])*

1.0 Short Circuit Methodology

1.1 Short Circuit Results

2.0 Load and Capacity Tables by Zone

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

3.2 Generation by Zone, by Year, by Type

4.1 Resource Adequacy Assessment

4.2 LOLE Results

5.0 Transmission Adequacy Assessment

5.1 Interface Definitions

5.2 Power Flow Contingency Lists

5.3 Assessment Results

* Email request to jfansler@nyiso.com