



**2005
TRIENNIAL REVIEW
OF
RESOURCE ADEQUACY**

**COVERING THE
NORTHEAST POWER COORDINATING COUNCIL'S**

NEW YORK CONTROL AREA

For the years 2006 – 2010

March 2006

Approved by the RCC March 8, 2006, subject to TFCP review and approval
Ratified by the TFCP March 29, 2006

1.0 EXECUTIVE SUMMARY

1.1 Major Findings

The New York Control Area (NYCA) Triennial Review of Resource Adequacy, conducted by the New York Independent System Operator (NYISO), supplants the 2002 Review that was approved by Northeast Power Coordinating Council's (NPCC) Joint Coordinating Committees in July, 2002.

The NYCA peak load has grown from approximately 27,300 in 1994 on a weather adjusted basis to 31,400 MW in 2004, which totals approximately 4,100 MW. This represents a ten-year compound growth rate of approximately 1.21%. However, Upstate NY (Zones A through F) has experienced negative load growth. Southeast NY (Zones G through K) has experienced a total load growth of almost 5,000 MW over the last ten years versus a net load growth of 4,100 MW for the NYCA as a whole. This is the result of the robust economy in Southeast NY after 1999 along with the projected economic recovery of the current mild recession. For the period 2005 through 2010, the anticipated load growth for Upstate NY and Southeast NY is 0.82% and 1.64%, respectively.

The 2005 Triennial Review demonstrates that the number of firm load disconnections range from 0.005 to 0.440 days/year for the base load forecast and .007 to .666 for the high load forecasts, recognizing Load Forecast Uncertainty (LFU). For the period 2006 through 2009, the New York Control Area (NYCA) is in compliance and has sufficient existing resource capacity and planned resource capacity additions to meet the NPCC resource adequacy criterion. It is anticipated that from April 1, 2005 to 2010, 5612 MW of new capacity will be added to the NYCA system and 2214 MW of existing generating facilities will be retired. In order to satisfy the resource adequacy criterion in 2010, the addition of 500 MW of new generation in Area J or equivalent transmission or resource proposals is required.

This year, NYISO has initiated a Comprehensive Reliability Planning Process (CRPP) to determine whether the electric system resources provided by a combination of market forces and regulated entities is providing sufficient resources to maintain the reliability of the New York State bulk power system. The NYISO has just completed the Reliability Needs Assessment (RNA) where it recognizes that additional electric facilities are required to meet the Reliability Requirements for the planned system. Proposals to satisfy the RNA will be evaluated in the first quarter of 2006 and the CRRP Plan will be developed by June, 2006.

1.2 Major Assumptions and Results

Table I shows study results and where in the report to locate the major assumptions. The basis for the assumptions in this study is the NYISO's Comprehensive Reliability Planning Process Study for 2006-2014¹.

TABLE I
MAJOR ASSUMPTIONS AND RESULTS

<u>ASSUMPTION</u>	<u>DESCRIPTION</u>	<u>REF. PAGE</u>
Criterion	NPCC Criterion of 0.1 day per year disconnection	6
Reliability Study		
Program	GE MARS Program	23
Load Model	8760 Hours	16
Load Uncertainty	Historical Basis	16
Unit Availability		
Definition	NERC-GADS (EFORD)	18
Basis	5 Year History	19
Maintenance Schedule	Planned, modified to reflect 5 Year History	18
Emergency Operating Procedures	Modeled	7
Operating Reserve	Modeled	7
<u>RESULTS</u>		
Adequacy of System	Through 2009 with base load forecast and 2008 with the high load forecast	10
	Base Case	High Forecast Case
	Expected Number of Firm Load Disconnections	Expected Number of Firm Load Disconnections
<u>Year</u>	<u>Days/year</u>	<u>Days/year</u>
2006	0.021	0.044
2007	0.005	0.007
2008	0.044	0.070
2009	0.095	0.146
2010	0.440	0.666

¹ NYISO Report titled, "Comprehensive Reliability Planning Process Draft Reliability Needs Assessment", dated November 22, 2005.

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3.0 INTRODUCTION

This report was prepared to satisfy the Triennial Review requirements of the Northeast Power Coordinating Council (NPCC) “Guidelines of Area Review of Resource Adequacy (Revised: November 29, 2005).”

The report demonstrates that NYISO is expected to meet the NYSRC and NPCC resource adequacy design criterion (i.e., the frequency of disconnecting non-interruptible customers due to resource deficiencies, on average, will be no more than once in ten years) for the period 2006 through 2009 under the base case and 2006 through 2008 under the high load forecast scenarios.

The NYISO had initiated a new Comprehensive Reliability Planning Process to determine whether the electric system resources provided by a combination of market forces and regulated entities is providing sufficient resources to maintain the reliability of the New York State Bulk Power System. The NYISO has just completed its first step in the process to perform a Reliability Needs Assessment (RNA). After the RNA has been approved, request for solutions to satisfy the RNA will be issued by the end of the year. These proposals will be evaluated in the first quarter of 2006 and a final Comprehensive Reliability plan will be developed by June 2006.

3.1 Previous Triennial Review

The NPCC Reliability Coordinating Committee approved the previous NYCA Triennial Review in July 2002. That review concluded that NYPP had adequate capacity planned or available to meet its load forecast for the five-year planning period.

3.2 Comparison of Current and Previous Resource Plans

3.2.1 Load

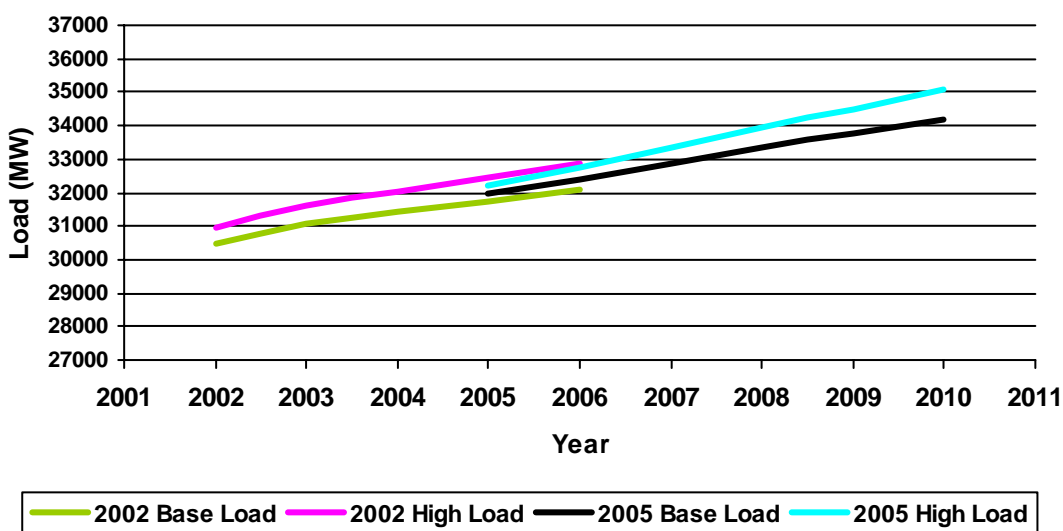
The comparison of 2002 and 2005 load forecasts is shown in Figure 1. Both forecasts are net of Demand Side Management (DSM).

The NYCA peak load has grown from approximately 27,300 MW in 1994 on a weather adjusted basis to 31,400 MW in 2004, which totals approximately 4,100 MW. This represents a ten-year compound growth rate of approximately 1.21%. However, a regional analysis presents a much different picture. Western NY (Zones A through E) and Upper Hudson Valley (Zone F) or Capital has experienced negative load growth. The Lower Hudson Valley (Zones G-H-I) has experienced a growth rate in excess of 2.4% annually (corrected for Rockland Electric Company joining PJM) with total load growth of approximately 915 MW. New York City (Zone J) or NYC has grown at a rate of 2.6% annually with total growth of approximately 2570 MW. Long Island (Zone K) or LI has grown at a rate of 3.5% annually with total load growth of approximately 1,500 MW over the last ten years. Together, the area

defined as LHV, NYC and LI or Southeast NY (SENY) has experienced total load growth of almost 5,000 MW over the last ten years versus a net load growth of 4,100 MW for the NYCA as a whole. **For the period 2005 through 2010, the anticipated load growth for Upstate NY and Southeast NY is 0.82% and 1.64%, respectively.**

The annual peak loads used in the 2005 Triennial Review are higher than the corresponding values used in the 2002 Triennial Review. The difference is mainly due to the result of the updated load forecast parameters used for the forecast process, including both economy and weather.

**Figure 1 Summer Peak Load Forecasts
2002 vs 2005 Triennial Review**



3.2.2 Resources

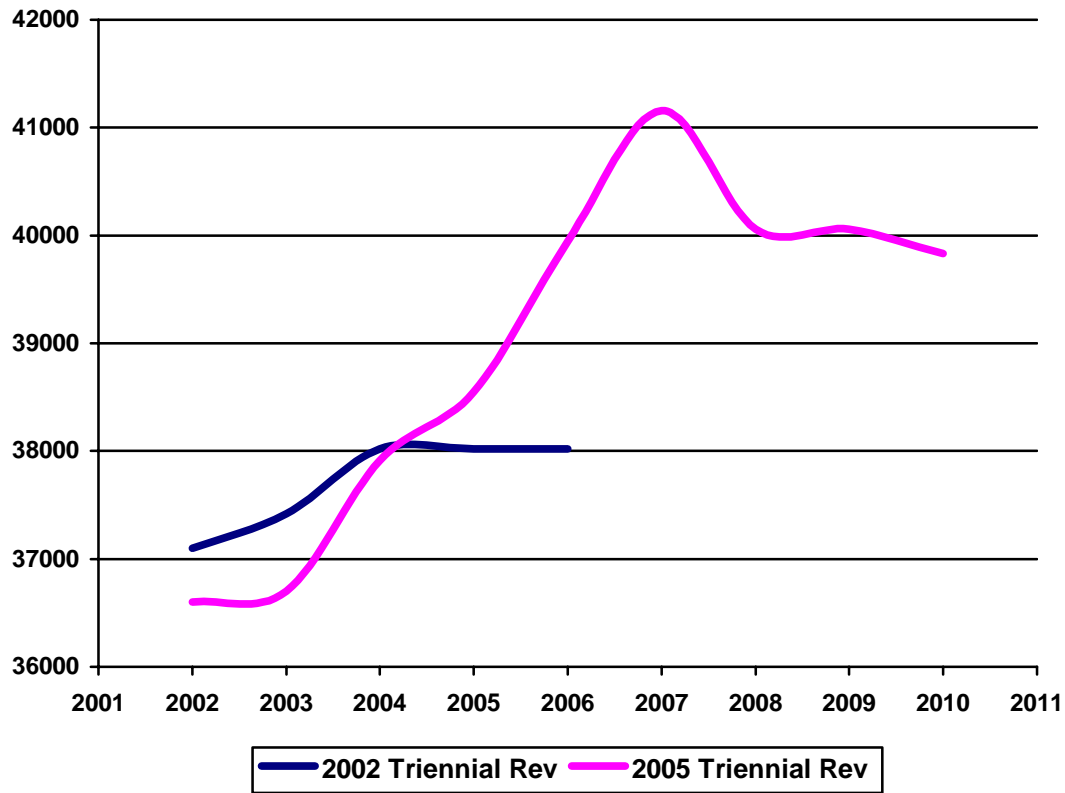
The 2002 Triennial Review assumed a total of 920 MW cumulative new capacity additions by the year 2004. As of April 1, 2005, the NYCA installed capability was 37,547 MW. This includes 1364 MW of new resources which was constructed and 416 MW of old resources that have been retired between 2002 and 2005.

To be consistent with studies conducted for the New York State Reliability Council (NYSRC), firm purchases are not included as a resource for this assessment. In the summer of 2004, for example, there were over 2,000 MW of external Installed Capacity (ICAP) purchases accepted into the NYCA market. For the summer of 2005 to 2007, the firm purchases is anticipated to be only 80 MW and zero between 2008 and 2010. For the summer of 2005 to 2009, the firm sales is anticipated to be 305 MW and 298 MW for 2010.

Figure 2 shows the capacity projection made in 2002 versus the current (2005) projection. The projected summer capacity does not include any projections of Special Case Resources

(SCR's). The projection of SCR's is 975 MW. See Appendix A, Section 1.1.4 for a discussion of SCR's.

Figure 2 Projected Summer Capacity
2002 vs. 2005 Triennial Review



4.0 RESOURCE ADEQUACY CRITERION

4.1 Statement of NPCC and NYSRC Resource Adequacy Criteria

The NYISO adheres to the NPCC resource adequacy criterion, which reads:

“Each Area’s probability (or risk) of disconnecting any firm load due to resource deficiencies shall be, on average, not more than once in ten years. Compliance with this criteria shall be evaluated probabilistically, such that the loss of load expectation (LOLE) of disconnecting firm load due to resource deficiencies shall be, on average, no more than 0.1 day per year. This evaluation shall make due allowance for scheduled outages and deratings, forced outages and deratings, assistance over interconnections with neighboring Areas and Regions, transmission transfer capabilities, and capacity and/or load relief from available operating procedures.”

The NYISO also adheres to the NYSRC resource adequacy criterion (A-R1), which reads:

“The NYSRC shall establish the Installed Reserve Margin(IRM) requirement for the NYCA such that the probability (or risk) of disconnecting any firm load due to resource deficiencies shall be, on average, not more than once in ten years. Compliance with this criteria shall be evaluated probabilistically, such that the loss of load expectation (LOLE) of disconnecting firm load due to resource deficiencies shall be, on average, no more than 0.1 day per year. This evaluation shall make due allowance for scheduled outages and deratings, forced outages and deratings, assistance over interconnections with neighboring control areas, NYS Transmission System transfer capability, and capacity and/or load relief from available operating procedures.”

The NYSRC criterion is consistent with the NPCC criteria. In addition, NYSRC imposes Installed Capacity Requirements on NYCA Load Serving Entities (LSE) (A-R2), as follows:

"LSEs shall be required to procure sufficient resource capacity for the entire NYISO defined obligation procurement period so as to meet the statewide IRM requirement determined from A-R1. Further, this LSE capacity obligation shall be distributed so as to meet locational ICAP requirements, considering the availability and capability of the NYS Transmission System to maintain the A-R1 reliability requirements."

This means that NYS Transmission System capability limitations shall not prevent NYISO from meeting the NYSRC resource adequacy criterion.

NYSRC uses these criteria to establish the appropriate NYISO installed reserve requirements. According to these criteria, expected disconnections are limited to once in ten years. However, before a load disconnection will occur, a series of emergency operating procedures (EOP’s) will be invoked. These are aimed at either reducing load or increasing capacity. The procedures are described in section 4.2.

4.2 Statement of NYISO Emergency Operating Procedures (EOPs)

Table II lists the selection of load control and generator resource supplements that may be available on an emergency basis to reduce the possibility of customer disconnections. These EOPs are initiated when required by the senior NYISO dispatcher. In general, the priority order shown in Table II is followed. These EOP's are also modeled in NYISO and NYSRC reliability studies.

TABLE II
EMERGENCY OPERATING PROCEDURES

Step	Procedure	Effect	Percentage	MW Value
1	Special Case Resources	Load relief	----	975 MW*
2	Emergency Demand Response Prog	Load relief	N/A**	269 MW
3	5% manual voltage Reduction	Load relief	0.26	83 MW
4	Thirty-minute reserve to zero	Allow operating reserve to decrease to largest unit capacity (10-minute reserve)	N/A	600 MW
5	5% remote voltage reduction	Load relief	1.53	493 MW**
6	Curtail Company use	Load relief	N/A	11 MW
7	Voluntary industrial curtailment	Load relief	N/A	128 MW**
8	General public appeals	Load relief	N/A	13 MW
9	Ten-minute reserve to zero	Allow 10-minute reserve to decrease to zero	N/A	1200 MW
10	Customer disconnections	Load relief	N/A	As needed
<p>* The SCR's are modeled as 975 MW, however they are discounted to 897 MW in July and August and further discounted in other months based on past performance.</p> <p>** These EOPs are modeled in the program as a percentage. The associated MW value is based on a forecast 2005 peak load of 32,320 MW.</p>				

4.3 Statement of Required Installed Reserve

For resource planning, NYSRC requires an 18% installed reserve margin over the NYSIO annual peak load. A recent reliability study (see Section 4.5) demonstrated that this reserve level meets the NPCC resource reliability criterion.

Interconnections to neighboring Areas are considered as a part of NYISO analysis of installed reserve adequacy. The 2005 NYSRC IRM study showed that interconnection support allows the installed reserve margin to be reduced from roughly 25% to 18% for approximately a 2,100 MW benefit. This interconnection benefit is an aggregate number. Interconnection benefits with individual neighboring systems have not been calculated.

4.4 Comparison of NYSRC and NPCC Resource Reliability Criteria

The NYSRC resource adequacy criterion is consistent with (see section 4.1) the criterion established by NPCC. The NYSRC maintains the criterion is met by imposing an IRM requirement on the NYCA.

4.5 Reliability Study Results

Studies² conducted since the last Triennial Review resulted in annual IRM requirements of 18%. These studies showed that for a NYCA installed reserve margin of 18%, the expected frequency of disconnecting non-interruptible customers due to resource deficiencies would be less than one day in ten years. The General Electric MARS (Multi-Area Reliability Simulation) model was used for these studies. This model has also been used in other periodic studies such as “Review of Interconnection Assistance Reliability Benefits” and “Summer Multi-Area Probabilistic Reliability Assessment” performed by Working Groups under the direction of NPCC’s Task Force on Coordination of Planning.

These IRM studies also determined that internal NYCA transmission constraints would not cause its resource adequacy design criterion to be violated when an 18% installed reserve margin is maintained. The IRM study demonstrates that when the locational installed capacity requirements are met, internal NYCA constraints do not affect statewide reserve margin requirements. These locational installed capacity requirements are set through an NYISO study³.

NYISO has updated the database used in the latest IRM study for use in the currently planned CP-8 “2004 Review of Interconnection Assistance Reliability Benefits” study. Updated load and capacity forecasts and revised forced outage rates are the most significant changes.

² NYSRC Report titled, “New York Control Area Installed Capacity Requirements for the Period May 2003 Through April 2004”, NYSRC Report titled, “New York Control Area Installed Capacity Requirements for the Period May 2004 Through April 2005”, and NYSRC Report titled, “New York Control Area Installed Capacity Requirement for the Period May 2005 - April 2006”.

³ “Locational Installed Requirements Study, Covering the New York Control Area, For the 2004-2005 Capability Year”, New York Independent System Operator

NYISO’s assumed interconnection benefit is within the bounds of the previous NPCC tie benefits study⁴.

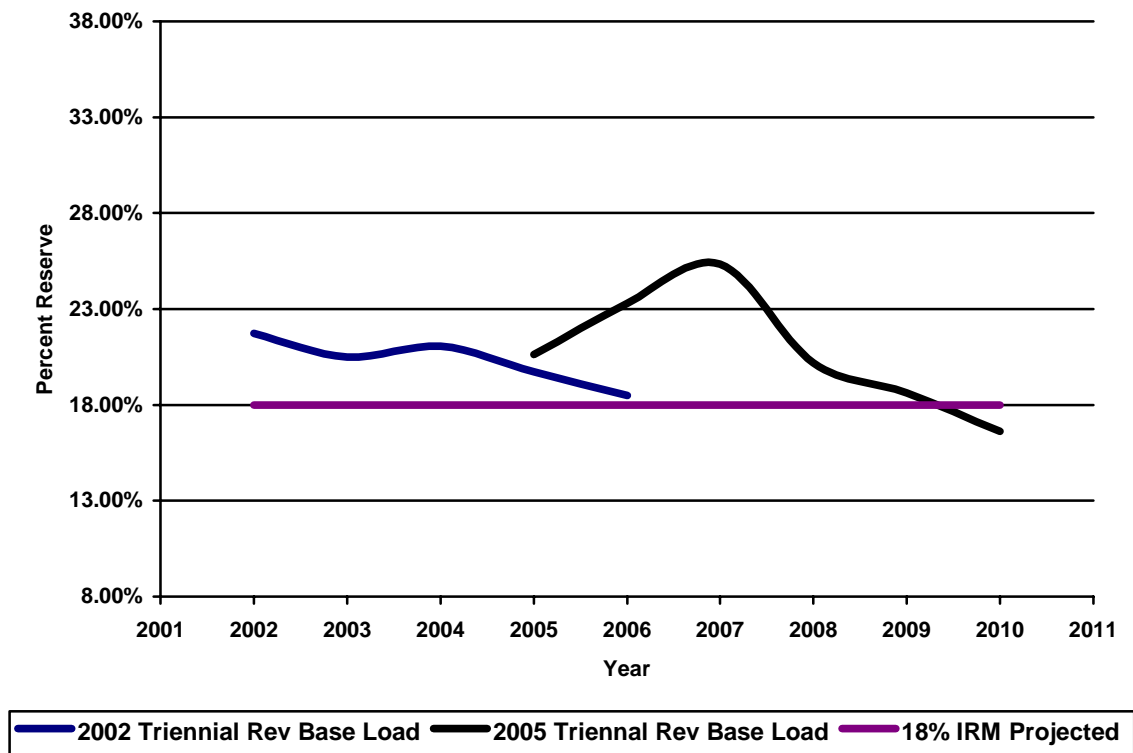
The above assessments demonstrate that an 18% reserve level is sufficient for NYISO to meet the NPCC resource adequacy design criterion.

5.0 RESOURCE ADEQUACY ASSESSMENT

5.1 Planned vs. Required Reserve for Base Case Load Forecast

Figure 3 shows the projected NYPP installed reserve levels for the base load forecast made in 2002 vs. the NYISO 2005 forecast along with the 18% required reserve margin for maintaining the NPCC criterion. The 18% requirement for the 2005-2006 capability year is extended, in the figure, for reference purposes. The NYSRC has not set reserves for the years beyond the 2005-2006 capability year. The base load forecast is based on a 2005 economic forecast that was provided by Economy.com (formerly RFA associates) and is the expected scenario, having 50% probabilities of being exceeded or of not being met.

Figure 3 – Percent Installed Reserve
2002 vs. 2005 Triennial Review



⁴ NPCC CP-8 Working Group report titled, “Review of Interconnection Assistance Reliability Benefits” dated June 29, 2004.

TABLE III							
COMPARISON OF PLANNED AND REQUIRED RESERVE BASE LOAD FORECAST							
Year	July Installed Capacity MW⁵	System Peak Forecast MW	Planned Reserve		Required Reserve⁶		LOLE
			MW	%	MW	%	
2006	39947	32400	7547	23.3	5832	18.0	0.021
2007	41158	32840	8318	25.3	5911	18.0	0.005
2008	40059	33330	6729	20.2	5999	18.0	0.044
2009	40059	33770	6289	18.6	6079	18.0	0.095
2010	39884	34200	5684	16.6	6156	18.0	0.440
2010*	40384	34200	6184	18.1	6156	18.0	0.100

*This line shows that 500 MW of capacity is needed to meet the 0.100 days/year LOLE criteria for 2010

Table III shows the planned vs. required reserves over the study period and compares them against the NYISO base load forecast. The NYISO 2005 Load and Capacity Report as of April 1, 2005, lists over 8331 MW of capacity of additional resources under construction and proposed, only 4415 MW of projects are represented in this analysis and 2078 MW of retirements for a net change in capacity of 2336 MW. While this approach is conservative, it should be noted that the majority of these selected resources are located in the zones within the NYCA that exhibit the highest LOLE in the MARS model output. The selection of these units was based on the ability of developers to recently site and build projects. These units have been built in the areas that have exhibited the highest energy prices in New York. Note that the table includes the retirement of the 885 MW Poletti unit in 2008.

Figure 3 and Table III show that NYISO is expected to have adequate installed capacity to satisfy the 18% reserve requirement through 2009.

5.2 Planned vs. Required Reserve for High Load Forecast

Figure 3 shows the NYISO 2005 high load forecast along with the 18% required reserve for maintaining the NPCC and NYSRC criterion. The 18% requirement for the 2005-2006

⁵ Excludes 975 MW of Special Case Resources (see Appendix A, section A 1.1.4)

⁶ Required reserves are set annually. The 18% requirement is for the period May 2005 through April 2006. This table shows 18% requirement in other years for reference purposes only.

capability year is extended, in the figure, for reference purposes. The 2005 high load forecast reflects a more robust economy than the base case. According to Economy.com, the vendor for the economic forecasts used by NYISO in this study, this level of economic growth is estimated to have approximately a 20% probability of occurring.

<u>TABLE IV</u>							
COMPARISON OF PLANNED AND REQUIRED RESERVE HIGH LOAD FORECAST							
Year	July Installed Capacity MW ⁷	System Peak Forecast MW	Planned Reserve		Required Reserve ⁸		LOLE
			MW	%	MW	%	
2006	39947	32762	7185	21.9	5897	18.0	0.044
2007	41158	33357	7801	23.4	6004	18.0	0.007
2008	40059	33961	6098	18.0	6113	18.0	0.070
2009	40059	34508	5551	16.1	6211	18.0	0.146
2010	39884	35057	4827	13.8	6310	18.0	0.666

Table IV shows the planned vs. required reserves over the study period and compares them against the NYISO high load forecast. Additional capacity will be required for 2009 and 2010 to meet the reserve requirement.

5.3 Contingency Plans

NYISO has initiated a Comprehensive Reliability Planning Process to address these reliability needs. For example, one of the options would be to delay the retirement of Poletti generation beyond 2008. This option would add 885 MW of generation to the installed capacity between 2008 and 2010, representing the total capacity of the retired generation. With the Poletti generation in service, the NYCA LOLE would be 0.008 in 2008 and 0.019 in 2009. NYISO will be evaluating this proposal and other proposals in developing its CRPP Plan in the first quarter of 2006. The final CRPP Plan will be completed by June 2006.

6.0 PLANNED RESOURCE CAPACITY MIX

⁷ Excludes 975 MW of Special Case Resources (see Appendix A, section A 1.1.4)

⁸ Required reserves are set annually. The 18% requirement is for the period May 2005 through April 2006. This table shows 18% requirement in other years for reference purposes only.

6.1 Planned Resource Capacity Mix

Figure 4 depicts NYCA’s resource capacity mix by fuel type for the year 2004 on an installed capacity basis.

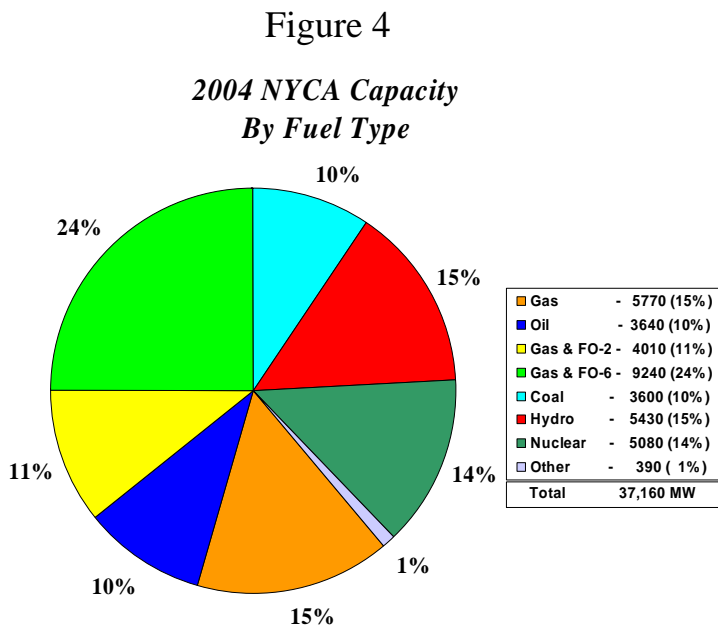


TABLE V							
Planned Resource Capacity Mix By Year							
Month Of July	Coal %	Gas & Oil %	Gas Only %	Hydro %	Nuclear %	Oil Only %	Other %
2006	9.0	46.9	5.9	14.8	12.9	9.0	1.6
2007	7.9	48.4	5.7	14.3	12.8	8.7	2.2
2008	6.9	48.2	5.9	14.7	13.1	9.0	2.2
2009	6.9	48.2	5.9	14.7	13.1	9.0	2.2
2010	7.0	48.0	5.9	14.8	13.2	9.0	2.2

Table V shows the projected installed capacity resource mix from 2006 through 2010. The “other” category includes wind power, resource recovery, wood burning, and other fuels.

6.2 Reliability Impact of Resource Diversification Strategy

The deregulation of the electric infrastructure and the opening of the wholesale electric markets have caused a lapse in the movement to develop diversely fueled resources. Although this is beginning to be addressed in the U.S. on a federal level through a national

energy plan, the short-term implication is that new capacity additions will be driven only by current economic considerations.

For the duration of this study period in New York, resources fueled by natural gas will meet all of the growth in projected energy consumption. Except for wind energy, no new resources employing other fuels are expected to be added in the planning period. The growth in gas is due to the new resources referred to in Section 5.1.

There is a potential for a natural gas shortage in New York State. This could cause natural gas fired units to burn other fuels or curtail operations. If unit operation curtailment due to fuel unavailability occurs in load pockets, generation from other areas would need to help meet demand, causing heavier loading on the existing transmission system. Many of the dual fired units are the larger older steam units located in load pockets and would impact reliability needs in a multiple ways if retired. The real challenge on a going forward basis will be to maintain the benefits that fuel diversity, in particular dual fired fuel capability, provides today. This will be especially critical in New York City and Long Island which are entirely dependent on oil and gas fired units many at which have interruptible gas transportation contracts. This issue will be considered in developing the CRPP Plan.

In terms of operational strategy, the NYSRC has adopted the following local reliability rule:

I-R3. Loss of Generator Gas Supply (New York City & Long Island)⁹

The NYS Bulk Power System shall be operated so that the loss of a single gas facility (i.e., pipeline or storage facility) does not result in the loss of electric load within the New York City and Long Island zones.

6.2.1 Fuel Risk Analysis

NYSIO categorizes generation capacity fuel types into three supply risks: Low, Moderate and High

Low Fuel Supply Risk: Low fuel risk is defined as the low probability of a generating unit running out of fuel, particularly during the winter heating season. Most of the fuels characterized as low fuel risk are not competing with fuels required to meet heating load or generators have effectively been able to manage the fuel supply risks. For this analysis, generating units with low fuel risk include:

1. Nuclear: nuclear units run for long periods of time without disruption from fuel supplies. The greatest fuel supply risk are extended outages when changing fuel rods or other protracted maintenance outages.
2. Hydro: Hydro units in New York have relatively stable supplies of fuel. While some hydro units are limited due to “run-of-river” limitations or are pump storage units, for the most part hydro units are not restricted by fuel supplies.

⁹ “NYSRC RELIABILITY RULES For Planning And Operating the New York State Power System”, Revision 2, Version 14, October 14, 2005

3. Coal: While there are no mine-mouth coal units operating in New York, coal generators effectively mitigate potential fuel interruptions with both on-site storage up to 30 days as well as firm transportation of coal to their facility, including purchasing their own railroad cars. Furthermore, many coal units source coal from multiple geographic locations, thereby minimizing disruption from any single coal source.
4. Dual Fuel w/Firm Natural Gas: A dual fuel unit with firm natural gas supply is considered to be a low fuel risk as it has reduced the risk for fuel interruption by having both firm gas contracts and alternative fuel availability.

Moderate Fuel Risk: Moderate fuel risk is characterized by units using fuels which could possibly face shortages during the winter months but have mitigated that risk with the availability of a secondary fuel or have firm contracts for the transportation of fuel.

5. Dual Fuel units with Residual Fuel Oil: As residual fuel oil is not used to meet heating load, generators capable of firing residual fuel oil face fewer supply risks than the other fossil fuels. The greatest risk to this group is delivery of residual fuel oil, particularly for the older steam boiler units. Fortunately in New York, most of these units are sited near a navigable water way and have firm barge transport for their fuel deliveries.
6. Dual Fuel units with Fuel Oil #2: Fuel oil #2 or heating oil faces greater supply risks during the winter months as this fuel is also used for heating homes. This is particularly true in the northeastern United States including portions of up-state New York. The increased demand for heating oil decreases available supplies as well as increases the delays in transportation.
7. Dual Fuel units with Kerosene or Jet-Kero: Kerosene or Jet-Kero is a very thinly produced market segment of the distillate fuels and as such is more prone to supply disruptions than the other fuels. The higher cost of this fuel relative to the other fuel oils limits its use in the economic dispatch in New York.
8. Natural Gas with Firm Contracts Only: Gas only units with firm contracts pose a higher risk than the other dual fuel units, particularly those generators with offsetting peaking options on their firm gas contracts.

High Risk: High fuel supply risk is characterized by units with a single source of fuel supply or intermittent resources such as wind generators. These units have no alternative or back-up fuel and therefore are exposed to shortages in their single source of fuel. The ranking within the high risk fuels also reflects the likelihood of shortages in that particular fuel. Note that gas fired generators without firm contracts are rated as one of the highest fuel risks in this analysis. Generators with high risk include:

9. Residual Fuel only: Typically, generators capable of firing with residual fuel also have gas fired capability. In New York there are no residual fuel only generators.
10. Distillate Fuel Oil only: This group typically includes GTs without access to natural gas and therefore use either fuel oil #2 or kerosene for their operations. Both of these fuels either compete with the heating load during the winter or are a very thinly produced segment of the fuel oil market and therefore prone to potential disruptions.
11. Gas Only Non-Firm: This characterizes the group of generators which have no firm natural gas supplies and no source of back-up fuel. There are a few older steam plants which fall into this category.

12. Other: The highest fuel risk characterizes those units with little or no control over the fuel supply. This includes intermittent resources including wind power as well as the smaller refuse or bio-fueled generators.

TABLE VI
Fuel Risk Profile

Rank	Risk	Fuel Type	Capacity in MW	Cumulative in MW
1	Low	Nuclear	5,113	5,113
2		Hydro	5,844	10,957
3		Coal	3,663	14,620
4		Dual Fuel w/ Firm Natural Gas	4,629	19,249
5	Moderate	Dual Fuel w/ Residual Oil	5,834	25,083
6		Dual Fuel w/ Fuel Oil #2	3,470	28,553
7		Dual Fuel w/ Kerosene	1,541	30,094
8		Firm Natural Gas only	2,091	32,185
9	High	Residual Fuel Oil only	-	32,185
10		Distillate Fuel Oil only	2,470	34,655
11		Gas Only non-firm	4,411	39,066
12		Other	371	39,437

The greatest risk to fuel supply interruption occurs during the winter months when both natural gas and heating fuel oils are competing to serve electrical and heating loads. Fortunately in New York, peak electrical loads occur during the summer months when demand is nearly 7,000 MWs greater than the winter peak. As such, New York can meet the winter peak of roughly 25,000 MW with sufficient generation without exposure to significant fuel risks. Even with a forced outage rate of 10%, there is sufficient generation in the low to moderate fuel risk categories to meet the winter electrical peak of 25,500 MW. This would leave a margin of nearly 4,000 MW or 14% of the total capacity characterized by low to moderate fuel risk.

APPENDIX A

A. DESCRIPTION OF RESOURCE RELIABILITY MODEL¹⁰

A 1.1 LOAD MODEL

A 1.1.1 Description of Load Model

MARS employs an 8760-hour chronological zonal load model. The load model currently used relies on an actual year of historical loads that has been demonstrated to give conservative results. **In addition, the NYISO has changed the load shape used from the 1995 load shape to the 2002 load shape reflecting recent trend analysis¹¹.** Over the last several years, the 2002 load shape has consistently exhibited this characteristic when compared to current and past years. This model is then scaled up to the summer peak for the future year being analyzed.

A 1.1.2 Load Forecast Uncertainty

For this study, new load forecast uncertainty models were provided for Consolidated Edison and LIPA for Zones J and K, respectively. The models are presented below:

Multiplier	NYCA Total	Con Ed(J)	LIPA(K)	NYCA Net
0.0062	1.0584	1.0457	1.1409	1.0413
0.0606	1.0499	1.0368	1.0924	1.0309
0.2417	1.0250	1.0173	1.0457	1.0206
0.3830	1.0000	1.0000	1.0000	1.0000
0.2417	0.9777	0.9682	0.9543	0.9852
0.0606	0.9460	0.9488	0.9076	0.9561
0.0062	0.9070	0.9410	0.8591	0.8987

The NYCA Net (i.e., Zones A-I) was determined by taking out the load weighted J and K contribution to uncertainty from the NYCA Total uncertainty. Load uncertainty for the State, as a whole was unchanged.

A 1.1.3 Loads of Other Areas

¹⁰ More detailed descriptions of the model can be found in the NYSRC Report titled, "New York Control Area Installed Capacity Requirements for the Period May 2005 Through April 2006"

¹¹ For a description of this analysis, see "New York Control Area Installed Capacity Requirements, For the Period May 2005 through April 2006, Technical Study Report" available on the nysrc.org website.

These are based on each Area's load model used in the summer 2004 CP8 study¹². The load models are scaled so the projected peaks for 2006 are obtained. Those control areas, external to NYCA, whose isolated LOLE's were below that of the NYCA were further adjusted to match the NYCA isolated LOLE.

A 1.1.4 Demand Side Management

The NYISO Demand Side Management program consists of the Special Case Resources (SCR) program and the Emergency Demand Response Program (EDRP). The Day-Ahead Demand Response Program, another component of the NYSIO DSM program, is not included in this study. These programs consist of loads that are capable of being interrupted and distributed generators that are activated on demand, and which are not metered directly by the NYISO. SCR's receive payment as ICAP providers for their capacity contribution. SCR and EDRP programs are available as resources to operators in order to mitigate operating reserve deficiencies.

SCRs are used to supplement other NYCA ICAP resources for meeting peak loads during July and August. This study assumed 975 MW of SCRs and 269 MW of EDRP will be available during the summer periods.

In the MARS model, SCRs and EDRP are modeled as Emergency Operating Procedures, as shown on Table II in Section 4.2.

A 1.2 RESOURCE UNIT REPRESENTATION

A 1.2.1 Unit Ratings

A 1.2.1.1 Definitions

The unit ratings in reliability calculations, referred to as Dependable Maximum Net Capability (DMNC), are based on seasonal certification that establishes each unit's sustained maximum net output. Combustion turbines are tested for a one-hour period and all other units, for a four-hour period.

A 1.2.1.2 Procedure for Verifying Ratings

The document that describes the procedure for verifying unit ratings through DMNC testing is in section 4.2 of the "NYISO Installed Capacity Manual".

A 1.2.2 Unit Unavailability Factors

A 1.2.2.1 Unavailability Factors Represented

¹² NPCC CP-8 Working Group report titled, "Review of Interconnection Assistance Reliability Benefits" dated June 29, 2004

NYISO represents forced outage rates, planned outages, maintenance outages, and partial outage rates.

A 1.2.2.2 Source of Outage Factors

Unit outage data is based on actual history. Unit forced and partial outage rates are calculated from NERC-GADS (North American Electric Reliability Council Generation Availability Data System) event data for the years 1999 – 2003.

Units that do not have a complete 5-year history for unscheduled outages are augmented with class average ratings from the NERC Generating Unit Statistical Brochure for the years 1999-2003.

Approved schedules for planned outages are compared to historical duration averages and may be adjusted before being input. Units that do not supply schedules are automatically scheduled by the program for durations based on historical averages from 5-year NERC-GADS data.

Historical hydro generation from the small units has been found to vary significantly by season. An analysis of the on-line data at the NYISO control center resulted in a monthly adjustment to the model.

A 1.2.2.3 Maturity Considerations

No separate immature/mature unavailability factors are used in NYISO reliability studies.

A 1.2.2.4 Tabulation of Unavailability Factors

Table A-1 presents the average availability factors used in the NYISO reliability study compared to NERC averages.

Table A2
Average Availability Factors

Unit Type	MW Nameplate	EAF%		FOR%		EFORd%	
		NERC	NYISO	NERC	NYISO	NERC	NYISO
Coal - Primary	All Sizes	84.90	85.74	4.56	4.94	6.21	7.50
Gas - Primary	All Sizes	85.97	81.81	6.38	9.51	5.86	7.59
Oil - Primary	All Sizes	83.77	80.75	5.64	3.65	6.73	5.82
Nuclear - All Types	All Sizes	86.86	87.28	3.83	4.94	4.77	5.66
Jet Engine	All Sizes	88.70	88.75	25.38	9.37	8.44	4.21
Gas Turbine	All Sizes	89.83	87.09	32.83	15.62	9.93	3.94
Combined Cycle	All Sizes	84.65	90.93	4.00	1.47	5.57	2.70
Hydro	All Sizes	89.04	83.08	3.70	0.82	3.49	0.86

EAF- Equivalent Availability Factor

FOR - Forced Outage Rate

EFORd - Equivalent Force Outage Rate during Demand

A 1.2.3 Purchase and Sale Representation

The following purchases of ICAP from other control areas and sales of ICAP to other control areas were modeled for the study years.

TABLE A3
ANNUAL EXTERNAL ICAP PURCHASES AND SALES – 2006-2010

Purchases/Sales	Installed Capacity (MW)				
	2006	2007	2008	2009	2010
PJM Purchases	80	80	0	0	0
Total Purchases	80	80	0	0	0
ISO-New England Sales	127	127	127	127	127
PJM-RTO Sales	176	176	176	176	169
Ontario Sales	2	2	2	2	2
Total Sales	305	305	305	305	298

A 1.2.4 Retirements

The following retirements were considered in the study.

TABLE A4
Plant Retirements – 2006-2010

Station	Zone	Date	Capability (MW)		Reason for Retirement
			Summer	Winter	
Waterside 6,8,9	J	7/1/2005	167	168	Station Repowering
Poletti 1*	J	2/1/2008	885	886	Station Replacement
Astoria 2	J	7/1/2010	175	181	Station Repowering
Huntley 63,64	A	11/1/2005	61	69	Environmental Restrictions
Huntley 65,66	A	11/1/2006	167	170	Environmental Restrictions
Russell Station	B	12/1/2007	238	245	Environmental Restrictions
Lovett 5	G	6/1/2007	188	190	Environmental Restrictions
Lovett 3	G	6/1/2008	68	68	Environmental Restrictions
Lovett 4	G	6/1/2008	174	175	Environmental Restrictions
Total:			2123	2152	

*Poletti retirement may be delayed if it is needed to meet the reliability resource adequacy criteria

A 1.3 INTERCONNECTED SYSTEMS

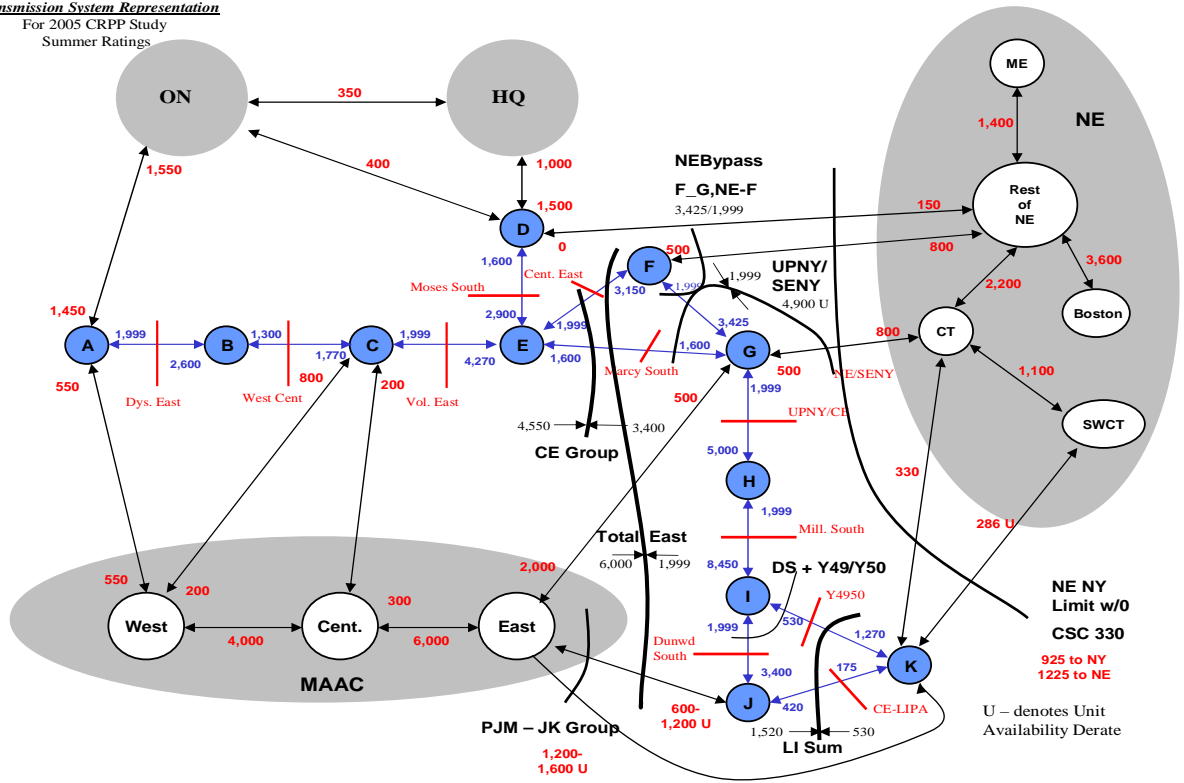
The Independent Electricity System Operator (IESO), ISO-New England, Hydro-Quebec, and PJM's interconnections were modeled as shown in Figure A1 below. The installed reserve margin was fixed at 15% for the 2006-2010 period for these Areas.

Figure A1

New York Control Area Transmission System Representation

New York Control Area

Transmission System Representation
For 2005 CRPP Study
Summer Ratings



A 1.4 MODELING OF LIMITED ENERGY RESOURCES

The Gilboa pumped storage facility is considered available for all hours in which the unit is not on forced or scheduled outage.

Seasonal variation in small hydro units is accounted for and is described in Section A 1.2.2.2 above.

The Robert Moses – Niagara hydroelectric project is modeled with a probability capacity model that is based on historical data.

A 1.5 MODELING OF DEMAND SIDE MANAGEMENT (DSM)

A description of the DSM program is given in section A1.1.4. 975 MW of DSM Special Case Resources are modeled in the study. This amount is less than the total registered for the program and reflects actual operating history of these resources.

A 1.6 MODELING OF RESOURCES

Modeling of resources is described in the above sections. Greater detail can be found in the IRM study¹³

A 1.7 OTHER ASSUMPTIONS

Internal ties were modeled at emergency limits and can be seen on the previous figure A-1. Maintenance over-runs and environmental constraints were not modeled in this study. The study assumes units needed for reliability will not be prevented from operating because of environmental constraints.

Derates on Gas Turbines were introduced due to lower output at higher than tested temperatures. These derates equate to 640 MW at a temperature of 100 Degrees F, or 80 MW per degree over the design test temperature of 92° F. There were no significant changes to the transmission limits for the 2006 to 2010 period.

A 1.8 RELIABILITY IMPACTS OF MARKET RULES

The Regional Greenhouse Gas Initiative (RGGI) is a plan developed by the northeastern states to address carbon dioxide emissions from power sources located in that section of the country. The plan is anticipated to start in 2009 and covers all units that are 25 MW or larger in size. Seven states have signed the Memorandum of Understanding (MOU) with a model rule anticipated in the summer of 2006. The impacts of this initiative are being considered in the CRPP.

¹³ NYSRC Report titled, “New York Control Area Installed Capacity Requirements for the Period May 2005 Through April 2006”

APPENDIX B

B. DESCRIPTION OF RELIABILITY PROGRAM

NYISO uses the GE MARS model to perform its reliability studies. MARS can model multi-pool power systems and each pool can be modeled as several zones. MARS uses sequential Monte Carlo simulation to model the availability of generating units over the time period of the study. The study period is one year, with each day modeled sequentially. For each unit, the model generates a random availability profile based on its forced and partial outage rates. Units can be fully available, forced out, or in one of several partial availability states. The availability profiles for each unit change from replication to replication. Scheduled maintenance is developed externally based on history.

Total resource capacities are developed from these profiles for each area. These are compared to the daily peak loads. If an area's resource capacity is not enough to meet its load, emergency purchases are made to the extent excess capacity is available elsewhere and transmission constraints allow the excess capacity to be transmitted to the deficient area. If emergency purchases are not sufficient for the area to meet its load, then additional emergency operating procedures are initiated. If more than one area is deficient, excess reserves from other areas are shared between the deficient ones proportionately.

If an area is still deficient after all these steps, the program records that it has experienced a loss of load for that day at that load level. These resources are compared to various load levels that simulate load forecast uncertainty. The resultant loss of loads, when weighted by the probability of being at each load level, produces an expected value for that replication. These expected values are accumulated over the number of replications and the LOLE, and other measures of reliability, are calculated and reported.