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New York Control Area Installed Capacity Requirements for the Period May 2010 through April 2011

Technical Study Report

December __, 2009

New York State Reliability Council, LLC
Installed Capacity Subcommittee

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(To be revised)

EXECUTIVE SUMMARY

A New York Control Area (NYCA) Installed Reserve Margin (IRM) Study is conducted annually by the New York State Reliability Council (NYSRC) Installed Capacity Subcommittee to provide parameters for establishing NYCA IRM requirements for the following capability year. This year's report covers the period May 2010 to April 2011 (2010 capability year).

Results of the NYSRC technical study show that the required NYCA IRM for the 2010 capability year is 17.9% under base case conditions.

For this base case, the study also determined Minimum Locational Capacity Requirements (MLCRs) of 79.6% and 104.9% for New York City (NYC) and Long Island (LI), respectively. In its role of setting the appropriate locational capacity requirements (LCRs), the New York Independent System Operator (NYISO) will consider these MLCRs.

These study results satisfy and are consistent with NYSRC Reliability Rules, Northeast Power Coordinating Council (NPCC) reliability criteria, and North American Electric Reliability Corporation (NERC) reliability standards.

The above 2010 base case IRM study value of 17.9 % represents a 1.7% *increase* from the base case IRM requirement determined by the 2009 IRM Study. The principle drivers for this significant increase in required IRM are:

1. An improved special case resource (SCR) performance model.
2. The continuing trend of increasing generating unit forced outage rates in NYCA. This trend is particularly significant for units located in New York City and Long Island.

The increase in the IRM caused by these and other factors are tempered to some extent by IRM reductions primarily caused by increased emergency assistance from neighboring control areas, an improved process for modeling loop flow during NYCA emergencies, and planned non-wind generation facilities and retirements.

Table 1 shows the IRM impacts of these and lesser factors that have resulted in a net 1.7% increase from the 2009 IRM base case value of 16.2%.

[Environmental issues discussion]

The study also evaluated IRM impacts of several sensitivity cases. These results are depicted in Table 2 and in Appendix Table B-2. In addition, a confidence interval analysis was conducted to demonstrate that there is a high confidence of meeting the reliability index within the NYSRC and the NPCC resource adequacy criteria.

The base case and sensitivity case IRM results, along with other relevant factors, will be considered by the NYSRC Executive Committee during a process in which it adopts the Final NYCA IRM requirement for the 2010 capability year.

INTRODUCTION

This report describes a technical study, conducted by the NYSRC Installed Capacity Subcommittee (ICS), for establishing the NYCA IRM for the period of May 1, 2010 through April 30, 2011 (2010 capability year). This study is conducted each year in compliance with Section 3.03 of the NYSRC Agreement which states that the NYSRC shall establish the annual statewide Installed Capacity Requirement (ICR) for the NYCA. The ICR relates to the IRM through the following equation:

ICR = (1 + IRM% / 100) x Forecasted NYCA Peak Load

The base case and sensitivity case study results, along with other relevant factors, will be considered by the NYSRC Executive Committee for its adoption of the Final NYCA IRM requirement for the 2010 capability year.

The NYISO will implement the final NYCA IRM as determined by the NYSRC, in accordance with the NYSRC Reliability Rules and the NYISO Installed Capacity Manual. The NYISO translates the required IRM to an Unforced Capacity (UCAP) basis. These values are also used in a Spot Market Auction based on FERC-approved Demand Curves. These Unforced Capacity and Demand Curve concepts are described later in the report. The schedule for conducting the 2010 IRM study was based on meeting the NYISO's timetable for these actions.

The study criteria, procedures, and types of assumptions used for this 2010 IRM Study are in accordance with NYSRC Policy 5-2, *Procedure for Establishing New York Control Area Installed Capacity Requirements,* dated July 11, 2008. The primary reliability criterion used in the IRM study requires, on average, a Loss of Load Expectation (LOLE) of no more than once in 10 years for the NYCA. This NYSRC resource adequacy criterion is consistent with NPCC reliability criteria and NERC reliability standards. IRM study procedures include the use of two study methodologies, the *Unified* and the *IRM Anchoring Methodologies.* The above reliability criterion and methodologies are discussed in more detail later in the report. In addition to calculating the NYCA IRM requirement, these methodologies identify corresponding MLCRs for NYC and LI. In its role of setting the appropriate LCRs, the NYISO will utilize the same study methodologies and procedures as in the 2010 IRM Study, and will consider the MLCR values determined in this study.

Two emerging energy issues that have the potential of impacting IRM requirements are covered in the *Models and Key Input Assumptions* section of this report: the growing capacity of wind generation and environmental initiatives.

Previous NYCA 2000 to 2009 IRM Study reports can be found at www.nysrc.org/reports.asp. Table B-1 in Appendix B provides a comparison of previous NYCA base case and Final IRMs for the 2000 through 2010 capability years. Definitions of certain terms in this report can be found in the NYSRC Glossary in the *NYSRC Reliability Rules for Planning and Operating the New York State Power System Manual,* at www.nysrc.org/NYSRCReliabilityRulesComplianceMonitoring.asp.

NYSRC RESOURCE ADEQUACY RELIABILITY CRITERION

The acceptable LOLE reliability level used for establishing NYCA IRM Requirements is dictated by the NYSRC Reliability Rule A-R1, *Statewide Installed Reserve Margin Requirements,* which states:

> *The NYSRC shall establish the 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 criterion 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 demand uncertainty, scheduled outages and deratings, forced outages and deratings, assistance over interconnections with neighboring control areas, NYS Transmission System emergency transfer capability, and capacity and/or load relief from available operating procedures.*

This NYSRC Reliability Rule is consistent with the NPCC Resource Adequacy Criterion in NPCC Document A-2, *NPCC Basic Criteria for Design and Operation of the Interconnected Power System*.

In accordance with NYSRC Rule A-R2, *Load Serving Entity (LSE) Installed Capacity Requirements*, the NYISO is required to establish LSE installed capacity requirements, including locational capacity requirements, in order to meet the statewide IRM Requirements established by the NYSRC for maintaining NYSRC Rule A-R1 above.

The full NYSRC Reliability Rule A-R2 can be found in the NYSRC Reliability Rules Manual on the NYSRC Web site, at
www.nysrc.org/NYSRCReliabilityRulesComplianceMonitoring.asp.

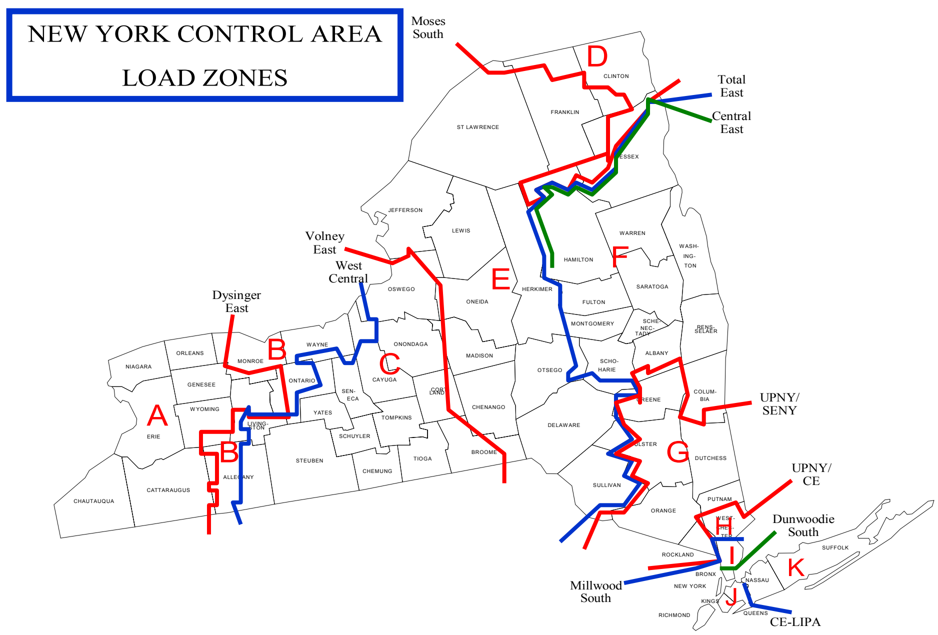
IRM STUDY PROCEDURES

The study procedures used for the 2010 IRM Study are described in detail in NYSRC Policy 5-2, *Procedure for Establishing New York Control Area Installed Capacity Requirements*. Policy 5-2 describes the computer program used for the reliability calculation in addition to the procedures and types of input data and models used for the IRM Study. Policy 5-2 can be found on the NYSRC Web site at,
www.nysrc.org/policies.asp.

This study utilizes a *probabilistic approach* for determining NYCA IRM requirements. This technique calculates the probabilities of generating unit outages, in conjunction with load and transmission representations, to determine the days per year of expected resource capacity shortages.

General Electric's Multi-Area Reliability Simulation (GE-MARS) is the primary computer program used for this probabilistic analysis. This program includes detailed load, generation, and transmission representation for eleven NYCA Zones — plus four external Control Areas (“Outside World Areas”) directly interconnected to the NYCA. The eleven NYCA zones are depicted in Figure 1 below. GE-MARS calculates LOLE, expressed in days per year, to provide a consistent measure of system reliability.

Figure 1: NYCA Load Zones



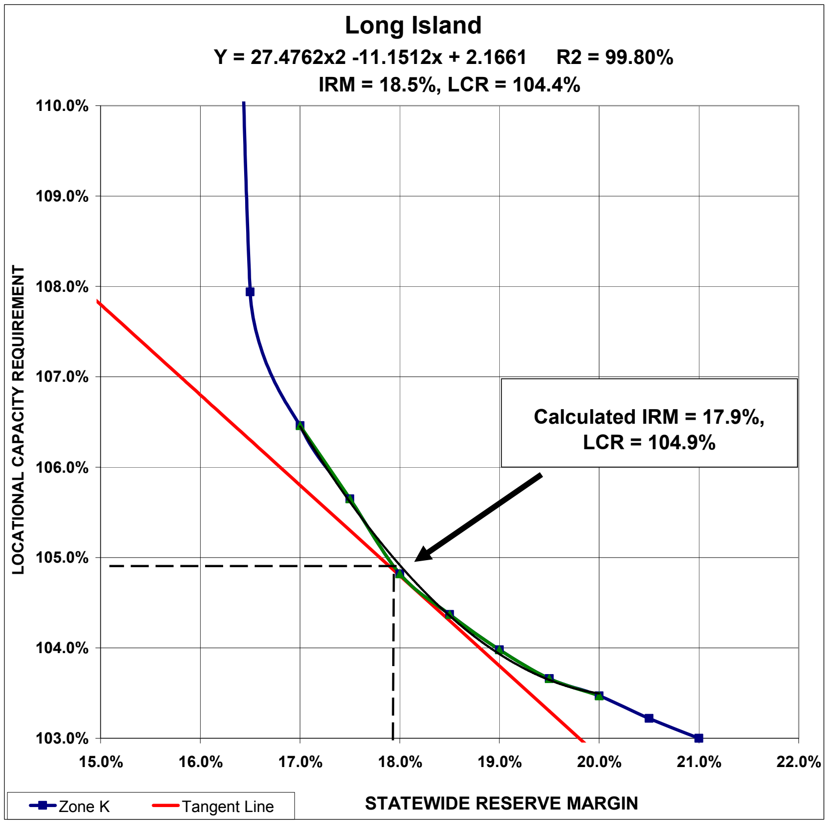
Using the GE-MARS program, a procedure is utilized for establishing NYCA IRM requirements (termed the *Unified Methodology)* which establishes a graphical relationship between NYCA IRM and MLCRs. All points on these curves meet the NYSRC 0.1 days/year LOLE reliability criterion described above. This methodology develops a pair of curves, one for NYC (Zone J) and one for LI (Zone K). Appendix A of Policy 5-2 provides a more detailed description of the Unified Methodology.

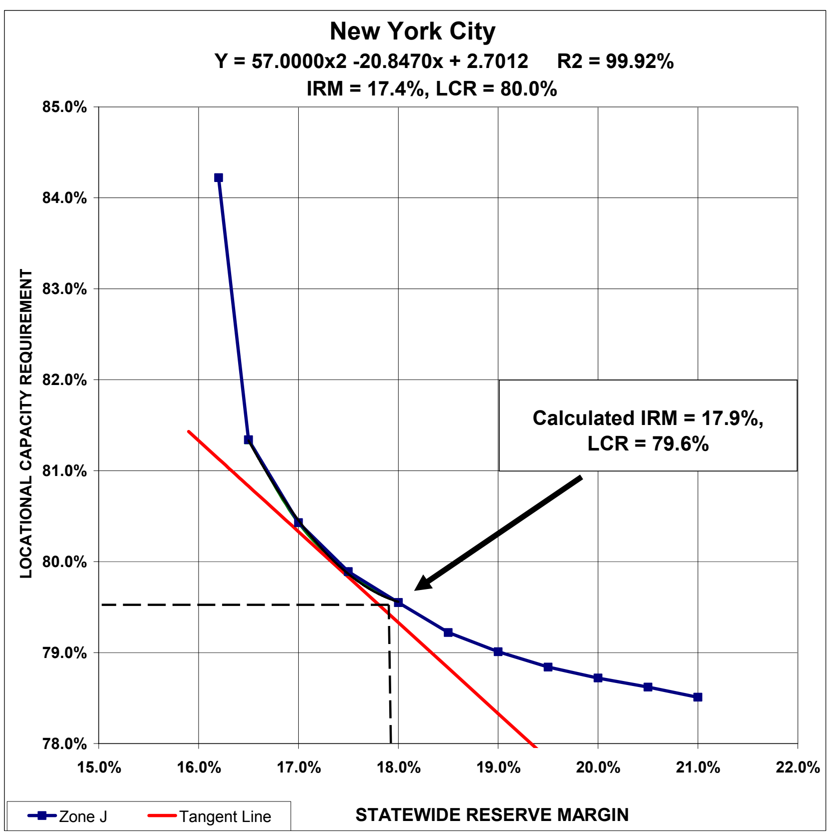
Base case NYCA IRM requirements and related MLCRs are established by a supplemental procedure (termed the *IRM Anchoring Methodology*) which is used to define an *inflection point* on each of these curves. These inflection points are selected by applying a tangent of 45 degrees (Tan 45) analysis at the bend (or “knee”) of each curve. Mathematically, each curve is fitted using a second order polynomial regression analysis. Setting the derivative of the resulting set of equations to minus one yields the points at which the curves achieve the Tan 45 degree inflection point. Appendix B of Policy 5-2 provides a more detailed description of the methodology for computing the Tan 45 inflection point.

BASE CASE STUDY RESULTS

Results of the NYSRC technical study show that the required NYCA IRM is 17.9% for the 2010 capability year under base case conditions. Figure 2 depicts the relationship between NYCA IRM requirements and resource capacity in NYC and LI. The

Figure 2: NYCA Locational ICAP Requirements vs. Statewide ICAP Requirements





points on the NYC and LI curves were calculated using the methodologies described in the previous "IRM Study Procedures" section.

The inflection points on these curves, from which the above base case study results are based, were evaluated using the Tan 45 analysis, also previously described. Accordingly, we conclude that maintaining a NYCA installed reserve of 17.9% for the 2010 capability year, together with MLCRs of 79.6% and 104.9% for NYC and LI, respectively, will achieve applicable NYSRC and NPCC reliability criteria for the base case study assumptions shown in Appendix A. The 79.6% MLCR for NYC is similar to that calculated for the 2009 IRM Study, while the 104.9% MLCR for LI represents an increase of about 8 percentage points from that calculated in the 2009 Study. The NYISO will consider these MLCRs when developing the final NYC and LI LCR values for the 2010 capability year.

A Monte Carlo simulation error analysis shows that there is a 99.7% probability that the above base case result is within a range of __% and __% (see Appendix A). Within this range the statistical significance of the __%, __%, and __% numbers are a 0.15%, 50%, and 99.85% probability of meeting the one day in ten LOLE, assuming perfect accuracy of all parameters and using a standard error of 0.05. If a standard error of 0.025 were used, the band would tighten from __ to __%. The base case IRM value of 17.9% is in full compliance with NYSRC and NPCC reliability rules and criteria.

MODELS AND KEY INPUT ASSUMPTIONS

This section describes the models and related input assumptions for the 2010 IRM Study. The models represented in the GE-MARS analysis include a *Load Model, Capacity Model, Transmission System Model, and Outside World Model*. Potential IRM impacts of pending environmental initiatives are also addressed. The input assumptions for the base case were based on information available prior to October 1, 2009. Appendix A provides more details of these models and assumptions. Table A-5 compares key assumptions with those used for the 2009 IRM Study.

Load Model

- ***Peak Load Forecast****:* A 2010 NYCA summer peak load forecast of 32,976 MW was assumed in the study. This forecast is a reduction of 867 MW from the 2009 summer peak forecast used in the 2009 IRM Study. The 2010 NYCA load forecast was completed by the NYISO staff in collaboration with the Load Forecasting Task Force in October 2009, and is based on actual 2009 summer load conditions. Use of this 2010 peak load forecast in the 2010 IRM study resulted in an increase from the 2009 IRM requirement by 0.3% (see Table 1). Although the NYISO will prepare a final 2010 summer forecast in early 2010 for use in NYISO locational capacity requirement study, it is expected that both the October and final 2010 summer peak forecasts will be similar.

- ***Load Shape Model****:* The 2010 IRM Study was performed using a load shape based on 2002 actual values. The same 2002 load shape was used in the four previous

IRM studies and is consistent with the load shape assumption used by adjacent NPCC Control Areas. An analysis comparing the 2002 load shape to actual load shapes from 1999 through 2008 concluded that the 2002 load shape continues to be the best suited for the 2010 IRM Study.

- ***Load Forecast Uncertainty (LFU):*** It is recognized that some uncertainty exists relative to forecasting NYCA loads for any given year. This uncertainty is incorporated in the base case model by using a load forecast probability distribution that is sensitive to different weather and economic conditions. Recognizing the unique LFU of individual NYCA areas, separate LFU models are prepared for four areas: Zone H and I, Zone J (NYC), Zone K (LI), and Zones A-G (the rest of New York State).

  New load forecast uncertainty models were prepared for the 2010 IRM Study by Consolidated Edison (for Zones H and I, and Zone J) and LIPA (for Zone K). An additional LFU model was developed by the NYISO for Zones A-G. Appendix Section A-5.2.1 describes these models in more detail. Use of the new LFU models for the 2010 IRM Study increased IRM requirements by 0.2%.

Capacity Model

The capacity model in MARS incorporates the several considerations, as discussed below:

- ***Planned Non-Wind Facilities, Retirements and Reratings****:* Planned non-wind facilities and retirements that are represented in the 2010 IRM Study are shown in Appendix A. The rating for each existing and planned resource facility in the capacity model is based on its Dependable Maximum Net Capability (DMNC). The source of DMNC ratings for existing facilities is seasonal tests required by procedures in the NYISO Installed Capacity Manual. This updated parameter decreased the IRM by 0.4% from the 2009 Study IRM. Appendix A shows the ratings of all resource facilities that are included in the 2010 IRM Study capacity model.

- ***Generating Unit Availability****:* Generating unit forced and partial outages are modeled in GE-MARS by inputting a multi-state outage model that represents an "equivalent forced outage rate on demand" (EFORd) for each unit represented. Outage data is received by the NYISO from generator owners based on specific reporting requirements established by the NYISO. Capacity unavailability is modeled by considering the average forced and partial outages for each generating unit that have occurred over the most recent five-year time period – the time span considered for the 2010 IRM Study covered the 2004–2008 period.

  Improvements of generating unit availability performance lead to stabilization of NYCA forced outage rates during the 2001-2006 period. This improved performance from previous years permitted required NYCA IRMs to be significantly reduced. However, during 2007-2008, NYCA generators experienced a trend towards higher forced outage rates, especially in NYC and LI. The higher forced outage rates during this two-year period caused the EFORd five-year rolling average used for the 2009 IRM Study to increase by 0.3%, and another 0.3% for the 2010 IRM Study, as compared to that used for the 2008 IRM Study. This resulted in IRM increases of 1.2% and 1.4% in the 2009 and 2010 IRM Studies, respectively (see Table 1).

- ***Wind Generation:*** It is projected that by the end of the 2010 Capability Period there will be 20 wind-powered generation locations in NYCA with a total capacity of 1,326 MW. This represents an increase of 117 MW since the 2009 capability period. All of these wind farms are located in upstate New York, in Zones A – E.

  The 2010 IRM Study base case assumes that the projected 1,326 MW of wind capacity will operate at an 11.0% capacity factor during the summer peak period. This assumed capacity factor is based on an analysis of actual hourly wind generation data collected for wind facilities in New York State during the June through August period, between the hours of 2:00 p.m. and 5:00 p.m. This test period was chosen because it covers the time when virtually all of the annual NYCA LOLE is distributed.

  The projected 1,326 MW of wind capacity in the 2010 base case increases 2010 IRM requirements by __% (see Table 2). This increased IRM is a direct result of the very low capacity factor of wind facilities during the summer peak period, as noted above. The increased wind capacity of 305 MW from 2009 to 2010 is responsible for increasing the base case IRM from the 2009 IRM Study by 0.2% (see Table 1). The impact of wind capacity on *unforced capacity* is discussed in the "NYISO Implementation of the NYCA IRM Requirement" section of the report.

  A detailed summary of existing and planned wind resources is shown in Appendix D.

- ***Emergency Operating Procedures (EOPs):***

  -- Special Case Resources (SCRs). SCRs are ICAP resources that include loads that are capable of being interrupted and distributed generation that may be activated on demand. This study assumes SCR base case value of 2575 MW in July with lesser amounts during other months based on historical experience. Also assumed is a limit of four calls per month in July and August for Department of Environmental Conservation limited generation (about a total of 30 hours). An improved historical SRC performance methodology was utilized in the 2010 IRM Study based on an analysis of historical SCR load reduction performance. This analysis is described in detail in the Appendix. Use of this improved modeling process resulted in a 1.4% IRM increase from the 2009 IRM Study (see Table 1).

  -- **Emergency Demand Response Programs (EDRP)**. EDRP allows registered interruptible loads and standby generators to participate on a voluntary basis - and be paid for their ability to restore operating reserves. The 2010 Study assumes 329 MW of EDRP capacity resources will be registered in 2010. This EDRP capacity was discounted to a base case value of 148 MW reflecting past performance, and is implemented in the study in July and August (lesser amounts during other months), while being limited to a maximum of five EDRP calls per month. Both SCRs and EDRP are included in the Emergency Operating Procedure (EOP) model.

-- Other Emergency Operating Procedures. In accordance with NYSRC criteria, the NYISO will implement EOPs as required to minimize customer disconnections. Projected 2010 EOP capacity values are based on recent actual data and NYISO forecasts. (Refer to Appendix B, Table B-3, for the expected use of SCRs, EDRP, voltage reductions, and other types of EOPs during 2010). The updated EOP model increased the IRM by 0.3% from the 2009 IRM.

- ***Unforced Capacity Deliverability Rights (UDRs):*** The Capacity Model includes UDRs which are capacity rights that allow the owner of an incremental controllable transmission project to extract the locational capacity benefit derived by the NYCA from the project. Non-locational capacity, when coupled with a UDR, can be used to satisfy locational capacity requirements. The owner of UDR facility rights designates how they will be treated by the NYSRC and NYISO for resource adequacy studies. The NYISO calculates the actual UDR award based on the performance characteristics of the facility and other data. LIPA's 330 MW HVDC Cross Sound Cable, 660 MW HVDC Neptune Cable, and the Linden VFT project are facilities that are represented in the 2010 Study as having UDR capacity rights. LIPA has the option, on an annual basis, of selecting the MW quantity of UDRs (ICAP) it plans on utilizing for capacity contracts over these facilities. Any remaining capability on the cable can be used to support emergency assistance which may reduce locational and IRM requirements. The 2010 IRM study incorporates the elections that LIPA has made for the 2010 capability year.

Transmission System Model

A detailed transmission system model is represented in the GE-MARS study. The transmission system topology, which includes eleven NYCA zones and four Outside World Areas, along with transfer limits, is shown in Figure A-9 in Appendix A. The transfer limits employed for the 2010 IRM Study were developed from emergency transfer limits calculated from various transfer limit studies performed at the NYISO, and refined with additional analysis specifically for the GE-MARS representation. Transmission Owner input and study results and internal constraints from neighboring control areas were also utilized.

Failure rates for overhead lines and underground cables are similar, but the repair time for an underground cable is much longer. Therefore, forced transmission outages are included in the GE-MARS model for the underground cable system from surrounding zones entering into New York City and Long Island. The GE-MARS model uses transition rates between operating states for each interface, which are calculated based on the probability of occurrence from the failure rate and the time to repair. Transition rates into the different operating states for each interface are calculated based on the individual make-up of each interface, which includes failure rates and repair times for the cable, and for any transformer and/or phase angle regulator on that particular cable.

The interface limit from Zones I to J was increased from 3925 MW, assumed in the 2009 IRM Study, to 4000 MW based on recent studies performed by Con Edison and the

NYISO. This increase in limit was due to better flow balancing of the circuits comprising the interface. In addition, the Moses South interface was reduced from 2,900 MW to 2,600 MW based on different base case flow patterns.

GE-MARS is capable of determining the impact of transmission constraints on NYCA LOLE. The 2010 IRM study, as with previous GE-MARS studies, reveals that the transmission system into NYC and LI is constrained and can impede the delivery of emergency capacity assistance required to meet load within these zones. The NYSRC has two reliability planning criteria that recognize transmission constraints: (1) the NYCA IRM requirement considers transmission constraints into NYC and LI, and (2) minimum LCRs must be maintained for both NYC and LI (See NYSRC Resource Adequacy Reliability Criteria section).

The impact of transmission constraints on NYCA IRM requirements depends on the level of resource capacity in NYC and LI. In accordance with NYSRC Reliability Rule A-R2, *Load Serving Entity ICAP Requirements,* the NYISO is required to calculate and establish appropriate LCRs. The most recent NYISO study (*Locational Installed Capacity Requirements Study,* dated January 15, 2009, at http://www.nyiso.com/public/services/planning/resource_adequacy_planning.jsp, determined that for the 2009 capability year, the required LCRs for NYC and LI were 80% and 97.5%, respectively. A LCR Study for the 2010 capability year is scheduled to be completed by the NYISO by February 2010.

Results from this study illustrate the impact on the IRM requirement for changes of LCR level assumptions from the base case. Observations from these results include:

- **Unconstrained NYCA Case** – If internal transmission constraints were entirely eliminated the NYCA IRM requirement could be reduced to __%, __ percentage points less than the base case IRM requirement (see Table 2). Therefore, relieving these transmission constraints is equivalent to adding approximately __ MW of generation in NYCA.

- **Downstate NY Capacity Levels** – If the NYC and LI LCR levels were *increased* from the base case results to 80.5% and 106%, respectively, the IRM requirement could be reduced by 0.9 percentage points, to 17.0%. Similarly, if the NYC and LI locational installed capacity levels were *decreased* to 79% and 104%, respectively, the IRM requirement must increase by 1.1 percentage points, to 19.0% (see Figure 2).

These results illustrate the significant impact on IRM caused by transmission constraints and implementing different LCR levels, assuming all other factors being equal.

Outside World Model

The Outside World Model consists of Control Areas in Ontario, Quebec, New England, and PJM. NYCA reliability can be improved and IRM requirements can be reduced by recognizing available emergency capacity assistance support from these neighboring interconnected control areas — in accordance with control area agreements during emergency conditions. Assuming such interconnection support arrangements in the base case reduces the NYCA IRM requirements by approximately __ percentage points (see Table 2). A model for representing neighboring control areas, similar to that applied in previous IRM studies, was utilized in his study.

The primary consideration for developing the base case load and capacity assumptions for the Outside World Areas is to avoid overdependence on these Areas for emergency assistance support. For this purpose, from Policy 5-2, a rule is applied whereby an Outside World Area's LOLE cannot be lower than its own LOLE criterion, its isolated LOLE cannot be lower than that of the NYCA, and its IRM can be no higher than that Area's minimum requirement.

Another consideration for developing models for the Outside World Areas is to recognize internal transmission constraints within the Outside World Areas that may limit emergency assistance to the NYCA. This recognition is considered either explicitly, or through direct multi-area modeling providing there is adequate data available to accurately model transmission interfaces and load areas within these Outside World Areas. For this study, two of the Outside World Areas – New England and PJM – are each represented as multi-areas (five zones for New England and three zones for PJM). This level of granularity better captures the impacts of transmission constraints within these areas, particularly on their ability to provide emergency assistance to the NYCA.

The Southwest Connecticut interface was increased from 1100 MW, assumed in the 2009 IRM Study, to 2350 MW to reflect system upgrades in New England. With the installation of new facilities in Southern New England, the limits for New England to New York Interface Grouping were reduced to reflect simultaneous export limits internal to New England when exports to Long Island are at their maximum. These changes are summarized in Table A-10. Updated Outside World Area load, capacity, and transmission representations in the 2010 IRM Study improved emergency assistance to NYCA, resulting in an IRM reduction of 0.5%.

Base case assumptions considered the full capacity of transfer capability from external Control Areas (adjusted for grandfathered contracts and estimated external capacity purchases) in determining the level of external emergency assistance.

Studies performed by NYISO and evaluated by General Electric, showed that in GE-MARS, NYCA internal transmission interface capability could be utilized by external control area loop flow through the NYCA, ahead of when the NYCA needs full use of its internal interfaces during NYCA emergencies to avoid loss of load. As a result of study process changes to prevent this anomaly, although the use of the NYCA transmission system for loop flow is still allowed in GE-MARS, but more appropriately, only after the NYCA has maximized its use of those interfaces to minimize LOLE. Use of this improved process for correctly modeling loop flow resulted on an IRM decrease of 0.4% (see Table 1).

<u>Environmental Initiatives</u>

[To be added later]

COMPARISON WITH 2009 IRM STUDY RESULTS

The results of this 2010 IRM Study show that the base case IRM represents an increase of 1.7 percentage points above the 2009 IRM Study IRM value. Table 1 compares the estimated IRM impacts of changing several key study assumptions from the 2009 Study. The estimated percent IRM change for each parameter was calculated from the results of a parametric analysis. These results were grouped and then normalized such that the sum of the +/- % changes totals the 1.7 percentage point IRM reduction from the 2009 Study.

As observed in Table 1, the principle drivers that have <u>increased</u> IRM requirements from the 2009 capability year are as follows:

(1) Improved SCR Performance Model. Refer to *Emergency Operating Procedures* under the "Models and Key Assumptions" section.

(2) Continued decline in NYCA generating unit availability. Refer to *Generating Unit Availability* under the "Models and Key Assumptions" section.

Also shown in Table 1 are the principle drivers that have <u>decreased</u> IRM requirements from the 2009 capability year, as follows:

(1) An updated Outside World Model. Refer to *Outside World Model* under the "Models and Key Assumptions" section.

(2) An improved process for modeling loop flow during emergencies. Refer to *Outside World Model* under the "Models and Key Assumptions" section.

(3) New Non-Wind Units, Retirements & Reratings. Refer to *Planned Non-Wind Units, Retirements & Reratings* under the "Models and Key Assumptions" section.

Table 1: Parametric IRM Impact Comparison with 2009 Study

Parameter	Estimated IRM Change (%)	IRM (%)
2009-10 Study – Base Case IRM		**16.2**
Updated Parameters Causing a Higher IRM:		
Improved SCR Performance Model	+ 1.5	
Updated Generating Unit EFORs	+ 1.4	
Updated NYCA Load Forecast	+ 0.3	
Updated EOPs	+ 0.3	
New Wind Capacity (117 MW)	+ 0.2	
New Load Forecast Uncertainty Model	+ 0.2	
Total of Other Parameters	+ 0.3	
Total IRM Increase	**+ 4.2**	
Updated Parameters Causing a Lower IRM:		
Updated Outside World Model	- 0.5	
Improved Process for Modeling Loop Flow	- 0.4	
New Non-Wind Units, Retirements & Reratings	- 0.4	
Updated Cable Outage Rates	- 0.2	
Capacity Purchases	- 0.2	
Capacity Sales	- 0.2	
Total of Other Parameters	- 0.6	
Total IRM Decrease	**- 2.5**	
Net Change From 2009-10 Study		**+ 1.7**
2009-10 Study – Base Case IRM		**17.9**

SENSITIVITY CASE STUDY RESULTS

Determining the appropriate IRM requirement to meet NYSRC reliability criteria depends upon many factors. Variations from the base case will, of course, yield different results. Table 2 shows IRM requirement results and related NYC and LI locational capacities for three groups of selected sensitivity cases. Certain of these sensitivity cases – particularly those included under the "Base Case Assumption Uncertainties" group – are important input when the NYSRC Executive Committee develops the final NYCA 2010 IRM. A complete summary of all sensitivity case results are shown in Appendix B, Table B-2. Table B-2 also includes a description and explanation of each sensitivity case.

Table 2: Sensitivity Cases
NYCA 2010 IRM and Related NYC and LI Locational Capacities Impacts

Case	Case Description	IRM (%)	% Change From Base Case	NYC (%)	LI (%)
0	Base Case	17.9	--	79.6	104.9
2009 IRM Impacts of Major MARS Parameters					
1	NYCA Isolated				
2	No Internal NYCA Transmission Constraints				
3	No Load Forecast Uncertainty				
4	No Wind Capacity (1326 MW)				
5	No SCRs and EDRPs				
6	No External Purchases				
2009 IRM Impacts of Base Case Assumption Uncertainties					
7	Higher Outside World Reserve Margins				
8	Lower Outside World Reserve Margins				
9	Higher EFORd's				
10	Lower EFORd's				
11	Higher than Forecast Peak Load				
12	Alternate External Purchase Assumption				
13	Alternate External Sale Assumption				
14	Alternate HQ Energy Wheel Assumption				
15	Alternate Zonal Capacity Shift Methodology				
16	Increase Con Ed Energy Efficiency Program by 200 MW				
17	1 Year Outage of Indian Point 2				
Future Year IRM Impacts of Possible System Changes After 2010					
18	Environmental Scenario (describe)				

Due primarily to time and resource constraints, there was no attempt to develop Table 2 sensitivity results utilizing the Tan 45 "inflection point" method. All sensitivity studies use a method for performing sensitivity tests developed by GE for use in past IRM studies. This method adds or removes capacity to all zones to achieve LOLE=0.1 and obtain IRM and LCR results. While this method is efficient for calculating the impact of system changes for a large number of sensitivity cases, it may introduce anomalies for the small number of sensitivity cases which disproportionately alter the Upstate or Downstate regions (e.g. Wind or Neptune). In 2009, ICS will examine the appropriate sensitivity study methodology to be used for the 2010 IRM Study.

NYISO IMPLEMENTATION OF THE NYCA IRM REQUIREMENT

NYISO Translation of NYCA Capacity Requirements to Unforced Capacity

The NYISO values capacity sold and purchased in the market in a manner that considers the forced outage ratings of individual units — Unforced Capacity or "UCAP". To maintain consistency between the rating of a unit translated to UCAP and the statewide ICR, the ICR must also be translated to an unforced capacity basis. In the NYCA, these translations occur twice during the course of each capability year, prior to the start of the summer and winter capability periods.

Additionally, any LCRs in place are also translated to equivalent UCAP values during these periods. The conversion to UCAP essentially translates from one index to another, and is not a reduction of actual installed resources. Therefore, no degradation in reliability is expected. The NYISO employs a translation methodology that converts UCAP requirements to ICAP in a manner that assures compliance with NYSRC Resource Adequacy Rule A-R1. The conversion to UCAP provides financial incentives to decrease the forced outage rates while improving reliability.

The increase in wind resources increases the IRM because wind capacity has a much lower peak period capacity factor than traditional resources. On the other hand, there is a negligible impact on the need for unforced capacity. See Appendix B for a more detailed explanation.

NYISO Implementation of a Spot Market Auction based on a Demand Curves

Effective June 1, 2003 the NYISO replaced its monthly Capacity Deficiency Auction with a monthly Spot Market Auction based on three FERC-approved Demand Curves. Demand Curves are developed for Zones J, K, and the rest of NYCA. The existence of Demand Curves does not impact the determination of IRM requirements by the NYSRC.