Control Area Readiness Audit Report

New York
Independent System Operator
April 14–15, 2004
Schenectady, NY

North American Electric Reliability Council

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Preface

This report has been developed and completed by the North American Electric Reliability Council. The report represents a review of the readiness of the New York ISO (NYISO) to meet the responsibilities of a control area and contains best practices of the NYISO and areas for improvement. It is the responsibility of the control area to address these areas for improvement and to operate its system in a reliable manner.

Introduction

In response to the August 14, 2003 blackout, on February 10, 2004, the NERC Board of Trustees committed to take immediate actions to strengthen the reliability of the North American bulk electric system. Specifically, the board adopted the recommendations of the NERC Steering Group that investigated the August 14, 2003 blackout. These recommendations included:

- A list of specific actions to correct the deficiencies that led to the August 14 blackout;
- Near-term strategic initiatives by NERC and its regional reliability councils to strengthen compliance with existing standards and to formally track completion of recommended actions arising from August 14 and other significant power system events; and
- Longer-term technical initiatives to prevent or mitigate the impacts of future cascading blackouts.

NERC tasked the readiness audit team with assessing the degree to which the control area meets their responsibilities that are defined as:

> "The control area authority is responsible for the safe and reliable operation of their portion of the bulk electric system in cooperation with neighboring control areas and their reliability coordinator."

The audit process includes:

- A self-assessment questionnaire for the control area being audited
- Questionnaires for neighboring control areas
- A questionnaire to the reliability coordinator
- A two day on-site audit by a selected audit team

Pre-audit information (responses to the self-assessment questionnaire, a set of questions and guidelines to assist the audit team in the on-site audit, and copies of some of the documentation provided by the control area being audited) was sent to the audit team to assist them in their readiness evaluation. The team met prior to the on-site visit to complete necessary preparations for the audit. This preparation included discussing and reviewing interview assignments, the audit process, interview questions, and questionnaire responses.

New York ISO Participants

Manager, Power System Operations
Supervisor of Operations
System Operations
Shift Supervisor
Shift Supervisor
System Operator
System Operator
Supervisor, Short Term Reliability
Manager, Market Operations
Supervisor, System Operator Training
Manager, Operations Engineering
President and CEO (Closing Comments)
VP Operations and Reliability (Introductions & Closing Comments)

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Executive Summary

Most importantly, the audit team believes that the NYISO is well equipped to handle the daily operation of the control area, including any emergency situations. The audit team found that the reliability of the interconnection is the primary objective of the NYISO and the management team in place at the NYISO supports the system operators in the performance of their duties. The audit team was impressed with the level of knowledge displayed by the system operators interviewed during the audit. The prepared reference material presented at the audit was a crucial part of the audit and contributed to its success.

NYISO provided a good cross-section of personnel during the interviews and all were responsive to the questions asked by the audit team. NYISO is a control area and reliability coordinator, an arrangement that is not unique, but it is not the norm either. This presents some situations where the response to the standard questionnaires is difficult. The audit team believes that the combination of the reliability coordinator function and the control area function within the NYSIO works very well and promotes reliable operations.

The team found agreements in place with the transmission owners and participants in the NYISO market that verified its operating authority within the control area. The audit team determined that an agreement with the reliability coordinator was not necessary since the NYISO provides both services. There are documents at the Northeast Power Coordinating Council (NPCC) declaring NYISO to be a control area.

The operational staff is completely NERC certified, with the current exception of two persons not in operating positions. These two staff persons are in training and check generation schedules and inter-area interchange. Certified operators oversee the implementation of the transactions initiated by these two persons.

Security for the primary facility appears to be quite adequate. There are no signs indicating the purpose of the site and a twenty-four hour guard is onsite. Access is controlled to the grounds as well as to the building. Access cards control several layers of admission with control room management in charge of approving keycard access to the control room. The team observed construction activity on new physical security improvements. New pillars are being placed in front of the building to replace the temporary barriers. Security at the backup or alternate control center includes a card entry system and a guard just inside. Both facilities require employees and visitors to wear identification tags.

The training program and facility is exemplary with a fully functional training simulator. The simulator equipment is updated with real-time data, ready to serve as a “hot standby” backup (or alternate control center), except when in the simulator mode. A staff of five dedicated trainers with the ability to call upon other specialists when needed makes an excellent training crew. The system operator training seminars (SOTS) bring together the NYISO and transmission owner system operators for a mandatory five-day training session that occurs two times per year (spring and fall). The SOTS program is used to provide the system operators with the latest procedural and practical knowledge in order to facilitate reliable and coordinated system operations in New York. In addition to the SOTS training, the NYISO system operators also participate in the spring and fall NPCC training seminars to ensure that operations are coordinated within NPCC and the other surrounding areas. Recently, the NYISO training program became one of the initial NERC approved continuing education providers, which may in the future, allow NYISO to keep its operators continuously certified through effective training programs rather than operators re-testing. The future for training looks even brighter as NYISO is installing a new Emergency Management System (EMS) system and a new training simulator in a new facility.

The authority of the control area and operators is documented but only the shift supervisor has the documented authority to shed load. The audit team interviewed the operators and is confident that the

system operator and generation operator have the functional authority and responsibility to shed load as well. The team recommends that the system operator and the generation operator job descriptions be changed to clarify this functional authority.

The audit team feels confident that the long term planning has provided facilities and processes for the day ahead planning and real-time analysis to operate the bulk electric system in a reliable manner.

The team also believes that the market processes utilized in New York has enhanced reliable operations within the control area rather than hindered them.

The audit team believed that the voltage control processes used by the NYISO were very effective in ensuring the reliable operation within the New York control area. The NYISO manages voltages through the use of a voltage profiles or schedules throughout the New York system and combines these voltage profiles with voltage transfer limits, which ensures reliable operations. The operators were well versed in the use of these voltage processes and the tools to monitor voltage. The NYISO manuals also clearly documented when the NYISO would move from the normal to emergency states for voltage conditions on the system.

Monitoring of the system is also done quite well. The system operators are fully trained on the use of their tools and demonstrated proficiency in their use to the audit team. The audit team found multiple frequency sources available for use by the system operators, however only four of the ten measurements were operating correctly. The audit team felt that the problems with the monitoring points should be corrected and additional monitoring points should be added at strategic locations throughout the control area. (Note that the repairs to the frequency monitoring displays have been completed as of April 29, 2004 so that all measurement values are operable. In addition, a new direct analog frequency point telemetered from the Goethals 345 kV station in New York City was added on May 11, 2004.)

The statewide restoration program has all the required parts and is coordinated well with the transmission owners. The restoration program was very effective in restoring the New York system during the August 14, 2003 event. In addition, the NYISO provides annual mandatory training and drills in system emergencies for each of its system operators and conducts a full-scale system restoration exercise each spring prior to the summer peak load. (Note this drill was successfully conducted on May 11, 2004).

Facility outage coordination is accomplished very effectively. The generator maintenance periods are scheduled a year in advance. Transmission system outages are studied on a case-by-case basis. When planned outages conflict and may affect reliability, analysis determines which outage is most important to assure reliability. Other conditions being equal, the first request is granted first.

NYISO's relaying and system protection practices are acceptable and are in accordance with NERC, NPCC and NYISO criteria. The system disturbance recorders attracted the attention of the team. NYISO owns and controls a few recorders, which are correctly time synchronized. However, there are also numerous recorders under the control of the transmission owners. The team recommends that NYISO encourage the transmission owners to time-synchronize these recorders as well.

The NYISO capacity and energy emergency plan considers all thirteen of the steps recommended by NERC. However, the fuel supply adequacy of power plants is a plant responsibility and is not monitored by NYISO. Because of the nature of the installed capacity and market structure used in the NYISO footprint, the plants have an incentive to ensure that the plants have sufficient fuel and are able to run as required, thus fulfilling the fuel supply issue through effective market design.

The wholesale market implementation in New York was clearly designed around reliability and was built from a foundation of longstanding (30+ years) successful control area operations.

The NYISO emergency procedures for load shedding are exceptional, with detailed voice and electronic notification protocols. In addition, and in accordance with NPCC criteria, the NYISO can manually shed 50% of the control area's load in 10 minutes.

Policy and procedure changes, sometimes called "Running Orders," are issued in both paper and electronic forms with a check-off for each operator to indicate that he or she is aware of any changes. Shift changes are made with communications between the shift personnel to convey the present state of the system.

NYISO transmission owners each maintain a vegetation management program in accordance with the New York Compilation of Rules and Regulations, Part 82, issued by the New York Public Service Commission.

Nuclear power plant's emergency power needs require special attention. The team understands that the nuclear power plants have agreements with the individual transmission owners, with which they are connected, and, in turn, the transmission owners communicate those requirements to NYISO as part of the transmission owner's criteria. The team recommends that the processes used by the nuclear power plants, transmission owners and NYISO be further documented in order to ensure that the needs of the nuclear power plants are being met.

Commendations

The training program and facility is exemplary with a fully functional training simulator. The simulator equipment is updated with real-time data, ready to serve as a "hot standby" backup (or alternate control center), except when in the simulator mode. A staff of five dedicated trainers with the ability to call upon other specialists when needed makes an excellent training crew.

The "storm watch" program for metropolitan New York City provides added security for the area during periods of storm activity. During storm watch periods, both real and reactive reserves are increased and second contingency reliability is used.

There is 24-hour onsite support to correct information technology problems.

A security constrained unit commitment scheduling program is used for committing day-ahead supplies, yielding a day ahead operating plan for every hour of the next day. These security constrained unit commitment scheduling program results provide a secure foundation for the short-term reliability requirements determined in the Balancing Market Evaluation (BME) process. The BME is also a security constrained unit commitment process very similar to SCUC, yielding a secure hour ahead operating plan.

NYISO can manually shed 50% of the control area's load in 10 minutes.

The audit team was impressed with the level of knowledge displayed by the system operators interviewed during the audit.

Areas For Improvement

Alarms are broken out into eight categories with priorities that are distinguished by four different colors of the text. The operators expressed confidence in the alarm displays and thought they were effective for reliable operation. However, the team believed improvements could be made in alarm prioritization and processing. Since a new EMS system is being developed with extensive alarm prioritization and processing capabilities and planned to be in service during Fall 2004, the team believes it would not be effective to introduce changes to the current alarm displays.

NERC Policy 3, Requirement 1.4 requires the control area to update tags within an hour when changes are made. The NYISO was in the process of automating this requirement at the time of the audit and completed the work on April 26, 2004.

The team members had a long discussion among themselves concerning the documentation of system voltage needs at nuclear power plants. The team understands that there is a process to satisfy these needs that is coordinated with the transmission owners to ensure reliable voltages at the nuclear power plants. The team recommends that the processes used by the nuclear power plants, transmission owners and NYISO be further documented to provide added certainty that the needs of the nuclear power plant are being met.

The shift supervisors, system operators and generation operators clearly stated to the audit team that they have the authority to shed load. This function is stated in the shift supervisor job description only and the authority of the NYISO is clearly documented in the emergency manual. The audit team would like the other two job descriptions clarified to include the same language

The transmission owners should be encouraged to synchronize the clocks in their microprocessor-based relays, system disturbance and fault recorders (as suggested in the NPCC A2 “Basic Design Criteria” document).

On-site Review Notes

New York ISO Overview

The NYISO is a not-for-profit organization formed in 1998 as part of the restructuring of New York State’s electric power industry. Its mission is to ensure the reliable, safe and efficient operation of the state’s major transmission system and to administer an open, competitive and nondiscriminatory wholesale market for electricity in New York State.

NYISO is both control area and reliability coordinator within the boundaries of the state of New York.

The NYISO is governed by an independent, ten-member board and is operated from a power control center near Albany, New York, by a professional staff of approximately 370, not including contractors.

History of NYISO

Following the northeast Blackout of 1965, New York’s eight largest electric utilities joined to create the New York Power Pool (NYPP) in 1968. In order to reduce the probability of another major power interruption, the NYPP combined the eight member’s knowledge and technical resources in power generation and transmission. The NYISO is an outgrowth of the NYPP.

For more than thirty years, the NYPP coordinated the statewide, interconnected transmission system, designed and operated a state-of-the-art control center and trained pool and member system personnel. A security constrained economic dispatch program, developed and implemented by the NYPP in 1977, provided New York State electric customers with reliable power at the lowest cost available.

In the mid 90's the Federal Energy Regulatory Commission (FERC) and the New York State Department of Public Service introduced new policies to redefine the rules in which electricity could be generated, dispatched, transmitted, purchased and sold. In 1993, the eight member systems of the power pool formed a group called the committee for the 21st Century. Its assignment was to improve the economic dispatch system in light of major changes occurring in the New York electric industry. Substantial expansion of non-utility generation and additional rulings by FERC required the committee to plan for open, nondiscriminatory access to the transmission system. The committee made a series of recommendations, which were approved by NYPP.

In 1997, the NYPP member systems filed a proposal with FERC, which dissolved the NYPP and replaced it with the NYISO. The NYISO facilitates fair and open competition in the wholesale power market and creates an electricity commodity market in which power is purchased and sold on the basis of competitive bidding. It utilizes a bid process for electricity and transmission usage, which enables the state's utilities and other market participants to offer electricity at competitive prices, rather than regulated rates.

NYISO transmission owners:

Central Hudson Gas and Electric Corporation
Consolidated Edison Company of New York, Inc.
Long Island Power Authority
New York Power Authority
New York State Gas and Electric Corporation
Niagara Mohawk Power Corporation
Orange and Rockland Utilities, Inc.
Rochester Gas and Electric Corporation

NYISO Control Area Neighbors:

Hydro Quebec
ISO New England
PJM Interconnection, L.L.C.
Independent Electricity Market Operator

1. Criteria and Compliance

1.1. Agreements

The control area must have agreements that establish its authority as a control area. The control area must have agreements that establish the reliability coordinator for its control area.

Audit Notes:
New York State has been a control area since 1969, first as the NYPP and then on December 1, 1999 as the NYISO. The authority of the NYISO as a control area is stated in the NYISO Tariff, approved by FERC. The authority is also stated in the membership agreement with NPCC and

agreements with the transmission owners. The NPCC, the NERC region of which NYISO is a member, most recently certified NYISO as a control area on October 30, 2003.

NYISO is both reliability coordinator and control area for the geographical boundaries of the state of New York. This is documented in the NPCC Security Process Plan, approved June 29, 2000 by the NPCC Reliability Coordinating Committee (RCC). Page seven of that document states that NYISO is the security coordinator (now called reliability coordinator) for the New York area.

	Applicable Documents	Dated	Version
1	NPCC Reliability Council Compliance Program	10/30/2003	
2	NPCC Security Process Plan	6/29/2000	
3	ISO Transmission Agreement with TO's Article 3 Responsibilities of the ISO Sec 3.01-a		

1.2. Staff Certification

Control area operators must be NERC certified operators. The control area must have sufficient NERC-certified operator staff for continuous coverage of the control area operating positions.

Audit Notes:

The shift supervisor of power system operation, the generation system operator and transmission system operator are positions that are required to be filled with NERC-certified operators. A total of 32 operators and supervisors are currently certified. There are six teams working rotating shifts with five persons on each team. Due to the rotation method, all seven shift supervisors work with all six teams. During a six-week period, the operators work four weeks, train one week and have a "coverage" week that is also used to cover vacations and sickness.

The associate power system operator position is not required to be NERC certified. Two positions are in this classification: entry-level interchange scheduler dispatcher and the BME. These two positions are always supervised by NERC-certified shift supervisors.

The NYISO has an incentive program to encourage the operators to become certified within two years of being assigned to these positions. Currently, the NYISO has two uncertified persons, both hired January 2004. In order to advance to higher level jobs, they have to become certified and both are in training for certification at this time.

The supervisor of power system operation is NERC certified. The team verified that all operating positions were filled by NERC certified operators for the month of February 2004.

There is no documented procedure to give an early warning that certificates are about to expire. However, both the manager of operations and the supervisor of training monitor the list of certificates to assure proper staffing and to provide advance notice of expiration. Each operator is a professional individual and has a desire to maintain certification. Should an operator's certificate expire, he or she would immediately be removed from shifts.

Approximately five of the operators have engineering degrees. Qualifications for new hires include a two-year technical degree or equivalent military or professional training and experience. An aptitude test is given to selected candidates. Extended interviews are then conducted and successful candidates must then undergo a psychological review.

The operators follow a code of conduct, as do all employees of the NYISO, including directors and officers. This code of conduct references the ISO Open Access Transmission Tariff, Attachment F, dated September 1, 2000.

The NYISO shift supervisors have an average of eighteen years experience. The system operators have ten to twelve years experience and the generation operators have six to eight years of experience.

Many of the transmission owner system operators are NERC certified; however, the scope of this audit did not allow sufficient time to determine if this should be a requirement. It is the opinion of the NYISO and regional staff that this is currently not a requirement.

	Applicable Documents	Dated	Version
1	NYISO Guide Readiness Audit		
2	Job descriptions for Shift Supervisor, System Operators Generation 2.0 Of Readiness Audit		
3	Open Access Tariff Attachment F	9/1/2000	
4	NYISO Policy/procedure 5-1	4/30/2001	

1.3. Security

Access to the control room must be controlled for security reasons.

Audit Notes:

The facility has a guard station at the entrance to the building that is staffed twenty-four hours per day. The guard checks employee ID cards. Visitors must present a photo ID and state whom they desire to meet. The guard will then verify with the employee, who then, along with a guard, escorts the visitor(s) to sign in.

The perimeter of the building area is fenced, including barbed wire, and has an electrically operated gate that can be card operated by certain employees. Recently, trees on the outside of the fence were cut and trimmed so a person could not climb a tree to jump the fence. A card-operated doorway near the guard station prevents intruders from gaining access to the grounds, but allows employees with access card to do so. There is a second card-operated door at the entrance to the building. There are temporary, heavy concrete barricades (the kind used at highway construction sites) a short distance from the front of the facility.

A project is underway, the installation of large concrete pillars, to further “harden” the facility and prevent a “car bomb” from penetrating the building. The temporary barriers will be removed when the project is completed.

The facility has redundant utility power sources in addition to emergency backup generation.

The card access system is programmed to allow several levels of access. Cards can be programmed in groups for employees with different requirements. The control room is the highest level of access, which is controlled by operations management, allowing in only those with a reason to be there. The short list of approved people includes the operators, supervisor of operations, manager of operations, and certain support personnel. There is no limit to the number of people that can be in the control room at one time, however management indicated the shift

supervisor has the authority to limit the number when necessary, in other words, to "clear the room of unnecessary personnel."

The backup facility is protected by a card entry system and a guard is posted just inside the door. Visitors must again sign in and be escorted.

Documentation of physical facility security was not solicited, as the physical evidence was more than sufficient to demonstrate that the process is in place and working well.

In accordance with NERC Policy 5, Section G.3, NYISO has established contacts with the Federal Bureau of Investigations (FBI) for reporting incidents of sabotage.

Cyber security is a vital concern to NYISO. Procedures and documents are in place to fully comply with NERC Cyber Security Standard 1200, measures 1201–1216. This was most recently certified by the chief information officer and vice president on December 13, 2004 for the NERC Compliance Program.

	Applicable Documents	Dated	Version
1	1200 Cyber Security Policy	2/13/04	

1.4. Training

The control area operators must be adequately and effectively trained to perform their roles and responsibilities. The control area must have documents that outline the training plans for the control area operators. The control area must have training records and individual staff training records available for review.

Audit Notes:

A six team, rotating schedule is meant to provide time for training. There are scheduled training activities for operators along with the control area transmission owners' operators in spring and fall of each year.

The training staff includes the supervisor, three trainers and an engineer to operate the simulator. They call upon specialists such as planners and engineers for specific topics. The training supervisor has 25 years of experience; the other training staff members have 15 to 20 years of experience. Most training courses are repeated over a six-week period such that all rotating shift workers may attend and still perform their normal duties. Some courses or seminars are bi-annual or annual. Generator operator training is offered once per year.

The space dedicated to training is a bit limited. The training simulator requires a considerable amount of space and NYISO does have a conference room suitable for a dozen or so persons. The new backup facility or alternate control center will have more space and will be located farther from the primary facility than is the existing alternate control center. This will greatly reduce the risk of both facilities being unavailable for a single event. The new facility will also have a library to store the many documents associated with the training program.

A new hire is considered for an independent position (requiring NERC certification) only after advancing through the non-certified positions as mentioned previously in staff certification. The training staff is involved in the hiring process for system (transmission) and generator operators. The power system operations manager, supervisor, and training supervisor conduct an interview

and have independent psychological interviews carried out on any successful candidates before they are offered a job.

Most new hires at NYISO do not have electric utility experience, but many candidates have prior experience in the military or nuclear sectors. They go through the basics of how the system operates in a classroom environment including simulator exercises, and then get four to six weeks of on the job training under the direction of a current qualified operator and shift supervisor. The new operator is then given a position on the floor as a system operator interchange scheduler plus. This position is considered suitable for an uncertified operator since the decisions that he or she makes are determined by software or by direction from shift supervisor or system operator or generation operator. The duties of non-certified personnel consist of checking data after the fact and making interchange transactions, but implementation of the transactions is under the direction of the certified personnel. The NYISO requires all "new hires" in the power system operation department to become NERC certified within two years.

The shift supervisors recommend candidates for advancement to positions requiring NERC certification, but management makes the final decision.

Required system operator training begins for new personnel with a basic program, "Concepts of Electric System Operations Course", of four weeks duration, which the transmission owner's operators also attend. This course may be repeated at an operator's discretion after a period of time. Spring and fall sessions of system operation training are conducted each year and again the transmission owner operators also attend these sessions. Five weeks of training are mandatory for all operators each year. In addition to this training, there are also twice-yearly training sessions sponsored by NPCC CO-2 Working Group (system operator training) that allow selected operators to meet and train with their counterparts in adjoining control areas.

A fully operational training simulator is available at the backup alternate control center. This training simulator can be started from real-time data or from data captured in the past. This training simulator equipment also serves as the backup system should the primary system fail.

A new EMS system is scheduled to be operational during the fall of 2004. A few of the operators have been actively involved in development, and all of the operators have been actively involved in both factory acceptance and site acceptance testing of this system. The vendor has provided training on the new EMS. Some operators expressed a desire for more training on this new system. The training supervisor advised the team that the delivered system is not yet fully integrated, but formal training is scheduled to begin May 1, 2004 and will continue into the fall. The new training will continue through the summer and the training will be required prior to implementation.

The mandatory five days training per year on emergency operations is incorporated in the system operator training seminar (SOTS) program. Operator schedules are adjusted to meet mandatory sessions of SOTS. Make up sessions are required for missed sessions.

The training supervisor retains records for each operator. The records indicate which courses have been completed and those that have been made-up by absentees.

The NYISO training program has been certified by NERC as a continuing education program.

	Applicable Documents	Dated	Version
1	NYISO Power System Operations Training (PSOT)		Manual
2	System Operator Training Simulator Seminar	Spring 04	
3	System Operator Training Simulator Seminar	Fall 03	
4	NERC Recommendation 6	4/12/04	

2. Authority

The control area is responsible for establishing and authorizing the control area operator position that will have the on-shift responsibility for the safe and reliable operation of their portion of the bulk electric system in cooperation with neighboring control areas and its reliability coordinator.

Audit Notes:
NYISO is both control area and reliability coordinator; hence the relationship between them is very good. The shift supervisor is the ultimate authority for both the control area and reliability coordinator.

The job description of the shift supervisor documents the responsibility to take any action necessary, up to and including load shedding, to maintain the reliability of the system. Load shedding actions were carried out on August 15, 2003, when problems developed while NYISO was recovering from the effects of the August 14, 2003 blackout. At the time of the audit, the team did not find the authority to shed load specifically written into the job descriptions of the system operator and generation operator positions. However, during interviews, the operators indicated that they would not hesitate to take such action. NYISO will be revising these job descriptions.

Every NERC-certified operator in the control room can perform the reliability functions, but it is primarily the responsibility of the shift supervisor, though both front desk positions routinely perform the reliability functions. NYISO uses the concept of multiple sets of eyes to monitor the power system; it also expects and accepts observations from local transmission owners regarding reliability.

At times, the system or generation operator sits with the shift supervisor as a means of cross training necessary for advancement.

	Applicable Documents	Dated	Version
1	Emergency Operations Manual Sec 3.3.1.x		
2	Emergency Operations Manual Sec 3.3		
3	Tariff Sec 5.5		
4	NYISO/Transmission Owner Agreement (Article 3.0, page 8).		
5	NYISO Transmission & Dispatch Manual (section 1, pages 6-10).		
6	NYISO Emergency Operations Manual (Section 1.1, page1 “definition of Order”).		

3. Planning Time Frame Responsibilities

The control area must have a process for day-ahead planning, as well as a process for longer term planning, such as week-ahead, year-ahead, etc., for the operation and outage scheduling of transmission facilities and generation and reactive resources.

The control area must have agreements with its reliability coordinator to ensure that day-ahead and longer term plans for the operation and outage scheduling of transmission facilities, generation and reactive resources, will not result in unacceptable bulk electrical system reliability.

Audit Notes:
The audit team felt very confident in the NYISO tools and processes and the how they are used from the initial design stages in long term planning to the operational planning timeframe and ultimately into the day-ahead and real-time processes. The team also believes that the market processes utilized in New York enhance reliable operations within the control area rather than hinder them.

The NYISO planning and operations personnel described in detail the handoffs that occur between the long term transmission and generation planning group and the operations engineering and short term reliability functions. The operations engineering and short term reliability groups work in cooperation with the day ahead team to ensure that a fully integrated, security constrained, transmission and generation plan is prepared prior to being turned over to the real-time system operators.

The NYISO participates in five to ten year, long-term, wide area planning studies in conjunction with the NERC Reliability Assessment study (RAS) and the MAAC-ECAR-NPCC (MEN) study group. Within NYISO, seasonal to annual planning studies are conducted in an ongoing process. In preparation for the summer peak seasonal assessment, all planned generator outages are submitted by the previous fall and this information is combined with any known facility changes (additions, retirements, and rating changes) to allow studies for stability, voltage and thermal limits to be completed. This information is updated throughout the year as short-term outage requests are received. As a result there are few last minute changes.

There is a formal, system impact study process for new facilities. In near term (next season), NYISO participates in the NERC reliability assessment process through NPCC to assure there will be adequate resources and transmission facilities in place to assure reliable operations. A full review is required by NPCC every three years along with an interim review in the intervening years. This process identifies any potential operating problems or issues.

The NYISO control area is a summer peaking system and, therefore, there is a strong focus on summer preparedness. A multi control area study (again with the participation of NPCC working groups) is made to project expected transfers, both with neighbors and internally. Internally, NYISO also studies transfer capabilities, voltage and stability limits as well as possible congestion issues.

Generators have a seven-day minimum for outage notification for planned outages. Transmission outages require a five-day notification. Also, seven days before any outage NYISO carries out a reliability evaluation and participates in the weekly NPCC conference call to discuss generator and transmission outages, reserve requirements and forecasted weather conditions with its neighboring control areas.

The day-ahead market closes at 5 a.m. and the projected conditions are posted by 11 a.m. so participants can make any required corrections and adjustments before the final posting for the next day at 4 p.m.

During the operating day, the capacity status report is posted at 6 a.m. and 2 p.m. The real-time market closes 75 minutes before the operating hour and the balancing market tools come into play at this time.

Once into the dispatch hour, the computerized security constrained dispatch system takes over and schedules generators and their outputs to maintain a reliable power system on a nominal five-minute basis.

Power System Simulator/Engineering (PSS/e) power flow tools, Power World, Multi-Area Reliability Simulation (MARS), Multi-Area Production Simulator (MAPS) are used by the long term and near term planning staff to study the system and ensure reliable operations. Long term transmission planning utilizes PSS/E and Advanced Systems for Power Engineering Inc. (ASPEN) OneLiner software is used for fault duty analysis. In the transmission planning process PSS/E and ASPEN are used for long-range transmission assessment. Resource planning is documented in NYISO OATT, Attachment S, the Transmission Interconnection Expansion Manual and the system Analysis Manual. That whole process is managed in the transmission planning and strategic planning group, including load forecasting and resource planning (which includes the loss of load expectation (LOLE)).

In the one-year timeframe, the operations engineering staff use the PSS/e tools to perform steady state and transient stability analyses, PSS/e PowerWorld for voltage stability and voltage steady-state analyses, and use ASPEN OneLiner to perform fault current assessment. Power World visualization tools are being considered for use in training and in the control room. There are two Transmission Planning Guidelines: No. 2 for Voltage Analysis and No. 3 for Stability Analysis.

Short circuit analysis is performed using the ASPEN OneLiner program. Operations engineering developed and maintains a single representation of the NYISO system as expected during the summer peak. Based upon this analysis, a priority order is created to identify generating units that may be de-committed to ensure fault duty currents are within equipment ratings.

The NPCC A2 “Basic Criteria for Design and Operation of Interconnected Power Systems” describes the areas of planning for design and operation of transmission, generation and protection of the system elements. This includes resource adequacy, reserve adequacy, fault clearing, emergency transfers, post contingency operation, and operation under high risk. Extreme contingency assessments are made to ensure that the system is operated in a reliable manner for major events.

Sections 5 and 6 of the NPCC A2 Design Criteria are used for both planning and operations, and identify the design contingencies that are evaluated for steady state thermal, voltage and transient stability assessment to determine secure operating limits for system operation. The contingency requirements exceed the NERC requirements particularly with regard to faults involving breaker failure, delayed clearing, operation of special protection systems, or simultaneous loss of both circuits on double circuit towers as normal contingencies.

NYISO has a representative group from the transmission owners called the Operating Studies Task Force. This group participates in the representation development and review of analysis, develops limits to ensure the reliability of the interconnected New York System and makes reports to the Operating Committee for approval in operations. If the NYISO cannot achieve consensus within the task force, it does have the authority to impose a more stringent limit, when required to ensure reliability.

The operators can run a power flow study based upon real-time data with 260 cases in contingency analysis.

	Applicable Documents	Dated	Version
1	NPCC A2 Basic Criteria for Design and Operation of Interconnected Power Systems	8/9/95	

4. Real Time Monitoring

4.1. General

The control area must provide the control area operators with effective, reliable computer and communication facilities for data and status monitoring, and voice communication at both the primary and the backup control facilities.

Audit Notes:
Monitoring is described in detail in the transmission and dispatching manual. Nearly all data is collected from the transmission owner's remote terminal unit using redundant Inter Control Center Communications Protocol links (ICCP). An "ALL CALL" party line can be used to direct the transmission owners to take emergency actions. Direct ring-down circuits (a phone system where one end being taken off-hook causes the other end to ring) without central office switching are used to communicate with the local transmission control centers. General communication to the generating stations is via the local transmission control centers and not directly from the ISO. Independent analog telemetry is used to drive chart recorders in the primary control center. Satellite phones are a backup and are tested weekly.

There is 24-hour onsite support to correct information technology problems. The information technology technicians retain a log of actions as a record of what action has been taken.

The operators are satisfied with their communications facilities.

A new replacement EMS project was underway prior to August 14, 2003.

	Applicable Documents	Dated	Version
1	Transmission and Dispatching manual Appendix A Operating Criteria	9-1-99	
2	Back up Dispatch Manual		

4.2. Alarms

The control area operator must have effective and reliable alarming capability. This should be supported in the control area's EMS and/or Supervisory Control And Data Acquisition (SCADA) system by alarm priority.

Audit Notes:
The transmission and dispatching manual describes the facilities to be monitored for alarm states and severity. The display for alarms normally used by NYISO is simply chronological with severity indicated by colors. The system has the ability to display the alarms by category and/or severity as demonstrated after the conclusion of the "tools team" interviews.

	Applicable Documents	Dated	Version
1	Transmission And Dispatching Manual Appendix B		

4.3. Plans for the loss of Control Facilities

The control area must have a workable plan to continue to perform the control area functions that are required to maintain a reliable bulk electrical system following the sudden catastrophic loss of

its primary control facility or full failure of its computer facilities or monitoring tools at the primary control facility.

Audit Notes:
An alternate control center is located a short distance from the primary facility and has full control capabilities but does not have analog recorders. The alternate control center is normally used as the training simulator, but is continuously updated with real-time data (except when used as a simulator). Therefore, the equipment is known to be functional at all times. Implementation of operations from the alternate control center typically occurs within one hour of initiation. The alternate control center is fully tested annually and it was last tested soon after the August 14, 2003 incident. The operators receive training twice a year on the training simulator.

The audit team was concerned that should a wide area evacuation occur, such as caused by a chemical spill, both the primary and alternate control center may need to be evacuated. In this case, a plan is in place for two transmission owners to take over the task of monitoring operation of the NYISO area. The new EMS to be installed in fall 2004 will provide an ACC/Training Simulator several miles away from the primary site.

	Applicable Documents	Dated	Version
1	Back up System Manual Overview 1.0	5/22/2003	

4.4. Monitoring Responsibilities

The control area operators must monitor operating data and status in real time operation, including:

- Multiple Frequency Monitoring
- Multiple Voltage Monitoring
- Facility Monitoring
- Transmission System Congestion
- Load Generation Balance
- Contingency Reserves
- Special Protection Systems
- Load Tap Changing (LTC) settings
- Status of rotating and static reactive resources

Audit Notes:
The entire NYISO defined bulk electrical system is monitored in accordance with NERC and NPCC policy. Certain lower voltage facilities are monitored, but are under the control of the local transmission control centers. All the data and status listed above are monitored.

A “Storm Watch” program is utilized for the metropolitan area of New York City. This program monitors approaching weather for New York City to determine when the storm watch program is to be implemented. During the watch period, special steps are taken, including bringing additional spinning reserves online, operating to N-2 limits, limiting transfers, and providing extra voltage support to New York City.

	Applicable Documents	Dated	Version
1	Transmission and Dispatch Manual Multiple sections	9/1/1999	
2	Emergency Operations manual	4/1/2004	
3	Control Center Requirements Manual 3.2.5		

4.5. Frequency Monitoring

The control area operator must monitor frequency and direct actions to resolve significant frequency errors, and correct real-time trends that are indicative of potentially developing problems. Frequency monitoring points should be of sufficient number and from several locations with sufficient area coverage to allow the control area operator to effectively monitor the control area, and be able to determine possible islands.

Audit Notes:

The primary frequency control measurement is from a nearby substation. Time signals derived from the National Institute of Standards and Technology (NIST) are compared with a system frequency driven clock to determine whether the system frequency is fast or slow.

System frequency is also digitally sampled at nine additional locations for operator reference. During the operator interviews, it was observed that several of the ten frequency measurements were not functioning properly. These monitored frequency points were developed by the local transmission control centers prior to the formation of the independent system operator.

A list is maintained of generator units that will trip (due to the effects of low system frequency) prior to the full automatic activation of under frequency load shedding. There are nearly equal amounts of load disconnected when these generators trip, so as not to place additional burden on the Interconnected System frequency. The operators do not have the frequency trip points clearly at hand, but the units are coordinated with the under frequency load shedding program.

The manual load shedding program is implemented via the local transmission control centers. In addition to direct “ring-down” communications, a strobe light in the local transmission control center, indicating that the load shedding program has been implemented, attracts the attention of everyone in the transmission owners dispatch office. Manual load shedding is apportioned throughout the NYISO using load ratio shares of firm transactions and load.

	Applicable Documents	Dated	Version
1	Transmission and Dispatch Manual Multiple sections	9/1/1999	
2	Emergency Operations manual	4/1/2004	

4.6. Voltage Monitoring

The control area operator must monitor voltage levels, and take appropriate actions to support the bulk electric system voltage if real-time trends are indicative of potentially developing problems. Voltage measuring points must be of sufficient number and from several locations and voltage levels to allow the control area operator to effectively monitor the voltage profile of their control area.

Audit Notes:
The system is operated within voltage security limits using standard monitoring and control methods such that any normal contingency will not cause adverse conditions on the bulk power system. All bulk power substations are monitored. A voltage profile is followed by utilization of reactive sources. Critical stations have identified voltage schedules with high and low operating limits established. Reactive reserve is not totaled, but reactive transfer limits are established for the critical voltage interfaces. If the network topology should change, the system operators are aware of the new transfer limits that reflect the topology changes and ensure continued reliability in real-time. Reactive control is most often a localized concern rather than a system wide problem. The operators are aware of the status of reactive resources. Voltage control training is included in the simulator sessions as well as tabletop exercises.

Only a few generating units in the control area are equipped with power system stabilizers. NYISO operators are notified when automatic voltage regulators are taken out of service and have rules that stipulate the number and location of automatic voltage regulators that are allowed to be out of service simultaneously. There is no telemetered status of power system stabilizer or automatic voltage regulators.

NYISO does not use under-voltage load shedding. The operators indicated that there are a couple locations that are quite voltage sensitive, but the system is always operated to ensure compliance with NERC and NPCC criteria. Imposing transfer limits and maintaining voltages above a minimum voltage profile at these locations ensures acceptable post-contingency voltages The team suggests that the NYISO review the applicability of under voltage load shedding at these locations as a backstop for extreme contingency events.

	Applicable Documents	Dated	Version
1	Transmission and Dispatch Manual Multiple sections	9/1/1999	
2	Emergency Operations manual	4/1/2004	
3	NPCC B-3 sec 2.0	11/06/1997	

4.7. Reactive Reserve

The control area must ensure that reactive reserves are available and properly located to satisfy the most severe single contingency.

Audit Notes:
The audit team believes that the voltage control processes used by the NYISO are very effective in ensuring the reliable operation within the New York control area. The NYISO manages voltages through the use of a voltage profile or schedules throughout the New York system and combines these voltage profiles with voltage transfer limits, which ensures reliable operations. The operators were well versed in the use of these voltage processes and the tools to monitor voltage. The NYISO manuals also clearly documented when the NYISO would move from the normal to emergency states for voltage conditions on the system.

The reactive reserve resource capability is established in accordance with NPCC B-3 procedure, “Guidelines for Inter-Area Voltage Control.’ The procedure specifically addresses voltage control between areas of the system.

The operators do not directly monitor automatic voltage control or power system stabilizer on generators. All generator (40 MW or larger) operators are required to notify the NYISO

regarding any changes in the status of either power system stabilizer or automatic voltage regulators.

	Applicable Documents	Dated	Version
1	Transmission and Dispatch Manual Multiple sections	9/1/1999	
2	Emergency Operations manual	4/1/2004	
3	NPCC B-3 sec 2.0	11/06/1997	

4.8. Critical Facility Monitoring

Monitoring of facilities that are critical to the reliability of the bulk electrical system is a joint responsibility of the control area operators and reliability coordinators.

There must be an established process to determine which facilities will be considered critical to the reliability of the bulk electrical system, and real-time operating information (data and status). Operating limits for the critical facilities must be provided to the control area operators and the reliability coordinators.

Audit Notes:
Critical facilities are determined in conjunction with asset owners and based on many years of operational performance and by offline analysis. NYISO also participates in the development of the NPCC critical facilities list that includes transmission elements whose removal from service could affect operations in a neighboring control area.

Contingency analysis and planning studies further identify and determine the severity of contingencies for these facilities. Limits from these studies are established within the EMS and alarmed when reached.

	Applicable Documents	Dated	Version
1	Transmission and Dispatch Manual Multiple sections	9/1/1999	
2	Emergency Operations manual	4/1/2004	

4.9. Transmission System Congestion

The control area must monitor transmission flow gates and be prepared to take actions to alleviate congestion in conjunction with and as directed by its reliability coordinator.

Audit Notes:
The NYISO operates a Locational Based Marginal Price market which will re-dispatch generation automatically to ensure that all reliability criteria are met in real-time utilizing the security constrained dispatch. NYISO believes that its security constrained dispatch program provides better results than a TLR. In addition, the NYISO uses congestion management within a security constrained unit commitment program during the day ahead studies to ensure that the system operators are presented with a commitment that meets the reliability criteria in real-time. NYISO believes that its security constrained unit commitment program provides better results for them than a TLR request.

The security constrained dispatch runs every five minutes, further overseeing the system. NYISO uses its own curtailment procedures in accordance with the transmission tariff to curtail transactions in real-time to ensure reliability. The local curtailment procedures are more

appropriate for use in New York considering its footprint and limited exposure to parallel flow problems. The NYISO will always respond to TLR curtailments in accordance with NERC policy when called by for any other reliability coordinator and will immediately act upon those curtailments to ensure reliability. The NYSIO attempts to agree with neighbors on interchange schedules and operating limits. When contracts do not match across an interface, the two control areas agree to a schedule and operate to that schedule. When a difference in transfer capability involves the same interface between control areas, the more conservative limit is agreed to and operated to.

Redispatch is automatically initiated if flows are causing a problem. Transactions may be adjusted along with redispatch. A final action would be curtailment of load and firm transactions on load ratio share.

Emergency transactions are not tagged, nor is it required when of less than one hour in duration. These transactions will be picked up by the market transactions in the next hour and appropriately tagged.

	Applicable Documents	Dated	Version
1	Transmission and Dispatch Manual Multiple sections	9/1/1999	
2	Emergency Operations manual	4/1/2004	

4.10. Load Generation Balance

The control area operator must monitor the balance of load, generation and net schedule interchange in the control area. The control area operator must take actions to mitigate unacceptable load, generation and net scheduled interchange imbalance.

Audit Notes:
One day ahead and hourly scheduling is made for transactions and a balancing market evaluation is made every hour.

The day ahead balancing is first a bidding process for resources. Installed capacity suppliers are required to bid into the day-ahead market. A security constrained unit commitment scheduling program optimizes energy and ancillary services offer the least cost configuration of resources. Deviations of suppliers are settled against real-time market prices.

The security constrained unit commitment scheduling program addresses reliability requirements. Internal constraints used in this program are thermal, stability and voltage transfer limitations. External scheduling and ramp limits are included and statewide and local area reserve requirements are included as well. This day ahead plan ensures that there is sufficient capacity to meet forecasted load and reserve. The day-ahead plan is presented to the transmission owners for review and, if necessary, supplemental resource evaluation is requested to address local reliability issues.

The security constrained unit commitment scheduling program provides the basis for day-ahead market total transmission capacity (TTC) and available transmission capacity (ATC) for OASIS postings. The security constrained unit commitment scheduling program also identifies external transactions for the day-ahead checkout process.

The hourly balancing market evaluator provides interchange transactions and manually controlled generator unit schedules to the security constrained dispatch. The security constrained dispatch evaluates system security every five minutes. Real-time locational market pricing and settlement is on a five-minute basis.

Similar to the day-ahead scenario, the hourly market operation uses a five minute Security Constrained Dispatch to satisfy reliability requirements in the short time frame (up to one hour). Again thermal, stability and voltage transfer limits are used internally and externally scheduling limits and ramp limits are used. This also includes statewide and local area reserve requirements. Regulation is included statewide. Sufficient capacity and reserve is ensured to meet the next hour as well as the next five-minute load forecasts.

Long-term capacity requirements are met using the installed capacity for the upcoming year, as verified by the New York State Reliability Council (NYSRC). (The NYSRC was formed by the New York transmission owners and other interested parties.) As stated above, installed capacity providers are required to bid into the market. This process ensures resource adequacy to meet reliability requirements. The transmission owners have a fiduciary, contractual and common law duty to maintain reliability. Reliability rules are binding in the NYISO.

In determining ACE, NYISO does not use the same metering source as the neighboring control area on all interconnection points. For some interconnection points, the NYISO and neighboring control area have agreed to use different metering points. The reasons for this range from RTU ownership to scan rates available. The values associated with operating the control area are monitored and compared on a regular basis. For purposes of billing, all control area ties use the same billing quantity metering (MWHR).

	Applicable Documents	Dated	Version
1	Transmission and Dispatch Manual Multiple sections	9/1/1999	
2	Emergency Operations manual	4/1/2004	

4.11. Contingency Reserves

The control area operator must monitor the required reserves, and the actual operating reserves in real-time, and must take action to restore acceptable reserve levels when reserve shortages are identified.

Audit Notes:

Contingency reserves are provided by the day-ahead security constrained unit commitment scheduling program process and in real-time by the security constrained dispatch. When reserves are used, additional reserves are put in place to withstand the next contingency. Also, NYISO participates in a shared activation of reserves program (for faster recovery times) with neighboring control areas (PJM, IMO and ISO-NE) as well as an actual reserve sharing agreement with ISO-NE.

	Applicable Documents	Dated	Version
1	Transmission and Dispatch Manual Multiple sections	9/1/1999	
2	Emergency Operations manual	4/1/2004	

4.12. Special Protection Systems

The control area operator and the reliability coordinator must be aware of the operational condition of special protection systems that may have an effect on the operation of the bulk electrical system.

Audit Notes:
Since the NYISO control area and reliability coordinator are the same organization there is no need for coordination of special protection systems between those functions. The special protection systems information is monitored by the transmission owner operators and any changes are passed along to the NYISO. The NYISO can order changes to the status of the special protection systems.

	Applicable Documents	Dated	Version
1	ISO Protection Memos 4.12	Multiple	
2	NPCC A-11 Special Protection System Criteria	11/9/2000	

5. System Restoration

The control area operator must have a documented system restoration plan that must be provided to the reliability coordinator.

The control area operator must be prepared to restore the control area following a partial or total collapse of the system and coordinate system restoration with the neighboring control areas and with the reliability coordinators.

Audit Notes:
The NYISO has a documented system restoration plan that was successfully utilized following the August 14, 2003 blackout. System restoration is practiced every year in a tabletop drill prior to the summer season, and all system operators are trained in its use. The NYISO has contracts with three large hydro plants, which can act as black start units. The hydro units are also used for regulation, as well. On August 14th, the NYISO used these plants to re-energize portions of the extra high voltage system and to speed re-synchronization with the Eastern Interconnection to stabilize frequency.

Under NYISO supervision, express feeders were energized in a sequence as defined by the restoration plan that facilitated restoration activities and provided cranking power for plants in the city. The (name removed) system was initially energized separately on gas turbines.

The NYISO's system restoration plan includes all NERC required elements and is updated annually.

	Applicable Documents	Dated	Version
1	Emergency Operations Manual Section 6	4/1/2004	

6. Delegation of Reliability Coordinator Functions

Any reliability coordinator functions that have been delegated to a control area operator must be clearly documented. The documentation must recognize that the reliability coordinator continues to be responsible for that function.

Audit Notes:
Since the NYISO is both reliability coordinator and control area operator, the functions are integrated totally within the shift supervisor, system operator and generation operator positions. Effectively, there are no delegated functions.

7. Outage Coordination

Planned control area transmission facilities and generating unit outages must be coordinated with the reliability coordinator to ensure that conflicting outages do not jeopardize the reliability of the bulk electrical system.

Information relative to forced transmission facilities and generating unit outages that may jeopardize the reliability of the bulk electrical system must be shared with affected transmission operators and the control area's reliability coordinator as expeditiously as possible.

Audit Notes:
The generation outage schedule is prepared in the fall of each year for the following year and posted on the website. This then becomes a continuous process as changes and forced outages occur. Re-evaluation of generator outages is made for each subsequent request.

Transmission maintenance requires a five-day advance notice to allow sufficient studies to be made to determine the effects of the outage and allow resolution of conflicts. The NYISO has outage coordination agreements with neighboring control areas.

	Applicable Documents	Dated	Version
1	Outage Scheduling Manual	5/30/2002	
2	Day Ahead Scheduling Manual	6/12/2001	

8. Transmission and Generation Relaying

Control areas must ensure that transmission and generator relay maintenance is carried out as per control area, Regional and/or NERC established requirements.

Audit Notes:
NYISO identified only a few NYISO-owned disturbance-monitoring recorders in its control area. There are many additional recorders throughout the system at major substations but they are owned and maintained by the transmission owners. The recorders owned by NYISO are time synchronized with Global Positioning System (GPS) satellites. The audit team could not verify that the other disturbance recorders were time synchronized.

Certain generators are allowed to trip prior to automatic under-frequency load shedding. So as not to impact the Interconnection, these generating units will have approximately an equal amount of load dropped when they trip due to low frequency.

The NYISO and NPCC require that all generator and transmission owners adhere to the NPCC Criteria Document A4, "Maintenance Criteria for Bulk Power System Protection." Facility maintenance records are stored at the facility owner's site and the NYISO monitors compliance with the program through the NPCC RCEP program.

	Applicable Documents	Dated	Version
1	NPCC A4 Minimum Maintenance Criteria	12/2000	

9. Capacity and Energy Emergency Plan

Each control area must have a capacity and energy emergency plan that address the following functions. (It should be noted that some of the items might not be applicable, as the responsibilities for the item may not rest with the entity being reviewed.)

1. **Coordinating functions.** The functions to be coordinated with and among neighboring systems. (The plan should include references to coordination of actions among neighboring systems when the plans are implemented.)
2. **Fuel supply.** An adequate fuel supply and inventory plan which recognizes reasonable delays or problems in the delivery or production of fuel, fuel switching plans for units for which fuel supply shortages may occur, e.g., gas and light oil, and a plan to optimize all generating sources to optimize the availability of the fuel, if fuel is in short supply.
3. **Environmental constraints.** Plans to seek removal of environmental constraints for generating units and plants.
4. **System energy use.** The reduction of the system's own energy use to a minimum.
5. **Public appeals.** Appeals to the public through all media for voluntary load reductions and energy conservation including educational messages on how to accomplish such load reduction and conservation.
6. **Load management.** Implementation of load management and voltage reductions.
7. **Appeals to large customers.** Appeals to large industrial and commercial customers to reduce non-essential energy use and start any customer-owned backup generation.
8. **Interruptible and curtailable loads.** Use of interruptible and curtailable customer load to reduce capacity requirements or to conserve the fuel in short supply.
9. **Maximizing generator output and availability.** The operation of all generating sources to maximize output and availability. This should include plans to winterize units and plants during extremely cold weather.
10. **Notifying IPPs.** Notification of co-generation and independent power producers to maximize output and availability.
11. **Load curtailment.** A mandatory load curtailment plan to use as a last resort. This plan should address the needs of critical loads essential to the health, safety, and welfare of the community.
12. **Notification of government agencies.** Notification of appropriate government agencies as the various steps of the emergency plan are implemented
13. **Notification to control areas and reliability coordinators.** Notification should be made to other control areas and to the reliability coordinator as the steps of the emergency plan are implemented.

Audit Notes:

The NYISO capacity and energy emergency plan considers all 13 requirements above. Although fuel supplies are not monitored directly by NYISO, market incentives are such that a generating station would have ample fuel supply. Special incentive programs with certain customers provide approximately 1,100

MW of demand side relief under the NYISO emergency demand response programs during emergency conditions.

	Applicable Documents	Dated	Version
1	Emergency operations Manual Section 4	4/01/2004	

10. Operating Policy/Procedure Changes

Control areas must have an established procedure to ensure that control area operators and operations staff are aware of any changes to NERC, Regional and/or local policies or procedures prior to taking over control of a shift position.

Control areas must have shift change procedures for updating incoming shift personnel on the current status of the system.

Audit Notes:
Both paper memos and email are used to notify all operational personnel of policy and procedure changes. A sign-off process is used to ensure the notification has reached all operators. During the shift turnover, the shift supervisor passes along any unusual operational information or policy changes.

	Applicable Documents	Dated	Version
1	Document Control Manual		

11. Vegetation Management (Line Clearances)

Control areas must have a documented Vegetation Management program.

Audit Notes:
New York Compilation of Rules and Regulations (NYCRR), Part 84 requires Transmission Owners to have plans to manage the rights-of-way, including vegetation, among other things. The NYISO Vegetation Management program is designed and managed by the individual transmission owners. The program is approved by both the New York Public Service Commission and the Department of Environmental Conservation. A visit to the transmission owners would be required to evaluate the effectiveness of each plan. NYISO stated that there were only three vegetation related line trips during 2003.

	Applicable Documents	Dated	Version
1	NYCRR Part 84.1 – 84.2 – 84.3 Pages 195 - 197	1/1/95	Reissued 7/95

12. Nuclear Power Plant Requirements

Nuclear power plants have regulatory requirements for voltage and power in both normal and abnormal operating conditions (N-1 and system restoration).

Audit Notes:
NYISO reported that transmission owner interconnection agreements address the needs of the nuclear power plants. The transmission owners supply the NYISO with the nuclear power plants requirements regarding voltages, trip times, pre and post-contingency system configuration concerns. The NYISO incorporates any specific constraints into the security constrained dispatch and real-time operating limits.

It then develops system voltage profiles, which must be adhered to in order to operate the system within the post contingency voltage as required in the transmission owner interconnection agreements.

The NYISO indicated that, as specified in its interconnection agreements the following nuclear power plant requirements are the responsibility of the transmission owners:

- Required voltage immediately after the plant trips
- Time required to provide post trip voltage
- Notifications when power system conditions are such that the post trip voltage will not be adequate, either in the present system configuration or post contingency
- And notification of system conditions that could impact the adequacy of the post trip voltage

The NYISO is involved in reviewing voltage requirements and revising operating procedures at one of the six nuclear power plants in its control area, in conjunction with the plant owner's design review and has requested NYISO's assistance. The NYISO Transmission and Dispatching Manual, Section 1.2.4, Transmission Owner Responsibilities and Authority does not specifically mention the nuclear power plant obligations in the list of responsibilities.

The team recommends that the processes used by the nuclear power plants, transmission owners and NYISO be further documented to ensure that the needs of the nuclear power plants are being met.

	Applicable Documents	Dated	Version
1	Transmission and Dispatching Manual Sec 1.2.4		

Conclusions

The audit team would like to thank NYISO staff for their hospitality and cooperation during the audit process and the audit team trusts that our findings are consistent with the staff's understanding of the control area's role and that the audit team's input will be of value.

The team believes that the NYISO is well equipped to handle both normal and emergency situations. The audit team found that reliability of the interconnection is the primary objective of the NYISO and the management team at the NYISO supports the system operators in the performance of their duties. The audit team was impressed with the level of knowledge displayed by the system operators interviewed during the audit.