NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Local Control Center
Reliability Readiness Evaluation Report

Long Island Power Authority
Hicksville, New York

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Introduction and Evaluation Process

The North American Electric Reliability Corporation (NERC) Reliability Readiness Evaluation and Improvement Program is one of the commitments of NERC and the industry following the blackout of August 14, 2003, to strengthen the reliability of the North American bulk power system. The program conducts independent evaluations of balancing authorities, transmission operators, reliability coordinators, local control centers, and other key entities that support the reliable operation of the bulk power system to assess their preparedness to meet their assigned reliability responsibilities. The evaluations identify strengths and areas for improvement in an effort to promote excellence in operations among these organizations. The document *NERC Readiness Evaluation Procedure* describes and defines the process used for reliability readiness evaluations. This document and other documents related to the program are available at http://www.nerc.com/~rap/.

The reliability readiness evaluation teams, each led by a NERC staff member and a regional co-leader, include industry volunteers with considerable expertise selected to provide representation from other interconnections, other regions, and neighboring operating entities. The teams also typically include representatives from the Federal Energy Regulatory Commission (FERC) staff.

The public version of the reliability readiness evaluation report contains the majority of the evaluation team's findings. Any discussion of findings pertaining to critical energy infrastructure will be contained in Appendix 1, a confidential appendix to the report that is sent privately to the organization evaluated and is not included in the public version of the report.

The evaluation team for the Long Island Power Authority (LIPA) met on-site with LIPA representatives on May 1–3, 2007. This report reflects the views and recommendations of the evaluation team regarding the readiness of the LIPA to meet its responsibilities as a local control center (LCC) and transmission owner.

Evaluation Team

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Organization Profile

The Long Island Power Authority was formed in 1998 by purchasing Long Island Lighting Company's transmission and distribution assets. LIPA is the third largest public power utility in the nation in terms of customers served. It delivers electricity to more than 1.1 million customers in a geographic service territory located on an island in the southeast portion of New York State. The extreme western part of the island, Kings County and most of Queens County has electric service provided by Consolidated Edison located in New York City. The remaining portion of the island, which includes Nassau County, Suffolk County, and a small portion of Queens County, is the LIPA service territory, consisting of 1,230 square miles with a system peak demand of 5,792 MW established of August 3, 2006. To the north is the Long Island Sound and to the south and east is the Atlantic Ocean. The island is 117 miles long and 25 miles wide with a flat terrain. The population density is greatest on the western portion of the island and decreases toward the eastern end of the island.

LIPA does not own any generation units in its service territory; however, it does own 18 percent of the Nine Mile Nuclear Power Station Unit 2 in Oswego, New York. At the time of this evaluation, LIPA had six transmission interconnection points to its electric system, which are listed as follows:

Designation	Voltage Level	Interconnected Utility	Ownership
Y49	345	Con Edison	New York Power Authority
Y50	345	Con Edison	Con Ed/LIPA
481	DC	Northeast Utilities	Cross Sound Cable
901	138	Con Edison	Con Ed/LIPA
903	138	Con Edison	Con Ed/LIPA
1385	138	Northeast Utilities	LIPA/Northeast Utilities

The operation and maintenance of the LIPA transmission and distribution systems are performed under the terms of a contract with KeySpan Energy Electric Services, LLC. The LIPA electric system operates at voltages ranging from 4 kV up to 345 kV. LIPA also operates a portion of the New York Power Authority 345 kV cable, Y-49, located on Long Island. The miles associated with Y-49 are not included in the table shown below. The breakout of transmission miles owned by LIPA as of February 2006 is listed as follows:

Voltage Level (kV)	Circuits	Overhead (Miles)	Underground (Miles)	Total (Miles)
23	31	63	53	116
33	50	95	13	108
69	184	569	120	689
138	59	248	140	388
345	1	0	8	8
System Total	325	975	334	1309

LIPA is a member of the New York Independent System Operator (NYISO). The NYISO is the transmission operator, balancing authority, and reliability coordinator for the New York area. At the time of the evaluation, LIPA was registered with NERC and NPCC as a transmission owner, distribution provider, load-serving entity, resource planner, transmission planner, and purchasing-selling entity.

Executive Summary

The evaluation team found no significant operational problems and concluded that LIPA has adequate facilities, processes, plans, procedures, tools, and trained personnel to perform the LCC/transmission owner functions necessary to maintain the reliable operation of the bulk power system, with no notable exceptions. The evaluation team identified a number of positive observations. It also offers five recommendations that, if implemented, will enhance LIPA's readiness to operate reliably and maintain the reliability of the bulk power system. The findings are listed in order of importance.

Positive Observations

The evaluation team noted the following positive observations during the reliability readiness evaluation process:

1. LIPA has created custom energy management system (EMS) monitoring applications to improve the functionality and availability of key operations tools (Section 10).
2. LIPA's alternate control center exceeds minimum requirements for a transmission owner backup facility (Section 9).
3. LIPA effectively manages its outage coordination process (Section 8).
4. LIPA's area voltage management procedures and practices help ensure system reliability (Section 12d).
5. LIPA's senior system and system operators are NERC certified (Section 4).
6. Excellent internal team work and communications exist among Electric System Operations personnel (Section 7).
7. LIPA's independent monitoring and a phase angle regulator control system provides redundant supervisory and control system (SCADA) information and control capability (Section 10).
8. LIPA monitors area control error to increase the operational awareness of its system operators (Section 12g).
9. Off-desk weeks in the system operator schedule are used to involve operators in operational support activities and various internal and regional committee activities (Section 5).
10. LIPA uses a non-operating internal group to evaluate loss of control facilities exercises (Section 9).
11. See discussion in Appendix 1.
12. See discussion in Appendix 1.

Recommendations

The evaluation team recommends that LIPA take the following actions to address issues discovered during the evaluation process:

1. Perform a transmission system operator job task analysis to define and document the training requirements for new transmission system operators as well as senior transmission system operators (Section 5).
2. Establish and implement standard evaluation criteria for all transmission system operator trainees to ensure new operators are uniformly trained and fully prepared to perform the duties of a transmission system operator (Section 5).

3. Develop and implement, as appropriate, changes to the display of transmission system voltages to increase operator situational awareness: (Section 12d)
    - geographic world view display of transmission system voltages
    - graphical representation of voltage profiles
4. Investigate and implement, as appropriate, a management tool for the training program and associated records to ensure operators receive the proper type and amount of training (Section 5).
5. Investigate and implement, as appropriate, a document management tool for cataloging, managing review and revision cycles, and recording operator check-off for new and revised documents to maintain up-to-date policies and procedures (Section 6).

Discussion

The reliability readiness evaluation team examined the following key areas during the evaluation. The detailed discussion that follows provides the foundation for the recommendations and positive observations that the team identified. The report uses the generic term "system operator" to refer to all on-shift operating personnel responsible for executing the functions necessary to operate reliably and maintain the reliable operation of the bulk power system. This term will be used for the discussions unless additional specificity is required, such as the *balancing* system operator, or *transmission* system operator.

1. Agreements

The local control center must have agreements that establish its authority as a transmission owner. The local control center/transmission owner must have agreements that establish the balancing authority/transmission operator for its footprint.

NYISO is the reliability coordinator, balancing authority, and transmission operator for the interconnected electric transmission system in the geographic boundaries of the State of New York. NYISO has an agreement with all the transmission owners of the electric transmission system in the State of New York titled *Agreement between the New York Independent System Operator and Transmission Owners.* As a transmission owner, LIPA is a signatory of this agreement and operates within the parameters defined by this agreement.

LIPA has interconnection agreements with all interconnected neighboring utilities as well as all the generators connected to the LIPA transmission system in the LIPA zone. These agreements are supplemented by the common operating instructions agreements, which are amended as needed to ensure that the operating environment defined is consistent with current NYISO, NPCC, and NERC requirements.

LIPA has an operating agreement with KeySpan Energy Electric Services, LLC for the operation and maintenance of the LIPA transmission and distribution system. In addition to the operation and maintenance contract, LIPA has a power supply agreement with KeySpan Energy Electric Services for the power supplied from the steam units owned by KeySpan Electric Energy. Based on this and other purchase power agreements, LIPA functions as a communications and coordinating intermediary between NYISO and the generating plants in the LIPA zone.

LIPA has interconnection requirements documents for any new transmission entity, generation entity, and/or end user that wishes to connect to the LIPA system. These entities would also be subject to the interconnection requirements of NYISO.

2. Operator Authority

The local control center is responsible for establishing and authorizing the system operator position that will have the on-shift responsibility for the safe and reliable operation of its portion of the bulk power system in cooperation with neighboring operating entities, the balancing authority/transmission operator, and the reliability coordinator.

The LIPA job descriptions for the senior system operators and the system operators clearly provide these employees with the authority to operate the LIPA transmission system in a safe and reliable manner up to and including the shedding of firm load. In addition, the operator's document *Statement of System Operator's Responsibility and Authority* authorizes the system operators to take any action necessary for safe and reliable operations up to and including the shedding of firm load.

The transmission system operator interviews conducted by the readiness evaluation team strongly indicate that the LIPA system operators are both willing and able to operate the transmission system in a safe and reliable manner up to and including the shedding of firm load. The interconnected neighbors are confident of the LIPA system operator's ability and authority to operate the transmission system in a safe and reliable manner.

3. Delegation of Authority

Any functions that have been delegated must be clearly documented. The documentation must recognize that the balancing authority/transmission operator that is delegating the function continues to be responsible for that function.

NYISO has not delegated any reliability coordinator, balancing authority, or transmission operator authority to LIPA. LIPA has not delegated any local control center or transmission owner responsibilities to NYISO or any other entity.

LIPA performs some overlapping operating functions with the balancing authority/transmission operator; however, these should not be considered as delegated operational functions. In the opinion of the evaluation team, the net result of these overlapping activities serves to strengthen operational reliability.

4. Staff Certification

Local control centers must have sufficiently qualified operators to cover all system operator positions. The balancing authority/transmission operator and the reliability coordinator must have a sufficient NERC-certified operator staff for continuous coverage of the system operator positions.

LIPA's seven senior system operators, six system operators, and the chief system operator are NERC certified with the transmission operator credential. One of the senior system operators is NERC certified with the reliability operator credential.

LIPA has made the decision to require all senior system operators and system operators to be NERC certified with the transmission operator credential. The evaluation team commends LIPA for this decision.

5. Training

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

LIPA's training program is managed by the chief system operator. Additionally, an employee is assigned the responsibility for creating and administering training scenarios using the dispatch training simulator (DTS).

LIPA uses a detailed approach for training new operators. LIPA interviews candidates under consideration for a system operator position and conducts a psychological exam before placing them as system operator trainees. LIPA uses vendor-supplied training to prepare the system operator trainee for the NERC certification exam. The on-the-job training provided to the system operator trainee is supplied by working with several of the system operators and senior system operators. Toward the end of this training cycle, the system operator trainee works with a single system operator for closer evaluation. The trainee takes courses such as the NYISO concepts of electrical system operations course and a number of DTS scenarios associated with voltage control, load shedding, and blackstart. After the trainee is considered qualified, becomes NERC certified, and is approved by the chief system operator, he or she is allowed to go on-desk as system operator. This period of training time usually lasts from six months to one year.

The system operator schedule provides for a training week every six weeks, which includes vendor-supplied training, NYISO system operators training, DTS training, NYISO drills, and individual learning activities that are NERC approved for continuing education hours. On average, each system operator and senior system operator is provided 150 to 200 hours of training each year, which includes the annual 32 hours of emergency operations training. Additionally, LIPA uses system operators and senior system operators on special projects and committee assignments to broaden their experience and provide a forum for the sharing of an operational perspective. The evaluation team commends LIPA for this creative approach to building a stronger operating team.

The training for the operator trainee, system operator, and senior system operator is not resourced based on a job task analysis to define, document, and measure the effectiveness of the training provided. The evaluation team recommends that LIPA perform a job task analysis for each of the three job classifications mentioned above and then develop individual training plans for each system operator and senior system operator. This analysis should establish standard evaluation criteria for all system operator trainees in the initial training process and should

review elements of the life-long learning process, for the senior system operators in particular. This involves the three basic categories of technical training, professional training, and personal development training.

LIPA uses spreadsheets to track training provided to the system operators and senior system operators. The evaluation team recommends that LIPA investigate and implement a training management tool to manage its training program and associated records.

6. Operating Policies and Operating Procedures

The local control center must have an established procedure to ensure that system 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.

The local control center must have shift change procedures for updating incoming shift personnel on the status of the system.

LIPA has a good body of operating policies and procedures that are effectively utilized to support the safe and reliable operation of the interconnected electric transmission system. These operating policies conform to the NYISO operating policy guidance. LIPA uses a manual process to review and revise operating policies and procedures, with each policy or procedure assigned a review/revision cycle based primarily on its criticality. The evaluation team recommends that LIPA investigate and implement as appropriate a document management tool for cataloging, managing review and revision cycles, recording operator check-off (acknowledgement of reading and understanding of the document), and identifying document ownership.

LIPA system operators are notified of a new and/or revised operating policy and procedure by e-mail as well as a hard copy that is placed on-desk for initialing after being read. Additionally, the new or revised policy is discussed at shift change or in response to a question for clarification.

LIPA uses a shift-change procedure consisting of a review of all changes to the transmission system, available generation, and system load. Additionally, the operators review a study case of operating day at hand. New and/or revised operating policies and procedures are reviewed along with the daily operating log from the previous shift.

7. Planning

The local control center and its supporting planning organizations must have a process for day-ahead planning, and for longer-term planning, such as week-ahead, seasonal, and year-ahead, for the operation and outage scheduling of transmission facilities and generation and reactive resources.

The local control center and its supporting planning organizations must have agreements with its balancing authority/transmission operator to ensure that day-ahead and longer-term plans

for the operation and outage scheduling of transmission facilities and generation and reactive resources will not jeopardize the reliability of the bulk power system.

LIPA has a well-staffed, thoroughly equipped, and adequately trained transmission planning department to accomplish all the NYISO, NPCC, and NERC planning requirements to support the safe and reliable operations of the interconnected transmission system. The portfolio of tools used by the transmission planning department includes the Siemens Power Technologies International Power Systems Simulator for Engineers load flow analysis program, resource planning programs, substation reliability program, short-circuit program, sensitivity analysis program, and a state estimator.

The long-range planning process is driven primarily by load growth on the LIPA system and produces the transmission expansion plan for the LIPA system as its end product. The long-range study existing at the time of this evaluation covers the period from 2005–2020.

LIPA performs a number of seasonal studies on a regular basis, such as the summer operating study, winter operating study, and the reactive resource requirements study. LIPA is an active participant in the regional study process that produces the NYISO summer and winter operational studies, reliability needs assessment, the installed reserve margin study, and interconnection studies known as system reliability impact studies.

In addition to the traditional steady state voltage analysis, LIPA uses a voltage stability concept to determine voltage adequacy and reactive resource requirements. These studies ensure that voltage limits are not violated for pre-contingency and post-contingency limits for both normal and emergency transfers in accordance with the New York State Reliability Commission reliability rules.

The LIPA Electric System Operations group performs the day-ahead to the month-ahead assessment of the transmission system. If a special study is required to address an unusual expected transmission system configuration or loading, the Operating Engineering Support section will request study assistance from the Electric Planning section. The LIPA system operators are very pleased with the support provided by Operating Engineering Support and the Electric Planning sections. The evaluation team noted and commends LIPA for the excellent internal team work and communications among Electric System Operations personnel.

The overall responsibility for the operating security of the interconnected bulk power transmission system is the responsibility of NYISO as the balancing authority/transmission operator. The LIPA Electric System Operations section performs the day-ahead assessment of the transmission system. The real-time operational analysis and contingency analysis of the transmission system are performed by the state estimator. The state estimator is set to run a current transmission system case every 10 minutes. These functions are also performed by NYISO, and any unusual system conditions are discussed with the NYISO system operators and the interconnected neighbors if applicable.

8. Outage Coordination and Communication

Planned outages of transmission facilities and generating units must be coordinated with the balancing authority/transmission operator and reliability coordinator to ensure that conflicting outages do not jeopardize the reliability of the bulk power system.

Information relative to forced outages of transmission facilities and generating units that may jeopardize the reliability of the bulk power system must be shared with affected balancing authorities, transmission operators, and the reliability coordinator as expeditiously as possible.

LIPA has detailed outage coordination procedures that conform to the *NYISO Outage Scheduling Manual.* LIPA coordinates all outage scheduling for the generation in the LIPA zone using an in-house-developed tool known as the generation outage management system. The generation scheduler notifies the transmission work coordinator of the outages so that a load flow with the generation dispatch can be executed for day-ahead operations. Generation outage requests must be submitted by 11:00 a.m. two days prior to the scheduled outage. Forced outages are coordinated and communicated with NYISO and the neighboring systems. Outages can be cancelled by the LIPA generation scheduler, transmission work coordinator, or system operator. NYISO has final approval authority for all scheduled outages, which includes cancellation or early recall authority.

For scheduled outages on the transmission elements of the bulk power system, LIPA must notify NYISO at least 30 days in advance. Using an in-house developed tool called the Equipment out of Service Application, the LIPA field supervisor issues an outage request for switching two days prior to the start date. On the day prior to the scheduled outage, the field supervisor confirms the start date and the switching order is prepared. Also on the day prior, the transmission work coordinator will assemble all transmission and generation outage requests and execute a study to ensure that the scheduled outages will not result in any limit violations on the transmission system. The system operator has the authority to cancel the outage if system conditions change or if there is a possible limit violation.

The evaluation team commends LIPA for effectively managing the outage coordination process. The team believes that the strong adherence to a well-documented outage coordination process is essential to sustaining safe and reliable transmission system operations.

9. Plans for the Loss of Control Facilities

The local control center must have a workable plan to continue to perform the transmission owner functions that are required to maintain a reliable bulk power system following the sudden catastrophic loss of its primary control facility, or the partial or full failure of its computer facilities or monitoring tools at the primary control facility.

LIPA has an alternate control center located less that one hour from the primary control center. LIPA has a detailed plan to maintain continuity of operations in the event of the loss of the primary control facility, titled *Business Continuation and Continuous Operations Procedure – Electric Energy Control Center.* This plan provides checklists of requirements prior to evacuation, during the transition, and for re-establishing operations at the alternate control

facility. LIPA does not use a grab-and-go bag methodology; however, at the time of the required evacuation of the primary control facility, the operator brings the operator logs, work permits, and other real-time information that is readily available.

The alternate control center contains current copies of NERC standards, regional policies and procedures, NYISO and LIPA operating policies and procedures, and the system restoration and blackstart plan. A LIPA employee checks and updates the documentation on a weekly basis to ensure the information is current.

LIPA conducts an annual drill to staff the alternate control center to validate plans, train system operators, and identify any areas needing improvement. During the drill, LIPA performs actual system operation from the alternate control center for approximately one hour. The alternate control center is tested monthly for an EMS failover. During this testing, the system is operated from the alternate center for approximately one-half hour. EMS and information technology staff exercise with the system operators so that both computer and communications support is available during the tests as well as the annual drill. LIPA uses an emergency preparedness group to evaluate the annual loss of control facilities drill. This is a non-operational group and the critique provided is more readiness and functionality based. The evaluation team commends LIPA for the creative thinking that has been instrumental in providing this kind of a review for operational training.

The EMS at the alternate control center does not have the full system view as at the primary control center based on the number of remote terminal units (RTUs) that can be accessed without transferring the communications fully to the alternate control center. The alternate control center is limited to viewing 53 of the 235 RTUs; therefore, only 46 of 170 substations can be modeled. LIPA plans to upgrade the RTUs and thus increase the operational functionality at the alternate control center over time. As long as the functionality at the primary control center is maintained, the EMS at the alternate control center has full functionality. If the functionality at the primary control center is lost, the limited functionality at the alternate control center is adequate to support LIPA's operational needs as a transmission owner. The team commends LIPA for implementing a functional alternate control center that is above and beyond minimum requirements for a transmission owner.

10. Tools

The local control center must have adequate analysis tools to perform the appropriate control and monitoring functions. Such tools include state estimation, precontingency and postcontingency analyses capabilities (thermal, stability, and voltage), mapboard (static, dynamic, hardwired, or projected), e-tagging program, weather service, outage scheduling system, trending tools, and a voice recording system.

LIPA has a full suite of tools to fulfill its assigned responsibilities for the safe and reliable operations of the interconnected transmission system, including an EMS with basic and advanced functionality, a state estimator with real-time contingency analysis capability, and a DTS. The team commends LIPA for the excellent EMS availability performance record of 99.996 percent in 2006 and 100 percent availability in 2004 and 2005.

LIPA has a dynamic mapboard that displays generator and transmission device status, outage scheduling programs, trending applications, intercontrol center communications protocol (ICCP) node for NYISO data, PI Historian database and associated tools, and a PC-based digital voice recording system. Additionally, LIPA uses weather applications such as lightning detection, storm sentry, weather sentry, and an Internet-based weather tool.

LIPA has developed and implemented a number of effectively used custom EMS monitoring applications:

- Big brother monitoring scripts — a series of standalone scripts that continuously runs on the EMS to check for backed-up messages on all the application processors, workstations, and front-end processors.
- Doctor node — one workstation is designated as the system doctor and ensures that all nodes are functioning/communicating properly.
- ICCP data transfer monitor — NYISO ICCP is monitored through integrated software and will similarly activate the annunciation system in the operation computing section when data transfer is interrupted for more than one minute.
- EMS data warehouse — long-term storage of historical real-time EMS operating data for access, reporting, and special studies.
- Breaker operation application — a Web-based application that identifies transmission system breakers that have not operated within a specified period of time. This application is utilized to supplement the breaker maintenance program.
- Stale data applications — a Web-based application that identifies possible "stale or frozen" data points (data has not varied for a prescribed period of time) on the EMS/SCADA. This is used to proactively identify possible problem points on the EMS.

The evaluation team commends LIPA for the development of these creative applications to enhance the functionality of its tools and, ultimately, the reliable and safe operations of the interconnected transmission system.

LIPA uses an independent monitoring and a phase angle regulator control system that provides redundant supervisory and control system information and control capability. The evaluation team commends LIPA for the utilization of this redundant control capability.

11. Load Shedding Plans

The local control center must establish plans for automatic load shedding for underfrequency or undervoltage conditions, coordinate load shedding plans with other interconnected entities, implement load shedding in steps to minimize further uncontrolled events, and have plans for operator-controlled manual load shedding to mitigate violations of system operating limits (SOL) or interconnection reliability operating limits (IROL).

Manual load shedding for the bulk power system occurs at the direction of NYISO. LIPA annually categorizes distribution circuits into one of four categories based on the critical nature of the load served. The feeders are then ordered based on geographic location, and the circuits are modeled in EMS so that the system operator can shed the required amount of load and implement rotational load shedding if needed.

LIPA uses automatic underfrequency load shedding that complies with the NPCC underfrequency load shedding requirements for frequency set points and percent of load to be shed per increment as defined in Section 4.6 of *NPCC Document A-03:, Emergency Operation Criteria.* The current LIPA underfrequency load shedding program exceeds the NPCC requirements, and the program is reviewed, and revised as needed, on an annual basis.

LIPA has made a concentrated effort to eliminate any overlap between the manual and automated load shed programs. Only a small amount of overlap remains. To ensure the competency of the system operators, each system and senior system operator receives annual training on the DTS using multiple load shedding scenarios. The system operators also participate in the annual NYISO load shedding exercise.

12. Real-Time Monitoring

a. System Visibility

The local control center must monitor operating data and status in real time for its area and adjacent areas as necessary to maintain situational awareness of its system.

LIPA's EMS visibility includes 345, 138, and 69 kV transmission lines and substation equipment, including breakers, transformers, switches, reactors, capacitors, generators, and distribution circuits. LIPA receives interconnected transmission systems data via the ICCP link to NYISO. Data includes tie-line voltages; megavars; megawatts; and status of breakers and switches, transformers, reactors, and capacitors. LIPA meets all the data requirements specified in Section 6.0 of *NPCC Document A-02: Basic Criteria for Design and Operation of Interconnected Power Systems,* and there are no transmission system visibility gaps within the LIPA zone or interconnected neighboring transmission system footprint that would hinder LIPA in fully performing its required reliability functions.

b. Alarms

The local control center must have effective and reliable alarming capability. This should be supported in the energy management system (EMS) and/or supervisory control and data acquisition (SCADA) system by alarm priority.

The LIPA EMS has the ability to define, categorize, and prioritize transmission system alarms and events. Alarms use both audible and visual indicators and require system operator acknowledgement. Events do not require system operator acknowledgement. Each alarm is assigned an alarm class that includes priority, coloring, and an audible tone. Additionally, each alarm is assigned an area of responsibility (a geographic area) in the LIPA transmission zone. The system operator can filter alarms based on area of responsibility and alarm priority.

All alarm and events are logged by the historical database subsystem and transferred to the data warehouse on the corporate computer network for long-term storage and access. The data warehouse is discussed in Section 10 (Tools).

c. Frequency

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

The transmission system frequency is monitored and managed by NYISO as the balancing authority/transmission operator for the LIPA transmission system. LIPA effectively monitors the system frequency for the LIPA zone. This is an area of operational overlap that only helps to strengthen the reliability of the interconnected transmission system.

The LIPA SCADA system has a dedicated screen that monitors the transmission system frequency at 8 of the 23 locations that can be remotely monitored by the EMS. There are multiple inputs at each of the frequency locations.

In the event that the frequency chart recorder in the primary control center loses its independent frequency source from the essential bus in the primary control center, the system operator has the capability to select other frequency points in SCADA. The frequency signals are time-error corrected to a Global Positioning System clock.

d. Voltage/Reactive Reserve

The balancing authority/transmission operator and local control center must monitor voltage levels and take appropriate actions to support the bulk power system voltage if real-time trends indicate potentially developing problems. Voltage measuring points must be of sufficient number and from several locations and voltage levels to allow the balancing authority/transmission operator and local control center to effectively monitor the voltage profile of its footprint.

The balancing authority/transmission operator and the local control center must ensure that reactive reserves are available and properly located to satisfy the most severe single contingency.

LIPA monitors the voltage and reactive conditions on the transmission system in accordance with Section 2.02.01.b of the *Agreement between the New York Independent System Operator and Transmission Owners* and the NPCC operating procedure documents. The LIPA system operators follow the voltage and reactive operating instruction of the NYISO operators. The principal voltage and reactive management on the bulk power system comes from the dynamic reactive capacity of the generation in the LIPA zone and the operation of the phase angle regulators.

The generators in the LIPA zone communicate with NYISO via LIPA, the transmission owner, using NYISO procedures. This is also the way that the status of the generator's automatic voltage regulator, generator derates, and other generator operating data are communicated to NYISO. The system operator has an EMS screen that displays the real and reactive power output of each generator in the LIPA zone.

The LIPA system operators can view transmission system voltages at each bus; however, there is not a screen available that presents a geographical world view of the transmission system voltages and voltage profiles. The evaluation team recommends that LIPA develop and implement changes in the display of transmission system voltages as follows:

- Geographical world view display of transmission system voltages
- Geographical representation of transmission system voltage profiles

The evaluation team reviewed a number of operating documents related to voltage and reactive management on the interconnected transmission system. Documents included those already referenced as well as Section 4 of the *NYISO Ancillary Services Manual* and a draft copy of the *LIPA 2006 Reactive Resource Study.* From this review, the team commends LIPA for the strong body of transmission system voltage and reactive study products as well as operating practices and procedures. In addition, the modeling and study assumptions adequately stress the transmission system to ensure that system reliability has been adequately addressed.

e. Critical Facilities

Monitoring of facilities that are critical to the reliability of the bulk power system is a joint responsibility of the balancing authority, transmission operator, reliability coordinator, and local control center.

An established process must determine which facilities are critical to the reliability of the bulk power system. Real-time operating information (data, status, and operating limits for these critical facilities) must be provided to the balancing authority, transmission operator, and local control center by the reliability coordinator.

NYISO has performed a transmission system analysis and informed LIPA that there are no critical facilities on the bulk electric system (as defined by NPCC). The bulk electric facilities on the LIPA transmission system are monitored and receive continuing analysis in the contingency analysis program. Any directives related to the bulk electric facilities on the LIPA transmission system would be implemented by LIPA, as directed by NYISO, to mitigate the conditions resulting from a contingency.

f. Transmission System Congestion

The transmission operator must monitor transmission flowgates and be prepared to take actions to alleviate congestion in conjunction with, and as directed by, its reliability coordinator.

This area of transmission system reliability is managed by the NYISO. LIPA will comply with any directives that it receives from the NYISO related to transmission system congestion.

g. Load Generation Balance

The balancing authority must monitor the balance of load, generation, and net scheduled interchange in its balancing area. The balancing authority must take actions to mitigate unacceptable load, generation, and net scheduled interchange imbalance.

This area of transmission system reliability is managed by NYISO as the balancing authority/transmission operator; however, LIPA does monitor the area control error for the LIPA zone, which increases the operational awareness of its system operators. The evaluation team commends LIPA for this initiative.

h. Contingency Reserves

The balancing authority must monitor the required reserves and the actual operating reserves in real time, and take action to restore acceptable reserve levels when reserve shortages are identified

This area of transmission system reliability is managed by NYISO as the balancing authority/transmission operator.

i. Special Protection Systems

The balancing authority/transmission 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 power system.

No special protective systems or remedial action schemes are used on the LIPA transmission system.

13. System Restoration

The transmission operator must have a documented system-restoration plan that is consistent with NERC reliability standard EOP-005-0 — System Restoration Plans. This restoration plan must be provided to its reliability coordinator.

The transmission operator in coordination with the transmission owner must be prepared to restore its transmission area following a partial or total collapse of the system and coordinate system restoration with its neighboring transmission operators and with the reliability coordinators.

As the transmission operator, NYISO has the overall responsibility for restoring the New York bulk power system. NYISO coordinates the restoration plan with the interconnected NYISO members and conducts annual restoration drills in which LIPA participates. The final step in the NYISO drill is to close the intertie to LIPA; therefore, LIPA does not have an active role in the NYISO plan.

LIPA has a local restoration plan for restoration of the transmission that is not defined as the bulk electric system and the distribution system. The LIPA restoration plan, which includes implementing the blackstart plan for the generation in the LIPA transmission zone, is modeled in the DTS for plan validation and the system operator training. LIPA can create as many as four islands in the LIPA zone and synchronize these islands; however, the LIPA system is synchronized to the interconnected transmission system when NYISO initiates the closing of the intertie previously mentioned in this section. The LIPA restoration plan is reviewed and updated as required on an annual basis.

14. Capacity and Energy Emergency Plan

Each balancing authority must have a capacity and energy emergency plan that address the applicable requirements of NERC reliability standards EOP-001-0 — Emergency Operations Planning and EOP-002-0 — Capacity and Energy Emergencies.

The capacity and energy emergency plan is owned and administered by NYISO as the balancing authority/transmission operator. LIPA will respond to any directives by NYISO with respect to the implementation of this plan. The areas where LIPA may be directed to respond are as follows:

- Active load management
- Public appeals for load reduction
- Manual load shedding and/or rotation

15. Equipment Maintenance and Testing

Transmission owners must ensure that maintenance of transmission lines, substation equipment, and transmission protective and control systems are carried out according to company, regional, and/or NERC requirements.

LIPA uses an in-house developed relay maintenance management tool called Relay Maintenance File to schedule and track relay maintenance on protection and control devices on the bulk and non-bulk electric transmission systems. The LIPA maintenance, testing, and calibration on the bulk electric system relays meets and in many cases is more conservative than that specified by NPCC for transmission system protection and control devices. The 2007 relay maintenance program is on schedule and the program for 2006 was completed on schedule. There were no misoperations of protective equipment on the LIPA bulk electric transmission system for calendar year 2006. The evaluation team noted that LIPA has a long-range program to replace bulk electric system electromechanical relays with microprocessor relays over time.

LIPA uses the Maximo maintenance management system to schedule and track its substation equipment maintenance program. The maintenance program includes a number of analytical and standard industry maintenance practices such as gas-in-oil analysis, Doble testing, visual inspections, and other operational inspection procedures. LIPA has a program to gradually replace aging substation infrastructure to ensure the operating integrity of the transmission system. The substation equipment maintenance program was completed on schedule for 2006 and is on schedule for 2007. There were no bulk electric system substation equipment failures of the LIPA system during the past 12 months.

LIPA uses a microprocessor disturbance fault recorder (DFR) for disturbance monitoring. These devices are time synchronized and can be remotely interrogated to obtain fault or disturbance data in the event that the LIPA transmission system experiences a fault or disturbance. The devices are maintained in accordance with procedures based on the manufacturer's recommended maintenance practices. The maintenance of DFRs is on schedule for 2007.

16. Vegetation Management

The transmission operator must have a documented vegetation-management program.

The Organization Profile section of this report provides a chart of the miles of LIPA transmission, subtransmission, and distribution lines that are constructed overhead as well as underground. When the NPCC definition of bulk electric facilities is applied to the LIPA transmission system, the only facilities identified as bulk electric facilities are underground transmission facilities at four locations. Based on the application of this definition, vegetation-management is not applicable; therefore, these activities will not be discussed in this report.

For the non-bulk electric facilities operated at transmission voltages, LIPA uses a vegetation management program to ensure operational reliability.

17. Nuclear Power Plant Requirements

Transmission operators must support nuclear power plants in meeting regulatory requirements that allow the plant operators to maintain voltages within design limits and adequate off-site power sources in both normal and abnormal operating conditions (n-1 and system restoration).

LIPA does not have a nuclear power plant in its service area footprint nor is there a nuclear power plant connected to its interconnected transmission system that depends on the LIPA transmission system for critical bus voltage support. LIPA is an 18 percent owner of Nine Mile Nuclear Power Station Unit 2 located in Oswego, New York. Oswego is located in the western portion of the State of New York, on the eastern shore of Lake Ontario, some distance away from the LIPA service territory.

APPENDIX 1: Critical Energy Infrastructure

The following discussion is presented under private letter to the audited entity only and will not be included within the public version of the report.

APPENDIX 2: Evaluation Participants

The following discussion is presented under private letter to the audited entity only and will not be included within the public version of the report.

APPENDIX 3: Documents Reviewed

The following discussion is presented under private letter to the audited entity only and will not be included within the public version of the report.