NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Balancing Authority/Transmission Operator Reliability Readiness Evaluation Report

Progress Energy Florida
St. Petersburg, Florida

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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 to strengthen the reliability of the North American bulk power system. The program conducts independent evaluations of balancing authorities, transmission operators, reliability coordinators, 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.

Since its inception in 2004, NERC and the industry have been working collaboratively to enhance the program. The evaluation process is based on fundamental aspects of reliability: culture, operations, maintenance, planning, and training. 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 infrastructure will be contained in Appendix 1, a confidential appendix to the report that is sent privately to the evaluated entity and is not included in the public version of the report.

An evaluation team met on-site with Progress Energy Florida (PEF) representatives on May 14–17, 2007. This report reflects the views and recommendations of the evaluation team regarding the readiness of PEF to meet its responsibilities as a balancing authority/transmission operator.

Evaluation Team

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Organization Profile

PEF, a subsidiary of Progress Energy, provides electricity and related services to more than 1.55 million customers in Florida. Headquartered in St. Petersburg, Florida, PEF serves a territory encompassing over 20,000 square miles, including the cities of St. Petersburg and Clearwater, as well as the central Florida area surrounding Orlando.

Progress Energy, headquartered in Raleigh, North Carolina, is a diversified energy company with more than 23,000 MW of generation capacity and $10 billion in annual revenues. The company's holdings include two electric utilities serving approximately 3 million customers in North Carolina, South Carolina, and Florida.

PEF's geographical service area encompasses the western and northern portions of Florida. PEF has 86 interconnections with nine neighboring systems. The PEF system voltage class and miles of transmission and sub-transmission lines include the following:

500 kV	169 miles
230 kV	1,475 miles
115 kV	1,005 miles
69 kV	2,169 miles

PEF's all-time peak demand of 10,131 MW, net integrated load, was set on January 24, 2003 (winter peak).

PEF is affiliated with the FRCC, and is registered with NERC as a balancing authority, transmission owner, transmission operator, transmission planner, generation owner, and generation operator.

Executive Summary

The evaluation team found no significant operational problems and concluded that the PEF balancing authority/transmission operator has adequate facilities, processes, plans, procedures, tools, and trained personnel to perform the balancing authority/transmission operator functions necessary to maintain the reliable operation of the bulk power system.

Like the system operators, PEF's corporate and operations management place a high emphasis on system reliability. Programs are in place for measuring corporate and department goals to support the company's emphasis on system reliability.

PEF has a dispatcher training program that includes a certification program for the generation and transmission operating functions and includes the use of a dispatcher training simulator. PEF requires that the trainee pass a two-day simulation exam with an overall grade of 80 percent. The evaluation team identified the dispatcher training simulator and training program as potential examples of excellence. The training program was also identified as a potential example of excellence by the previous NERC readiness audit team in 2005. PEF uses a human performance program to minimize safety events and other types of errors. In addition, PEF has a good document development and control process as well as a technical trainer who is very knowledgeable in all operating positions. The evaluation team notes the aforementioned items as positive observations.

PEF provides its system operators with advanced applications to monitor and analyze the PEF electric system. In addition, PEF requires operators to be NERC certified with the reliability operator credential.

PEF has reviewed the evaluation team's recommendations and has identified several that will enhance its performance for system reliability. Items selected include 1) the use of all limiting elements in the capacity ratings for line segments in the EMS; 2) providing the system operators with the specific underfrequency trip setpoints of generating units; and 3) developing a process to verify that the system operators have read and understood new standing orders or operating procedures when issued.

Overall, the evaluation team identified nine positive observations and two potential examples of excellence. In addition, the team offers 13 recommendations that, if implemented, will enhance PEF's readiness to operate reliably and maintain the reliability of the bulk power system. The findings are listed in order of importance.

Potential Examples of Excellence

The evaluation team identified the following potential examples of excellence in its reliability readiness evaluation:

1. The dispatcher training simulator replicates the working conditions of the control room (Section 5.1).
2. The dispatcher training program includes an internal certification program for generation and transmission reliability operating positions and an 18–24 month operator training qualification program (Section 5.1).

Positive Observations

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

1. PEF uses a rigorous human performance program to minimize safety events and other types of errors (Section 5.2).
2. PEF's technical trainer is a subject matter expert in all operating positions (Section 5.1).
3. PEF uses a rigorous process to develop and control its operations reference manuals and control center procedures (Section 2.2.3).
4. The structured new-hire program includes psychological testing and seeks candidates with an advanced education (Section 5.1).
5. System operators, support staff, and management are NERC certified with the reliability operator credential (Section 5.1).
6. Management provides financial support and tools for operator training (Section 5.1).
7. User-friendly energy management system (EMS) displays for load shed and reactive control present pertinent data for system operations (Section 2.4).
8. The operational planning group reviews seasonal studies for problems and updates or develops mitigation plans accordingly (Section 4).
9. PEF uses an outside contractor tool to compare planning models with real-time data (Section 4).

Recommendations

The evaluation team offers the following recommendations:

1. See discussion in Appendix 1.
2. See discussion in Appendix 1.
3. See discussion in Appendix 1*.
4. Provide system operators with formal training on reliability coordinator functions to ensure proper backup capability for the FRCC reliability coordinator (Section 5.1).
5. Develop and verify with generating plant personnel actions to be taken during low system frequency excursions so that units are not manually tripped prior to the activation of the automatic underfrequency relay protection scheme (Section 4).
6. Develop a monitoring process to notify the system operators for failure of the EMS alarm processor and/or when a failover of the EMS servers has occurred (Section 3.2.1).

7. Include all limiting elements (e.g., wave traps, breakers, busses, jumpers) in the capacity ratings for line segments to provide operators with more information for real-time monitoring and contingency analysis (Section 2.3)*.
8. Provide system operators with a listing of frequency trip setpoints for each generating unit to help operators anticipate system scenarios (Section 4)*.
9. Develop a sign-off procedure to verify that the system operators have read and understood new standing orders or new operating procedures (Section 2.2.3)*.
10. Develop an EMS display of available operating reserves by unit to increase situational awareness for system operators (Section 2.1).
11. Modify the state estimator to provide system operators with contingency violations in percent of overload (Section 2.3).
12. Confirm the accuracy of Study Net when simulating loss of large generator to ensure operators do not receive conflicting results when using this tool along with the real-time contingency analysis program (Section 2.3).
13. Train the system operators on the existence and proper use of the "all-call" phones in the energy control center to provide expedited communication capabilities during emergencies (Section 5.1).

*Jointly identified by the company and lead evaluator as a key recommendation.

Discussion

The reliability readiness evaluation team examined the following key areas during the evaluation. The detailed discussion that follows provides the foundation for the considerations, recommendations, positive observations, and potential examples of excellence 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. Culture

1.1 General

The corporate organization provides the necessary leadership and management for system operations to sustain high levels of safe, reliable operation.

PEF postures its system for the next contingency in order to avoid uncontrolled, cascading outages. To meet this, transmission equipment and generating unit maintenance requests are reviewed in advance for impact on the PEF system. In addition, the maintenance activities are entered into the Florida Transaction Management System in order to share the outage information with other transmission providers and the reliability coordinator for day-ahead evaluation.

PEF tries to staff its control room support organizations with personnel who have successfully made it through the PEF dispatcher qualification program and have spent a minimum of three years in the control room. PEF also attempts to have back office personnel NERC certified. PEF believes that NERC certification training has proved to have a beneficial impact on the work of key support areas.

PEF provides its system operators with the tools for monitoring the PEF electrical system (EMS with state estimation and real-time contingency analysis) and the authority and capability to make decisions and take necessary actions to return the PEF system to normal when unexpected events or conditions occur.

PEF management notifies its system operators of document and procedure revisions.

1.2 Organizational Effectiveness

1.2.1 Foundation for System Reliability

The organization's values and behaviors—modeled by its leaders and practiced by its members—serve to make system reliability a top priority.

PEF's corporate management and operations department goals align to maintaining system reliability as a high priority. In addition, based on corporate philosophy, operational safety is also a high priority. PEF has made improvements to its safety program as it has received a better

commitment to people working safely. As an example, field crews conduct daily pre-briefings before going on the job.

Corporate management has made a commitment to reliability excellence as evidenced by taking SAIDI, a key outage statistic, from over 100 minutes to 80 minutes in duration beginning in 2002. Reliability and customer service has become a top priority.

1.2.2 Leadership and Management

Managers, by leadership, commitment, and example, establish and reinforce high standards of performance and align the organization to achieve safe, reliable system operation.

The PEF corporate and operations management team are committed to operating the bulk power system in a safe and reliable manner. Operating procedures are well documented and thorough. PEF has a structured training program, which was identified by the audit team in its 2005 audit report as an example of excellence.

PEF uses human performance and root cause analysis to handle incidents and investigate day-to-day activity. In addition, a work management system is used as a feedback mechanism. PEF also has a very active internal audit process to review NERC-related or regulatory-related issues.

All operating support groups are in the same line organization, and this allows for all the groups to meet to discuss daily operations and to take actions on real-time operations, when required.

1.2.3 Corporate Oversight and Monitoring

Line management is used to strengthen reliability and improve performance. System reliability is kept under constant scrutiny through techniques such as self-assessments, performance indicators, and periodic management meetings.

Overall system reliability is indicated by the following key performance indicators used to track performance of the PEF system:

- Safety
- SAIDI (customer outages in minutes)
- Forced sustained outages (transmission elements forced out of service)
- Generation impacting events (optimal generation performance of costs done after the fact)
- NERC/FRCC compliance (zero violations)
- Human performance program (events undergo a root cause evaluation and corrective actions are tracked until completion)

1.2.4 Human Resources

Personnel resource needs are anticipated and individuals are systematically recruited, developed, and assigned positions in the system operations organization.

PEF does succession planning to recruit, develop, and assign positions within its system operations organization. A formal process is in place where every employee has a set of goals

and developmental plans, established at the beginning of the year. These goals and plans are reviewed annually in July and the first month of the next year.

The succession plan looks at employees ready now and those employees to be ready for the company's long-term plans. Each year, corporate management holds succession retreats in August and February to match company needs to current employees and determine the professional development required. This process charts employees for progression to other positions one to two years away. Daily feedback to employees is provided to make sure professional developmental plans meet the expectations of the people needed. In addition, a supervisor assessment program is utilized to develop potential supervisory personnel.

Over the past four years, staffing levels have increased in the system operations area. A trainer has been added and PEF has begun using shared resources and subject matter experts for training personnel.

The system operators indicated there is no impact on system reliable operations from vacancies on shift. The required operating positions are filled with overtime, if required. If additional support on shift is required, the system operators can call people in to help, without supervisory approval.

1.2.5 Corporate Communications

System operations communications inform and engage both corporate and system operations employees so they can contribute to the strategic priorities of the organization.

PEF communicates its new or revised corporate goals to the system operators by holding operator meetings four times per year. The system operations group is involved in the development of corporate goals. The goals are brought to the operations staff and reviewed at the department level; the department goals link to the corporate goals and strategy. The goals are updated monthly with the issuance of an information bulletin, and status of the goals can be accessed on a company intranet page. Senior management will take immediate action when performance is not meeting the goals, when required.

In addition, employee opinion surveys are conducted every other year to provide on a confidential forum for expressing opinions to the company management.

2. Fundamentals of Operations

2.1 General

Operations personnel monitor and control the system in a manner that ensures safe, reliable operation.

PEF provides its system operators with a dynamic mapboard and EMS displays for overview monitoring of the PEF electrical system. The EMS alarm system's functionality provides the system operators with major and minor alarms with audible tones. Alarms are categorized for supervisory control and data acquisition, remote terminal units, generation, and the electrical system.

PEF provides its system operators with data input from three geographic locations for monitoring system frequency: the northern, central, and southern areas of the PEF footprint. In addition, two frequency sources are located at the substation adjacent to the primary control center.

PEF has several PEF documents outlining voltage and reactive support requirements for the PEF transmission system. The EMS provides PEF's electric system voltage to the system operators on an all-voltages display, and the EMS has the capability to sort voltages by violations, high-to-low, and north to south. Reactive reserves are monitored by what is in service or out of service, but no data are available to the system operator to show the amount of reactive power being utilized or the amount of reactive capability remaining in static or dynamic reserves. Therefore, the evaluation team offers that PEF consider providing its system operators with an EMS display capable of calculating dynamic and static reactive reserves on reactive devices and alarming when there is a shortage of reactive reserves.

The EMS has a generation area status page that has a direct link to a page that allows the system operator to implement reserve sharing. The EMS has summary data of available operating reserves, but does not indicate the actual availability of the reserves by generation unit. The evaluation team recommends that PEF provide system operators an EMS display of available operating reserves by generating unit. In addition, the evaluation team offers that PEF consider providing its system operators with an EMS display of available regulating reserves by each individual generating unit.

2.2 Operational Focus

2.2.1 Operational Safety

System operation activities are conducted in a manner that maintains high levels of safety and reliability for all system conditions.

The PEF electric system has 11 special protection schemes that are monitored in the EMS by an automatic remedial control program. The system operator will receive a major alarm to arm or disarm the automatic remedial control scheme. The alarm notification program uses post-contingent loading output from the real-time contingency analysis program to make the recommendation. When an automatic remedial control scheme is armed, the system operator will notify the reliability coordinator.

PEF uses FRCC procedures when taking relays out of service for maintenance. Any equipment that can affect another utility will go though the reliability coordinator. The system operators informed the evaluation team that there always has to be protection on a line, or the line has to be removed from service.

2.2.2 Operational Decision-Making

Operational decisions are reached using a systematic and thorough approach that supports safe, reliable, and efficient system operations.

Provided time is available, the system operators are trained to work as a team and solicit advice/input from supervision and support staff when making critical operational decisions.

However, the system operator does have the authority and responsibly to take whatever action is required. The priorities of the system operator listed from most important to least important are safety, reliability, and economics. Procedures and other references are maintained to assist the system operators in collecting data, communicating information, and making the best decision possible. System operators are trained extensively in the training simulator using sound human performance techniques and problem solving methods.

2.2.3 Operational Alignment

Organizational structure supports safe and reliable system operation.

PEF does not delegate any of its balancing authority or transmission operator functions to others.

The *Security Process for the FRCC Bulk-Power Electric System* document identifies PEF as the responsible entity performing the operations planning function for the FRCC reliability coordinator. This activity is performed by the operational planning group, which consists of NERC-certified staff. The document requires that FRCC members, such as PEF, are responsible for following directives from the FRCC reliability coordinator. Currently, Florida Power & Light (FPL) is the FRCC's agent performing the real-time reliability coordinator function for the FRCC region, and FPL serves as its own backup. FPL is also the FRCC's agent to perform capacity assessments; TECO Energy is the back up for this function.

PEF is a member of the FRCC reserve sharing group, which is documented in the *FRCC Handbook* and in a PEF System Operations Reference Manual - Florida (SORMF) document. PEF provided standard interconnection requirements, facility connection requirements documentation, and transmission interface agreements with the PEF generating unit operators for review.

PEF provides regulating service and operating reserves to the Utilities Commission of New Smyrna Beach.

The primary control center is staffed as follows:

- Transmission operations
  - Staffed around-the-clock
- Generation operations (balancing authority)
  - Staffed around-the-clock
- Interchange operations (transmission services)
  - Staffed with one system operator from 6 a.m. to 2 p.m. and one from 2 p.m. to 10 p.m..
  - The interchange operations function is performed by the generation system operator between the hours of 10 p.m. and 6 a.m.
- Control room supervisors
  - Staffed from 6 a.m. to 6 p.m., Monday through Sunday.
  - Supervisors are available outside these hours on a call-out basis. PEF has plans to increase control room supervisor coverage in the future.

PEF has a system operator authority letter, signed by the vice president of transmission operations and planning, posted in the dispatcher training simulator room, located adjacent to the primary control center operating room. The letter indicates that the system operators have the responsibility and obligation to operate the power system in a safe and reliable manner and includes the authority to shed firm load, if necessary to fulfill that responsibility. In addition, the SORMF *CP-14 Operational Requirements and Responsibilities* document defines the roles and responsibilities of operating personnel in the control room.

PEF has a good process for developing and managing its operations documentation, such as operator reference manuals and control center procedures. PEF follows a rigorous process handling the system operator reference manuals, resulting in well-designed, user-friendly documents. The evaluation team commends PEF for the development and control of operations documentation.

PEF notifies its system operators of new or revised operating standing orders or procedures by e-mail and by placing the documents in a book operators are expected to read. The evaluation team observed no feedback process in place for PEF to verify that its system operators have read and understood the new documents or revised documents. Therefore, the evaluation team recommends that PEF develop a sign-off procedure to verify that the system operators have read and understand new standing orders or new operating procedures.

The system operators utilize a shift-turnover form, with an extensive list of shift-change requirements, for passing on the necessary operating information from the outgoing to incoming system operators. In addition, outgoing operators at all desks provide incoming operators with a shift report containing any notes taken during their shift.

2.3 Managing System Configuration

Power system configuration is carefully designed, analyzed, maintained, and controlled throughout the life of the infrastructure, ensuring that system and equipment margins are understood, considered in decision-making, and managed consistent with design and system requirements.

The FRCC region performs a study for every winter and summer peaking season. The studies identify significant contingencies and system operator actions to mitigate them. Each study is verified by the PEF operational planning engineers.

The SORMF *TD-15 Summer and Winter Contingency Studies* procedure is updated to incorporate the appropriate study results so that the system operators can quickly reference mitigation plans that were developed from the study analysis. These contingency studies are part of the "Operating Plan" developed by PEF management for each peak season.

PEF has automatic voltage regulators (AVR) installed on all its generating units in its footprint. The AVR status is tracked in the EMS, and plant personnel are required to call the system operator of any change.

PEF has one power system stabilizer installed on its nuclear generating unit. Like the AVR status, the power system stabilizer status is tracked by the EMS. The reliability coordinator can also obtain the status of both the power system stabilizer and AVR through the reliability data link. The system operator is required to notify the reliability coordinator on a change of status.

PEF provides its system operators with an AREVA EMS for real-time monitoring that includes automatic generation control, economic dispatch, supervisory control and data acquisition, alarm monitoring, equipment tagging, and the advanced applications of real-time state estimation and contingency analysis.

PEF uses the capacity ratings for line segments, as used in the EMS, for real-time monitoring and contingency analysis. The evaluation team recommends that PEF include all limiting elements (e.g., wave traps, breakers, busses, jumpers) in the line segment capacity ratings. During the system operator tools interview, the evaluation team observed that the state estimator does not provide violations output in percent of overload. The evaluation team recommends that PEF provide the system operators with contingency violations as limits read in percent of overload in the state estimator.

System operators have a Study Net application that can be used to analyze system conditions. During a simulation done by a system operator for the evaluation team, Study Net did not solve for a loss of a large generating unit scenario, but the real-time contingency analysis program did. Since both Study Net and the real-time contingency analysis program are mirrored to each other, the evaluation team recommends that PEF confirm the accuracy of Study Net when simulating a loss of a large generating unit.

PEF considers all of its transmission equipment 230 kV and above as critical facilities; however, this is not documented. The evaluation team observed that the system operators were not familiar with the PEF critical facilities list. Therefore, the evaluation team offers that PEF consider providing a critical facilities list to its system operators.

Any system operating limit or interconnected reliability operating limit violations and mitigation plans detected by the advanced application tools are communicated by the system operators to the reliability coordinator over the FRCC hotline.

PEF supplied a copy of an EMS display of its area control error calculation and PEF's monthly inadvertent data for review by the evaluation team.

2.4 Emergency Preparedness

The organization is prepared to manage and mitigate the impact of system emergencies in order to preserve the reliability of the system and to protect the interests of the public.

PEF has manual and underfrequency load shedding programs. PEF also utilizes a fast-acting load shed program that monitors for a major loss of transmission lines and then automatically sheds load only in selected areas of the PEF electric system. The evaluation team commends PEF for providing EMS displays for load shed and reactive control that are well organized and present pertinent operating data for system operations.

PEF's EMG-SUBS-00002 *General Load Reduction and System Restoration Plan-Florida* is its capacity and energy emergency plan and system restoration plan.

PEF's NGGM-IA-0003 NGG *Interface Agreement, Transmission Interface Agreement for Operation, Maintenance, and Engineering Activities at Nuclear Plants* details the nuclear power plant requirements. The agreement identifies the system operator's responsibility to notify plant personnel of operating parameters for voltage schedule, desired switchyard bus voltage, minimum and maximum Mvar output, and MW output.

The real-time contingency analysis program automatically provides a major alarm to the system operator for critical voltages on the 230 kV system supplying power to the nuclear power plant. In addition, the EMS is programmed to monitor and alarm the nuclear power plant substation voltage.

3. Fundamentals of Maintenance

3.1 General

Maintenance is conducted by skilled personnel to achieve safe, reliable control center equipment and system performance.

The FRCC region uses an automatic reporting program to allow system operators to easily detect and resolve hourly inadvertent interchange discrepancies with other neighboring systems. Identified meter errors can be offset in the automatic generation control application to bias the area control error so that the meter error is minimized until the problem is resolved.

PEF uses redundant TrueTime XL-DC Time Frequency receivers with the FTM III Frequency & Time Deviation option, and no calibration is required per the vendor.

PEF has digital fault recorders installed on its transmission system, and all are time synchronized with Global Positioning System satellites, except one site. The time boards are no longer available for that unit. Therefore, the evaluation team offers that PEF consider replacing the digital fault recorder without time synchronization with one that is, so that during system events actions are accurately time-captured for analysis.

3.2 Equipment Reliability

3.2.1 Equipment Performance

The organization achieves high levels of equipment reliability. Equipment problems that impact reliability are resolved in a thorough and timely manner.

PEF has a failover subsystem that monitors important and critical EMS processes. If a critical process fails, the system will failover to the backup system. In addition, PEF has a code running to monitor other processes and automatically restart them if they fail. The system operators monitor all EMS alarm displays, and alarms are generated to bring failed items to the attention of the system operators**.** The evaluation team observed that there is no process to notify the system

operators of a failure of the alarm monitoring systems failure. The evaluation team recommends that PEF develop a monitoring process to notify the system operators for failure of the EMS alarm processor and/or when a failover of the EMS servers has occurred.

3.2.2 Work Management

Work activities, including corrective, elective, and preventive maintenance, surveillance testing, and modifications, are managed effectively to support safe, reliable operation during both outage and routine periods.

The evaluation team reviewed with corporate management a recommendation made from the NERC readiness audit report from 2005 that pertained to PEF's relay testing and maintenance program. PEF assessed the problem and backlog of maintenance items and has put additional funding and resources in mitigating the backlog. Plans are being incorporated to prevent a backlog and place a more-focused approach to relay maintenance.

4. Fundamentals of Operational Planning

Operational planning provides the technical information and support necessary for safe, reliable system operation.

The operational planning group, which consists of degreed electrical engineers who are expected to be NERC certified with the reliability operator credential, uses the Power System Simulator for Engineers and a transmission analysis program for planning work. The source of the base case model is the FRCC-approved annual seasonal transmission assessment of single contingencies. The regional model includes 69 kV and above equipment. Generator dispatch scenarios are developed from the FRCC regional economics dispatch file. To determine valid equipment characteristics and ratings, the model is verified by comparing the seasonal transmission assessment against the seasonal transmission operational assessment models.

For thermal, voltage, and stability criteria, the operational planning group uses the normal thermal rating of a facility. Emergency ratings are not used in the operational assessment process. During normal system operations, voltage is allowed to deviate 5 percent plus or minus from nominal. For a contingency event, voltage can decline 10 percent from nominal. To enhance the process, the evaluation team offers that PEF consider aligning the voltage criteria used in planning studies with neighboring utilities.

The planning process to support day-ahead and real-time operations in determining transmission limits and generation facility commitment/dispatch is incorporated into the EMS advanced applications: the state estimator and the real-time contingency analysis. PEF uses a constrained outage application program for coordinating generating unit tests, maintenance, deratings, and outages. In addition, PEF uses the system work and maintenance program for scheduling and planning transmission and switching and outage requests. All generating unit outages and deratings and transmission outages are also reported through the Florida transaction management system. The reliability coordinator communicates the next-day analysis results to anyone adversely impacted. The reliability coordinator conducts a call every morning to discuss any changes to the next-day analysis completed on the prior day.

The nuclear power plant requirements included in the planning models are outlined in the NGGM-IA-003 *Interface Agreement, Transmission Interface Agreement for Operation, Maintenance, and Engineering Activities at Nuclear Plants* document.

PEF uses disturbance data to develop, maintain, and enhance steady state dynamic models and generator performance models for its systems. Fault recorder and relay data are communicated to the reliability lab in North Carolina for analyzing and determining misoperations.

Operational planning evaluates system performance after an event by retrieving saved cases and plugging them into Study Net to perform off-line studies. The planners have historical data, low resolution and digital fault recorder data, and sequence of event recorders available to them.

The operational planning studies system configuration was verified early this year. An outside contractor developed a tool to compare the static and dynamic variables in both the planning models and the EMS planning models for accuracy, and the program flags severe differences between the models. The evaluation team commends PEF for the utilization of an outside contractor tool to compare planning models with real-time data.

The system operators are prepared on the results of the seasonal analysis or seasonal peak load flow study by use of the SORMF *TD-15 Summer and Winter Contingency Studies* procedure, which points out problems that are found in the seasonal assessment. The procedure provides operating instructions to mitigate the problem. The evaluation team commends PEF for the review of seasonal studies by operational planning group and the updating and development of mitigation plans.

The system operators are prepared for the next-day operating plan by use of a capacity assessment for the day ahead with the reliability coordinator. A “plan of the day” is issued by the shift supervisor each morning that provides the current day’s system conditions as well as the seven-day load forecast.

The system operators can provide input to their shift supervisor, not directly to management, for determining actions to be taken to resolve future system performance problems. The shift supervisor passes the information on to operations management. The evaluation team observed that the system operators receive minimal feedback on their input to the shift supervisor. Therefore, the evaluation team offers that PEF consider improving the lessons-learned feedback process for the system operators to include items identified to improve future system performance.

PEF has an underfrequency load shedding program that it is described in the SORMF *TD-25 Firm Underfrequency Load Shedding (UFLS) Program* document.

PEF indicated that all generator frequency trip points and time delays are within FRCC regional requirements. The evaluation team observed that the system operators are aware of the general underfrequency trip points for the generating units but not the specific underfrequency trip setpoints of each generating unit. The evaluation team recommends that PEF provide the system operators with a listing of underfrequency trip setpoints for each generating unit. In addition, the

evaluation team observed that the generating plant personnel may manually trip units off during low frequency events to save the plant equipment, prior to the automatic underfrequency relay protection scheme activating. The evaluation team therefore recommends that PEF develop and verify with the generating plant personnel actions to be taken during low system frequency excursions.

Overall, the evaluation team notes that PEF has well-documented procedures and processes for the system operators to use for notifying the operations planning group to study real-time issues that arise.

5. Fundamentals of Training

5.1 General

Training in both specific job-related skills and broader technical fundamentals is used to provide highly skilled, knowledgeable personnel for safe, reliable operations, and to achieve performance improvement.

PEF has a structured and documented training program administered by a trainer who is knowledgeable in all aspects of operations. The evaluation team commends PEF for the technical trainer being a subject matter expert in all operating positions. Management is responsible for developing and updating the training program. Input from the trainer, the trainees (associates), the system operators, and NERC are considered for program updates. The trainer and staff believe that management is very responsive to training requests. The evaluation team commends PEF management for providing financial support and tools for operator training.

PEF has a 24-month initial training program, after which the trainee will be qualified to work on any of the four operating desks. Within the first 60 days, the trainee will be NERC certified. Two-day qualification exams are given after completing each of the three steps (transmission, generation, and interchange), and the qualifying exams must be passed within two attempts.

PEF indicated that 21 students have qualified, and their average score was around 88 percent. The training program includes three methods of training:

a. Classroom (with lesson plans)
b. On-the-job training in the control room (the evaluator and trainee sit at an operating desk, and the evaluator provides feedback on the trainee's performance)
c. Dispatcher training simulator (working in the simulator is the same as working in the control room)

Training instructors are NERC-certified operators who have completed the 24-month program.

When discussing blackstart and system restoration, the evaluation team observed that system operators were not sure about charging current and transformer inductance when energizing lines and picking up transformers and the effect of cold-load pickup. Therefore, the evaluation team offers that PEF consider including in its blackstart training program information about charging current, transformer magnetizing currents, and cold-load pickup.

PEF administers the Edison Electric Institute - System Operator Power Dispatch Test to candidates as well as a psychological examination before they are hired. In addition, PEF has begun a hiring program to hire degreed electrical engineer personnel. The evaluation team commends PEF for the thorough and structured new hire program, which includes psychological testing and an advanced education.

The evaluation team identifies the dispatcher training program as a potential example of excellence. The program includes the following:

- A thorough recruitment program that has enabled the company to select mostly degreed electric engineers in a bargaining unit covered environment
- Psychological evaluation test to provide a measure of motivational fit for long-term retention and job satisfaction
- An internal certification program for generation and transmission reliability operating positions and a 24-month operator training qualification program

PEF runs a continuing education training program. The program consists of a five-week rotation and is delivered in two sessions (each session is 40 hours). Blackstart and system restoration training are performed annually. The training sessions include classroom work, presentations, and simulation.

A handful of system operators have attended FRCC seminars; however, management feels that the same training material is already covered in the PEF training and does not justify attendance.

The supervisors are required to be NERC certified and complete the continuing education program.

All system operators get trained at the backup control center. All operators go to the backup control center on a quarterly basis to make sure their keycards work and that they are able to log into all applications. During the visits, operators control the system for two hours on the EMS and operate for two hours manually, calculating the area control error. During discussions for the backup control center, the evaluation team observed that system operators were unfamiliar with PEF's "all-call" phone system. The evaluation team recommends that PEF train the system operators on the existence and proper use of the all-call phones.

All system operators are trained in all control room operating positions. The evaluation team learned that PEF is the backup for the reliability coordinator during the interim period the reliability coordinator is implementing its backup control center. The evaluation team recommends that PEF provide formal training for its system operators on the functions of the reliability coordinator.

PEF has a dispatcher training simulator that replicates the working conditions in the control room and the simulator is used to prepare the system operators for the upcoming peak season conditions with data from the peak season planning models. The evaluation team identifies this replication as a potential example of excellence.

All system operators, support staff, and management are NERC certified with the reliability operator credential. The evaluation team commends PEF for requiring all system operators, support staff, and management to be NERC certified with the reliability authority credential.

PEF treats events as a learning experience. After a system event, a root cause analysis is performed. The analysis results are incorporated into PEF's training and procedures to ensure that the event does not happen again.

5.2 Organizational Effectiveness

5.2.1 Human Performance

Personnel select and apply appropriate human error prevention techniques commensurate with the importance of assigned tasks to minimize the frequency and consequences of events.

PEF uses a rigorous human performance program and root cause analysis to minimize safety events and other types of errors. The evaluation team commends PEF for the use of this program.

Several system operators have received root cause qualification training and participate on human performance investigations teams. The system operators also have the tools and procedures available to them to identify problems or error precursors.

APPENDIX 1: Critical Infrastructure

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

APPENDIX 2: Entity Participants

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

APPENDIX 3: Documents Reviewed

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