

NERC

NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

Reliability Readiness Evaluation Report Balancing Authority/Transmission Operator

Western Farmers Electric Cooperative
Anadarko, Oklahoma

to ensure
the reliability of the
bulk power system

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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 Western Farmers Electric Cooperative (WFEC) representatives on December 10–13, 2007. This report reflects the views and recommendations of the evaluation team regarding the readiness of WFEC to meet its responsibilities as a balancing authority and transmission operator.

Evaluation Team

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Organization Profile

WFEC is a generation and transmission cooperative that serves 19 electric distribution cooperatives, several cities, and an air force base. The 19 cooperative and municipal utilities provide the distribution to the retail customers. WFEC serves as the balancing authority and transmission operator for about 75 percent of the state of Oklahoma, one city in Kansas, and one city in Arkansas. One of its cooperatives serves a small area in the Eastern Interconnection area of Texas.

WFEC owns and operates 1,700 miles of 138 kV and 1,600 miles of 69 kV transmission lines that serve more than 250 distribution substations. WFEC controls to the low side of the distribution transformers in the substations connected to the transmission system. WFEC connects to Grand River Dam Authority, Southwestern Power Administration, American Electric Power, and Oklahoma Gas & Electric with 36 physical points and 4 pseudo ties. WFEC owns, but does not operate, 70 miles of radial 345 kV line connecting a generation plant to ERCOT (Electric Reliability Council of Texas) transmission.

WFEC has developed a substation automation system that gives parallel operation of the distribution system to WFEC and the distribution cooperatives. This allows WFEC to provide emergency operations such as manual load shedding on the cooperative systems when those systems are not staffed.

WFEC has three generation plants with a total capacity of 1,232 MW as well as long-term hydro purchase contracts with Southwestern Power Administration for 279 MW. Its Mooreland plant has three gas turbines with 322 MW of capacity; the Anadarko plant has three gas-fired steam turbines, two quick-start turbines, and three combined-cycle units with a total capacity of 460 MW; and the Hugo coal-fired steam plant with a capacity of 450 MW. The balancing area all-time peak load of 1,384 MW was reached on July 20, 2006.

The balancing authority and transmission operator control center is located in the same facility as the corporate offices. WFEC has contracted with ACES Power Marketing to purchase and sell power for the balancing area. SPP is the reliability coordinator for WFEC and the transmission service provider for the WFEC transmission system. SPP runs a real-time market in the SPP Region and provides the generation set point using a constrained-path economic dispatch program.

Executive Summary

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

WFEC is a smaller company with open communications among all levels of the organization. It is able to foster a cohesive environment where the staff works together as a team to “keep power to the light switch” for its customers. WFEC is serious about reliability as demonstrated by its investments in a new energy management system, a state of the art redundant communications system, and an independent backup control center.

WFEC drills extensively on its emergency procedures but does not have facilities to provide lifelike exercises on abnormal system operations. The company has a large geographic display of its entire system and an independent substation automation system to provide additional, and overlapping, control to compliment the EMS. WFEC has provided its operator and maintenance staff a database of equipment and line information accessed through a system map.

While not having the resources or advanced energy management system (EMS) applications of the larger companies, WFEC coordinates its operations closely with the SPP market operator and reliability coordinator to leverage the SPP contingency analysis. SPP also performs the current-day and next-day operational studies for WFEC.

The team points out a few areas for enhancement. WFEC’s current alternate control center is fully dependant on primary control center operation. Regarding tools, real-time system data does not include information from neighboring systems, and WFEC does not operate a state estimator or run real-time contingency analysis. A formal document control process does not exist, and initial training objectives are not formalized.

Overall, the evaluation team lists six positive observations. In addition, the team offers 12 recommendations that, if implemented, will enhance WFEC’s readiness to operate reliably and maintain the reliability of the bulk power system. The recommendations are listed in order of importance.

Positive Observations

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

1. WFEC performs unannounced drills on all emergency procedures and documents the operators' compliance to the procedures (Section 5.1).
2. WFEC has a large geographic overview of its portion of the electric system with voltage indication at all substations and other pertinent operational information (Section 2.3).
3. The substation automation system allows the operators to drill down into the cooperative customer systems and gives them full control of distribution breakers (Section 2.1).
4. WFEC has provided its entire staff with an equipment database accessed through a digitized map with detailed information on the transmission system components, including lines, structures, and substation equipment (Section 3.2.2).
5. WFEC planning and relay engineering groups perform two independent in-house reviews of transmission relay trips (Section 4).
6. WFEC has open communication among all levels of the organization, which helps promote teamwork and gives its employees ownership in the reliability process (Section 1.5).

Recommendations

The evaluation team offers the following recommendations:

1. Confidential information on the backup control center and communications redacted from public report. See discussion in Appendix 1.
2. Obtain or develop a documentation management system that includes features for verifying that documents are reviewed, tracking changes, and requiring review dates to ensure that the working documents are up to date (Section 2.2.3).*
3. Obtain state estimator and real-time contingency analysis so the operators are prepared for unplanned equipment operations (Section 2.3).
4. Monitor the contingent element of the WFEC flowgate on an EMS display and calculate the post-contingency flow on the monitored element so the operators are better informed of the potential for the flowgate loading in the event of a contingency (Section 2.1).
5. Monitor generation reactive availability to help ensure adequate dynamic reactive reserves are available (Section 2.1).*
6. Confidential information on the backup control center redacted from public report. See discussion in Appendix 1.
7. Perform a job task analysis to identify initial training objectives to ensure operators are fully trained prior to assuming independent operation (Section 5.1).*
8. Restrict the entry of completed course data to the training coordinator as way to improve record control and ensure the consistency and accuracy of the records (Section 5.1).
9. Require the trainee, chief system operator, and trainer to sign the initial training checklist when objectives have been met to help verify that training objectives have been satisfactorily achieved (Section 5.1).

10. Develop an electronic operator log with an area for operator comments to ensure complete logs are in a format that allows automated processing by the operators and other groups completing investigations (Section 2.2.3).
11. Add more detail to the *Capacity and Energy Emergency Plan*, including duties and responsibilities for individuals or positions and proper emergency contact information, to provide better coordination and enable someone not entirely familiar with the plan to help the operator during system problems (Section 2.4).
12. Confirm overlap of manual and automatic underfrequency programs to make sure the two do not contain excessive overlap and review with operators to ensure they are familiar with both programs and their applications (Section 2.4).

*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 recommendations and positive observations 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 *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.

WFEC’s corporate culture supports safe and reliable bulk power system operations. WFEC’s mission statement emphasizes safety and reliability, and employees believe that it is their mission to keep the power available to the customer light switch. As a cooperative power company, the concept of “power to the light switch” reinforces reliability in serving both its customers and owners. Since WFEC is a generation and transmission cooperative, employee-achieved safety and reliability objectives result in increased balancing authority and transmission operator safety and reliability.

WFEC serves rural areas and small- to medium-size communities. The employees are proud to be a part of the organization that provides reliable power at a competitive price. With about 360 employees, the organization is small enough to foster a family atmosphere. Employees tend to see themselves as part as a close-knit group working together to complete the company mission.

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.

The WFEC mission statement is displayed on attractive eye-catching posters and well distributed throughout the office facilities. The staff embraces the reliability as a top priority. The evaluation team found that all levels of the organization work towards operating reliably. The company is making the investments in necessary projects — such as the new EMS, enhanced redundant communications system, and a backup control center — to improve reliability.

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.

WFEC management is accessible to the operating and support staff. The office of the manager of control area services is located in the control room area. The WFEC management closely monitors operations, and close proximity to the operating floor helps keep them informed of operating issues. WFEC's culture encourages two-way communications among all levels of the organization. The evaluation team found the operating staff members believed they could take an issue to any organizational level, including the top management of operations, and the staff feels it has input into WFEC future plans.

WFEC has a goal to improve reliability but needs objectives and measurements against those objectives to determine if progress is being made. The evaluation team found the operators did not have an understanding of specific company goals or the progress being made in achieving those goals.

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.

WFEC management promotes a team approach to meeting corporate objectives. The first-line operations supervisor works from a console in the control room behind the operators, and the manager of control area services works in an office next to the control room. Managements' close proximity to operating staff facilitates the WFEC team approach and management awareness of issues affecting operations.

In documentation supplied to the evaluation team and during interviews, the company management stated that WFEC uses the System Average Interruption Duration Index (SAIDI), the System Average Interruption Frequency Index (SAIFI), and other comparative data to measure its performance against other generation and transmission cooperatives. However, the evaluation team did not find examples where WFEC performance was measured against other companies. The evaluation team did not find that specific company goals were effectively communicated to the staff. The performance against the goals was reported to the employees at the end of the year.

WFEC has monthly staff meetings to review operations and information with the operators that may include discussion or review of operating issues. Any operating issues, close calls, or operator ideas for improvement are informally reviewed among the staff and passed onto others not at the meeting. WFEC does not develop formalized training for lessons learned.

1.2.4 Human Resources

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

WFEC is developing plans to prepare for operations staff departure. The company is adding an assistant operator as a training position to meet future operating staff needs. Prior to the readiness evaluation, two experienced operators had left WFEC, and two operators were in training to fill the vacated positions. WFEC plans to have a six-person rotation but has only five

shifts currently; for now, one shift is filled by the chief system operator. After the two trainees are added to the shift rotation as independent shift operators, WFEC will add another trainee as an assistant system operator.

WFEC tries to promote new operators and other operating staff from within the organization. The company has found that employees from the Oklahoma area tend to stay local, and it is difficult to attract and retain employees from outside of the geographic area. WFEC uses existing and retired employees to mentor trainees and has used retirees to meet temporary staffing needs. Company policy, such as flexible work schedules and open management communications, encourages staff flexibility to complete required tasks.

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.

WFEC has several periodicals to keep employees informed of company activities and goals, including those associated with reliability. WFEC publishes a quarterly magazine, distributed to all employees, that focuses on employee activities and items of company-wide interest. The company sends a monthly newsletter to all transmission and distribution employees focusing on activities and projects related to system operations. In addition, a weekly e-mail is sent regarding current operational activities.

Senior management holds quarterly “brown bag” lunches with each area of the company to answer questions, listen to suggestions, and provide information about company projects. This gives the staff an opportunity to interface and give feedback to management. Management often visits the operating area on an informal basis and talks about operating and employee issues with the staff. The operators believe that management effectively communicates with them and listens to their issues. The evaluation team commends WFEC for its open communications between management and staff; this approach allows issues to be discussed among all organizational levels and gives all staff an opportunity to provide input for company decisions.

2. Fundamentals of Operations

2.1 General

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

WFEC has an EMS that monitors the transmission system and generators. The EMS software and hardware were installed in 1999 and have not received any major upgrade other than modifications shortly after initial installation that were necessary to achieve anticipated performance. Both the software and hardware vendors have announced they are not going to support the version that WFEC is operating, and WFEC is replacing the EMS in 2008.

The EMS monitors frequency, voltage, and real power contingency reserves. WFEC has adequate visibility of its system but does not have visibility of neighboring systems on its EMS. The evaluation team recommends that WFEC develop a display to monitor both the contingent

and monitored elements of its only flowgate and calculate post-contingency flow on the monitored element. This will provide the operators with the contingency flow on a line that is important enough to be a reliability coordinator-designated flowgate. This will also give the operators experience with a limited wide-area view and the value of having that information.

For reactive power, WFEC has a display of available static capacitor banks and their status on its 138 and 69 kV transmission systems. This information is also shown on the WFEC system overview display. The generation display shows the reactive output of each of the generators and the total reactive power provided by the generators. However, the display does not show the available reactive capacity from generation, and the evaluation team recommends that WFEC add this information so that the operators have a convenient view of available reactive power to enhance situation awareness.

The alarming system is the EMS vendor standard that has more than enough capacity for a system the size of WFEC. The operators also have access to the trending system provided on the EMS. The points normally monitored are preset in the trending displays, but the operators can trend any point on the EMS and can set up the trend as needed.

WFEC has a separate substation automation system that monitors and provides control of the distribution breakers on the low side of the transformers on the distribution cooperatives' systems that WFEC serves. This is a dual system that allows control of the breakers by the distribution cooperatives or WFEC. WFEC can use this system for load shedding or other system control when the distribution cooperative operators are not available. Besides providing a service to the distribution cooperatives, this gives WFEC additional control and an alternate method of controlling substation loading. The evaluation team commends WFEC for implementing this operator-friendly system that provides the WFEC operators full control of the distribution breakers.

The operators have a load-forecasting package based on historical data. ACES Power Marketing, contracted by WFEC, predicts the load peak and curve and commits resources to meet the forecast. The system operator has the final approval and can require additional power resources if he or she finds them necessary. The operators have access to an industry-standard interchange transaction scheduling package and electronic tagging tool.

The control room has adequate communications equipment. All business lines and radio conversations are recorded.

WFEC has signed the NERC *Operating Reliability Data Confidentiality Agreement* and can receive status on neighboring systems but does not currently use this information in its real-time systems. The neighboring balancing authorities and transmission providers as well as the SPP reliability coordinator provided positive feedback about WFEC operations and did not list any issues working with the group.

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.

WFEC places a high priority on safety and reliability. Safety and reliability are included in the mission statement, and system operation activities are conducted in a manner that maintains high levels of safety and reliability for all system conditions. WFEC has formed safety committees for the transmission and distribution group and the power plant group and includes safety in its yearly core training. WFEC has a safety record that generates discounts on its insurance and workman's compensation rates.

WFEC does not have any special protection systems.

2.2.2 Operational Decision-Making

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

The operators understand their role in system operations and maintaining reliability. WFEC operators work closely with the operators at the distribution cooperatives, and the responsibilities of each are clearly understood. SPP provides an overview of the WFEC system and performs EMS advanced application analysis (see Section 2.3) on the WFEC transmission system. The WFEC operators have close coordination and communication with the SPP reliability coordinator operators.

2.2.3 Operational Alignment

Organizational structure supports safe and reliable system operation.

The operators have the necessary authority to reliably manage the bulk power system. The authority is documented in the operator job descriptions and in a letter from the chief executive officer that includes authority to take whatever actions are necessary including the shedding of firm load. Based on the operator interviews, the evaluation team confirms that operators know they have the appropriate authority and are expected to use it if necessary.

The operators inform the reliability coordinator of any change in system status or capability. The reliability coordinator has real-time monitoring capability for the WFEC system, and all scheduled outages are coordinated through its outage scheduling system.

The operators have a shift-turnover checklist that outlines the items the operator coming on shift must review. The operator must sign off that the review has been completed. The process does not document the status of significant operating conditions; documentation would help ensure that the oncoming operator has been brought up to date on the status of the system. The operator logs are a manual entry report, and the evaluation team recommends that WFEC develop an electronic operator log with automatic entries from the EMS and an area for operator comments. The electronic log would allow all groups to have access to the log information and events in one

program and would alleviate the possibility of error when hand writing the previous day's residual log entries to the current day's log.

The documents the team reviewed were current, with most being revised within the last 12 months. The documents do not include revision history, and some of the documents distributed to the evaluation team were out of date or incomplete. The evaluation team recommends that WFEC acquire or develop a documentation management system that stores the most recent version of the document, assigns responsibility for keeping the document updated, tracks the revision history, tracks the newest revision or review requirements, and tracks the review of the document by its users.

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.

WFEC has developed an operator-friendly system overview of all 138 and 69 kV lines that is displayed on a large projection monitor for all operators. The display includes other important operating information, such as the WFEC area control error system frequency, total generation, net interchange, voltages, and the status of the capacitor banks. The display highlights any line in an abnormal state. Operators can select any line and display specific details, including the state of all equipment on the line. The evaluation team commends WFEC for developing a display that enables operators to visualize the overall state of the WFEC system.

SPP operates a real-time market for the SPP Region and provides load set points directly to the generators. SPP tracks the schedules and gives WFEC the net interchange signal. WFEC conducts the schedule checkout with SPP and the actual interchange checkout with its interconnected neighbors. SPP calculates the generators' target load for the next five-minute period and sends four-second increment loads for the generations to ramp to the target value. WFEC monitors area control error and will adjust the generation to reduce it if it is over a predetermined value. WFEC does not regulate area control error as long as the SPP set points maintain it within the predetermined range.

WFEC does not run a state estimator or real-time contingency analysis program. WFEC depends on SPP to run these as the reliability coordinator. SPP includes all WFEC 138 kV lines in its contingency analysis and will change operating conditions to maintain the WFEC system within its safe first contingency limits. While SPP provides review of the WFEC system, the evaluation team recommends that WFEC obtain, maintain, and use a state estimator and a contingency analysis program so its operators are aware of conditions that might affect system security.

The power plant operators notify the WFEC system operators of any change in the plant capabilities, including automatic voltage regulator status changes. The WFEC operators notify SPP of the regulator changes, and the operators communicate capacity changes directly to SPP as required by the market rules. While the actual reporting is properly conducted, the documentation only requires the power plant operators to log the change in automatic voltage

regulator status. The documentation should be brought up to date to conform to the correct procedure as used.

WFEC has indicated that all 138 kV and tie lines are considered critical facilities. WFEC does not have any lines that would be listed in a potential interconnection reliability operating limit (IROL) under expected contingencies.

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.

WFEC has the required emergency plans in a procedure manual located in the control room and accessible to the operators. The operators are familiar with the plans and drill on them regularly (see Section 5).

WFEC's *System Restoration Plan* includes details for starting a blackstart unit and using power generated by it to start a larger unit. The *Western Farmers Black Start Plan* continues with plans for restoring the entire WFEC balancing authority area.

WFEC has load-shedding plans. The automatic underfrequency load shedding is on the distribution breakers in the amounts and frequencies required by the *SPP Criteria*. WFEC operators can manually open the distribution breakers using the substation automation system. WFEC can implement manual load shedding using transmission system breakers. WFEC has a rolling blackout program using the substation automation system and opening the same distribution breakers as the automatic underfrequency load shedding. The evaluation team was unclear about which load was included in the manual and automatic load shedding process and the relationship between the manual load shedding on the distribution automation system and the automatic underfrequency load shedding — answers received from the operating staff were not consistent. The evaluation team recommends that WFEC confirm overlap of manual and automatic underfrequency programs and review this information with the operators.

The *Capacity and Energy Emergency Plan* includes sections on fuel supply and inventory plans, directives for removing environmental constraints for generating plants, reduction of entity's own energy usage, public appeals for voluntary load curtailment, appeals to large industrial and commercial customers to reduce non-essential energy usage, implementation of contractual load management, loads that can be interrupted or curtailed, maximizing generator output and availability, and load shedding.

The evaluation team reviewed the emergency plans and found they covered the topics suggested in the review process. However, the duties and responsibilities were not clearly defined in all the procedures. The evaluation team recommends that WFEC add more detail to the *Capacity and Energy Emergency Plan*, including duties and responsibilities for individuals or positions and proper emergency contact information, to provide better coordination and enable someone not entirely familiar with the plan to help the operator during system problems. Other procedures should be reviewed for similar updates.

3. Fundamentals of Maintenance

3.1 General

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

WFEC uses a planning calendar to coordinate all electric system maintenance schedules and other activities. This straightforward process works very well for a company the size of WFEC. Safety is stressed in all physical projects on the system.

All relay trips are analyzed, and the digital relays are time synchronized to assist in event analysis. SPP does not require WFEC to have any disturbance monitoring equipment on its system.

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.

The EMS has an availability of 99.999 percent. The operators are pleased with EMS availability and stated that the system is seldom down.

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 system operator has the authority to delay or cancel an outage if the outage would jeopardize the system reliability under current conditions.

The control system modification tracking is largely an informal process. Larger projects are tracked on a white board in the information technology area. The chief system operator has the final approval on control system changes and when they are implemented.

Telephone and communication equipment is checked daily and repaired as needed.

WFEC has developed a system map that allows users to drill down to obtain equipment descriptions. The map starts with a high level one-line of the transmission system, and equipment or line details can be obtained by selecting the desired element. Drill-down detail for lines includes conductor type, support structure, and insulator by location. The print includes transmission line structure numbers for quick reference and coordination between operations and maintenance. A substation display allows the selection of individual components to view a description. This mapping system helps maintenance personnel find needed information and coordinate activities with the operations personnel. The same information is available to all the

staff involved in a project. The evaluation team commends WFEC for developing the map based database that provides information by simply drilling down to the specific component.

4. Fundamentals of Operational Planning

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

Operational studies are largely the responsibility of SPP as the transmission service provider, market operator, and reliability coordinator. The operational studies SPP completes as the reliability coordinator and market operator include the WFEC system. SPP performs a current- and next-day operational study and operates the market to meet the limitations in the study. As the transmission provider, SPP determines the available transfer capacities and posts them on the Open Access Same-time Information System, known as OASIS, for the next-day transactions. SPP operates the current-day market and honors transfer limits and line-loading limits using a constrained-path economic dispatch program.

The WFEC planning department performs operational studies when requested by the operators. The planners have evaluated the system for adequate voltage after the first contingency and have found voltage problems on the 69 kV systems in their study cases. They have not found any real-time problems. The planning department performs seasonal studies each year but does not provide any formal training on them to the operators. Any potential issues are reviewed in the monthly operational meetings. The planning department develops operating guides for temporary conditions, such as abnormal equipment configurations during maintenance or construction.

WFEC uses the rating methodology from the *SPP Criteria* and shares the rating with SPP. SPP coordinates the ratings throughout the region and provides WFEC with neighbor ratings. WFEC has not verified its planning models against actual system performance during a system event for several years

SPP performs outage evaluations and approves outage requests as appropriate. Outages are requested and coordinated through the SPP OPS-1 outage reporting system. Forced outages are also entered onto the OPS-1 system.

WFEC analyzes all relay line trips. Both the relay engineering and system planning groups perform the analysis, thus providing independent results. The substation automation system collects data to assist in the analysis. The evaluation team commends WFEC for the depth of review including duplicate reviews of system events.

WFEC uses the critical facility list developed by SPP. SPP has not listed any IROLs to monitor for violation limits on the WFEC system for normal studied contingencies. WFEC has one flowgate listed in the NERC Interchange Distribution Calculator.

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.

WFEC provides both initial training for new operators and ongoing education for qualified operators. WFEC is not a NERC-approved continuing education provider; however, it has obtained continuing education approval for some of the training events it offers. Training is the responsibility of the training and customer services coordinator. She dedicates a significant portion of her time to the training program.

The current continuing education program provides the required elements for the operators to maintain certification. WFEC uses a combination of internal training, vendor training, and SPP-sponsored training events to meet the requirements. WFEC does not generally target training for individual needs, such as those that might be identified during the employee's evaluation. Each individual employee determines any specific or specialized training based on his or her own needs, and supervisors are generally receptive to training applicable to the job. Training goals are not included in the employee evaluations.

Most of the training events include learning objectives, a lesson plan, a statement of content, a learning assessment, and feedback from the participants. The 2007 course material is vendor-supplied, but WFEC is developing in-house material for 2008.

The current shift schedule does not indicate dedicated training time. Much of the ongoing training is completed on relief days scheduled throughout the year. Because these days tend to be spread out, they are not ideal for any training that takes more than one day to complete. WFEC management recognizes that the current schedule makes it difficult to provide adequate time. WFEC is in the process of training two system operators. When these operators complete their training, WFEC will add an additional shift to have a six-shift rotation and move the chief system operators off the shift. The six-shift rotation will have a week of training time every sixth week for each operator. The evaluation team believes that this is a better rotation for completing training.

The evaluation team reviewed the training records for individual operators and found them to be complete. Individual records included completed course certificates, completed test results, and emergency drill evaluations. WFEC also had an electronic training summary available to authorized company personnel who have a need to review the records. It appears to the evaluation team that individual trainees entered their own records. The records were not consistent; some were confusing and some were entered twice. The file folders are the official record, and team does not question that the proper training was complete; however, the electronic records reviewed by many in the company do not give an accurate summary. The evaluation team recommends that only the trainer enter the completed course data into the electronic training database so that the final records are accurate and consistent.

Initial training consists largely of on-the-job-training supplemented by vendor-supplied training. The trainer has developed a checklist of required material that the trainee initials as each item is completed. The checklist includes primarily training material and does not list tasks the operator must master to successfully perform the system operator responsibilities. The evaluation team recommends that WFEC complete a job task analysis to identify initial training objectives for the checklist and add to the list a demonstration to show the operator is competent in performing the required tasks. The evaluation team also recommends that the supervisor and trainer sign off (in addition to the trainee) when each objective on the checklist is met to verify that the objective was actually mastered to the satisfaction of the supervisor and trainer.

Most of the operator positions are filled with personnel promoted from within the company. WFEC has found that company employees tend to stay with the company, but those hired from outside are more likely to leave after receiving experience. WFEC is working with local universities to develop programs that can provide skilled employees to meet future needs. WFEC hires coop engineers and has an employee educational assistance program in which 75 percent of the employees have participated.

The trainer conducts unannounced drills on the emergency procedures, including evacuation to the alternate site (twice a year), loss of communications (twice a year), the SPP restoration drill (annually), loss of EMS (twice a year), and the *Capacity and Energy Emergency Plan* review (annually). The trainer monitors the operators as they progress through the drill and uses a check-off sheet to verify that the operator performs necessary functions. The operators go through the emergency procedures on their regular shift while the chief system operator monitors the system from the primary control room. The evaluation team commends WFEC for its extensive drilling on emergency procedures.

WFEC does not have a functional dispatcher training simulator. While WFEC conducts simulated exercises for emergency procedures, it does not provide simulator type of experiences for events that the operator may see on the electrical system. Adding realistic training for operating scenarios would benefit the operators. The operators believe a simulator would improve the WFEC training program.

The operators informally discuss lessons learned from operating events in control room meetings. The evaluation team believes that exposing the operators to the circumstances of these events during more formal training would be beneficial.

The human resources department handles code of conduct and culture training.

The trainer is active in the NERC Training Working Group but has not participated in any train-the-trainer activities in the past several years. She has previously completed the NERC train-the-trainer course.

The evaluation team reviewed the staff operator certification records and the shift schedule. All shifts were covered by NERC certified system operators. The certification list contained the operator names, certification numbers, job titles, and certification level. All are NERC certified with the reliability operator credential, with no certifications expiring prior to 2009.

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.

WFEC has not offered training on human error prevention. Two operators review switching orders when two are available.

APPENDIX 1: Critical Infrastructure

APPENDIX 2: Entity Participants

APPENDIX 3: Documents Reviewed
