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NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

Reliability Readiness Evaluation Report Balancing Authority/Transmission Operator

Western Area Power Administration
Watertown, South Dakota

to ensure
the reliability of the
bulk power system

June 25–28, 2007

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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 the Western Area Power Administration (East and West), Upper Great Plains Region (UGPR) representatives on June 25–28, 2007. This report reflects the views and recommendations of the evaluation team regarding the readiness of the UGPR to meet its responsibilities as a balancing authority and transmission operator.

Evaluation Team

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Organization Profile

The Western Area Power Administration (WAPA) was organized in 1977, within the U.S. Department of Energy, to provide transmission facilities and services for power generated at U.S. Army Corps of Engineers and U.S. Bureau of Reclamation hydroelectric power plants. The WAPA corporate service office is located in Lakewood, Colorado. WAPA is divided into five regional offices: the Colorado River Storage Project Management Center, the Desert Southwest Region, the Rocky Mountain Region, the Sierra Nevada Region, and the Upper Great Plains Region (UPGR). This report details the operations carried out by system operations personnel in the UPGR offices, specifically the system operations office located in Watertown, South Dakota.

UPGR is headquartered in Billings, Montana. In addition to these corporate facilities and the system operations office, UGPR has state maintenance offices in Ft. Peck, Montana; Bismarck, North Dakota; and Huron, South Dakota. UGPR is divided into two balancing authority areas, the Western Area Upper East (WAUE) and Western Area Upper West (WAUW), and has load in both the Eastern and Western Interconnections, although the load in the Western Interconnection is only four percent of the total. Collectively, these operations areas are referred to by the designation UGPR. With loads in the two interconnections, UGPR is located in two NERC regions, MRO in the eastern interconnection and WECC in the western interconnection; however, all system operations work takes place in a single office in Watertown, South Dakota.

UGPR owns and operates 7,747 miles of transmission line and 99 substations in Montana, North Dakota, South Dakota, Nebraska, western Minnesota, and western Iowa, covering approximately 320,000 square miles. The WAUW and WAUE balancing authorities set peak loads of 124 MW and 2,950 MW, respectively, on July 28, 2006. The UGPR system operations work is divided between north and south transmission operators. The generation in both control areas is controlled simultaneously by the generation operators.

Generating capacity in the overall UGPR footprint is primarily hydroelectric and thermal, with about 100 MW of wind-powered turbines. The U.S. Army Corps of Engineers determines the water release at the hydroelectric plants for the next day, next week, and long term. Energy availability is determined from these releases. If necessary for the reliability of the power system, the Corps and UGPR discuss deviations in the water release volumes and come to an agreed amount.

Executive Summary

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

The evaluation team found the UGPR employees, both management and non-management, to be friendly and open in their discussions with the team. A culture of sustaining reliability and getting the job done is evident. Even though the Watertown office is not located with corporate administration offices, the UGPR team exhibited a healthy understanding of WAPA events and a support of corporate directives and initiatives.

The team noted UGPR's training partnership with Bismarck State College a potential example of excellence and found multiple positive observations regarding system operator tools and support. To help prepare operators for system events, the team recommends that UGPR provide training on some of its emergency plans and update certain operator policies and procedures.

Overall, the evaluation team identified 11 positive observations and one potential example of excellence. In addition, the team offers nine recommendations that, if implemented, will enhance UGPR's readiness to operate reliably and maintain the reliability of the bulk power system.

Potential Examples of Excellence

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

1. UGPR's partnership with the Bismarck State College program is an important development for the industry, designed with industry input as a tool to identify new candidates and train them as employees to be system operators (Section 1.2.4).

Positive Observations

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

1. Supervisory control and data acquisition (SCADA) and computer support personnel are part of the operations organization, allowing for increased flexibility in energy management system (EMS) development and maintenance activities (Section 2.3).
2. The team observed a high level of engagement by support staff members, indicating a personal and professional ownership for their area of expertise. Operators were pleased with the competence and response of the various support groups (Section 2.2.3).
3. System operators have tools to build their own displays in the EMS (Section 2.1).

4. The operators have built a series of pop-up notes in the EMS with up-to-date information about the specific location selected (Section 2.3).
5. Time-synchronized sequence of events information is available on the SCADA system with millisecond accuracy (Section 2.1).
6. System operators have developed “dispatcher diagrams,” one-page documents detailing specific operational characteristics at all locations (Section 2.2.2).
7. UGPR provides switching training to its power distributors at no cost (Section 5.2.1).
8. Alarm sounds are kept to the desk responsible for the geographic location, muffled from the rest of the room, resulting in a calm atmosphere in the control room (Section 2.1).
9. UGPR is an active participant in local, regional, and national committees, subcommittees, and working groups (Section 1.2.1).
10. Operators are provided with a single phone number for tech support, eliminating the need to search for specific individuals or determine who is on call (Section 3.2.2).
11. Confidential information on computer systems and support redacted from public report. See discussion in Appendix 1.

Recommendations

The evaluation team offers the following recommendations:

1. Provide and track periodic training to all system operators on the implementation of the capacity and energy emergency plan, manual and automatic load shedding schemes, backup control center activation, and the system restoration plans so that operators can gain familiarity of actions required during emergency situations (Section 5.1).
2. Ensure that the procedural documents used by system operators in the control center are the latest versions and include correct phone numbers and names of other entities (Section 2.2.3).
3. Provide additional staffing resources given the new certification retention requirements and pending personnel attrition to alleviate concerns regarding excessive overtime and training requirements (Section 1.2.4).
4. Provide the system operator with a summary sheet of the capacity and energy emergency plan that details the steps required during an energy emergency alert or transmission loading relief situation to ensure a more complete and consistent response to these events (Section 2.4).
5. Modify the evacuation procedure to notify the Pacific Northwest Security Coordinator (PNSC) rather than WECC of the move to the backup control center since PNSC would assist in system monitoring (Section 2.4).*
6. Confidential information on physical security redacted from public report. See discussion in Appendix 1.
7. Expedite the implementation of a document management process that provides for better revision control, regular updating and review, distribution control, and document approval to ensure operators are using the most up-to-date policies and procedures (Section 2.2.3).
8. Consolidate each employee’s training records in a single location to simplify employee access to records and overall training status (Section 5.1).

9. Revise the system operator job descriptions to clarify language relating to the authorities and responsibilities of the position and include a statement of the minimum level of certification required (Section 2.2.3).

*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, positive observations, and potential example 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.

The evaluation team discussed corporate issues with company executives stationed in Watertown, and believes that the WAPA agency holds reliability as a high standard. A spirit of cooperation exists among the different WAPA entities, and UGPR is well represented within the corporation. UGPR employees and management underwrite the corporate philosophy of high reliability.

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 evaluation team found that UGPR is an active participant in local, regional, and national committees and working groups. The team notes this level of involvement as a positive observation, particularly given the relatively small size of the UGPR structure. Providing an active venue for discussion of industry events and committee activities is a challenge for UGPR, but the management team puts a high value on this activity.

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 evaluation team found that the leadership and management at the Watertown office location set a good example of commitment to reliability and engagement with industry events. Management personnel frequently visit the operations center and are familiar with the work requirements of the system operations staff. There is an atmosphere of concern for the individual as well as a focus on system reliability.

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.

The various WAPA locations use a common approach to goal setting, fostering a sense of competition among the operations locations. UGPR is involved in several types of evaluations, each of which produces a specific set of products relating to compliance and/or readiness. UGPR management indicated that regular upper-management meetings are held to communicate corporate information and share local information.

1.2.4 Human Resources

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

The location of the UGPR control facilities leads to some level of difficulty in hiring and training personnel for the system operator positions. The company has developed a unique approach to this problem by forming a partnership with the Bismarck State College. The college has developed (with industry input) a program to provide initial training activities for persons interested in becoming power system operators. In the partnership arrangement, UGPR utilizes this program as a tool to identify new candidates for system operator positions and to train them as employees. The evaluation team believes this is an important model for the electric utility industry and cites this partnership as a potential example of excellence.

The U.S. Department of Energy has established a human capital initiative to better position all of its operating organizations for future changes in staffing due to retirements and attrition. The purpose of the initiative is to identify critical positions, particularly where retirements or moves to other jobs would have a detrimental effect on system reliability. UGPR management stated that this is a corporate-wide effort, with each region in WAPA being individually examined. As part of the program, a regional management team performs an annual review to identify and fill any developing gaps.

In discussions with UGPR system operators and training personnel, concerns regarding a perceived increase in the need for system operators to use overtime to attain training goals were expressed. The evaluation team recommends that UGPR provide additional staffing resources given the new certification retention requirements and pending personnel attrition to alleviate concerns regarding excessive overtime and training requirements.

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.

The evaluation team reviewed a number of corporate communications documents and believes that UGPR communicates effectively with its system operations group. With a corporate officer stationed in Watertown, there is ample opportunity for a free flow of information between operations staff members and corporate personnel.

2. Fundamentals of Operations

2.1 General

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

UGPR utilizes industry-standard hardware and software for its monitoring and operations activities. The evaluation team observed several of UGPR's operator tools and noted that there is a display depicting minute-by-minute interchange values for a rolling four-hour window. This information is based on implemented tags and is transferred to the computer that determines automatic generation control. System operators add dynamic tags on an after-the-fact basis. In addition to this information, the operator real-time display shows the ramping requirements associated with each schedule. Because of the operations in two interconnections, the system operators have east and west area control error indications on trend charts. The unit status listing shows units that are on currently under automatic generation control, as well as generators that could be used if needed. Some generators can be used for condensing if needed for voltage control, and the procedure calls for the system operators to notify the specific generation plant of the desired operation.

For monitoring weather patterns across the system, UGPR primarily relies on cable television sources and specific Internet weather sites. The system operators indicated that they find these weather information sources to be more accurate than a previous weather information supplier.

The EMS utilized by UGPR has a feature set that enable system operators to build custom displays. The evaluation team observed several of these displays and notes that the system operators believe this to be an effective tool. The evaluation team sees this developmental tool as a positive observation, since it allows the system operators to try a variety of display methods to find the most efficient one for their needs.

The evaluation team observed the UGPR control center and noted that alarm sounds are kept to the desk responsible for the geographic location, effectively muffled from the rest of the room. The team noted a calm atmosphere in the control room due to this feature and cites this as a positive observation.

The evaluation team discussed and observed other tools used by the system operators, including frequency monitors and displays for voltage, reactive reserves, and contingency reserves. UGPR maintains time-synchronized sequence of events information, which is available on the SCADA system, with millisecond accuracy. The team notes this as a positive observation, one that greatly enhances UGPR's ability to analyze events on the power system.

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.

Discussions with management and system operators indicated that UGPR has a cautious approach to the completion of switching sequences. For example, training is provided to switchmen responsible for field operations. This training includes instruction regarding unexpected results. If an unexpected result occurs, the switchman is to stop the switching sequence and take no further action until the system operator can analyze the situation. If necessary, the system operator can seek assistance from other operating center personnel, but retains the responsibility for resolving such situations. UGPR has two special protection schemes, both of which are associated with its dc tie line.

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 evaluation team found that UGPR system operators have a cultural bias toward conservative system operations. Decisions are made using all information at hand, including station-specific information and current system configuration. In order to enhance real-time information, the UGPR system operators have developed dispatcher diagrams — one-page documents that detail any specific operational characteristics at all locations where UGPR has either ownership or operational jurisdiction. These diagrams are readily available to the operators on the EMS, and the evaluation team finds this availability of contemporary information to be a positive observation.

UGPR management noted that the nature of the system operator position requires constant decision making with limited time and information. All decisions made by the UGPR system operators are based primarily on the safety of any personnel involved in the activity. Maintaining constant awareness of field personnel whereabouts and the work they are performing is critical. For this process, UGPR relies on on-the-job training and experience. Any operational risk assessment is performed through discussions with the appropriate reliability coordinator, on-site subject matter experts, and neighboring entities.

2.2.3 Operational Alignment

Organizational structure supports safe and reliable system operation.

The evaluation team found that UGPR has adequate agreements in place to ensure system monitoring and control, if needed, by other parties. Outages are coordinated with neighboring systems and provide for involvement of the reliability coordinator(s) if necessary. UGPR takes part in scheduled conference calls to discuss system events and outage plans.

Discussions with UGPR system operators revealed a thorough understanding of their authority to take actions necessary to safely and reliably operate the power system. Documents supporting this authority were examined, and the evaluation recommends that UGPR revise the system operator job descriptions to clarify language relating to the authorities and responsibilities of the system operator and include a statement of the minimum level of certification required. The current job descriptions reference authorities granted by referencing those authorities through citations of NERC documents. UGPR does not delegate any reliability functions to other entities.

The team observed a high level of engagement by support staff members, indicating a personal and professional ownership for their various areas of expertise. System operators were pleased with the competence levels and response times of the various support groups. The evaluation team notes this competence and engagement by the support organizations as a positive observation.

While the expectation of UGPR management is to utilize online processes and procedures, the evaluation team observed a wide diversity of hard copy documentation within the control facility, including documents in various formats as well as some lacking indication of exact dates of issue. Because of the volume of operating procedures and standards required for reliable operations, the evaluation team recommends that UGPR ensure that the procedural documents used by system operators in the control center are the latest versions with correct phone numbers and names of other entities. Overall, the team was not concerned that the system operators were working from inaccurate information, but rather that the overall complexity of the document management process could lead to problems in the future.

UGPR has recently obtained a comprehensive document management system to manage all documentation related to the reliable operation of the power system. The evaluation team recommends that UGPR expedite the implementation of this document management process to provide for better revision control, regular updating and review, distribution control, and document approval. The team notes that having such a system in place (and populated) will improve UGPR's knowledge management and retention as well as better position the organization for any changes in personnel.

Discussions with system operators indicated that changes in operating policies and procedures are communicated directly to them from their supervisor, in both hard copy and e-mail format. These transmittals are shared among the system operators at each shift change, and personnel are required to sign an acknowledgement that they have read and understand any changes. This process conforms to the written shift-change procedure the team reviewed. In addition to any changes in documentation, the shift turnover procedure includes a general discussion of the current system configuration, including any outages or abnormal setup. All such information is included in the system operator logs.

For issues involving emergent work, the UGPR system operators indicated that the Midwest Independent Transmission System Operator (MISO) reliability coordinator must approve all outages prior to initiation. Because the UGPR system operators do not have any access to state estimation or real-time contingency analysis, MISO performs all of the near-term and next-day planning studies. The UGPR system operators indicated that this process is acceptable. This process also provides for outage coordination through MISO, ensuring all potential abnormalities in system configuration are studied.

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.

UGPR's EMS and SCADA are in-house developed packages that run on personal computers. The packages are designed on a distributed computing model such that failure of an individual part will not cause the entire system to fail. UGPR indicated that it is currently using the fourth software version. The system provides for customary SCADA functionality, such as alarms processing and reporting, reporting and annunciation status changes (for circuit breakers, etc.), and remote operations. For events stored in SCADA, the information includes time measured to the millisecond. The SCADA package also contains special functionality for the control of static var units and a dc converter stations.

The EMS developed by UGPR does not have a state estimator, so other advanced network applications, such as real-time contingency analysis, are not available. Discussions with UGPR system operators indicated that when the need for contingency analysis arises, the reliability coordinator(s) is relied on for this function. As stated earlier, the reliability coordinator must approve all planned outages, so contingency analysis has already been performed for these events.

As a part of the system, UGPR system operators have certain design capabilities for new displays. For example, the system operators have built a series of pop-up notes in the EMS with up-to-date information about the specific location selected. This allows for the consolidation of critical information into one location as switching plans are developed or other projects are considered. The evaluation team notes this particular functionality as a positive observation in that it improves reliability and situational awareness. Additionally, system operators have the ability to build individual trend charts or use those already developed.

UGPR stated that it uses dynamic voltage control devices, such as automatically switched reactive and capacitive devices and static VAR systems for voltage control, but has no means to provide contingency voltage conditions due to the lack of a state estimator. For scheduled outages, UGPR's system studies personnel provide an operating guide if stability or voltage control issues are found. UGPR relies on the MISO reliability coordinator to provide notice of any real-time contingency voltage stability issues.

The evaluation team observed that the SCADA and computer support personnel are part of the operations organization, not reporting through a corporate information technology group. The team determined that this is a positive observation, allowing for increased flexibility in EMS development and maintenance activities.

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.

UGPR system operators discussed with the team how they would determine which loads to shed manually, if needed. For the UGPR balancing areas, the engineering group has performed studies and developed a page on the SCADA system showing available load shed points and the amount of load available. The operators noted that there is overlap between underfrequency load shedding and manual load shedding, but were unsure of the exact amount of overlap, which is actually 100 percent according to company documents. UGPR does not employ undervoltage load shedding on either system.

The evaluation team examined the extensive capacity and energy emergency plan document provided by UGPR. The team found the plan to be comprehensive and covers many aspects of the declaration and implementation of the plan. The team was concerned with the volume of information that the system operators are expected to use as a part of the plan and recommends that UGPR provide system operators with a summary sheet that details the steps needed in the event of an energy emergency alert or operating transfer capability event (essentially a transmission loading relief scenario). The team believes this will provide for a more complete and consistent set of responses to these events.

In its review of the emergency evacuation procedure, the team noticed a discrepancy regarding who would be notified in the event that the procedure was implemented. The evaluation team recommends that UGPR modify the evacuation procedure to notify PNSC (reliability coordinator) rather than WECC of the move to the backup control center. The team determined that this notification was more efficient given that PNSC would be assisting in monitoring the western operating system.

3. Fundamentals of Maintenance

3.1 General

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

The evaluation team interviewed several UGPR employees who are responsible for maintenance activities associated with the control center, specifically the computer systems, EMS, and communications systems used by the system operators. The team found that the individuals were knowledgeable about their areas of expertise and took pride of ownership regarding their work. Discussions with UGPR system operators indicated that they are confident in the abilities of these support personnel and are aware of processes to obtain any needed assistance.

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 UGPR EMS and SCADA system use a distributed computing model that allows the systems to monitor themselves. UGPR uses two independent monitoring programs for all essential real-time applications and systems. In addition, the EMS and SCADA system are monitored with timers that have been incorporated in various applications, enabling one function to effectively monitor another. The communications network is continuously monitored via a separate application equipped with alarming capabilities. UGPR personnel indicated that communication channels are continuously monitored and that any failure lasting beyond two scan cycles would result in an alarm being generated and displayed on the SCADA displays.

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.

UGPR uses a vendor-supplied system for work management that has schedules for all preventive maintenance activities related to the telecommunications infrastructure. The EMS and SCADA system are typically maintained on a six-month schedule. Calls for any corrective maintenance activities are entered into the work management system and tracked to completion by the system operators.

Maintenance personnel are available on-site during normal business hours. A single phone number is used for technical support, and support personnel carry a specific cellular phone continuously, whether on-site or away from the facility. This relieves the system operators of the need to determine who is on call and how to communicate with them. The evaluation team notes this one-number service as a positive observation.

4. Fundamentals of Operational Planning

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

Since UGPR controls facilities in both the Western and Eastern Interconnections, the company is a member of large-scale studies groups in each area. The majority of UGPR's load is located in the Eastern Interconnection, and those relevant seasonal studies are performed by the Northern Mid-Continent Area Power Pool Operating Review Working Group as well as the MRO Model Building Subcommittee. For studies in the Western Interconnection, UGPR provides study information to and participates in the WECC Technical Studies Subcommittee. Group members share system data as required. Once the studies are analyzed, standing operating guides are reviewed in the context of any planned outages, and any needed changes are initiated. When necessary, additional studies are conducted, and interim operating guides are provided to the system operators.

UGPR's operations planning group uses an industry-accepted software package for load flow and stability analysis studies, relying on data supported by the above groups. Discussions with operational planning personnel indicated that all system models include explicit detail at or above 100 kV, but some models specific to a study purpose include explicit detail at or above 50 kV. Generator dispatch scenarios are developed for each interconnection study group, based on economic generation unit dispatch. As needed, specific scenarios are developed by individual MRO and WECC members that consider extended unit outages. UGPR stated that equipment characteristics, ratings, and settings are systematically verified during routine model building as appropriate. Such verification activities include coordination with maintenance field personnel for visual inspections.

UGPR uses internally developed criteria to determine facility ratings. The studies group noted that the majority of challenges for one geographic region are stability related rather than thermal limitations. The facility rating process requires coordination with neighboring systems and

operations study and review groups. For next-day studies, UGPR relies on the reliability coordinator to communicate any emerging problems.

UGPR analyzes events to ensure proper equipment operation and protective device coordination. The operations planning group is involved in certain specific cases, but these analyses are primarily the responsibility of UGPR's protective relaying group. This organization gathers information regarding system events and determines whether the resultant operations were correct according to design parameters.

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.

The evaluation team interviewed members of the UGPR training staff to determine how UGPR approaches system operator training within the confines of shift work. UGPR uses a combination of several methods to develop and deliver training, including internally developed classroom and on-the-job training exercises; regional training opportunities supplied by region entities, reliability coordinators, and other entities; and computer-based training. UGPR training coordinators are selected through a competitive process from among experienced system operators. Once selected, they attend appropriate training courses provided by NERC and the Electric Power Research Institute, as well as other sources.

UGPR provides a dedicated week of training to all system operators each spring. The training activity takes place at various intervals within a six-week period when system operators are not permitted to take personal vacation time. UGPR has determined that this philosophy allows the company to ensure completion of required system operator training activities related to continuing education. There are other training activities that occur outside this training schedule, primarily related to emergency operations (supplied by outside sources) and other training as required by the US Department of Energy.

UGPR participates in restoration exercises for each interconnection. In the eastern portion of the system, the process focuses on restoration in coordination with MISO. The restoration plan contains the step-by-step restoration process and is available in hard copy at the system operator desks. The coordinated MISO restoration drill typically occurs in the fall, and other sub-regional drills may occur at other times. The training coordinator indicated that the MISO restoration plan utilizes a computer database to track system-wide restoration activities.

For restoration exercises relating to the western portion of the system, the Pacific Northwest Security Coordinator facilitates a table-top restoration exercise at the UGPR facilities. Other activities for the western portion are also available and used as UGPR identifies a need. The training coordinator indicated that UGPR analyzes drills performed by other organizations and incorporates their methodologies as appropriate.

For backup control center startup and operations, UGPR has an established training plan that involves transporting two system operators and a generation operator to the backup location.

This particular drill uses the emergency evacuation procedure from its initiation to the startup of the backup center activities. The information technology support personnel at the remote location are contacted to start up the various systems. For simulated scenarios, system operators are given operational instructions via phone while en route to the backup location. It was not clear to the evaluation team that all operators have participated in the drills, and discussions with system operators confirmed this. (Similar conclusions were drawn regarding the capacity and energy emergency plans, manual and automatic load shedding schemes, and system restoration.)

The evaluation team recommends UGPR provide and track periodic training for all system operators on the implementation of the capacity and energy emergency plan, manual and automatic load shedding schemes, backup control center activation, and the system restoration plans.

Individual training requirements are largely determined by the supervisor, who is required to identify the needs of each system operator through employee reviews and performance analysis. Overall training activities are conducted according to the needs of the individual and the operations team as a whole. If a need is identified, the supervisor can request specific training. At the midpoint of the training year, the training coordinators conduct a review of emergent training needs. The fall training schedule is then tailored for the specific needs of the system operators.

UGPR training personnel indicated that system operators do not typically move from one operating position to another. Rather, there is a competitive process for such a job selection. For those moves that do occur, training is coordinated by the training staff for specific job activities as needed. In addition, operators participate in on-the-job training, and the supervisor uses a checklist to ensure all relevant job tasks are checked for proficiency.

Individual training records are maintained in various locations – the training staff tracks NERC-eligible continuing education hours, the supervisor tracks on-the-job training activities, and the office staff tracks corporate training activities. Discussions with system operators indicated some confusion regarding the exact status of an individual's training requirements because of the various locations used to store and coordinate this data. The evaluation team recommends that UGPR consolidate each employee's training records in a single location, making access to the overall training picture easier for employees to understand.

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.

UGPR system operators and management indicated that the expectation is for system operators to approach their work cautiously with a continuous emphasis on safe operations. The outage coordinator submits all planned outages to MISO via the outage scheduling program. UGPR has a policy of second-party verification for the issuance of transmission switching orders. One system operator writes the switching order detailing the individual steps to be performed. The completed order is checked by the other system operators, specifically checking for errors.

UGPR operators indicated that at least one other system operator is expected to check the switching order except for the instance where there is an emergency outage. In that case, the same person may be required to both develop and check the initial switching order. The two switching areas, North Dakota area and South Dakota area, normally provide the second-party verification of switching orders prior to issuance and execution. In addition, UGPR expects field operations personnel that receive a copy of the prepared switching via fax to provide an additional check prior to executing the order.

UGPR system operators discussed the company's expectations regarding unexpected events during switching sequences. If an unexpected result occurs at any point during the switching order, the field switchman is expected to stop the activity immediately and contact the system operator for analysis and support. Field switchmen are expected to use a UGPR process referred to as the "six basic steps of switching" in order to check and verify that the correct device is being operated and that the result is as expected.

UGPR system operators indicated that the field switchmen are normally employees of UGPR power system distributors or power cooperatives used to distribute UGPR power to customers. As part of the UGPR process to reduce errors, UGPR provides training in correct switching to these distributor or cooperative personnel at no cost. The evaluation team notes this agreement as a positive observation and believes it correctly postures UGPR system operations to provide for an error-free switching environment.

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.