NERC

NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Reliability Readiness Evaluation Report

Balancing Authority/Transmission Operator

Dairyland Power Cooperative

La Crosse, Wisconsin

to ensure the reliability of the bulk power system

October 1–4, 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 Dairyland Power Cooperative (DPC) representatives on October 1–4, 2007. This report reflects the views and recommendations of the evaluation team regarding the readiness of DPC to meet its responsibilities as a balancing authority and transmission operator.

Evaluation Team

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Organization Profile

DPC, headquartered in La Crosse, Wisconsin, is a generation and transmission cooperative that provides wholesale electric services to 25 member distribution cooperatives and 18 municipal customers. The cooperatives and utilities, in turn, provide service to over a half-million customers spanning an area of 44,500 square miles in 62 counties of Wisconsin, Minnesota, Iowa and Illinois. The distribution cooperatives supply electricity to mostly rural and small community customers. DPC traditionally has been in the heart of Wisconsin's dairy farms as its name implies. However, in recent years the customer base has more commercial and some industrial customers.

DPC is a balancing area and transmission operator. DPC is a member of MRO and the Midwest Contingency Reserve Sharing Group, previously the Mid-Continent Area Power Pool Generation Reserve Sharing Pool. The Midwest ISO (MISO), St. Paul, serves as the reliability coordinator for DPC, which has refrained from joining the MISO market venture. DPC is keeping aware of the happenings of the MISO market and may join the group in the future.

DPC is governed by a board of directors, one member from each of the 25 cooperative members. Additionally, the Dairyland Managers Association provides advisory support and represents each cooperative.

DPC owns about 1,100 MW of generating capacity, which includes common sources of power such as coal, gas, oil, and hydro as well as renewable energy sources such as wind power, methane digesters, and landfill gas. The all-time peak was 887 MW in July 2006. DPC owns over 3,000 miles of transmission lines, including 608 miles of 161 kV, 2,493 miles of 69 kV, and 10 miles of 34.5 kV.

DPC has many interconnections, including points where loads are connected to other companies' transmission systems or where other companies' loads are connected to DPC's transmission system. DPC's interconnected neighbors are American Transmission Company, Xcel Energy, Alliant West, Southern Minnesota Municipal Power Agency, Rochester Public Utilities, Corn Belt Power Cooperative, Northwestern Wisconsin Electric Company, and Great River Energy.

Executive Summary

The evaluation team found no significant operational problems and concluded that DPC 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 DPC priorities are correctly implemented as safety of personnel and equipment, reliability of the electric system, and economics of operation. DPC management and executives have a good communication path with operating personnel and dispatchers. Quality training and support are provided to dispatchers and operators, and the evaluation team noted a number of positive observations in these areas. All DPC personnel were professional in their interviews, helpful to accommodate the needs of the evaluation team, and displayed a positive attitude towards the team.

The evaluation team co-leaders and DPC personnel initially agreed on three key recommendations. The first of the recommendations addressed two related issues involving DPC's energy management system (EMS) migration plan at its backup control center. This initial recommendation has been divided into two recommendations for easier database tracking. The other key recommendations encourage DPC to automate the e-tag process to make faster acceptance/denial and entry to eliminate possible errors, and to implement the results of the job task analysis to customize the training program.

Overall, the evaluation team identified 12 positive observations and offers 10 recommendations that, if implemented, will enhance DPC'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. DPC is a NERC-approved continuing education provider (Section 5.1).

2. DPC has a dedicated trainer (Section 5.1).

3. The in-house continuing education program has over 100 hours of NERC-approved classes (Section 5.1).

4. The continuing education classes focus mostly on NERC standards (Section 5.1).

5. The dispatchers have a single number to call for EMS and communications problems (Section 3.1).

6. Confidential information on computer systems and support redacted from the public report. See discussion in Appendix 1.

7. DPC has an open-door policy that extends throughout all levels of supervision, up to and including the chief executive officer (Section 1.1).

8. The dispatchers rotate between functions of generation and transmission frequently (Section 5. 1).

9. Planners conduct seasonal meetings with operations to provide information and explain any necessary operating guides for unusual conditions of the forthcoming season (Section 4).

10. The dispatchers have a shift turnover procedure that includes a required reading mailbox (Section 2.2.3).

11. Dispatchers have a form for providing feedback on any new or revised procedure or policy (Section 1.2.5).

12. Confidential information on computer systems and support redacted from the public report. See discussion in Appendix 1.

Recommendations

The evaluation team offers the following recommendations:

1. Confidential information on plans for loss of control facilities redacted from public report. See discussion in Appendix 1.*

2. Confidential information on computer systems and support redacted from the public report. See discussion in Appendix 1.*

3. Automate the acceptance or denial of e-tags to reduce the time required to enter the approved e-tags into the interchange scheduling program (Section 2.3).*

4. Implement the results of the job task analysis as soon as the results are available to enhance the training program with customized instruction (Section 5.1).*

5. Improve the frequency options for loss of EMS to allow the dispatchers to continue monitoring system frequency (Section 2.3).

6. Formalize and document the implementation plan for NERC critical infrastructure protection (CIP) standards CIP-002 through CIP-009 to increase awareness of the infrastructure concerns (Section 5.1).

7. Conduct periodic meetings of management and all dispatchers to discuss new and revised policies or procedures and operational events (Section 1.2.2).

8. Use the document control procedure found in the *System Operations Procedures* book, which covers all items necessary to ensure the document is up to date and in proper order, to manage all other control center documentation (Section 2.2.3).

9. Confidential information on plans for loss of control facilities redacted from public report. See discussion in Appendix 1.

10. Confidential information on communications systems and support redacted from public report. See discussion in Appendix 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 recommendations, and positive observations that the team identified. The report uses the generic term "system operator or dispatcher" 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.

DPC has an open-door policy that extends throughout all levels of supervision, up to and including the chief executive officer. The dispatchers have all levels of management available to call on for operational and personal advice, and the evaluation team cites this as a positive observation.

DPC has two dispatcher positions staffed 24 hours per day, 7 days per week and increased the staff of dispatchers from 11 to 12 in June 2007. This increase provides additional training time. The dispatchers rotate between generation desk and transmission desk frequently, and the evaluation team cites this practice a positive observation.

There is little turnover of dispatchers, who as a result have many years of experience and perform their duties well. Annual performance is evaluated and praised when it exceeds expectations. The operators are accountable for high standards, including DPC objectives as well as NERC standards. Discipline can be administered when intentional poor performance is determined.

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 DPC supervisors, managers, and executives all support and communicate safety, reliability and economic operations of the DPC system. Transmission reliability is reinforced by the budget process; $261 million is planned for transmission capital expenditures between 2006 and 2012. The funding will be used to install, rebuild, or upgrade 50–60 miles of transmission line every year. Some upgrades include raising the structures by a method called *Phase Raiser*, whereby a metal splint is placed on the lower part of a pole to make it taller.

To assist dispatchers with real-time reliability issues, DPC staff provides analytical support. Two operations engineers focus on transmission system reliability. The engineers rotate on-call duties during off hours to assist the dispatchers when system issues arise that require additional analysis or support. Both the dispatchers and engineers use the EMS security analysis tool to determine the course of action to alleviate system loading and voltage concerns. The dispatchers work closely with neighboring systems and the reliability coordinator at MISO. The reliability coordinator requests and directives are followed when system problems arise.

DPC's holistic approach to culture of support is evident in its *System Operations Vision, Mission, and Values* document, as quoted below:

> "Our Vision
> Our Vision is to be an industry leader. This is achieved through a workplace based on integrity, consistency, and accountability. Essential to that is a mutually respectful workforce which can have fun while focusing on common goals and open communication.
>
> Our Mission
> The Mission of System Operations is to coordinate the safe, reliable, and efficient generation and distribution of electric energy.
>
> Our Values
> - We value a comfortable, enjoyable, and safe work environment based on fairness and camaraderie; providing variety, fun, and job satisfaction.
> - We value teamwork characterized by an empowered and cooperative workforce bonded together by communication, honesty, respect, trust, and common goals.
> - A sense of purpose achieved through a productive and rewarding work environment which provides both financial and job security.
> - We value creativity, health, free time, and peace of mind.
> - We value our environment, both natural and man-made, and seek a balance through good stewardship."

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.

Operations management provides strong leadership by promoting safety and reliability, and by communicating effectively with the dispatchers as well as executives. Each Monday morning, operations management conducts a meeting with the dispatchers on relief and training shifts, to discuss the status of projects and the operating plan for the current week. Both dispatchers and management indicated a desire to conduct meetings with all dispatchers occasionally. The evaluation team recommends that operations conduct periodic meetings with all dispatchers to discuss policies, procedures, and current or future projects. Discussion with management concluded that quarterly meetings could be targeted.

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.

DPC staff personnel communicate system reliability-related matters to senior management in several ways. First, DPC's power deliver department utilizes a monthly activity reporting process where employees in key areas such as operations engineering and transmission planning provide written reports to managers on key activities, accomplishments, and issues. Managers review this information and provide a further report to the vice president, power delivery, who takes key issues and initiatives to the remainder of DPC's senior management. Finally, certain issues and initiatives are then elevated to the DPC Board of Directors level as necessary for either information purposes or for the purposes of receiving necessary approvals, if required.

Reliability-related matters are also discussed at routine internal DPC staff meetings. For example, the operations/planning group meets on a regular basis to discuss both upcoming and completed projects; the power delivery department has monthly planning meetings that include operations engineering, transmission planning, transmission maintenance, transmission design, and transmission construction personnel among others; and the vice president of power delivery has regularly scheduled direct-report meetings where such issues are addressed and discussed when appropriate.

1.2.4 Human Resources

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

Succession planning is an important focus of the system operations center management. Dairyland increased its normal dispatcher staffing from 11 to 12 in June 2007 and over half (seven) of the dispatchers as well as the manager will reach normal retirement age within the next nine years. These eight employees currently have 170 combined years of operating experience and will have 212 combined years of experience when they reach normal retirement age.

DPC management and human resources foresee this as a rigorous succession project. A staffing assessment is performed during the annual budget process so that trainee wages and training expenses can be included in the next year's budget. In anticipation of a retirement, a trainee was included in the 2007 budget. The hiring process normally requires about six months and initial training normally takes about a year. To achieve an advance start on succession, DPC is currently discussing and planning for posting two job openings for dispatchers. Bringing trainees into the training program at a controlled pace, approximately one year prior to expected requirements, will allow DPC to train and continuously provide a full compliment of dispatchers.

DPC is also employing a succession planning program at a system operations management level; the director of system operations position is being used as a management training position to allow key staff members to gain management experience and to learn more about system operations. DPC has the flexibility to do this due to the retirement of the incumbent director and the fact that the system operations staff and personnel are all experienced employees who are for

the most part self-directed professionals. The director of system operations position is being targeted as an 18 to 24 month assignment for staff members identified to gain management experience.

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.

A feedback form is included with each new or revised system operations center procedure when it is routed for operator review. The team cites this feedback process as a positive observation. During annual required reviews of the various emergency plans, the dispatchers are directed to submit questions and suggestions for improvement to management and support staff. Weekly department meetings are held in the system operations center, which allows employees to suggest discussion topics and offer ideas to improve performance.

Dairyland has a disaster preparedness plan and a corporate business continuity plan. Both plans address continuing business activities in the event of a disaster or other situation that interrupts normal operations. The disaster preparedness plan procedures establish a disaster recovery center that includes providing communications equipment and paths for system operations center personnel. The manager of system operations is responsible for establishment of this disaster recovery center. The business continuity plan also addresses communication between departments and external entities. DPC's loss of primary control facility plan also stresses the importance of communication with other reliability entities. The *Emergency Operations Action* plan is specific to the loss of primary control facilities.

2. Fundamentals of Operations

2.1 General

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

The DPC dispatchers use the EMS to monitor and control the DPC power system. This EMS has all the functionality that is expected and is discussed further in the confidential computer systems and support section of Appendix 1. The EMS and the supervisory control and data acquisition (SCADA) computer system provide information about the DPC system as well as many facilities in neighboring systems. The control functions include control of generator loading, breaker status, load tap changer position, and capacitors. The EMS has advanced applications of state estimation and security analysis. Alarms are activated when preset limits on facilities are reached.

The EMS has two frequency measurements to use in the automatic generation control application. Should the primary measurement fail, the secondary measurement is automatically switched into the program. It requires manual intervention to return from the secondary to primary measurement. DPC also monitors frequency at the power plants and key substations. A total of seven frequency measurements are included on a single display to allow the dispatchers to determine if the system has split or islanded from the interconnection.

DPC has both underfrequency and manual load shedding. The underfrequency load shedding plan is compliant with the MRO requirements, having three steps with approximately 10 percent of the total load dropped at each step. The dispatchers initiate the manual program and are aware of its overlap with the underfrequency program. If load shedding must be accomplished quickly, distribution substations may be completely dropped. If time allows, individual feeders may be interrupted by SCADA or by the local cooperative personnel.

The dispatchers have a single display that includes 19 voltage measurements to observe the condition of the transmission system and interconnection voltages. The voltage limits for load serving buses are set at 95 and 105 percent of nominal. Under contingency conditions, however, the voltages are allowed to drop to 90 percent. DPC does have a couple of instances of undervoltage load shedding, but these are only initiated for local problems and do little towards system-level reliability.

Primary voltage control devices used on the DPC system are generators, capacitors, and load tap changing transformers. Generators are operated in automatic voltage regulator mode when possible but are occasionally operated manually by plant operators if system conditions dictate deviation from normal voltage schedules. Capacitors and load tap changing transformers are usually operated in automatic mode but are at times controlled manually by the dispatchers using the SCADA within their dead band (92 to 105 percent) for tighter system voltage control.

The areas where DPC loads are connected to other systems are transmission dependent and somewhat depend on the neighboring systems to control voltage within limits. DPC static reactive devices (capacitors) are used to aid voltage control.

DPC generators with capacity greater than 50 MW operate with automatic voltage regulators in service, with the exception of Alma 4 and Alma 5. These units are run in constant reactive mode while the JP Madgett unit is on line to prevent circulating reactive power between these units. Similarly, power system stabilizers are installed on the two largest units in the DPC system. These stabilizers are placed in service during startup when either unit is ramping up at about 100 MW and remain in service until the unit is being taken out of service.

Reactive reserve is monitored, and alarms indicate when levels are insufficient. A single display provides information of both dynamic and static reactive resources. The dynamic portion of the reactive reserve is calculated by use of the generator capability curves.

DPC currently relies on the manufacturer's calculated capability curves for each unit. These curves are provided to the dispatcher in Section 5 of the *Transmission Security Reference Book*. The MRO has recently instituted a reactive power testing program requiring all units to be tested over the next five years, including 2007. At least 20 percent of the units are to be tested each year. A five-year schedule has been developed for the testing of DPC units. Testing of DPC's large coal-fired generators will require study and coordination with the MISO reliability coordinator and neighboring utilities. This coordination should include development of operating guides for these tests to ensure that they do not cause reliability issues on the system. When the initial tests have been completed, the data and operating information obtained will be used to provide the dispatchers with the necessary tools and functional capability to test/validate the reactive power limits in real time.

DPC is a member of the MISO Contingency Reserve Sharing Group. This group maintains enough contingency reserve to replace the largest contingency of the group, which is nearly twice the entire load of DPC. DPC provides its share of contingency reserve when the group is called upon to respond to a contingency. The DPC contingency reserves are maintained to meet the minimum requirement set by the group.

The DPC mapboard has two lamps, one for each computer, which will illuminate whenever a failure of either primary or secondary computer system application occurs. The lamp indicator gives the dispatchers warning that a serious EMS problem has developed, including the possible failure of the alarm processor.

The alarm application has several alarm priorities, which are separated by color and can be assigned to an audible group. The dispatchers are content with the alarm system. A buffer overflow action will cause the system to switch to the secondary mainframe computer should the condition arise.

The DPC system has two independent power producer facilities that DPC does not control. The first facility is a 20 MW wind farm. DPC purchases the wind farm's output, which is proportional to the wind speed and typically less than the 20 MW installed capacity. The fluctuations in output are absorbed by regulation of DPC generation. The second facility is a power plant controlled by its owner/marketer. The power is delivered to the marketer's customer(s) by hourly interchange schedules. The interchange schedules do not always match the output of the power plant, causing DPC generators to regulate to the difference. At times, this scheduling error has the potential to create contingency reserve shortages for DPC. The evaluation team suggests that DPC consult with the marketer to determine the cause of the schedule errors and attempt to resolve the issue.

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.

DPC describes safety as "job one" and has initiatives in place to protect its employees and system. DPC has a corporate safety group, which reports directly to human resources and indirectly to the chief executive officer. There is a certified safety staff member at the power plants to provide training to employees. To enhance coordination, field staff and power plant personnel are expected to have safety "tailgate" sessions prior to performing each job.

Safety and reliability are the first priorities of the DPC dispatcher. There are no special protection system relays in the DPC system. However, there are special protection system relays on adjacent systems that protect the DPC system from certain overload and/or low voltage conditions. DPC system protection is applied to thermal limits of the transmission system using the most restrictive element in each circuit. Generator relays are not included in any special protection schemes.

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 DPC dispatchers have the authority and responsibility of implementing any emergency plans. This authority is defined not only in the job description, but also in a letter signed by the appropriate vice president and posted on the wall at the primary and backup control facilities. A second letter defining the dispatchers' authority is distributed to personnel working under the direction of the dispatchers.

Dispatchers collect and analyze all available information before making operational decisions. Risks associated with any possible action are to be considered and minimized if at all possible. If time allows, information and input from support staff, such as the transmission security engineers, is requested and incorporated into the decision-making process. Other dispatchers on shift are also consulted as time allows, obtaining the benefit from their knowledge and experience. The dispatcher authority statement defines the responsibility and authority of the Dairyland dispatcher to make any decision necessary for the reliable operation of the system.

Switching orders are normally written by the dispatchers. The orders are checked by other dispatchers and then implemented, usually by the dispatcher writing the order. In the case of complex switching, the supervisor or transmission security engineers may be involved in the switching order preparation.

2.2.3 Operational Alignment

Organizational structure supports safe and reliable system operation.

DPC is a signatory to the standard MISO reliability coordinator agreement. The agreement is implemented and coordinated by the MISO regional transmission organization *Reliability Plan*, dated April 1, 2007.

DPC has proper interconnection agreements with its neighbors, including the DPC loads that are connected to neighbor transmission systems. In an exception to having an interconnection agreement in place, a transmission-to-transmission agreement between DPC and American Transmission Company (ATC) is nearly complete; however, ATC has deferred completion until MISO has developed a transmission-to-transmission agreement template for use by its transmission owners. Until that agreement is completed, DPC, ATC, and Alliant Energy East (WPL) are using an older DPC-WPL interconnection and interchange agreement as a reference document to resolve operational issues.

DPC submits forced and planned outage information to the reliability coordinator and neighbors by either telephone or the Mid-Continent Area Power Pool (MAPP) communications network, a regional dedicated communications network of computers with printers. Transmission security engineers report planned outages to the MISO reliability coordinator by phone or by using the MISO Outage Scheduler tool.

DPC has not delegated any reliability functions to others beyond the normal reliability coordinator functions performed by MISO. DPC does have some control in member cooperative distribution substations for the purpose of load shedding.

DPC dispatchers have a shift-change policy that includes a "required reading" mailbox for each dispatcher; the team cites this policy as a positive observation. Important policy and procedure changes are prominently placed on the dispatcher's desk. The dispatcher must acknowledge that the information has been understood.

The system operations procedures manual has a good procedure for document control. It covers all the aspects necessary to ensure that the documents are up-to-date and in proper order. This process can be applied to other manuals or books in the control center, and the evaluation team recommends that DPC expand this document control procedure to those other documents.

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.

DPC has all the proper tools necessary to reliably operate its system. The EMS includes state estimator and security analysis applications that warn the operators of any possible problems caused by transmission and/or generation contingencies. The dispatcher training simulator is not only used for training, but can also be used to study an event that has been stored in the archives.

The mapboard status lamp indicators are automatically updated by the EMS. The mapboard only indicates breaker status and substation alarm status. To resolve any alarm, the dispatcher must either select the alarm display or the substation in question. There are digital displays, driven by the EMS, at the top center of the mapboard indicating frequency, time of day, and time error. Should the EMS fail completely, the digital displays will not provide correct information. The dispatchers connect a meter to a wall outlet to determine the system frequency, but this would be a bit time consuming in the event of an emergency. The evaluation team recommends that DPC improve the frequency display options for loss of EMS to allow the dispatchers to continue monitoring system frequency.

The dispatchers have some concerns about the schedule entry process for the transaction scheduler program. There are times when several transactions start, change, or end at the same time. Whenever a group of schedules is revised due to congestion management and other schedules need to be implemented in a short period of time, the entry process is not always completed before the tag goes to the passive denial state. This requires the dispatcher to manually revise the tag to implement the transmission loading relief (TLR) reductions. To reduce this problem, the evaluation team recommends that DPC provide an automated method of approving or denying e-tags for faster entry into the interchange scheduling application. Automating this process will reduce manual decisions and eliminate possible errors. DPC has considered an additional automated process of approved e-tag entry into the scheduling application. However, should DPC join the MISO marketing group it becomes a moot issue.

DPC dispatchers have the necessary communications facilities to perform their duties. Telephone, cell phone, satellite phone, and radio provide communications over both private and public communications facilities. Communications equipment is further discussed in the confidential communications section of Appendix 1.

The MISO reliability coordinator is responsible for congestion relief on the transmission system. DPC dispatchers follow the directives and requests of the reliability coordinator when TLR is requested. There are times when DPC dispatchers request the reliability coordinator to implement the TLR process.

Currently, DPC has three 161 kV flowgates that are reciprocally coordinated between MAPP and MISO with respect to *Schedule F*, a MAPP commercial activity, and with respect to the MISO energy market. The flowgates are monitored by the MISO reliability coordinator as well DPC dispatchers. These three flowgates do not require interchange reliability operating limits to be applied and are considered local problems. System operating limits (SOLs) are applied to DPC facilities that are monitored and alarmed within the EMS. When facilities are violating a potential SOL, the dispatcher may call on the reliability coordinator to verify limit settings and results of the DPC security analysis with the reliability coordinator contingency analysis. The dispatcher and the reliability coordinator will work together to eliminate the possible, or actual, SOL violation.

Outage scheduling is normally arranged by the transmission security engineers. An application developed by DPC tracks each outage as it is requested, studied, approved (by DPC engineers and MISO reliability coordinator), implemented, and completed.

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.

DPC has the required documents for blackstart, system restoration, capacity and energy emergencies, loss of primary control facilities, and breach of physical or cyber security. The dispatchers have the responsibility and authority to implement any of the emergency plans without contacting supervision or management. The capacity and emergency energy plan addresses the points listed in the NERC standard EOP-002-2. These plans are shared and coordinated as needed with neighbors and the reliability coordinator. The documents were reviewed by the evaluation team, and the necessary parts were found in each.

The Minnesota-Wisconsin area of MAPP is divided into nine subsystems for parallel restoration. Each subsystem or island is restored independently. Due to the interconnected nature of the system in MAPP, these subsystems do not match up with balancing area boundaries. DPC is responsible for the restoration of a subsystem that includes most of the DPC power plants and core 161 kV systems. MISO has a tool that provides a mechanism to all subsystem coordinators to keep them informed on the status of all subsystems around them. It also helps to keep the MISO reliability coordinator informed. When it is time to synchronize subsystems, an interconnection checklist is prepared by the subsystem coordinators to decide whether or not the conditions are right for interconnection. A conference call of the subsystem coordinators and the MISO reliability coordinator occurs to ensure that the MISO reliability coordinator concurs that

it is the proper time to interconnect. The power system restoration action plan identifies the roles and responsibilities of the restoration team at DPC. DPC participates in regional drills twice each year for the purpose of system restoration. The emergency plans are reviewed and updated if necessary each year.

DPC's balancing area contains one load-serving entity. When load forecasting and unit commitment is performed for the balancing area, forecasted capacity and energy adequacy is determined. Load forecasts are updated to reflect changing conditions. Unit capability limits are monitored and entered into an overview display. The result of comparing forecast and/or real-time load and unit capabilities is displayed to the dispatcher as upper and lower regulating margins. Either of these margins becoming negative indicates a capacity/load imbalance.

DPC's *Emergency Load Reduction Plan* provides dispatchers with the necessary guidance and authority to effectively deal with a tight energy situation on the DPC system. Dispatchers have the authority and responsibility to utilize the procedure whenever energy supply resources are insufficient to meet demand. The plan lists the following examples of criteria that might trigger activation of load shedding:

- DPC generator contingency coupled with inability to balance load and generation due to insufficient reserves in MAPP and coupled with frequency under 60 Hz.
- When the frequency is below 59.7 Hz (when this occurs, it is likely that DPC is part of an electrical island that is isolated from the Eastern Interconnection); should the frequency drop below 59.5 Hz, there is risk of damaging DPC's steam units.
- Generator contingency in MAPP with insufficient reserves on the DPC system; the emergency load reduction plan is used to deliver reserves.

DPC has no operating nuclear power plants in its system. However, it does have a decommissioned nuclear plant that has not been completely dismantled. There are no system reliability concerns.

3. Fundamentals of Maintenance

3.1 General

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

DPC communications and EMS support personnel regard the EMS and associated communications network as the highest priority of work. Any trouble calls from operations will interrupt any routine work that may be in progress. The dispatchers have a single number to call in case of trouble, and the evaluation team cites this as a positive observation. The support staff has two phones, and repairs are made 24 hours per day, 7 days per week.

Since the vendor no longer supports the system, DPC keeps a third computer system running to be certain that usable spare parts are available. DPC has purchased "used parts" from other companies when necessary. The most common type failures are disk drives, power supplies, and logic boards.

DPC repair personnel keep a log or diary of problems and associated resolutions. This searchable online database can be used to determine if a problem may be a reoccurrence or if it is unique. Should a non-critical failure occur, such as one to a printer or other peripheral device, the dispatcher will complete a form to advise the repair personnel of the problem so it can be fixed during regular working hours.

A common model is used for the state estimator and real-time security analysis tools. The state estimator and real-time security analysis tools are updated whenever transmission system changes occur. The applications run on a six-minute cycle. The state estimator and real-time security analysis can run faster; but with a two-minute solution time, the dispatchers need some time to evaluate results before another update is performed. The operator training simulator model is updated less frequently than the state estimator and real-time security analysis model — perhaps two to four times per year, with the updates being performed simultaneously with "builds" on the EMS. When the simulator is in use, its solution time (three to four seconds) and periodicity are the same as available on the real-time EMS.

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 DPC equipment, facilities, and tools are kept in a good state of repair. Any metering errors are determined by comparing integrated data with hourly accumulated demands. Rate-of-change alarms and quality codes of data are monitored for irregularities. Interchange checkout with interconnected neighbors may also locate meter errors at interchange points. When an error is determined, repair personnel are promptly dispatched to correct the problem.

DPC verifies its frequency measurements at least annually for use in the area control error calculation. Other frequency measurements are verified or calibrated on an annual basis. At power plants, it is easy to measure the shaft revolutions per minute and convert to frequency values for comparison.

MAPP has not recommended disturbance monitoring equipment. However, DPC replaces electromechanical relays with electronic relays capable of disturbance monitoring at substations as digital controls are installed.

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.

DPC has a *Transmission Security Reference Book* that describes, among other activities, the facility planned outage procedure. The MISO reliability coordinator is responsible for approving outages in the DPC bulk power system (100 kV or more). An outage is identified by maintenance personnel and submitted to the DPC dispatcher or transmission security engineer. An outage request form is completed by the person fielding the request. The DPC transmission

security engineer reviews the request for any obvious conflicts and either asks for a change of date or continues the approval process. The request is forwarded to neighbors or the reliability coordinator if facilities over 100 kV or certain 69 kV facilities are involved. Once approvals and notifications are completed, the outage is ready for finalization by setting the approved switch in the DPC outage scheduler. This causes notification of all neighbors affected by the outage. Prior to actual switching for the outage, the dispatcher once again reviews the system for any concerns.

4. Fundamentals of Operational Planning

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

DPC operations management conducts a weekly meeting with the dispatchers who are on relief and training shifts each Monday morning to discuss any major activities for the week. The dispatchers have an opportunity to question details of any plans for the week. The relationship of management and dispatchers is excellent and allows a free flow of information in both directions. The value of these meetings improves dispatcher performance and creates a professional atmosphere.

The bulk power system is considered to be 100 kV and above at DPC. Any planned outages of 100 kV and above facilities are coordinated with neighbors and MISO.

The planning engineers meet seasonally with the dispatchers to provide information for the forthcoming season and explain any operating guides that may be necessary for unusual events or contingencies. These meetings are actually NERC-approved continuing education training sessions. The transmission planners and operations engineers serve as subject matter experts and the dispatchers earn continuing education hours that apply toward maintaining NERC system operator certification. The evaluation team cites this practice as a positive observation.

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 system operations center coordinator is the training supervisor, effectively serving as a dedicated trainer. The evaluation team cites the presence of a dedicated trainer as a positive observation. The coordinator provides the training in an area separated from the primary control room. DPC is a NERC-approved continuing education provider with over 100 hours of training classes approved, and the classes are based on NERC standards. The evaluation team cites the approved classes and focus on standards as positive observations.

The evaluation team examined the training records of a dispatcher selected at random and found the records to be complete. Records and certificates, if applicable, were listed for each training activity the dispatcher had completed, inside and outside the company, and continuing education

hour (CEH) credits were up-to-date for the dispatcher. Each dispatcher has log-in credentials for the records database to check on his or her activities. The coordinator keeps the database up-to-date. Training for dispatchers' credential renewal is accomplished by the NERC continuing education program.

The dispatchers are required to complete the monthly training review questions provided by the MISO System Operations Training Working Group. Working group members are required to take turns writing articles for the monthly exercises. Copies of all completed modules are kept in the individual's files. For example, if the dispatcher participates in a restoration drill, the coordinator files a copy of the overview report on the drill and how well it was performed.

Initial training for a newly hired dispatcher is set up with modules. A certain amount of information is relatively static, but DPC updates the modules for process and other information changes. An in-house DPC subject matter expert develops new modules as needed. Power system restoration drills and other regional events are included in the program. On-the-job training is a part of the initial training program. During this time the trainee is working with a NERC-certified dispatcher until passing his or her own NERC certification test. The usual training time needed before a new hire works independently is 12 to 18 months.

DPC is nearing completion of a job task analysis, which will become the backbone of the future training program. DPC will use the analysis to determine the skills and knowledge of the dispatchers, and enable the training to concentrate on the dispatchers' weaker areas. The evaluation team recommends that DPC implement the results of the job task analysis as soon as the results are available to provide employees with customized training.

The dispatchers rotate between functions of generation and transmission frequently, and the team considers this a positive observation.

Critical infrastructure facilities training is delivered online, as an interactive continuing education class, in the form of CIP-002 through CIP-009, and these have been recently assigned to the dispatchers for completion. This training is delivered along with the CIP online training. Although DPC has training established for the CIP standards, there is not a formal document that describes this implementation. The evaluation team recommends that DPC formalize and document the implementation plan for NERC standards CIP-002 through CIP-009.

FERC Standards of Conduct are not a DPC requirement, but DPC follows the guidelines as if they were.

The transmission security group delivers seasonal updates to the dispatchers twice per year. Also, when a critical outage is forthcoming, the group will again meet with dispatchers to convey any concerns associated with the outage, such as facilities that may be affected.

DPC has two dispatcher training simulators (DTS). The first is a generic one that provides basic training of dispatcher actions for system events. The second is DPC system specific and uses the same model as the state estimator and the real-time security analysis applications. The second DTS is used for power system restoration drills. The DTS is being developed for more scenarios and emergency operations training in the future.

Dispatcher short courses are also included in DPC dispatcher training. Two or three dispatchers are normally sent to the Power System Operator Short Course offered by the MISO System Operator Training Working Group each year. Regional training events are treated the same as the short course for training purposes. The most senior dispatcher has been a long-term member of the Dispatcher Training and Education Committee of the American Power Dispatcher Association.

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.

As mentioned in section 3.2.2, DPC has a thorough outage planning process with steps built in to protect against unintended events. Multiple planning, approval, and notification steps are used in the process, right up to the time of switching. As a step prior to actual switching for the outage, the dispatcher once again reviews the system for any concerns.

Other error prevention techniques include emergency and backup control center drills as well as dispatcher simulator training. As mentioned in the previous section, DPC has two training simulators. One simulator is system specific and uses the same model as the state estimator and real-time security analysis applications.

The majority of the DPC dispatchers are certified with NERC reliability operator credentials. Three have balancing, interchange, and transmission operator credentials. DPC provided a spreadsheet of the dispatchers' names, certificate numbers, credential levels, and credential expiration dates. This spreadsheet was compared to the work schedule for 2007, and there were no instances of persons not having the proper credentials. The only format irregularity was in June 2007 when the dispatchers' work schedule was revised from 11 to 12 dispatchers.

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.