

**Balancing Authority/Transmission Operator
Reliability Readiness Evaluation Report**

**Ameren Services,
Operator of AMIL and AMMO**

**St Louis, Missouri
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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 Ameren representatives responsible for transmission operations and the balancing authority areas on May 14–17, 2007. This report reflects the views and recommendations of the evaluation team regarding the readiness of Ameren to meet its responsibilities as a balancing authority/transmission operator.

Evaluation Team

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Organization Profile

Ameren Corporation has utility operations in Illinois and Missouri. Three subsidiaries are end-use providers (AmerenCILCO, AmerenCIPS, and AmerenIP) and operate in Illinois in the AMIL balancing authority, and one (AmerenUE) operates in Missouri in the AMMO balancing authority. AmerenUE is the largest electric utility in Missouri. Ameren's three Illinois utilities cover most of the state of Illinois, except for the Northern Illinois/Chicago area. Another subsidiary, Ameren Services Company, is the balancing authority and the transmission operator for Ameren's entire system and operates within the Midwest Independent Transmission System Operator (MISO) footprint. Ameren has other subsidiaries operating unregulated energy supply. The four Ameren utilities also have natural gas operations in Illinois and Missouri. This report will use Ameren when referring to the operation of both balancing authority areas and the function of the transmission operator.

MISO is the reliability coordinator for Ameren Services Company, AMIL, and AMMO. All of the utilities operate in the MISO market. Ameren operates 1,648 miles of 345 kV, 137 miles of 230 kV, 782 miles of 161 kV, 4,056 miles of 138 kV, 144 mile of 110 kV, and 3.2 miles of 69 kV transmission lines. Ameren connects to 16 different entities at 110 different interconnection points, which include 14 kV and 34 kV ties.

AMMO's 2007 peak load projection is 8,747 MW, while AMIL's 2007 projection is 9,736 MW. Current Ameren-owned net generating capacity is just over 16,200 MW. Ameren has two nuclear plants in its transmission area: Callaway (owned by AmerenUE) and Clinton (owned by Exelon). The generation is largely coal fired, but has substantial natural gas and oil-fired plants with a small amount of hydro. The energy for AMMO is primarily provided by the regulated generation owned by AmerenUE. Much of the energy for the AMIL balancing authority area is purchased from its non-regulated subsidiaries or other energy suppliers. Ameren serves retail customers in Illinois and Missouri as well as several municipal customers in Missouri and municipal and cooperative customers in Illinois.

Executive Summary

The evaluation team found no significant operational problems and concluded that the AMIL and the AMMO balancing authorities and the Ameren Services Company transmission operator have 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.

Ameren operators, management, and support staff are knowledgeable and competent. The company has a high regard for safety and has initiated policies and research to improve its safety program. To support its operators, the company has developed or provided useful system display screens and analysis programs, and the planning staff works closely with operators on any changes.

The team made multiple recommendations regarding documentation. Improvement in this area will increase consistency in responses to system events and reduce potential issues during emergencies.

Overall, the evaluation team identified 15 positive observations. In addition, the team offers 12 recommendations that, if implemented, will enhance Ameren's readiness to operate reliably and maintain the reliability of the bulk power system. The findings are listed in order of importance.

Positive Observations

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

1. Dynamic EMS displays provide a clear and comprehensive view of system to the operators (Section 2.1).
2. Ameren maintains both a static mapboard and dynamic screens of the transmission and distribution system (Section 2.1).
3. Confidential information on physical security redacted from public report. See discussion in Appendix 1.
4. Confidential information on power supply for control facilities redacted from public report. See discussion in Appendix 1.
5. Confidential information on computer systems and support redacted from public report. See discussion in Appendix 1.
6. The real-time contingency analysis program looks well outside the Ameren boundaries and includes external outages (Section 2.3).
7. Reactive reserve monitoring is visible to the operators on one screen (Section 2.1).
8. Ameren uses its dispatcher training simulator to deliver emergency operations training and provide operators with an opportunity to see results of actions in a virtual environment (Section 5.1)
9. The operator training developed a training tracking database that is used extensively for training records, certification information, and quiz scores (Section 5.1).
10. Ameren has helped develop a tool called E-Terravision that will allow operators to see outside of Ameren's system on a generalized basis for a better understanding of the condition of neighboring systems (Section 2.3).
11. The planning groups support operators by delivering and explaining to the operators any changes to the real-time contingency analysis tool and by collaborating with the operators on some future projects (Sections 2.1 and 4).
12. Confidential information on physical security redacted from public report. See discussion in Appendix 1.
13. Ameren displays a commitment to safety practices through benchmarking research, internal policy setting, and ongoing dialogue between operators and their manager (Section 1.1 and 2.2.1).
14. Ameren achieved seamless operations throughout the merger and system cutover with Illinois Power (Section 1.2.1).
15. The company shows a commitment to promote NERC certification among support staff (Section 5.1).

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

3. Expand the capacity and energy emergency plan to include greater detail in all areas of responsibility and expectations to increase efficiency and reduce judgment calls during emergencies (Section 2.4).
4. Expand the system restoration plan to include greater detail in all areas of responsibility and expectations to help achieve a consistent and safe return to normal operations (Section 2.4).
5. Confidential information on plans for loss of control facilities redacted from public report. See discussion in Appendix 1.
6. Confidential information on plans for loss of control facilities redacted from public report. See discussion in Appendix 1.
7. Require that switching orders be reviewed by a second qualified person as an added human error prevention technique (Section 5.2.1).
8. Review and update as required operating documentation, such as sabotage reporting, and capture current operating practices in documented procedures to ensure operational consistency (Section 2.2.3).
9. Confidential information on plans for loss of control facilities redacted from public report. See discussion in Appendix 1.
10. Develop a procedure for verifying that operators receive and understand new operating policies, corporate goals, etc. (Section 2.1).
11. Develop a structured shift-turnover document to ensure a consistency in information exchange (Section 2.1).
12. Develop an Ameren-specific transmission emergency operations plan to help the operations staff ensure personal and system safety during an emergency (Section 2.4).

Discussion

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

1. Culture

1.1 General

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

Three years ago, the organization began a process to revamp its safety program because it was not satisfied with results. The expectation was to create a culture that strived for zero unsafe events. To learn from other companies, Ameren reviewed benchmarking processes to identify best practices. Key performance indicators at corporate and business units target safety and all employees are now required to take a pledge that they will adhere to safety rules. Switching errors, for example, are measured with a goal of zero errors. A specific initiative is the energy delivery group’s seven “rules to live by.” This initiative requires any employee who sees another

employee breaking one of these seven rules to stop the employee and report the incident. The offending employee is sent home for violating these rules. The team recognizes this application of safety awareness and daily focus as a positive observation; further discussion can be found in section 2.2.2.

Ameren strives for excellence in reliability; however, this report included several near duplicate observations and recommendations stated in the 2004 report. The team fully understands the effect of the mergers and other business changes that have taken place since 2004, but is concerned about the overall reliability focus. On the positive side, the successful implementation of business changes without disruption of load was a huge accomplishment and stands on its own merit. It is the opinion of the team that some of the recommendations contained in the 2004, which are now in this 2007 evaluation, merit priority status.

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.

Ameren completed its merger and system cutover with Illinois Power, forming what is now AMIL in a fashion that was seamless to the customers of both regions. The team considers this accomplishment to be a positive observation. Acquisitions of other companies provided the opportunity to align equipment and cut over. The organization also ensured that it kept the local talent to help transfer knowledge of those systems.

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.

Ameren encourages an open-door policy between its management staff and its system operators, which includes occasional corporate-level management visits to the control room. The evaluation team believes this provides a strong basis for the higher levels of employee engagement. In most interviews, the understanding of commitment to high standards was noted.

As discussed in both the culture and safety sections, leadership needs to be the driving force for company initiatives. Accordingly, every meeting between the CEO and his leadership begins with safety as the first topic of discussion.

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.

Ameren uses switching errors, transmission-related customer loss of service hours, CPS performance, and compliance with reliability standards as key performance indicators. The team

agrees that Ameren's participation in the MISO owner/operator forums helps provide benchmarking against other transmission providers. Training is not tied into performance appraisals unless it is developed for a specific observed need.

1.2.4 Human Resources

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

Ameren has developed a succession plan focused more towards upper management. Although it is a goal of the operations manager, there is no true succession plan for the system operators. The operational manager has had no difficulty in acquiring additional personnel when the need to fill a position was justified, and Ameren has additional staff certified who are considered to be the next system operators.

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 operational staff manager has an open-door policy, which provides the opportunity for better employee engagement. The manager receives regular feedback from system operators concerning what they feel should receive focus. Follow-up on the suggestions is done with the other transmission operations supervisors and their supervision.

Corporate strategies are communicated annually via the corporate e-mail. Draft corporate scorecards are then developed based on input from each section of the organization. The operations manager then meets with the team to develop its scorecard in support of those corporate strategies. Typically, the scorecard will include safety, reliability, and operational performance. Ultimately, the final scorecard is circulated throughout the organization, and pieces of the scorecard are incorporated into compensation (individual performance and overall business area performance). System operators are not usually included in the score card development process; however, their supervisors do provide input.

2. Fundamentals of Operations

2.1 General

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

Ameren has a robust energy management system (EMS) for monitoring its portion of the bulk power system. The EMS has adequate line loading and voltage displays and effectively controls the generation to meet the load balancing requirements. The dynamic EMS displays, which must be seen from a system operator's perspective to fully appreciate the quality, provide a clear and comprehensive view of the system, and the team recognizes the displays as a positive observation. The evaluation team also commends — via a positive observation — Ameren for maintaining both the static mapboard and dynamic screens of the transmission and distribution

system. This combination provides the operator with a visual overview along with the necessary system details, allowing the operator to make meaningful and accurate real-time decisions.

Ameren controls voltage to within 5 percent of nominal and has automatic voltage regulators on all units. Plant personnel immediately notify the system operators if the regulators are out of service. The system operator then notifies the reliability coordinator. Ameren's real-time contingency analysis solves for post-contingency voltage. The reactive reserves are contained in a single user-friendly display. This display can be a valuable tool during events when voltage support can help in the event mitigation. The evaluation team commends Ameren for consolidating reactive reserve information in a single display for the operators and considers it a positive observation.

Ameren enters shift information into an electronic log and also uses "relief notes" to ensure all the important information is passed on from the current operators to the next shift. The system operators follow a checklist to verify everything is working as expected. The shift-turnover seemed effective during team observation, but Ameren does not have a formal written process. The evaluation team recommends that Ameren develop a structured shift-turnover document to ensure that all necessary and important information is brought to the next shift's attention.

Providing relevant information to the system operator and the operations staff is an important part of the business. At Ameren, the supervisor brings all new procedures to the operator on duty and follows up with e-mail notification. In separate discussions with various levels in the organization, there was a slight, yet obvious, disconnect in how information was actually received and how the information was followed up on to ensure understanding. Currently, Ameren does not have an established procedure to verify that the operators have received or read the e-mails. Although we are confident in the line supervisor's desire and intent to make all of this occur, the evaluation team did not sense any verification that the operators understood policy and procedural changes. The evaluation team recommends that Ameren develop procedures for verification that operators have received and understand new operating policies, corporate goals, etc.

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.

In each of the operator, line management, and upper management interviews, the evaluation team members sensed a high regard for safety and would characterize the Ameren safety program by stating the company practices what it preaches. As an example of this, the team recognizes that this safety remained a priority even through the mergers and the concurrent unbundling of the utilities, which often seem to value cost as the highest priority. The evaluation team recognizes Ameren's commitment to safety as a positive observation.

The team did, however, identify a concern for the procedure used by Ameren to conduct transmission switching activities. Details, along with a recommendation, can be found in Section 5.2.1.

Ameren has one special protection system, and the operators are familiar with the system and its purpose. Normally armed, the special protection system would only be disabled for maintenance at which time the disabling would be logged. The EMS does not automatically monitor the status of the special protection system.

2.2.2 Operational Decision-Making

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

In addition to internal review, daily operations are monitored by MISO. Ameren and MISO communicate on a regular basis. Decisions affecting the Ameren footprint, but not immediate in nature, can and will be discussed with MISO.

Ameren Operations maintains a standing order of “no surprises” regarding information flowing to the operations manager. Any issue considered important to the operator is to be communicated to the manager. The manager then follow up with a response intended to address the concerns and resolve the issues. Operators receive periodic reports from the manager to gain an understanding of what is taking place both inside and outside of operations.

2.2.3 Operational Alignment

Organizational structure supports safe and reliable system operation.

Based on team review, Ameren’s operating agreements with all neighboring entities and MISO are adequate. Ameren has the necessary agreements in place to safely and reliably operate its footprint while interconnected to the grid.

The transmission planning group evaluates each outage request to identify any local problems on the Ameren system and potential problems to a neighboring interconnection. If the Ameren analysis proves workable, the outage request is entered into the MISO outage scheduler for MISO evaluation and final approval or rejection. Outage requests do include protective devices and telemetering equipment.

The operators have the authority to make system operating decisions without obtaining higher management approval. The operators interviewed feel comfortable about their authority to dispatch units and to take any actions necessary up to and including manual load shed.

Ameren has a need to develop a new methodology for reviewing, modifying, and documenting its operating policies, plans, and procedures. The company needs to investigate a better method of ensuring that documentation is current and adequate for effective operations. The evaluation team recommends that Ameren review and update its operating documentation, as required. Sabotage reporting is an example.

Similarly, Ameren has a need to capture all of its current operating practices and develop them into documented procedures. In multiple interview sessions, employees within the operations group were asked to show a documented plan for addressing different issues or events. Responses indicated that they usually did know what to do but had no written procedure to back it up. Again, the development of these procedures should include some documented review plan.

2.3 Managing System Configuration

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

The Ameren EMS, which runs on fully redundant servers, monitors the generation, transmission, and some distribution equipment. The system was upgraded in 2006 and is operating on the latest release of software from the supplier. All local area network (LAN) communication is fully redundant with circuits running at 1 GB/sec. All EMS servers are separated from the corporate system and other external systems (such as MISO) by redundant firewalls.

Ameren has a robust real-time contingency analysis program that evaluates the effect of outages and ranks them by severity. The state estimator and real-time contingency analysis run every six minutes. Transmission planning and operations work together to ensure correct contingencies are monitored. The results of seasonal assessments are also used to update the contingency list. Real-time contingency analysis includes the status of the special protection systems and evaluates the system appropriately. The real-time contingency analysis program includes the neighboring electric system, including the modeling of each neighbors' outages. The evaluation team cites this ability to include neighbor's outages and the total wide-area view as a positive observation.

Somewhat tied to the contingency analysis efforts mentioned in the previous paragraph is Ameren's key role in the development of the E-Terravision tool, which provides a much wider view of the grid for entities involved in the process. E-Terravision will allow Ameren to see outside of its system on a generalized basis to give the operators a better understanding of the condition of neighboring systems. The commitment to provide resources and expertise in an effort to better manage the reliability of the grid is truly commendable. For its future role in improving reliability, the evaluation team cites the Ameren efforts in development of the E-Terravision as a positive observation

The Ameren footprint includes some significant nonconforming loads that continually create difficulties in area control error (ACE) management. Managing these major swings is mostly accomplished by the EMS response. Since the MISO market process uses a 15-minute look-ahead forecast based on current values, significant load swings can create forecast errors. Ameren operators must at times make manual adjustments to address these issues, meaning more operator intervention is required to follow the large load swings. The balancing authority operators and MISO work together to respond to these load swings.

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.

Emergency preparedness requires a combination of well-prepared procedures and documented plans with operator practice. Ameren has a capacity and energy emergency plan in place. The procedure, however, is minimal in detail. The evaluators expected to see more substance with more clearly defined roles and responsibilities. The team recommends that Ameren review and expands its capacity and energy emergency plan and adds greater detail.

Similarly, the team recommends that Ameren expand its system restoration plan to include greater detail in all areas of responsibility and expectations. The current plan lacks specificity.

Related to improving current plans, the team recommends that Ameren develop a comprehensive transmission emergency operations plan.

Ameren has two nuclear plants in its area and has agreements with plant operations that include the operating requirements. The plant voltages are included in the real-time contingency analysis. The plant auxiliary loads are doubled to ensure adequate voltage in the event of a unit trip, since that is the most severe voltage contingency. Ameren has not had to report any voltage excursions since the year 2000.

3. Fundamentals of Maintenance

3.1 General

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

Ameren staff performs maintenance activities related to the control center and communication system equipment. Ameren has a corporate staff responsible for providing continuous support for its EMS and supervisory control and data acquisition (SCADA) equipment, as well as the required computer equipment used in the control centers. Support personnel are available on a continuous basis and may be called by system operations personnel or alerted automatically if a need occurs.

Ameren supplies the system operators with a display that shows the identities of on-call support personnel and details for how they can be contacted if needed.

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.

Ameren operates a reliable transmission system. Other than one major ice storm, which had some significant effect, there have been no major problems. From an EMS perspective, the longest disruption in system view for the operators has been about 15-minutes due to issues during an upgrade. These issues were worked around and resolved by rolling back to the previous system condition. During this time, the operators informed MISO to focus attention on the Ameren system.

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.

Ameren operators are provided with quality visibility, which is essential to operations. The Ameren transmission mapboard is designed such that any hardware or electrical failure affects only one section. Mapboard computer hardware and servers have a three-year scheduled replacement cycle. Plasma screens do not have a scheduled replacement cycle based on experience and the availability of a spare screen in inventory.

When issues arise for network or data problems, operators create a trouble ticket as part of a corporate system called REMEDY. This process could be a good industry practice, but currently lacks any method of tracking. Ameren is looking into some sort of tracking component for this effort.

4. Fundamentals of Operational Planning

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

Ameren uses industry-standard software for performing system studies, including the EMS vendor's state estimator and real-time contingency analysis program. The model for the study tool and the real-time contingency analysis is developed by the planning department. As the reliability coordinator, MISO also performs planning studies and real-time contingency analysis of the Ameren system and surrounding area. Having both Ameren and MISO perform these studies from different perspectives increases the reliability of the electric system.

The transmission planning department is responsible for keeping system models updated. Ameren uses the MMWG model for updating the electric system of surrounding transmission providers. Changes made to the Ameren system are updated in the Ameren study model, and the online model is then sent to MISO to be included in its updating process. MISO has a Web-based application for receiving and distributing system changes or updates when equipment is removed from or returned to service. Ameren is currently reviewing the reactive capacity in its transmission area and has plans to add capacitors in areas needing additional reactive reserves. Also, Ameren is adding a 161 kV loop and planning an additional 345 kV loop to maintain voltages in areas identified as needing this additional support.

Transmission planning studies concurrent outages on several major generators within localized planning areas to verify the system is robust enough to withstand extreme generation outage contingencies. Ameren then utilizes this study to verify adequate reactive reserves are available to withstand the loss of these significant reactive resources. In essence, Ameren planning studies consider contingencies exceeding the required n-1 contingencies.

Ameren has just completed a three-year study to verify that all the substation equipment ratings matched the ratings used in the planning studies. This study involved every substation on the system and included field visits if necessary. Ameren also recently completed a power flow study that included more detailed substation information to the bus tie level. Ameren now believes that it has correct power factors for all its substations for improved system modeling.

Ameren does traditional season planning studies in conjunction with MISO. Studies are done under maximum power and reactive power requirements. Ameren validates the power factors to ensure study accuracy. These seasonal studies identify system constraints and are reviewed with the operators and then included in the real-time contingency analysis.

Ameren performs day-ahead evaluations using the MISO model for that day. Ameren uses the MISO model along with a supplemental local information model to evaluate system conditions for the next month. While Ameren studies focus more on local issues, MISO does similar studies with an emphasis on the wider area. Although differences seldom occur, Ameren and MISO planners quickly resolve any discrepancies.

Transmission planning works closely with the system operators. When the operators see an unusual situation or experience operating issues, transmission planning will evaluate the situation immediately. The system operators feel well supported by the planning group. In addition to real-time efforts, some future projects are developed based on a collaborative effort with the system operators. Each time updates are made to the real-time contingency analysis tool, the information about these changes are delivered and explained to the operators. The evaluation team commends Ameren planning for its support and availability to operations; the team recognizes this effort 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.

Ameren is a NERC-approved continuing education provider. Ameren staff includes a dedicated trainer.

The team found the initial training program for new system operators to be of sufficient depth. Initial training starts with 11 proven vendor-provided computer-based modules accompanied by supplemental training on the NERC standards. The trainer assists the trainees as they go through

the self-study modules. This preparation for the remainder of the initial training usually takes about two weeks. This training is also used by plant operators to gain NERC certification.

Once this preparatory training is completed, the trainee begins specific transmission operator training. Training includes transmission system operations, switching and tagging, SCADA equipment, EMS, and alarming. The above courses are covered in four text books and take about three months to complete.

The final module for the new operator is the on-the-job training portion. This takes at least three months to complete and ends with an oral review by the training supervisor and the control center manager. The control center manager makes the final determination when the trainee is ready to assume shift responsibility.

A job task analysis was performed to determine training needs, and all training documents include scope, objectives, outlines, and handouts for each topic.

Ongoing training is focused on the NERC-required 32 hours, which is accomplished using the dispatcher training simulator at the control center. Ameren has six, six-hour simulation courses. It also has computer-based training courses available for the continuing education hours required for NERC operator certification. Operator training includes the NERC standards and simulation exercises. Operators have additional training opportunities through MISO, but not all operators have attended the MISO seminars.

System operators do not have a specific ongoing training program. The trainer indicated that he does not have the time to develop a program for them because he must focus on training for so many operators (approximately 40 operators throughout the organization). The training includes quizzes and the quiz results are included in the database. The operators must achieve a score of 70 percent to have successfully completed training on a given subject, except for switching, which requires a perfect score. During interviews, the trainer expressed the desire to create opportunity for further training programs. He indicated that he would like to have more staff to provide him the time to develop new training as well as deliver training. .

The system operator schedule includes training time. The trainer keeps detailed records of the training completed in a database he developed. The database tracks training records for each operator and all NERC-certified staff, including quizzes, NERC certifications, and certification expiration date. The trainer can track records for NERC-approved continuing education hours and report data to NERC. Operators can access the database to view information on available training courses and the type of training hours provided by the courses. This database provides security that gives the trainer a view of all records and gives each individual access to only his or her information. The team was impressed with this database and considers it a positive observation for the both the effort and tracking capability.

Ameren seeks to incorporate any operating lessons learned into its training. For example, any switching errors become subjects for lessons learned training. Ameren does not provide regular training on new or revised policies and procedures. The evaluation team recommends that

Ameren develop a procedure to verify that operators receive and understand new policies, procedures, corporate goals, etc.

Ameren has quality training facilities. The operators have a separate area for training on the dispatcher training simulator. The training simulator is used to provide all emergency operations training, and the trainer indicated that the simulator has been very beneficial to the operators. This simulator provides an opportunity for operators to see the result of their actions in a virtual situation rather than in real time. This also gives Ameren an opportunity to review the operator response to system events and determine if the action was appropriate. The team reviewed the simulator and commends Ameren for acquiring, developing, and effectively using the simulator. The simulator is a “standalone” system that has the capability to take snapshots of actual system conditions and use that real data for the basis of a simulation exercise.

All continuing education training at Ameren includes a participant feedback form that is used to improve the training program. Ameren does not have a documented method of obtaining input for improvement to the training program, but the trainer informally seeks feedback from the operators for improvement. The successful completion of the course quizzes and the number of operators receiving certifications are indicators to the trainer on the success of the training.

Although there are no required teaching credentials or formal job description for the trainer, he has a degree in education and is NERC certified. The trainer participates in the MISO operator training working group and NERC train-the-trainer workshops. He is also a member of the Energy Provider Coalition for Educators and the Bismarck State College Electrical System Advisory Board.

Ameren encourages NERC certification, requiring it for all positions in the control center. Some plant operators are also certified. The team commends Ameren for encouraging support staff certification.

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.

Ameren proactively utilizes its simulator to re-create real-life scenarios. This practice stimulates discussions regarding actions that were taken during an operating event, as well as the results of those actions, in order to train system operators in human error prevention.

Ameren does not require any review of switching orders by anyone other than the author. Being that this is directly opposite of the trend in the industry, the question was brought up to management as to why they do not require additional review. Ameren’s response indicated a belief that making one individual responsible for switching assignments without having a second person review makes errors less likely. Having a second person review makes the responsibility for switching unclear. The evaluation team discussed this position and unanimously voted to disagree with Ameren’s philosophy, citing many corporate switching orders that mandate a

second-party, and in some cases a third-party, review prior to issuing switching orders. The team feels that Ameren should reconsider its position. Accordingly, the team recommends that Ameren require switching orders to be reviewed by a second qualified person as an added human error prevention technique.

The team understands that an Ameren employee is scheduled to attend a MISO seminar for training system operators on decision making and risk analysis.

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.