Final Report
Verification/Monitoring
Investigation of Wind and
Ice Storm Preparedness and Restoration of
Ameren Illinois

Presented to the:

Illinois Commerce Commission

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I. Summary

A. Introduction

After storms in the summer and early winter of 2006 caused many, lengthy service interruptions in the territory served by the Ameren companies in Illinois (Ameren-IL), the Illinois Commerce Commission (ICC) asked for an investigation to determine whether those companies:

- Appropriately planned, designed, constructed, inspected, and maintained their electricity delivery systems
- Adequately planned, prepared, and executed service restoration efforts following the July 2006 windstorms and the November/December 2006 ice storm.

In late August 2007, the ICC and The Liberty Consulting Group (Liberty) executed a contract for that investigation. Liberty issued its final report, which contained over 150 recommendations, on the investigation on August 15, 2008.

In November 2008, Ameren-IL issued a plan for implementing Liberty's recommendations. The ICC contract also provides for a Phase 2, which is a series of quarterly verifications to measure Ameren-IL's progress in implementing the recommendations and any initiatives Ameren-IL planned to undertake. Liberty issued quarterly reports on Ameren-IL's progress and the status of Liberty's review. This is the 16th and final quarterly report on Liberty's verification work.

This report contains two major sections. This introductory section names areas in which Ameren-IL made significant improvements since 2006, particularly important areas of change, and a few areas in which Ameren-IL's improvements remain in progress. It identifies these more significant recommendations by number (e.g., III-1). The second major section contains reports on each recommendation.

B. Background

In its 2008 final audit report, Liberty concluded that, despite the large number of areas in which Ameren-IL can improve, Ameren-IL acceptably planned, designed, constructed, and maintained its electric delivery systems, and that it worked very hard to restore its customers' service following the 2006 storms.

Liberty also concluded that the interference of vegetation with overhead electric facilities caused much of the storm damage. While Ameren-IL could not have reasonably avoided some of this damage, improvements to vegetation management practices would improve service reliability and lessen the consequences of future storms. In addition, prior to the 2006 storms, Ameren-IL did not systematically inspect its distribution systems and this likely contributed to the negative effects of the storms.

Liberty also found that Ameren-IL experienced significant failures in its call center telephony systems during the extremely high volume of calls received during 2006 storms. These problems contributed to customer dissatisfaction with Ameren-IL's performance. With regard to

Emergency Planning, Liberty concluded that numerous specific areas needed improvement, there were inconsistencies among the plans, and there was a lack of familiarity with the existing plans.

Liberty's work at Ameren coincided with the integration of three utilities (CIPS, CILCO, and IP) that served in Illinois. At the same time, Ameren-IL was responsive to Liberty's recommendations. The combination of implementing standard and best practices from the legacy companies and Ameren-IL's clear objective of implementing Liberty's recommendations in effective and efficient ways has resulted in a company whose performance during storms and outages has improved and whose customers should see improved reliability during normal operations.

C. Storm and Outage Performance

Several of Liberty's recommendations related to the content and use of emergency plans. These included III-1 through III-5, III-8 through III-11, IV-29, -31, -34, -48, -50, and -51. In its implementation of these recommendations, Ameren-IL rebuilt its plans from the beginning, rather than attempting add-to or change sections of the old plans. This approach resulted in comprehensive yet user-friendly plans. Ameren-IL demonstrated effective education, training, and exercising of all facets of emergency response. Ameren-IL developed consistency in its emergency response across its operating divisions and various parts of the organization. Finally, Ameren-IL has recognized the importance of objective self-assessment in maintaining and improving its emergency response.

Ameren-IL has displayed a clear understanding of the importance of providing meaningful and accurate information to its customers, particularly during storms and electric service interruptions. It made significant improvements in the telecommunications systems (IV-22 and -26), communications plans (III-10, IV-23, and -24), and providing estimated restoration times (IV-19). It made improvements to the Outage Analysis System (OAS). Ameren-IL expects to have its new Distribution Management Systems (DMS) fully implemented by the end of 2013. This should result in even better outage management and customer information.

Liberty recommended that Ameren-IL establish a more proactive, aggressive approach in procuring and mobilizing outside resources in advance of the onset of a major outage event (IV-5). In its implementation, Ameren-IL addressed the issue of advance warning of an impending major outage. Enhanced procedures with the weather vendor, increased diligence in ongoing monitoring, and the aggressive pursuit of a predictive model all contributed toward that goal. Ameren-IL also improved processes and increased efforts in advance recruitment of outside help.

With regard to the flow of timely information from field crews (IV-44), Ameren-IL developed explicit guidelines in all operating division emergency plans, reviewed the performance after each event, and conducted numerous training sessions. The performance in this effort has suffered due to a lack of acceptance from division leadership. Ameren-IL has restructured its organization and added a position to which all division heads report under the operating vice president. This individual is responsible for monitoring and directing the response efforts in each division, including the issue of daily reports from field crews. The strong emphasis and support

of the Ameren-IL operating vice president has been helpful in bringing along compliance in this area, and Ameren-IL reports continuing improvement.

Liberty had pointed out the need for Ameren-IL to identify and train in advance an adequate number of employees to serve as Field Checkers and Public Safety Advisors during a major outage restoration (IV-46). Ameren-IL pursued implementation of this recommendation by first identifying employees in the organization with the requisite skills to perform the tasks of these two roles and conducting necessary training. As a result, a number of Field Checkers and Public Safety Advisors were prepared and responded in subsequent storms. Ameren-IL continued to monitor the performance in this area. In the early stages of implementation, the performance in this area still needed improvement. Ameren-IL intensified its efforts and now the performance in these two important areas meets expectations.

D. System Design, Maintenance, and Inspection

One of the most significant changes and improvements that resulted from the Liberty audit and the integration of the three legacy companies was implementing uniform distribution construction standards (V-20), developing a common engineering manual (V-21), and employing uniform distribution design processes (V-22). The benefits of these initiatives are many, and include better purchasing efficiencies, the use of best practices, and improved training and customer interaction. One aspect of this standardization, the common engineering manual, still requires considerable Ameren-IL effort to complete.

Another very important improvement that Ameren-IL accomplished concerns its inspection practices. It has put into practice a thorough circuit inspection program (VI-9), regular and comprehensive pole inspections (VI-10), an improved substation inspection program (VI-5), and a common inspection program for equipment such as regulators, switches, capacitors, and line reclosers (VI-11). Ameren-IL will see the benefits of these efforts in improved reliability and storm performance.

Liberty recommended that Ameren-IL improve its underground distribution cable program (VI-12). Ameren-IL's implementation of this recommendation resulted in a new focus on underground cable failures and the timely repair of underground looped systems.

Recommendations called for an increased concentration on lightning performance and protection (e.g., V-37 and VI-26). As a result, Ameren-IL has a heightened awareness of lightning-caused interruptions, and has installed and replaced lightning protection devices.

Several of Liberty's recommendations were associated with the methods and depths to which Ameren-IL evaluated its electric delivery system. As examples, Liberty recommended that Ameren-IL improve the information systems available for judging system conditions (VI-29), improve the analysis and reporting of incidents and equipment failures (VI-30), better analyze conductor galloping (V-10), consider low-probability but high-consequence events such as a total loss of a substation (V-7), and institute a formal root-cause analysis program (VI-31). Taken together, Ameren-IL's implementation of these recommendations brought about an improved culture of self-assessment. Individually, the implementation resulted in specific changes such as

the installation of anti-galloping devices, the introduction of the Distribution Management System (some of which remains to be implemented), and the improved inventory of portable electric delivery equipment.

II. Recommendation Verification Reports

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Recommendation

I-1

Establish an effective quality assurance program that is applicable to all of Ameren-IL and that ensures consistency in construction, maintenance, inspection, design, and planning of the electric delivery systems.

Background

Ameren-IL said that it established a quality assurance program in May 2007. This occurred after the timeframe of Liberty's investigation and Liberty had not reviewed the program's effectiveness. Ameren-IL said that a focus of the program was line construction. This is a reasonable and important heart of a quality assurance program. However, the program's applicability to maintenance, inspection, and design could yield significant benefits.

Ameren-IL's Implementation Plan

Ameren-IL agreed with the recommendation of expanding the quality assurance program to assure consistent standards and practices across the Illinois footprint.

The initial effort was to help verify that construction was meeting all applicable standards, codes, and plans. There was one individual performing this function, and Ameren-IL planned to add another auditor in 2008, and a third by the end of 2009.

Ameren-IL indicated that it would develop a process for selecting engineering projects for quality review by the end of 2008 and implement the process in 2009.

Ameren-IL initiated Quality Assurance work on inspection and maintenance activities in August 2008. Ameren-IL indicated that two individuals are randomly selecting circuits for review and reporting on any maintenance work required, as well as verification of the thoroughness of the inspection work recently taking place on the given circuits.

Verification Discussion and Conclusions

During an interview in May 2009,[1] Ameren-IL's personnel described various aspects of what it called a quality assurance program. The different aspects included planning, design, materials, distribution line construction, vegetation management, transmission line design and construction, and oversight of pole and circuit inspections. In general, Ameren-IL has some type of Ameren oversight, or quality assurance, of contractors who perform various field activities. For work performed by in-house organizations, Ameren has various quality control mechanisms in place but generally does not employ any independent quality assurance methods or auditors. Ameren-IL indicated that it audits distribution construction performed by in-house personnel. Ameren-IL also plans to use one person whose total job will be distribution engineering and design review.

Construction QA

Ameren-IL indicated that it does post-construction audits of distribution line construction work performed by contractors. About November 1, 2008, Ameren-IL started performing post-

[1] Interview #239, May 6, 2009.

inspection audits of distribution construction work performed by Ameren crews. Ameren-IL indicated that there are about five to ten of these audits per division per month. Ameren-IL provided and Liberty reviewed a list of audits and audit findings that an Ameren-IL individual conducted during March and April 2009.[2] The listing included 73 violations of National Electric Safety Code (NESC) and Ameren standards. The audits appeared to find important items for correction, such as:

- "Ineffective insulator placement in down guy
- "No wildlife protection installed
- "No cap on lightning arrester
- "Service drop ground clearance less than …"

Economic conditions and Ameren's financial situation have affected the implementation schedule set forth in Ameren's initial plan. Ameren-IL indicated that it hired a second auditor in March 2009 and plans to have the third auditor in place in 2010.[3] In February 2012, Ameren-IL indicated that management approved the requisition for the third auditor, and expected that it would fill the position within a couple of months.[4] At the same time, Ameren-IL said that it has seen improvements in its construction work resulting from the quality efforts. The implementation of company-wide standards has been an area that resulted in some QA findings as the company makes common its construction work.

In May 2010, Liberty reviewed the status of Ameren-IL's construction QA.[5] Ameren-IL has two construction auditors, who are both highly experienced. Ameren-IL described the process for selecting jobs for audit, conducting the audit, and follow-up on the deficiencies.[6] For audits of Ameren-conducted construction that included deficiencies, QA holds a meeting with the division to give and obtain feedback. All deficiencies are included in a corrective action database. Operations Support tracks and closes items for contractor construction. The divisions close Ameren-constructed deficiencies, but QA can monitor and track the closure. The corrective action database is a relatively new tool developed for tracking QA-identified issues.

The QA auditors recently started issuing bulletins that are intended to provide information on standards revisions, identify trends seen in the field needing correction, give advance notice on issues that QA will be looking for during audits, and publish answers to questions from exit meetings.[7] Ameren provided and Liberty reviewed a recent summary of audits conducted in one division.[8]

Other QA Efforts

Ameren-IL indicated that it has a program for quality review of vegetation-management contractor work. Liberty will review this item in detail in relation to Recommendation VI-37. For

[2] Response to Data Request #1189.
[3] Interview #239, May 6, 2009, response to Data Request #1183, and comments on draft interim report.
[4] Interview #469, February 6, 2012.
[5] Interview #361, May 4, 2010.
[6] Response to Data Request #1413.
[7] Interview #361, May 4, 2010 and response to Data Request #1421.
[8] Responses to Data Requests #1414 and #1415.

this recommendation, Liberty requested that Ameren-IL provide samples of audit reports for Liberty's review.[9] Liberty reviewed the Ameren-IL response, and found that the audits appeared to be numerous, extensive in scope, and detailed in finding documentation. In an interview conducted in August 2009, the Ameren-IL superintendent of vegetation management indicated that the audits were valuable in holding contractors to Ameren-IL requirements and in being thorough in their work.[10] Liberty reviewed some of the completed audit forms with the superintendent.

With regard to transmission-line vegetation management, responsibility remains with Ameren Services in St. Louis, even though there are people stationed in and responsible for work done in Illinois. Liberty inquired how Ameren-IL management knows whether the transmission vegetation-management work is up to date and performed to requirements.[11] Liberty reviewed the Ameren-IL response and concluded that it did not provide reasonable assurance to management that transmission line work was up to date and thorough. In an August 2009 interview, Ameren-IL indicated that it would attempt to supplement the information provided to Liberty.[12]

In May 2011, Ameren-IL provided[13] and discussed[14] the report Ameren Transmission now provides to Ameren-IL management. The reports include an overall summary of progress, a discussion of any variances between scheduled and actual progress, and detailed listings of each transmission line indicating scheduled and completed vegetation work.

Ameren described the processes it uses in transmission design, engineering, and construction. They included various quality control measures such as design reviews at 30, 60, and 90 percent completion. None of the measures described constituted what Liberty would classify as independent quality assurance.

Liberty reviewed progress on engineering QA during a May 2010 interview.[15] Ameren recently initiated a QA process across Illinois that is similar to that used by Ameren-IP before the merger. The process has four phases:

- A pre-release review and approval of design drawings
- Certification by construction of compliance with the engineering design and standards
- A method of capturing construction feedback to engineering
- The regular review of issues for improvements to standards, design practices, and training.

Ameren-IL had not fully implemented this program. However, in February 2012, Ameren-IL said that with the realization of its second design center, it fully implemented the engineering and

[9] Data Request #1191.
[10] Interview #277, August 12, 2009.
[11] Data Request #1190.
[12] Interview #277, August 12, 2009.
[13] Response to Data Request #1525.
[14] Interview #434, May 12, 2011.
[15] Interview #361, May 4, 2010, and response to Data Request #1412.

design QA program.[16] QA feedback on matters such as crew preferences, materials, and customer preferences has been valuable.

Ameren-IL indicated that it performs audits of contractor ground-line inspections. Liberty requested and Ameren-IL provided a sample of the quality audit reports.[17] It appeared that the Ameren-IL quality review was limited to checking a sample of poles that the contractor already classified as reject or restorable. In February 2012, Ameren-IL clarified the scope of these quality reviews.[18] The responsible Construction Supervisor indicated that he monitors the work of the ground-line inspection contractor several times a month. He also independently checks hard-to-get-to poles and other areas of difficult accessibility to assure that the contractor is complete in its work.

Ameren-IL also indicated that it performs quality review of the work done by contractors on circuit inspections. Ameren-IL audits about ½ of 1 percent of the circuit work (by number of poles). Ameren-IL provided a sample of audit reports generated in 2009.[19] It appeared that the focus of the quality audits was to verify the accuracy of deficiencies noted by the contractor. In a 2012 interview, Ameren-IL said that it has two individuals who monitor the quality of the contractor's work, not just to verify contractor-identified deficiencies.[20] Ameren-IL said that these individuals get out in the field six to ten times per month.

Liberty's verification work on this recommendation is complete. Ameren-IL appears to have a positive attitude and an understanding of the benefits of an effective QA/QC program. Liberty is satisfied that Ameren-IL has made significant strides in this area, and clearly has a broader and more meaningful quality program than when Liberty first reviewed the area in 2008.

[16] Interview #469, February 6, 2012.
[17] Response to Data Request #1193.
[18] Interview #469, February 6, 2012.
[19] Response to Data Request #1194.
[20] Interview #469, February 6, 2012.

Recommendation

II-1

Improve service level agreements with weather service providers. Engage weather service providers more aggressively.

Background

Liberty recommended that Ameren-IL establish written service level agreements with weather services providers with explicit criteria for notification timeliness and qualifying severity conditions prior to and during severe weather including significant changes in forecasted and actual weather phenomenon. The criteria should address at a minimum the content, notification thresholds of qualifying severity conditions, and timeliness of significant weather conditions notifications. The service level agreement should also address the content, timing, and confidence levels communicated in forecast services. The service level agreement should define the transmittal protocols and distribution call-out policies for after-hour notifications.

Liberty also recommended that Ameren-IL engage more interactively with its weather service provider to affect an improvement in Ameren-IL's preparedness for severe weather. Ameren-IL should engage in direct contact with weather service providers in the event of severe weather prediction or detection to improve its understanding of weather prediction assumptions, modeling weaknesses, and confidence levels of weather service intelligence. Ameren-IL may need to develop scripts, teleconference formats, or other appropriate methods to extract better forward business intelligence from weather service providers during these interactions.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation and considered its actions complete. The signed contract with weather service provider is in place. Capabilities provided through this weather service are available on-line 24/7/365. Ameren-IL's Emergency Operations Center (EOC) staff engages the weather service provider through on-going, detailed inquiries into forecasted conditions that might negatively affect the Ameren-IL service territory.

Verification Discussion and Conclusions

In January 2009, Liberty conducted on-site interviews and reviewed data furnished by Ameren-IL in response to data requests, and found the following:[21]

- The signed contract with weather vendor DTN/Meteorlogix is in place.
- The service provided by DTN/Meteorlogix is not Ameren-specific (i.e., not customized to Ameren-IL's service area exclusively) and is primarily "off the shelf" with some customization.
- Weather vendor sends alerts on lightning strikes.
- Ameren does not receive alerts on winter storms. They do receive regular severe weather forecast updates for a 3-day period, which would include winter storms.
- Ameren has implemented a more aggressive interrogation/interaction process with the weather vendor.

[21] Interview #214, January 28, 2009, and responses to Data Requests #1005, #1007, #1036, and #1040.

- Communications with the weather vendor are almost exclusively e-mail to facilitate documentation. Very seldom do Ameren response team members talk to weather vendor by telephone. One member of the Ameren-IL EOC (Emergency Operations Center) team almost exclusively handles contacts with weather vendor.
- The EOC sends copies of e-mail responses from the weather vendor to all members of the Ameren-IL response team.
- Dispatchers – who are on duty 24/7/365 – have access to this weather tool and contact the supervisor on-call upon notification of any significant weather developments.

In August 2009, Liberty conducted an on-site interview and reviewed data furnished by Ameren-IL, and found:[22]

- Ameren-IL experienced two major outage events in the second quarter of 2009. These were May 8-15, affecting Division VI, especially Marion and Carbondale, and June 18-21, affecting Division I (Peoria, Elmwood, and Galesburg), Division II (Quincy), and the entirety of Division IV.
- During both of these storms, two-way communications between Ameren-IL and the weather vendor were handled via e-mail.
- The content of the e-mails was concise, and e-mail responses from the weather vendor were timely.
- Ameren-IL initiates the e-mail communications when the potential for a major weather event arises.
- Ameren-IL believes the weather vendor missed the forecast on the May storm. The June storm came in earlier than forecast. No forecasters predicted either one of the storms accurately.
- Ameren-IL does not believe that it would have done anything differently, even if the weather predictions had been more accurate.
- Ameren-IL has identified two more individuals who can manage the e-mail communications in the event of the absence of the primary contact.
- Ameren-IL is satisfied that the e-mail communications process with the weather vendor is meeting its needs, and overall it is satisfied with the performance of the weather vendor.

Since November 30, 2009, Liberty has been receiving and monitoring the e-mail communications between Ameren-IL and the weather vendor.[23] Liberty also had ongoing discussions of these communications with Ameren-IL.[24] The e-mail communications are proving to be an effective means to communicate with the weather vendor and to engage the vendor in aggressive pursuit of information concerning potential weather events. They provide a good means of documenting the efforts by Ameren-IL in preparing for a major weather event. Several emergency response organizations throughout the geographic region view the communications. Ameren-IL has been using this system for several years with a number of significant outages and threats of outages, and the system is accomplishing its intended purpose.

[22] Interview #285, August 12, 2009, and response to Data Request #1242.
[23] Response to Data Request #1339.
[24] Interview #359, February 11, 2010, Interview #464, November 7, 2011.

The tables below show the activity of the Ameren-IL EOC with the weather service provider and the Ameren-IL response organization for the past 24 months.[25]

Type	Definition													2010
		J	F	M	A	M	J	J	A	S	O	N	D	Total
Inquiries	A formal communication to the weather vendor requesting clarification or additional detail					13	19	11	19	9	5	7	6	89
Advisories	Formal communication to all AIU emergency response stakeholders outlining the response by weather vendor to inquiries					3	0	1	1	0	1	5	4	15
Alerts	Formal communication to all AIU emergency response stakeholders outlining the response by weather vendor concerning severe weather conditions that are anticipated or imminent.					2	5	3	2	1	1	2	1	17
Updates	Formal communication to all AIU emergency response stakeholders outlining the response by weather vendor to inquiries after an Alert has been issued.					4	11	15	0	0	3	0	0	33
	EOC Activations					0	3	2	0	0	1	0	1	7
	Storm Events Affecting >2,000 customers					1	7	2	3	1	1	0	1	16

Type	Definition													2011
		J	F	M	A	M	J	J	A	S	O	N	D	Total
Inquiries	A formal communication to the weather vendor requesting clarification or additional detail	6	8	4	13	7	7	15	8	2	1	2	0	73
Advisories	Formal communication to all AIU emergency response stakeholders outlining the response by weather vendor to inquiries	1	4	0	3	2	0	0	0	0	0	0	0	10
Alerts	Formal communication to all AIU emergency response stakeholders outlining the response by weather vendor concerning severe weather conditions that are anticipated or imminent.	2	2	1	4	2	7	3	2	0	1	1	0	25

[25] Response to Data Request #1637

Updates	Formal communication to all AIU emergency response stakeholders outlining the response by weather vendor to inquiries after an Alert has been issued.	**1**	**4**	**1**	**15**	**6**	**8**	**4**	**2**	**0**	**1**	**2**	**0**	**44**
	EOC Activations	**2**	**1**	**0**	**1**	**1**	**3**	**1**	**0**	**0**	**0**	**0**	**0**	**9**
	Storm Events Affecting >2,000 customers	**1**	**2**	**0**	**1**	**1**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**9**

Type	**Definition**													**2012**
		J	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**Total**
Inquiries	A formal communication to the weather vendor requesting clarification or additional detail	**8**	**1**	**9**	**8**									**26**
Advisories	Formal communication to all AIU emergency response stakeholders outlining the response by weather vendor to inquiries	**1**	**1**	**2**	**4**									**8**
Alerts	Formal communication to all AIU emergency response stakeholders outlining the response by weather vendor concerning severe weather conditions that are anticipated or imminent.	**1**	**1**	**6**	**7**									**15**
Updates	Formal communication to all AIU emergency response stakeholders outlining the response by weather vendor to inquiries after an Alert has been issued.	**1**	**1**	**6**	**7**									**15**
	EOC Activations	**0**	**1**	**0**	**1**									**2**
	Storm Events Affecting >2,000 customers	**0**	**1**	**0**	**1**									**2**

Liberty reviewed these data with Ameren-IL emergency response leaders in a teleconference in May 2012.[26] It is helpful to understand that on a number of occasions, it was necessary to move directly from inquiries to alerts, skipping the advisory communication. (See the definitions.) It is Liberty's opinion that Ameren-IL's approach remains aggressive and productive in effecting a best-class emergency response.

Ameren-IL has met its implementation plan within its timeframe. The efforts addressed the intent of Liberty's recommendation. Liberty reviewed the communications between Ameren-IL and the weather vendor as well as the Ameren-IL EOC communications to the response organization on an as-it-happened basis. It is apparent to Liberty in monitoring the communications between Ameren-IL and the weather vendor and subsequently to the response organization, that the e-

[26] Interview Request #477, May 24, 2012.

mail communications process initiated by Ameren-IL is accomplishing the intended purpose in this recommendation. Liberty therefore considers its verification work complete.

Recommendation

II-2

Develop an integrated forensics process to examine equipment and infrastructure failures.

Background

Liberty recommended that Ameren gather and index forensic data for storm damage and major equipment failure (*e.g.*, substation) events. The evidence for archival and analysis should include photographic data, meteorological data, design standards, material field condition reports, and other pertinent data. The forensic analysis team should include applicable technical expertise. The analysis should provide an assessment of the correlation of infrastructure failures and forensic evidence gathered. Liberty intends this recommendation to improve Ameren's ability to estimate infrastructure storm damage in future storm events.

Ameren-IL's Implementation Plan

Ameren-IL's plan calls for three tiers of implementation. The Post Disturbance Analysis Committee (PDAC) process addresses major substation equipment failures. Major storms with significant distribution infrastructure damage have their weather parameters compiled during the event. Ameren-IL also gathers the photographic evidence of infrastructure damage.

Verification Discussion and Conclusions

In April 2009,[27] Liberty found that the substation-equipment failure process, PDAC, is independent of the storm analysis process.

Ameren-IL gathered weather parameters for a major storm in May 2006.[28] In addition, Ameren-IL uses archival weather parameter data in the development of its predictive weather damage model (Recommendation II-3B). Ameren-IL's weather archival data sources include DTN, the National Weather Service (NWS), and weatherunderground.com, an online weather network resource.[29]

Liberty found evidence of photographic archival on Ameren-IL's website http://illinoisoutage.com.[30] Liberty found that Ameren-IL organized the photographic evidence in an intuitive manner. It presented good information about Ameren's restoration efforts for storms that occurred on December 18, 2008, January 27, 2009, and May 8, 2009. Several media clips and video evidence were available on the site to present Ameren's story in an effective manner. In addition, weather maps and radar images were contained within the website's content.

In November 2009, Liberty found that Ameren's Corporate Communications department posts photographic and video media content to the corporate website (illinoisoutage.com) after a significant weather event.[31] Ameren public relations media personnel (photographers and video

[27] Interview Nos. 248-252, April 27, 2009, and Response to Data Request #1064.
[28] Response to Data Request #1064B, attachment.
[29] Response to Data Request Nos. 1064B & C, attachments, and Interview #387, August 17, 2010.
[30] Response to Data Request #1064C. Website review conducted 05/26/09.
[31] Responses to Data Requests Nos. #1216-1219, and Interview Nos. 324,325, and 330, November 9, 2009.

production personnel) provide this content. Public sources, e.g., YouTube, and Ameren personnel amateur photography as selected by Ameren staff supplement the content. Photographic content posted includes the GPS coordinates of the damaged facilities. Ameren intends the content to display damages that are representative of facility damages in the general vicinity of significant weather activity within the Ameren service territory.

In parallel with Corporate Communication's effort is a forensic review process initiated by the Reliability Group, triggered by any storm preparedness or storm response notification by the Ameren-IL Emergency Operations Center (EOC) management team. This forensic review process is not predicated on the EOC status to have been declared Active (the EOC command center opened), only that the EOC status notification was issued.

The forensic review process uses the outage data (in Outage Analysis System, OAS) and weather parameter data, e.g., NWS data, to establish whether weather parameters, e.g., wind, ice loading, were in excess of NESC design parameters. If they find this true, then it codes the outages for the affected area for severe weather above NESC design basis in the OAS system. While this does not alter the cause code that the troubleman or first responder entered into the system, it does affect the environmental conditions recorded in OAS and the summation of outages attributed to weather in Ameren-IL's annual ICC reporting. In 2009, this led to a significant reduction of outages attributed to weather and a corresponding increase in the outages attributed to equipment failure in annual ICC reporting.

Supplementing the forensic review process by the Reliability Group is a mapping process that uses the GPS coordinates of weather parameters and the overlay of Ameren-IL service center level mapping details to align the weather GPS data and the OAS outage GPS detail.

In April 2009, it was unclear to Liberty whether this resource presented a select (*i.e.*, publicly available) archive of evidence pursuant to this recommendation, or whether additional Ameren-IL resources exist that contain a complete collection of archival evidence and indexing. In July 2009, Liberty found that the website is the only archive for Ameren's forensic process.[32]

Ameren-IL has taken a number of positive key steps, but the forensics process is not complete. Ameren-IL needs to review equipment and material failures after a storm to determine whether they are in line with expected failures given the severity and extent of the storm. It should then refer abnormal results to equipment standards personnel and designers for evaluation. Liberty suggested, and Ameren-IL agreed, that the review of equipment and material failures could be a regular part of Ameren-IL's post-storm critiques.[33]

In August 2011, Liberty learned that Ameren-IL had not yet revised its procedure, which is part of the Emergency Response Plan, for post-storm critiques.[34] Ameren-IL provided evidence that shows it plans system changes resulting from storm performance.[35]

[32] Response to Data Request #1216.
[33] Interview #387, August 17, 2010.
[34] Interview #439, August 2, 2011.
[35] Response to Data Request #1588.

In July 2012, Ameren-IL demonstrated that it revised the post-storm critique procedure to cover whether pre-existing electrical system conditions contributed to the damage and whether there was evidence of the failure or malfunction of equipment at a rate that exceeded that expected for the severity of the event. Ameren also provided a completed critique discussion guide from an actual event where it considered these questions.[36]

Ameren-IL met its implementation plan and Liberty's verification of this recommendation is complete.

[36] Response to Data Request #1645.

Recommendation

II-3
Develop a comprehensive weather intelligence process.

Background

Liberty recommended that Ameren-IL take several actions to develop a comprehensive weather intelligence process. These were:
a. Continue to improve and refine baseline general knowledge of service territory weather, historical severity, trending, historical weather "hot-spots" or geographic sub-pockets, severe weather risk periods, etc. though retrospective analysis and quantification.

b. Establish usage of pre-storm predictive modeling and damage assessment models. (Refer to Recommendation IV-2.)

c. Improve pre-storm preparation and communications based upon interactive weather service interrogation and sensitivity analysis. (Refer to Recommendation II-1 above.)

d. Explore opportunities to obtain more detailed real-time weather data. Improve in-storm weather intelligence from ground truth observation, expedite data transfer, and incorporate developing weather-tool capability enhancements.

e. Improve post-outage cause assignment and conduct damaged facility weather severity correlation from weather monitoring/metering facilities.

f. Establish post-outage, root-cause archival and photographic evidence integration/archival at least on a sampling basis. (Refer to Recommendation II-2 above.)

g. Establish programmatic weather hardening initiatives based on system trending of storm damages, and weather severity, and weather hardening initiatives.

h. Conduct analysis and mapping of nearest weather station metering for Ameren facilities. Conduct cost effectiveness studies and analysis of pilot programs that include additional weather monitoring devices, distribution and sub-transmission facility mounted weather camera surveillance as a component of weather monitoring.

(Part A – Improve and refine baseline service-territory weather information.)

Ameren-IL's Implementation Plan

Ameren executed a contract with DTN/Meteorlogix. It receives a 5-day forecast on a daily basis. Conditions and forecast information is available 24/7/365 via the DTN/Meteorlogix web portal. This information includes: satellite view, radar view, storm corridors, lightning frequency and intensity, information for all official weather observation sites (approximately 60 located within the state boundaries of Illinois), wind speed, wind direction, temperature, humidity, dew points, 10-day and hourly forecast for Ameren Illinois-designated sites, and all official weather watches, warnings, and advisories. Ameren Illinois Utilities Distribution Operations personnel have the ability to establish specific alert levels by threat and by designated site.

Verification Discussion and Conclusions

In January 2009,[37] Liberty found that DTN's web portal provided enhanced capability to monitor Ameren-IL's service territory for real time weather conditions and severe weather preparedness. Liberty also found that Ameren-IL Distributions Operations management personnel had been using the new capabilities of the DTN service. Liberty found that Ameren-IL demonstrated competence in using the new service during a winter storm that occurred January 27-28, 2009, which included icing in its most southern division. In addition, organizational preparedness was evident from the e-mail distribution records from this event, and the declaration of alert levels leading up to the initiation of the EERP on January 27, 2009. [38] As of January 2009, Liberty had not witnessed sufficient evidence that Ameren-IL completed retrospective analysis and quantification of severe weather history in its service territory.

In April 2009, Liberty found that Ameren-IL continued to use DTN's web portal for pre-storm and real time (storm development) weather intelligence. Ameren-IL intentionally limits the use of this tool to a small management circle, which it sees as means of command and control. However Liberty had not witnessed evidence that a core team had mastered the use of these tools to enable depth of experience and bench strength needed to accommodate personnel absence, rotation, and 24/7 call duty.[39] In August 2010, Liberty learned that eight people within Ameren-IL had the license to contact DTN. Typically, one individual is the primary point of contact. However, others have interfaced with DTN when that one individual was not available.

The Ameren-IL reliability group conducts a post-outage cause code review and weather severity correlation with respect to National Electric Safety Code design requirements.[40]

Liberty found in November 2009 that Ameren-IL had conducted a baseline retrospective assessment of severe weather activity in Ameren-IL service territory via the review of historical archives of the University of Illinois at Urbana-Champaign's Atmospheric Sciences department (UIUC AS).[41] This review included archival records from as far back as 1901 for several severe weather parameters of interest. Furthermore, this analysis was consistent with Liberty's recommendation to include a complete review of severe weather not limited to large storms. Ameren concluded that while no "hotspot" pattern emerged from tornado geo-spatial data, the common finding with all of the UIUC AS severe weather data was that central Illinois ranked high in all of the baseline parameters (tornados, icing, straight-line winds, lightning density, etc.). Liberty reviewed these baseline data and found them to be comprehensive.[42]

Ameren-IL met its implementation plan and the intent of the recommendation. Liberty considers this part of Recommendation II-3 verified and closed.

[37] Interview Nos. 220-222, January 26, 2009, and Response to Data Request Nos. 1005-1007.
[38] Interview #214, January 28, 2009.
[39] Interview Nos. 248-252, April 27, 2009.
[40] Interview Nos. 248 and 250, April 27, 2009, Interview #390, August 17, 2010.
[41] Interview #325, November 9, 2009.
[42] Interview #390, August 17, 2010.

(Part B – Use pre-storm predictive modeling and damage assessment models.)

Ameren-IL's Implementation Plan

Ameren-IL's implementation plans include the development of a predictive storm damage/restoration model. The intent of the plan is to improve Ameren-IL's ability to initiate emergency storm planning, estimate resources required, and improve the accuracy of customer communications about expected restoration times.

Verification Discussion and Conclusions

In April 2009, Liberty found that Ameren-IL had begun implementation plans to develop these models. Progress included modeling of past Ameren storm data and model fitting of Ameren-IL outage history to prediction curves that best predict the effects of severe weather upon Ameren-IL's system.[43] Ameren-IL plans to enlist the services of the atmospheric science and electrical power engineering colleges at University of Illinois at Champaign Urbana to assist in the development of these models.[44]

In November 2009, Liberty found that Ameren-IL expected a presentation on the results of the work at the University of Illinois Atmospheric Sciences in December 2009.[45] In August 2010, Liberty reviewed the presentation and Ameren-IL's progress with regard to the predictive model development.[46] Liberty concluded that while a basic model structure exists, much work remains before the model will be of use. This work includes gathering more historical data, using and testing more variables, and making the model output consistent with and more useful to emergency plan implementation. The model may be useful in advance of winter-type storms and after the inception of summer-type storms. Ameren-IL needs to define the intended uses and work towards having a model that will supplement the experience on Ameren-IL's personnel in anticipating the effects of significant storms.

In May 2012, Liberty learned that Ameren-IL is using the predictive model, and has identified and trained personnel to run the model in major events.[47] Liberty's verification of this part of the recommendation is complete.

(Part C – Improve pre-storm preparation and communications based upon interactive weather service interrogation and sensitivity analysis.)

Ameren-IL's Implementation Plan

Ameren-IL indicated that it uses on-line consultation with DTN/Meteorlogix whenever the development of severe weather conditions is possible. This service is available 24/7/365. Ameren-IL maintains historical records of consultative inquiries and responses.

[43] Interview Nos. 248-249, April 27, 2009, and Response to Data Request #1066.
[44] Interview Nos. 248-249, April 27, 2009, and Response to Data Request #1186.
[45] Interview # 326, November 9, 2009.
[46] Interview #390, August 17, 2010.
[47] Interview 477, May 24, 2012.

Verification Discussion and Conclusions

In January 2009,[48] Liberty reviewed examples of on-line consultation with DTN from the preceding nine months. In addition, during this time a winter storm developed in Ameren-IL's southern most division for which Ameren-IL initiated the EERP.

In April 2009, Liberty had not witnessed sufficient storm activity for which it could complete additional verification. Liberty verified that the Ameren-IL website http://illinoisoutage.com addressed several small-scale weather events in 2009 prior to the May 8, 2009, major storm event.[49] Liberty will seek additional verification of pre-storm preparations and communications that demonstrate an interactive interrogation of DTN's forecast sensitivity in the next quarter for the May 8, 2009, and any additional future storm events.

In November 2009, Liberty found that storm preparedness practices continued throughout 2009 as described above.[50] Liberty noted from periodic inspection of Ameren-IL's illinoisoutage.com website that it activated the EOC on four more occasions since January 27, 2009 (3/8/09, 5/8/09, 6/18/09, and 6/27/09). In effect, 2009 was a mild year for severe storm activity for Illinois. Liberty also noted that Ameren-IL cited 15 additional EOC Alert levels on the illinoisoutage.com EOC webpage, showing more evidence of organizational preparedness for severe weather challenges. Some of the events were local and handled at the division level while others were effectively non-events. Liberty also noted that weather monitoring and preparedness correspondence files retained by Ameren-IL were more numerous than reported on the illinoisoutage.com EOC webpage.

In August 2010, Liberty found that Ameren-IL adequately addressed Liberty's concerns about the "bench strength" of EOC management. Ameren-IL has several people who have performed pre-storm preparation and communications with the weather service provider. In addition, Ameren-IL demonstrated that the on-line format is sufficiently responsive and dynamic to ensure timely and effective interrogations of the weather provider.

Ameren-IL met its implementation plan and Liberty considers this part of the recommendation verified and closed.

(Part D – Explore opportunities to obtain more detailed real-time weather data)

Ameren-IL's Implementation Plan

Ameren-IL uses the DTN web portal tool to assess the storm threat potential. This tool has many real-time capabilities including weather parameters, radar, and NWS weather statements (watches and warnings). Ameren-IL managers monitor the development of weather events. On screen displays[51], on line consultation portals, and e-mail notifications are tools within the DTN service to access real time information.

[48] Interview #214 and Response to Data Request #1006.
[49] Response to Data Request #1064C.
[50] Interview #327, November 9, 2009, and responses to Data Request Nos. 1224-1228.
[51] Response to Data Request #1069A.

Verification Discussion and Conclusions

In January and April 2009, Liberty observed the ability of Ameren-IL managers to use the DTN tool. They demonstrated many capabilities and features during the January 27, 2009, winter storm and during "live shots" during interviews on April 27, 2009.[52] However, because thunderstorm activity was not occurring on these dates, Liberty was not able to witness an improvement in either the in-storm intelligence from ground-truth observation or the transfer of that data into adaptive storm response. Liberty expects that storms such as the May 8, 2009, and future summer storms will provide opportunities to assess this capability.

In August 2010, Ameren-IL demonstrated and discussed the multiple ways that it obtains weather data.[53] This includes the several newly installed cameras that give real-time views of a few specific locations in the service territory.[54] Additional inputs include the many weather stations and the dispatch stations.

Liberty is satisfied with Ameren-IL's ability to obtain detailed real-time weather data, improve in-storm weather intelligence from observations, and incorporate weather-tool capability enhancements. Ameren-IL met its implementation plan and Liberty considers this part of the recommendation verified and closed.

(Part E – Improve post-outage cause assignment and conduct damaged facility weather severity correlation from the weather monitoring/metering facilities)

Ameren-IL's Implementation Plan

Ameren-IL began the initial planning steps to develop a post-outage cause assignment and damage correlation analysis process. Ameren-IL's implementation plan includes the "tagging" of specific outages occurring in major storms for post outage analysis by the reliability group.

Verification Discussion and Conclusions

In April 2009, Liberty found that Ameren-IL tags outage records from the Outage Analysis System, OAS, for post outage review. The intent of this activity is to limit "weather-related" outages to only those for which the weather parameters exceeded the NESC design basis, *e.g.*, above 70 mph winds or above ½″ ice accumulation.[55]

In November 2009, Liberty found that Ameren began to modify its process for outage records accumulated in 2008.[56] The post-outage correlation for 2008 was done in a batch method for instances of EOC notification (as of Q1 of 2008 until year-end). The new (2009) process does not require that Ameren-IL activate the EOC, only that it initiates EOC notification. The intent of this criterion is to trigger reviews of outages for weather events that are significant but not necessarily in excess of the NESC criterion. The Reliability Group conducts a review of weather parameter data (wind and ice) and the associated GPS coordinates to map the severe weather to

[52] Interview Nos. 220-222, January 26, 2009, and Interview Nos. 248-249, April 27, 2009.
[53] Interview #390, August 17, 2010.
[54] Response to Data Request #1437.
[55] Interview #250, and Response to Data Request #1067A
[56] Interview Nos. 330-331, November 9, 2009, and responses to Data Request Nos. 1230-1233.

service center level coordinates. For instances where the weather exceeds the NESC criterion, the OAS outage is recoded for weather conditions with a flagging indicator that identifies weather in excess of NESC design. The group categorizes these outages as "weather-related" for the annual ICC reporting. When the review indicates that weather is below the NESC criterion, the outages are attributed to the cause code in OAS (note weather is not a cause code; it is an environmental condition field only). As a result, the amount of "weather-related" outages dropped dramatically in 2008 due to this post-outage correlation process. The re-coding of outages resulted in more outages attributed to overhead equipment malfunction.

Ameren-IL has improved its post-outage cause assignment and has met its implementation plan. Liberty suggested, and Ameren-IL agreed, that Ameren-IL could do more with respect to correlation of damaged facilities with weather severity. Ameren-IL indicated that it would make this a part of its regular post-outage critique. However, this suggestion goes beyond the implementation plan and is included as part of Recommendation II-2 above. Liberty considers this part of the recommendation verified and closed.

(Part F – Establish post-outage root-cause archival and photographic evidence integration/archival at least on a sampling basis)

Ameren-IL's Implementation Plan

Ameren-IL has begun to explore ways to obtain photographic evidence and archive storm photographic evidence.

Verification Discussion and Conclusions

In May 2009, Liberty found evidence of photographic archival on Ameren's website http://illinoisoutage.com.[57] Liberty found that Ameren-IL organized the photographic evidence in an intuitive manner and that it presented good general information about Ameren-IL's restoration efforts for storms that occurred on 12/18/08, 1/27/09, and 5/08/09. Several media clips and video evidence were available on the site to present Ameren's story in an effective manner. In addition, weather maps and radar images were contained within the website's content.

It was unclear to Liberty whether this resource presents a select (*i.e.*, publicly available) archive of evidence pursuant to this recommendation, or whether additional Ameren-IL resources exist that contain a complete collection of archival evidence and indexing. In July 2009, Liberty found that the website is the only archive for Ameren's forensic process.[58]

In November 2009, Liberty found that Ameren's Corporate Communications department posts photographic and video media content to the corporate website (illinoisoutage.com) after a significant weather event.[59] Photographic content posted includes the GPS coordinates of the damaged facilities. Ameren intends the content to display damages that are representative of

[57] Response to Data Request #1064C. Website review conducted 05/26/09.
[58] Response to Data Request #1216.
[59] Interview Nos. 324-329, November 9, 2009.

facility damages in the general vicinity of significant weather activity within the Ameren service territory.

In parallel with Corporate Communication's effort is a forensic review process initiated by the Reliability Group, triggered by any storm preparedness or storm response notification by the Ameren-IL Emergency Operations Center (EOC) management team. This forensic review process is not predicated on the EOC status to have been declared Active (the EOC command center opened), only that the EOC status notification was issued.

The forensic review process uses the outage data (in OAS) and weather parameter data, e.g., NWS data, to establish whether weather parameters, e.g., wind, ice loading, were in excess of NESC design parameters. If they find this true, then they code the outages for the affected area for severe weather above NESC design basis in the OAS system. While this does not alter the cause code that the troubleman or first responder entered into the system, it does affect the environmental conditions recorded in OAS and the summation of outages attributed to weather in Ameren-IL's annual ICC reporting. In 2009, this led to a significant reduction of outages attributed to weather and a corresponding increase in the outages attributed to equipment failure in annual ICC reporting.[60]

Supplementing the forensic review process by the Reliability Group is a mapping process that uses the GPS coordinates of weather parameters and the overlay of Ameren-IL service center level mapping details to align the weather GPS data and the OAS outage GPS detail.

Ameren-IL met its implementation plan and Liberty considers this part of the recommendation verified and closed

(Part G – Establish programmatic weather hardening initiatives based on system trending of storm damages, weather severity, and weather hardening initiatives)

Ameren-IL's Implementation Plan

Ameren-IL has begun the initial implementation steps of the plan to develop system-wide programmatic weather hardening.

Verification Discussion and Conclusions

In May 2009, Liberty found examples of weather hardening initiatives for alternative pole designs and for service connections.[61] In April 2009, Liberty found that the reliability group had begun to conceptualize a general process for system weather hardening, however much of the work is still in the planning stage.[62]

In November 2009, Liberty found that the Reliability Group had completed some analysis work on sub-transmission adequacy in 2009 that it passed along to Division Engineering.[63] At this

[60] Interviews 324-329, November 9, 2009, and Interview #390, August 17, 2010.
[61] Response to Data Request #1065.
[62] Interviews #248 and #251, April 27, 2009.
[63] Interview #330, November 9, 2009, and response to Data Request #1234.

point, it is unclear that formal system weather-hardening processes exist beyond the initial phase of the process. Liberty's concern is whether the process is robust and not limited to ad-hoc instances that could potentially lack the design adequacy review steps and potentially standards modifications when necessary.

In August 2010, Liberty again reviewed with Ameren-IL the steps it takes that could lead to weather hardening.[64] In its analysis of worst performing circuits, Ameren-IL may suggest changes to circuits that only appeared on the worst performing list because of storms. Liberty reviewed examples of this circumstance.[65] Second, any Ameren person can submit an unsatisfactory performance report that goes to the standards group and that may have generated because of performance during severe weather. Finally, Ameren-IL agreed to add to its post-outage critique a section on questioning the reasonableness of equipment and material failures given the nature and severity of the storm. (See Recommendation II-2 above.) Ameren-IL met its implementation plan and the intent of Liberty's recommendation. Liberty considers this part of the recommendation verified and closed.

(Part H – Conduct analysis and mapping of the nearest weather station metering for Ameren facilities. Conduct cost effectiveness studies and analysis of pilot programs that include additional weather monitoring devices, distribution and sub-transmission facility mounted weather camera surveillance as a component of weather monitoring.)

Ameren-IL's Implementation Plan

Ameren-IL will map weather stations and consider cost-effectiveness of adding more.

Verification Discussion and Conclusions

In November 2009, Liberty found that Ameren had compiled a list of NWS monitoring sites in Illinois; however, it did not conduct an assessment to answer the coverage and minimum proximity questions.[66]

In August 2010, Ameren-IL presented information showing the wide range of weather gathering stations across its service territory. It also shared communications with DTN showing that to gain more extensive coverage, Ameren-IL would have to install hundreds of new stations.[67] Even at a modest cost per station, the total cost would be in the millions of dollars and would produce data that would have questionable value in responding to severe weather situations.

Ameren-IL uses fixed cameras to acquire some real-time information, as mentioned in Part D above.

Ameren-IL met its implementation plan and the intent of Liberty's recommendation. Liberty considers this recommendation verified and closed.

[64] Interview #390, August 17, 2010.
[65] Response to Data Request #1438.
[66] Interview #331, November 9, 2009, and response to Data Request #1235.
[67] Interview #390, August 17, 2010.

Recommendation

II-4

Conduct an assessment of the effect of OAS storm mode inaccuracy on annual ICC reporting programs.

Background

Liberty found that Ameren-IL should conduct an investigation into the effect of OAS storm mode contributions to quantify the inaccuracy of storm mode operations on annual ICC reporting programs. Ameren-IL should address in this study the effects on annual reliability indices, worst performing circuits, and the Customer Target Programs that rely on retrospective OAS data for summary aggregation or facility identification.

Ameren-IL's Implementation Plan

Ameren-IL indicated that it would investigate OAS data from 2008 major weather events in an attempt to quantify any potential inaccuracy of outage data during these events. This will include any impact that these potential differences may have on Ameren's reporting of annual reliability indices, worst performing circuits, and the Customer Reliability Targets Program.

Verification Discussion and Conclusions

Ameren developed a post-storm OAS duplicate query that searches for occurrence of duplicate transformers in outages that occur simultaneously. If it finds duplicate and simultaneous instances of a transformer outage, it assigns the outage the longest duration of the duplicate records and removes the duplicate record from the permanent year-to-date file. Ameren-IL implemented this duplicate screening (data auditing) for 2008 on 13 occasions as it prepared the data for the 2008 ICC annual report.

Ameren-IL's analysis of 2008 reliability data indicated a 1.6 - 1.8 percent error in customer interruptions and customer interruption minutes because of duplicate OAS outage reporting. There were three IP circuits placed on the worst performing list in error. For 2009 and current, Ameren-IL corrects the data after each major storm.[68]

Ameren has issued an RFP for the ultimate replacement of the OAS system. Ameren is proceeding with Phase I of its project to replace OAS. The vendor is ABB. Actual implementation would be in 2012 and 2013.

Ameren-IL met its implementation plan and the intent of Liberty's recommendation. Liberty considers this recommendation verified and closed.

[68] Interview #390, August 17, 2010.

Recommendation

III-1

Review and modify as necessary all existing emergency plans to ensure that all key response areas are included as a section in a plan or are covered by a separate plan.

Background

Liberty found that Ameren did not have emergency response plans for key response areas at the time of the 2006 storms. As an example, two specific functional areas that the Ameren corporate EERP (or other emergency plans) did not address were the Call Centers and the Safety function. A thorough review of the corporate EERP reveals that there is a need for additional plans for functional areas such as these two or Ameren should add sections to the existing plan to address them. Liberty recommended that Ameren-IL review and modify as necessary all existing emergency plans to ensure that they include all key response areas as a section in a plan or as a separate plan.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation. It said that the key response areas currently developing specific plan documents / protocols or updating existing plans include:

- Safety
- Corporate Communications
- Call Center Operations
- Supply Chain Support
- Logistical Support
- Operating Division Response

When complete, Ameren-IL will incorporate these independent plans as appendices to the Ameren-IL Emergency Response Plan.

Verification Discussion and Conclusions

During the second quarter of 2009, Liberty reviewed the status of Ameren-IL's implementation of this recommendation as reported in responses to Liberty's data requests.[69] Thus far, Ameren-IL has developed Roles and Responsibility (R&R) documents and other emergency response guidance documents as indicated below:

- Call Center – Ameren-IL has developed R&R documents for the following Call Center response assignments: Staffing, Communications, Information Technology (IT) Support, Safety, Logistics, and Division Liaison. In addition, Ameren-IL developed a Critical Contact document for the Call Center emergency response plan.
- Supply Chain – Ameren-IL has not developed any documents in the R&R format, but has developed the following documents for Supply Chain: Pre-Storm Checklist, List of Storm Managers with contact information, Process Overview flowchart, Emergency Process Overview narrative, and Materials Management Checklist.

[69] Responses to Data Request Nos. 1080, 1081, 1082, 1083, 1084, 1085, 1086, and 1087.

- Logistics – Ameren-IL has developed R&R documents for Logistics Lead positions at both the state EOC level and at the Division Command centers. In addition, it has developed a summary logistics document that includes a staffing matrix for logistics support based on the size of the workforce supported.
- Division Emergency Plan template (to be used as a template for the development of all division plans) – To date Ameren-IL has developed one document outlining the division plan in Table of Contents format.
- Safety – Ameren-IL has developed an R&R document for the Safety Lead at the Division Command Center.
- Corporate Communications – Ameren-IL has developed R&R documents for Corporate Communications for the following positions: Communications Management Lead, Media Management Lead, Division Community Relations Lead, Employee Communications Lead, Field Media Relations Lead (separate documents for North and South Leads), Hotels and Logistics Lead, Information Management Lead, and Life Support Relations Lead.
- Operations Support – Ameren-IL has developed R&R documents for the following Operations Support positions: Division Operations IOS Foreign Crew Liaison / Field Supervisor, EOC Foreign Crew Manager, and EOC IOS In-Processing Site Supervisor.

In August 2009, Liberty conducted an on-site interview, reviewed Ameren- IL responses to several data requests, and found:[70]

- In implementing this recommendation and others associated with the emergency plans, Ameren-IL has decided to re-build its emergency plan "from scratch" rather than trying to add/delete/modify sections of the old plan. In this approach, Ameren-IL is developing protocols that provide guidance to responders in the interim until the final plan is completed.
- Of the 33 separate recommendation areas covered in this recommendation, Ameren-IL reports that it completed 24.
- The Ameren-IL implementation plan included the development of a matrix that tracks the progress on different individual segments and sections of the emergency plan. The matrix lists 112 total entries. Of that number:
    - 36 are reported as "Active," i.e., the plan wording completed and ready for the final emergency plan document
    - 41 are included in other sections of the plan
    - 4 have been submitted to upper management for review and approval
    - 5 are in development
    - 21 are not yet written (of this number, 10 have separate protocols in place to guide responders until the final wording is complete).

In November 2009, Liberty again conducted an on-site interview, reviewed the Ameren- IL response to a data request, and found:[71]

- Ameren-IL has addressed all aspects of this specific recommendation, and

[70] Interview #285, August 12, 2009, and responses to Data Requests #1243, #1037, and #1087.
[71] Interview #323, November 19, 2009, and response to Data Request #1321.

- The Ameren-IL Emergency Response Plan is now complete; Ameren-IL sent it to the printer in November 2009.

In March 2010, Liberty attended an Ameren-IL emergency response exercise and reviewed responses from Ameren-IL to data requests.[72] Liberty found that:

- Ameren-IL is putting a strong emphasis on its emergency plan
- The wording in the plan is well thought-out and comprehensive
- Ameren-IL is identifying key issues and implications, and is stressing them in the early training efforts
- Ameren-IL is involving their entire response organization in making presentations and working through issues of interpretation and application
- The exercise was well attended and participation was excellent
- Ameren-IL's top management, the CEO and operations vice presidents, are clearly supportive and involved in the implementation of the new emergency plan. They were all present and participated enthusiastically in the exercise.

In August 2010, Liberty reviewed with Ameren-IL personnel the wording of the Introduction and first 14 sections of the Ameren-IL Electric Emergency Response Plan (EERP).[73] Liberty and Ameren-IL discussed several specific items for clarification and for purposes of monitoring for effectiveness in future events. The group did not identify any items that needed modification. The emergency plan is very comprehensive and yet user-friendly. The effective use of appendices and "Roles and Responsibilities" protocols provides quick reference for users during emergency events.

During the months of January and February 2011, Liberty received verification from Ameren-IL of ongoing reviews and revisions it was making to the Electric Emergency Response Plan (EERP). Issues arising from a number of different Liberty recommendations, which Ameren-IL addressed in practice, were confirmed with clear language in the EERP. This includes:[74]

- Reporting relationship between senior management and the response organization
- Role of the division manager during major outage events
- Coordination with Illinois Emergency Management Agency (IEMA) during major outages
- Ameren-IL's "ramp-down" process.

Ameren-IL has met its implementation plan within the stated timeframe. The efforts have addressed the intent of Liberty's recommendation.

On May 23, 2011, Liberty conducted an interview with the Ameren-IL personnel directly responsible for the implementation of and adherence to the new Emergency Plan, including the

[72] Interview #360, March 10, 2010, and responses to Data Request Nos. 1381-1384.
[73] Interview #398, August 10, 2010.
[74] Responses to Data Requests #1485-1492.

six Ameren-IL operating division managers, and the Emergency Operations Center leadership.[75] Some of the areas covered in this interview were:

- Compliance and use of the division emergency plans
- Documentation and retention of key data, milestones, decisions, issues, etc.
- Activation and Ramp Up Plan application
- Real-time updates of the Ameren-IL Outage Analysis System (OAS)
- Updating Estimated Restoration Time (ERTs) on individual orders
- Implementation of daily conference calls between division and satellite division command centers
- Daily Work Plans developed in collaboration with Distribution Control Office
- Daily reports from field restoration repair crews
- Damage Assessment (Field Checker) process and Public Safety Advisors
- Establishing and implementing a ramp-down plan to provide guidance in releasing resources and de-activating command centers.

While Ameren-IL is making tremendous progress in the implementation of the new emergency plan, it appears to Liberty that there is an opportunity to improve in some areas in the operating divisions. Some specific findings noted:

1. In a few cases, there appears to be less than a full appreciation for the value of good storm documentation, and therefore the effort necessary to come into complete conformity with the plan in these areas is not as aggressive as it should be.
2. There appears to be some confusion concerning the responsibility for certain response functions/tasks, *e.g.*, Field Checking (Damage Assessment).
3. Division leadership should try to demonstrate a more enthusiastic commitment to achieve complete conformity with the new Emergency Plan.
4. There is an apparent lack of agreement among division leadership regarding use of certain forms and/or the proper format for particular reports, *e.g.*, Daily Work Plan, Field Crew daily report.

Liberty sees this as an excellent opportunity and the right time for Ameren-IL corporate leadership to reinforce their commitment to the total implementation of and compliance with all of the Ameren-IL excellent new Electric Emergency Response Plan. Corporate leadership should undertake efforts for more team building between division and EOC leadership.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions affected by the May and June storms, with EOC leadership, and with the VP of Operations for Ameren-IL. In addition, the Liberty auditor sat in on an Ameren-IL Emergency Response Retreat in Pawnee, IL.[76] Based on this and previous verification work, Liberty considers that its verification work on this recommendation is complete. Ameren completed its

[75] Interview #435, May 23, 2011.
[76] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.

implementation several years ago, and all key response areas are covered. The experience gained during the past two years with numerous outage events has verified that the plan adequately covers all response areas. The interviews in August 2011 gave clear indication that Ameren-IL has satisfactorily handled Liberty's concerns.

Recommendation

III-2
Revise emergency plans so that they are coordinated and consistent.

Background

Liberty noted several instances of inconsistency and lack of coordination between the emergency plans of different functional groups within Ameren-IL. One example is the definition of various storm levels. Ameren-IL should ensure that all emergency plans are consistent and coordinated with other plans.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation and in the implementation plan stated that all plan appendices are to reference the terminology outlined within the Ameren Illinois Utilities Emergency Response Plan protocol documents.

Verification Discussion and Conclusions

In August 2009, Liberty conducted an on-site interview, reviewed Ameren-IL's responses to several data requests, and found:[77]

- Ameren-IL is making good progress in developing the different sections of its primary emergency plan as well as in the plans for different functional areas.
- Ameren-IL is making significant effort to coordinate all of these plans and plan sections and to ensure their consistency. For example, it has developed a division emergency plan template to provide guidance and control in the development of emergency plans in the operating divisions.
- Ameren-IL is building its new emergency plan "from scratch," *i.e.*, it is developing different sections and segments of the plan as building blocks.
- Ameren-IL is using Roles and Responsibilities (R&R) documents, other protocol documents, and checklists to provide guidance and training to responders as it rolls out the plan. These documents will remain a part of the overall emergency plan, while Ameren-IL reviews them as it gains more experience.

In November 2009, Liberty again conducted an on-site interview, reviewed the Ameren- IL response to a data request, and found:[78]

- Ameren-IL has addressed all aspects of this specific recommendation, and
- The Ameren-IL Emergency Response Plan is now complete; Ameren-IL sent it to the printer in November 2009.

In March 2010, Liberty attended an Ameren-IL emergency response exercise and reviewed Ameren-IL's responses to data requests.[79] (Refer to comments under Recommendation III-1 above.)

[77] Interview #285, August 12, 2009, and responses to Data Requests #1244, #1080-86, and #1111.
[78] Interview #323, November 19, 2009, and response to Data Request #1321.
[79] Interview #360, March 10, 2010, and responses to Data Request Nos. 1381-1384.

In August 2010, Liberty reviewed with Ameren-IL personnel the wording of the Introduction and first 14 sections of the Ameren-IL Electric Emergency Response Plan (EERP).[80] Liberty and Ameren-IL discussed several specific items for clarification and for purposes of monitoring for effectiveness in future events. The effective use of appendices and "Roles and Responsibilities" protocols provides quick reference for users during emergency events and helps with functional group coordination during the response to a major outage event.

Ameren-IL has met its implementation plan within the stated timeframe. The efforts addressed the intent of Liberty's recommendation. Liberty has not completed verification work on this recommendation and will follow-up with Ameren-IL in:

- Continuing the review of all wording in the new Emergency Plans to ensure that it is clear and complies with Liberty's recommendations
- Reviewing the use of the plan in future major outage events to ensure compliance and effectiveness, specifically with regard to the coordination and consistency of emergency plans.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions affected by the May and June storms, with EOC leadership, and with the VP of Operations for Ameren-IL. In addition, the Liberty auditor sat in on an Ameren-IL Emergency Response Retreat in Pawnee, IL.[81]

Based on its findings from these interviews, its ongoing review of the new Ameren-IL Electric Emergency Restoration Plan (EERP), and its observations of the responses to recent major outage events, Liberty concluded that the wording of the plan is clear, complies with recommendations, and is coordinated and consistent with other plans. It is also obvious that the entire Ameren-IL response team has accepted the plan, it is consistently used, and it is proving effective in improving response performance. Liberty considers that its verification work on this recommendation is complete.

[80] Interview #398, August 10, 2010.
[81] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.

Recommendation

III-3

Review and improve the Electric Emergency Restoration Plan.

Background

Liberty concluded that the Ameren corporate Electric Emergency Restoration Plan (EERP) needed improvement in a number of different areas. Liberty's review of the corporate EERP noted several improvement opportunities. The list included:

- Section 1 - Ameren should revise the EERP to include a mission statement, restoration target/goal, logic behind the organization of the plan itself, types and severity levels of emergencies covered by the plan, and a clear statement of company leadership support and expectations regarding the plan.
- Section 2 - Ameren should restructure Section 2 – Emergency Operations Center (EOC) – so that the subject matter more accurately fits the section title and so that it either covers other subjects in a new separate section or combines them with existing sections. Ameren should revise the EERP wording to establish clearly the priority of the EOC to direct the restoration activities. Ameren should revise the second part of the EERP definition of a "major event" so as not to require activation of the EOC when not necessary.
- Subsection 2.1 - Ameren should revise the EERP to include specific criteria requiring activation of the EOC and to establish an activation notification process such as a company-wide paging system.
- Subsection 2.2 - Ameren should reclassify the storm levels as defined in this subsection to communicate the severity of the event and the anticipated restoration time. Ameren should establish restoration goals for major events that would reflect the storm level, maintaining its present 72-hour target for certain level storms, while establishing targets for larger storms that recognize the scope and amount of damage.
- Subsection 2.3 - Ameren should improve the format of this subsection to facilitate quick access, such as a chart-type presentation. Ameren should address additional support activities in this subsection such as safety, transportation, logistics, and security and should furnish additional information that sets out areas of responsibility for logistics functions.
- Subsection 2.4 - Ameren should revise Subsection 2.4 to provide a complete checklist with appropriate detail.
- Subsection 2.5 - Ameren should create a separate section to deal with resource procurement/release. Ameren should provide a chart to communicate some of the key responsibility areas. Ameren should revise the EERP to spell out clearly the process for the EOC Director/designee to work with Operations Managers in procurement of resources and to provide specifics for the responsibility of contacting Mutual Assistance utilities.
- Subsection 2.7 - Ameren should revise the EERP to establish the process to ensure that it performs post-event critiques, captures action items, and tracks the action items to completion.
- Section 3 - Ameren should revise the EERP to include all positions that comprise the response organization in a major restoration effort and should provide details of job duties in sections of the EERP dealing with those response functions.

- Subsection 4.3 - Ameren should revise the EERP to include the process for the Field Checker to input the damage assessment into the system.
- Subsection 4.4 - Ameren should revise the EERP to reference Section 6 in Subsection 4.4 and to expand the use of the Heavy Localized Damage Assessment process. Ameren should include a chart in the EERP to illustrate more effectively the applications of the different damage assessment stages.
- Subsection 5.1 - Ameren should revise the EERP to provide scheduled times for the Restoration Update Calls with a provision to change as required and to identify call participants while encouraging others to sit in on the calls.
- Subsection 5.3 - Ameren should revise the EERP to establish the procedure of furnishing restoration status information in advance of Restoration Update Conference Calls and to relocate the instructions for "muting" the telephone to Subsection 5.1.
- Section 6 - Ameren should revise the EERP to allow for more flexibility in the use of the Extensive Damage Recovery process.
- Section 7 - Ameren should revise the EERP to provide more detail concerning the content of the Division EERP, *e.g.*, a table of contents.
- Section 8 - Ameren should revise the EERP to provide a checklist of essential division supply items with specific assigned responsibility for ensuring availability/operability of all items prior to onset of a major event.
- Section 9 - Ameren should revise the EERP to furnish specific details on logistic duties and activities at the EOC, Division, and Operating Center level.
- Section 10 - Ameren should revise the EERP to combine sections 10 and 11, and provide more details on sending and receiving crews, *e.g.*, pre-travel and travel activity instructions and the process for meeting with the leaders of crews who have come in to assist.
- Section 11 - Ameren should revise the EERP to combine sections 10 and 11 and provide more specifics concerning both sending and receiving crews.
- Section 12 - Ameren should revise the EERP to include section 12 in the new combined sections 10 and 11 dealing with sending and receiving crews. The EERP should include specific information placing clear responsibility for making the contacts with Mutual Assistance utilities and establishing guidelines as to the maximum number of resources that Ameren would be willing to send to assist other utilities.
- Section 13 - To provide comprehensive emergency restoration guidance, Ameren should include more information in EERP Section 13 concerning available technology, such as the content of work packets and how it will use this technology in developing work packets.
- Section 14 - Ameren should correct the EERP to either add information to Sections 7 and 9 as referenced in Section 14 or else remove this reference.
- Appendix - Ameren should revise the EERP to provide supplemental information in the Appendix, such as a subject index.
- Overall Plan – Ameren should revise the EERP to provide specific instructions requiring annual drills and training in the EERP. The Ameren corporate EERP should reference all other emergency plans such as the Distribution Dispatch Operations (DDO) Electric Storm Process and the Communication Plans for Severe Storms, and the definitions of storm levels should be consistent between these plans.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation. It described the implementation plan as follows:

- Core Plan Protocols - established and in place
- When completed, the Ameren-IL Emergency Response Plan will include text to provide for the following as outlined in the text supporting this recommendation:
    - Training
    - Periodic Drills
    - Regular review and update
- Completed plan document will be available at the distributions operations website
- This recommendation also references 33 separate areas of improvement mentioned in the body of the Audit report.

Verification Discussion and Conclusions

From the review of Ameren-IL's responses to data requests,[82] Liberty found:

- Ameren-IL developed a matrix tracking the progress of its implementation of this recommendation. This matrix showed the following facts:
    - Ameren-IL tracks 109 separate plan items with 54 specifically linked to this recommendation.
    - Ameren-IL reports 10 as "active" – or in place in the plan.
    - It reports 16 in "draft" form
    - It reports 17 as "in process"
    - Another section (Section 4) covers 3 items
    - It reports 1 item as to be combined in another section not requiring additional wording
    - Ameren-IL reports that work has not yet begun on the wording of the remaining items.
- Ameren-IL developed two Power Point presentations that it used in meetings with response team members – one addressing the Incident Command Structure concept of emergency response organization and the other providing an overall orientation of the new Ameren-IL emergency plan and its approach to emergency response.
- Ameren-IL also developed the following documents associated with this recommendation:
    - Field Assessment document for Stage II emergencies
    - Damage Assessment – Wires Down – Field Checking Protocol
    - Ramp Up / Ramp Down Responsibilities
    - After-Action Critique Form.

Due to the similarity between this recommendation and Recommendation III-1, Liberty has combined the review of the implementation progress by Ameren-IL in both of these recommendations. Please refer to the Verification Discussion and Conclusions comments on the

[82] Responses to Data Request Nos. 333, 1038,1047, 1048, 1049, 1057, and 1087

August and November 2009, March 2010, and August 2010 reviews in Recommendation III-1 above.[83]

Ameren-IL has met its implementation plan within the stated timeframe. The efforts addressed the intent of Liberty's recommendation. Liberty has not completed verification work on this recommendation and will follow-up with Ameren-IL in reviewing its use of the plan in future major outage events to ensure compliance and effectiveness. Liberty will also continue to review carefully all wording in the emergency plans to ensure clarity and compliance with Liberty's recommendations.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions affected by the May and June storms, with EOC leadership, and with the VP of Operations for Ameren-IL. In addition, the Liberty auditor sat in on an Ameren-IL Emergency Response Retreat in Pawnee, IL.[84] In May 2012, Liberty verified that Ameren-IL continued to review and improve its emergency plan.[85] Based on its findings from emergency plan reviews and interviews, Liberty considers that its verification work on this recommendation is complete.

[83] Interview #360, March 10, 2010, and responses to Data Request Nos. 1381-1384.
[84] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.
[85] Interview #477, May 24, 2012, and response Data Request #1633.

Recommendation

III-4

Ensure that all emergency response personnel are familiar with and use emergency plans.

Background

Liberty found that during the 2006 storms, there was a general lack of familiarity with and limited use of the corporate EERP by many of the Ameren responders. Liberty's interviews with a large cross-section of the Ameren response organization revealed that a number of interviewees were not familiar with the plan or did not refer to the plan during the response effort. In Ameren's response to Liberty detailing the EOC positions employed during the 2006 storm restoration, there was a disparity with the EOC positions listed in the EERP. As an exception, several division interviewees – notably from Divisions III and IV – clearly had a great deal of familiarity with the corporate and division EERPs and relied on them during their response.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation and summarized the implementation plan as follows:

- Overview and orientation training sessions have been completed in all operating divisions and for other emergency response stakeholders
- Guidance to all operating divisions has been documented whereby information regarding the existence and utilization of the Emergency Response Plan components are to be discussed and shared with all Ameren-IL response stakeholders
- "Roles and Responsibilities" checklist documents for various emergency response position leads are being developed and shared with Ameren-IL response stakeholders. Ameren-IL will use these checklists as part of future after-action critiques to determine compliance with the plan and its protocols during response events.
- Ameren-IL will provide for periodic review of plan appendices and protocols in its Emergency Response Plan document.

Verification Discussion and Conclusions

During the second quarter of 2009, Liberty reviewed the Ameren-IL response to a data request, and found that it made the following progress toward implementation of this recommendation:[86]

- "Overview and orientation training sessions have been completed in all operating divisions and for other emergency response stakeholders
- "Guidance to all operating divisions has been documented whereby information regarding the existence and utilization of the Emergency Response Plan components are to be discussed and shared with all Ameren Illinois Utilities response stakeholders. This specific responsibility is outlined in the "Roles and Responsibilities" checklist document for the Division Command Center Director…
- "'Roles and Responsibilities' checklist documents for various emergency response position leads are being developed and made available to Ameren Illinois Utilities response stakeholders. Ameren-IL will use these checklists as part of future after-action critiques to determine compliance with the plan and its protocols during response events…

[86] Response to Data Request #1088.

- "Provision for periodic review of plan appendices and protocols to be included in the Ameren Illinois Utilities Emergency Response Plan…"

In August 2009, Liberty conducted and on-site interview, reviewed the Ameren-IL response to a data request, and found:[87]

- All six operating divisions report that they have completed initial training and orientation on the emergency plan.
- All emergency responders have access to the emergency plan on the web site.
- Members of the EOC core team have conducted meetings in the divisions to monitor and reinforce the familiarity of responders with the emergency plan.
- The results of the critiques following the second quarter major outage events affirmed the familiarity of responders with the emergency plan.

Ameren-Il has met its implementation plan within the stated timeline. The efforts are in accord with the intent of Liberty's recommendation. Based upon the results of the August 2009 review, Liberty considers its verification work on this recommendation to be complete. In May 2012, Liberty confirmed that Ameren-IL continued to conduct training and drills.[88]

[87] Interview #285, August 12, 2009, and response to Data Request #1245.
[88] Interview #477, May 24, 2012, and response to Data Request #1634.

Recommendation

III-5

Make the Electric Emergency Restoration Plans (both corporate and division) accessible to all key response personnel, including bargaining unit employees.

Background

Liberty found that the corporate and division EERPs were not accessible to bargaining unit employees involved in the emergency response to the 2006 storms. Other than Ameren-IL Division IV, the operating divisions told Liberty during interviews that union employees did not have access to the EERP. While it is understandable that some information needs to be restricted in a collective bargaining environment, it is important that key response personnel have access to and are familiar with the emergency restoration plans.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation and summarized its implementation plan as follows:

- All Emergency Response Plan components, protocols, and roles and responsibilities documents are available to all Ameren-IL employees at the distribution operations website.
- Ameren-IL sent instructions to access this site to all operating divisions and to other emergency response stakeholders.
- Ameren-IL has distributed instructions to meet and discuss the Emergency Response Plan and its components with bargaining unit employees via e-mail correspondence.

Verification Discussion and Conclusions

Based on information received from Ameren-IL's response to a data request,[89] Liberty found:

- Five of the six Ameren-IL operating divisions report that the review of the Ameren-IL Emergency Response Plan with bargaining unit employees is complete or will be complete by the end of the second quarter of the verification phase.
- The remaining division reports that planning is underway to complete this review with its employees.

Ameren-IL has followed and completed its implementation plan as described above in the timeframe indicated. Even though there remains some work to be done in one division in reviewing this plan with their bargaining unit employees, Ameren-IL has accomplished the intent of Liberty's recommendation. Liberty considers its verification work on this recommendation to be complete.

[89] Response to Data Request #1089.

Recommendation

III-6

Conduct annual training and storm drills that involve response employees from all operating divisions and key response functional areas.

Background

Liberty concluded that Ameren was inconsistent in training on emergency plans and made very little use of storm drills prior to the 2006 storms. Three of the seven Ameren-IL operating divisions did not do any training of employees in the EERP. Only one of the seven divisions reported that it held a storm drill, and one other division sent representatives to sit in on those drills. In addition, interviewees from other key functional areas in the Ameren response organization indicated that they did not conduct training or drills.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation and provided the following summary of its implementation plan:

- At this point in the evolution of this initiative, Ameren-IL focused training and drills on developing awareness within the organization, education of key response stakeholders, familiarization with the plan protocols and with individual response position roles and responsibilities.
- As the organization matures in its understanding and knowledge, the nature of drills will shift to active utilization of the various plan components.
- First Training – April 30, 2009
- First Drill – May 29, 2008
- All divisional training completed – October 9, 2008
- Next Scheduled Exercises – Division Command Center Team Positional Drills – Quarter 4, 2008
- Provision outlining annual training/drills/exercises to be included as part of overall plan development

Verification Discussion and Conclusions

During the first quarter of 2009, Liberty conducted an on-site interview and reviewed Ameren's response to data requests, and found the following:[90]

- Ameren-IL conducted two "table-top" drills in 2008 – one on May 29, 2008, and one December 2-4, 2008.
- In the May 2008 drill, Division Managers, Supervising Engineers, and Division Superintendents were the participants. The topics covered were: Initial Damage Assessment, Public Safety Advisors, Safety Professionals, Foreign Crews, Workers Protection Assurance, and Resource Allocation/Balancing.
- In the December 2008 drills, positional leads from the division command teams, EOC liaison personnel, and employees from Distribution Design Center and IL Operations Support were

[90] Interview #214, January 28, 2009, and responses to Data Requests #1039 and #1058.

involved. Topics covered were: Crew Management, Coordination/Work Management, Field Check, Engineering Support, and Logistics.

- Ameren-IL provided follow-up introductory training to response team members on December 4, 2008.
- Ameren-IL will include wording in its Emergency Response Plan providing for regular, ongoing drills and training of emergency response personnel.

During August 2009, Liberty conducted an on-site interview, reviewed the response to a data request, and found:[91]

- Ameren-IL is conducting ongoing training of members of the emergency response organization.
- Ameren-IL is making good use of the emergency plan protocols, Roles and Responsibilities (R&R) documents, and plan sections as it develops them as tutorials for training of responders.
- Recent specific training has been conducted as follows:
  - "Table-top" drill in Division IV
  - Familiarity review in Division I
  - Division III is conducting "Opening steps" review of plans
  - A "more advanced" table-top drill with Logistics group
- Ameren-IL is not ready at this time to conduct a simulated drill.

Liberty learned that weather events forced Ameren-IL to re-schedule training sessions in January and February 2010.[92] Liberty observed a training session on March 10, 2010.[93] Attendance was good and participation excellent.

Ameren-IL is continuing a structured, aggressive program for training and drilling emergency responders. Ameren-IL advised that it scheduled 3-day drill and training sessions, including a 2-day simulated drill, for each of the six operating divisions beginning October 2010 and ending in January 2011.[94] Liberty plans to attend a session in Division 6 in January.

On January 18-19, 2011, Liberty observed an Ameren-IL training session at the Division VI headquarters in Belleville. During the two-day session, the Ameren-IL training team led the division-command center team through an in-depth discussion of the question "What does it mean to be a member of the Division VI Command Center Team?" The group explored the answers to the following questions:

- Who is my customer?
- What information do they need? When do they need the information?
- What information can I provide? When should I provide it?

[91] Interview #285, August 12, 2009 and response to Data Request #1246.
[92] Interview #359, February 11, 2010.
[93] Interview #360, March 10, 2010.
[94] Responses to Data Requests #1460 and #1471.

- How can I help the division Command Center Team?
- How can I help the Ameren Illinois Team?

Attendees were well prepared and very enthusiastic. Although the training team had developed a well-designed mock storm simulation script, Ameren-IL did not hold the drill because of the interest and the length of important discussions on the above topics. Ameren-IL also provided training on the Outage Analysis System (OAS) during these two days. It provided a third day of training for other Division VI responders on January 20.[95]

Ameren-IL has met its implementation plan in the timeframe indicated. The efforts are in accordance with the intent of Liberty's recommendation. However, Liberty has not completed verification work on this recommendation and will:

- Work with Ameren-IL in developing a simulated drill.
- Sit in as an observer of a simulated drill.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions affected by the May and June storms, with EOC leadership, and with the VP of Operations for Ameren-IL. In addition, the Liberty auditor sat in on an Ameren-IL Emergency Response Retreat in Pawnee, IL.[96]

The chart below outlines the training hours for the EOC team and all operating divisions in the past twelve months:[97]

Operations	# of Attendees	Total # of Training Hours	Beginning Date	Ending Date	Logistics	# of Attendees	Total # of Training Hours
Div I	28	244	10-04-10	10-06-10			
Div II	32	286	11-15-10	11-17-10			
Div III	25	225	11-30-10	12-02-10			
Div IV	39	347	1-25-11	1-27-11			
Div V	30	265	3-23-11	3-24-11			
Div VI	34	307	1-18-11	1-20-11			
			12-15-10		EOC Tm	2	4
			02-10-11		All Div	15	60
			03-10-11		All Div	18	144
			05-09-11		EOC Tm	4	8
			07-06-11		All Div	12	24
All Div	30	195	08-17-11				
Total Ops Training Hrs		1,869	Total Training Hours 2,109		Total Logistics Training Hours		240

[95] Interview #424, January 18 and 19, 2011.
[96] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.
[97] Response to Data Request # 1591.

Based on its findings, which reflect a dedicated and continuing effort to provide training for response team members, Liberty considers that its verification work on this recommendation is complete.

Recommendation

III-7
Hold post-event critiques following every significant outage event.

Background

Liberty concluded that Ameren was inconsistent in the use of post-event critiques before and after the 2006 storms. Only three of the seven Ameren-IL divisions submitted critiques, even though at least one more division had significant outages during the November/December 2006 storm, and all divisions participated in the restoration effort. In addition, several key functional areas did not perform critiques, most notably the EOC. The failure to use the post-event critique process results in Ameren-IL missing improvement opportunities.

Liberty recommended that Ameren-IL hold post-event critiques following every significant outage event. Ameren-IL needs to capture systematically and completely lessons learned from significant outage events. Critiques should include all affected operating divisions and response functional areas.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation and summarized its implementation plan as follows:

- Section 12 of the Ameren-IL Emergency Response Plan outlines the after-action critique form utilized as the initial segment of an introspective organizational analysis of emergency response performance
- Organizational critique meetings are conducted following emergency response events
- Provision defining this recommendation to be written into the Ameren-IL Emergency Response Plan

Verification Discussion and Conclusions

During the first quarter review, Liberty found and reported the following regarding Ameren-IL's implementation effort on this recommendation:

- Ameren-IL holds after-action critique meetings following each major outage event.
- Ameren-IL developed a template used to gather information from response team members in the after-action critique process.
- Ameren-IL has and will continue to revise this template as necessary to gather information to make the critique process more comprehensive
- After gathering information, Ameren-IL holds a follow-up meeting involving Division Managers, Division Superintendents, Division Supervising Engineer, Operations vice presidents, Operations Managers, and EOC staff.

In its review during the second quarter, Liberty submitted a data request to follow-up on Ameren-IL's progress. Liberty found that:[98]

- Ameren-IL developed and approved wording for insertion in the Emergency Response Plan.

[98] Response to Data Request #1091.

- The wording provides an ambitious but realistic timeline to have all steps of the post-event critique (after-action reviews) completed, as well as a process to follow to completion after each event.

Ameren-IL followed and completed its implementation plan within the indicated timeframe. The efforts were in accordance with the intent of Liberty's recommendation, and Liberty considers its verification work on this recommendation complete.

Recommendation

III-8

Implement a structured process for soliciting, collecting, and incorporating feedback on needed changes and updates to emergency plans.

Background

Liberty found that Ameren had no structured process for soliciting, collecting, and incorporating feedback on needed changes or updates to their emergency plans prior to the 2006 storms. There were no provisions for plan feedback, updates, or modifications in any of the emergency plans. Just as important as post-event critiques is a structured process to ensure that Ameren-IL solicits, collects, and incorporates feedback on the plans. To do this requires a clearly defined process with accountability and follow-up to ensure that it makes updates and changes in a timely, accurate, and comprehensive manner.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation and provided the following implementation summary:

- A "Parking Lot" document is maintained to capture feedback on needed changes and updates that are identified during:
  - Training sessions
  - Exercises
  - After-Action critiques
- This document to be moved to the DDO website to provide visibility throughout the Ameren-IL organization
- "After-Action Critique" survey form is in place as Section 12 of the Ameren-IL Emergency response Plan protocols
- "After-Action Critique" survey is utilized following emergency response events during which the Emergency Operations Center is activated – mailed to all Ameren-IL emergency response stakeholders listed on EOC distribution lists
- Summaries of all written comments received within the completed survey forms are compiled and distributed to primary emergency response stakeholders/

Verification Discussion and Conclusions

In its first quarter verification review with Ameren-IL, Liberty found and reported that:

- Ameren-IL uses the after-action critique process, including the "After-Action Critique" survey form and the "Parking Lot" document process to capture critique items for action.
- To particularly focus on the issue of this recommendation, that is, critique items dealing with the emergency plan itself, Ameren-IL added four questions to the "After-Action Critique" survey form:
  - Any items that were not found in the emergency plan that should have been
  - Any items in the plan that were executed according to the plan but did not work
  - The extent to which the respondent used the plan, with explanation required if the plan was not used

- Any suggested changes to the plan.

During the second quarter review, Liberty found:[99]

- Ameren-IL developed wording approved for insertion in the Emergency Response Plan that addresses this recommendation.
- This wording provides that Ameren-IL will capture and report input received during this process through the Ameren Illinois Utilities Emergency Response Plan repository.
- The repository will be available for ongoing review by all response stakeholders.

In August 2009, Liberty conducted an on-site interview, reviewed the Ameren-IL response to a data request, and found:[100]

- Ameren-IL has developed a structured process for soliciting, collecting, and incorporating feedback on needed modifications to the emergency plans.
- Ameren-IL used this process in critiques following the two major outage events during the 2nd quarter of 2009, and in the training sessions on the emergency plan.
- The Ameren Illinois Emergency Response Plan repository as referred to above serves the purpose of collecting and following up on feedback.
- Ameren-IL has developed a report that is available on the web site and updated periodically listing the:
    - Description of the specific feedback issue
    - Origination (date and event prompting the origination) of the issue
    - Status of review/development
    - Priority of the issue
    - Owner (person responsible for review/development) of the issue
    - Comments providing more detail on review/development

Ameren-IL is using the process described above and has not experienced any concerns with the results to date.[101] Liberty notes that the effectiveness of this type process can only be rightly determined by monitoring the compliance and end results over time.

Ameren-IL furnished details of its ongoing post-event feedback collection and follow-up process.[102] The chart below summarizes the results of its efforts from April 2008 through September 2010.

Year	2008	2009	2010	Total
Feedback Items	20	17	5	42
Total Complete	16	4	0	20
High Priority Items – Complete/Total	11/11	2/2	0/3	13/16

[99] Responses to Data Request Nos. 1091 and 1092.
[100] Interview #285, August 12, 2009, and response to Data Request 1247.
[101] Interview #359, February 11, 2010.
[102] Response to Data Request #1461.

These figures reflect what Liberty would anticipate with Ameren-IL implementing a new emergency plan. That is, one would expect to see a larger number the first year, with declining numbers each succeeding year. Likewise, the high priority items identified declined significantly in the second and third year. It is apparent that Ameren-IL has institutionalized the feedback/follow-up process and is resolving these issues in a timely, effective manner. A few medium and high priority items remain in process and bear watching.

Ameren-IL has completed its implementation plan in the timeframe indicated. The efforts are in accordance with the intent of Liberty's recommendation. Liberty has not completed its verification work on this recommendation. Liberty will follow-up with Ameren-IL to monitor the use and effectiveness of this process in future major outage events, in the ongoing training sessions, and in the review of the emergency plans.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions impacted by the May and June storms, with EOC leadership, and with the VP of Operations for Ameren-IL. In addition, the Liberty auditor sat in on an Ameren Illinois Emergency Response Retreat.[103] During these interviews and the retreat, Ameren-IL addressed the following feedback items from the critique of recent response efforts:

- Initial Damage Assessment – need to better follow the EERP in formalizing these assessments
- Field Checking – still having some issues with field checkers who are brought in to assist. This is not their normal line of work, and although they have received regular training, there are still some deficiencies. There is also varying opinions among the operating divisions as to what a field checker should be expected to do.
- Estimated Restoration Times – there is still some work to be done here. All divisions have committed resources to monitor ERTs and to ensure they are received timely and are accurate.
- End-of-Day Reporting – this reporting by field crews has not been as consistent as it should be, and some divisions have not followed the plan completely in the format of these reports.
- Daily Work Plans – some of the divisions have not been preparing daily work plans and submitting them to the DDC – distribution dispatch center – and as a result there have been some delays in the completion of necessary switching and tagging prior to the crew beginning to work on a particular line. The lack of good, detailed daily work plans also hinders the EOC ability to keep up with the restoration progress.

During the Ameren Emergency Response Retreat, Ameren-IL discussed these items in detail. Several of them have already been successfully resolved, and all of them have a good plan and specific responsibility and timelines assigned.

Ameren-IL met the intent of the recommendation and Liberty considers its verification work complete.

[103] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.

Recommendation

III-9
Improve Division emergency response plans.

Background

Liberty found that Ameren-IL should develop a comprehensive template that all operating divisions will use in developing or improving their Electric Emergency Restoration Plans.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation and provided the following implementation summary:

- To serve as a "template" for individual division plan development, a Table of Contents outlining specific items and order of inclusion within each Division Emergency Response Plan is under development.
- When completed, this "template" will be distributed to all operating Divisions
- All Divisions will be instructed to build their respective plans utilizing the template provided to them – as needed, assistance will be provided by the Illinois Distribution Operations Emergency Response staff
- When completed, all Division Plans will be added as appendices to the overall Ameren Illinois Utilities Emergency Response Plan
- All Division Plans will be added to the distribution operations website.

Verification Discussion and Conclusions

In August 2009, Liberty conducted an on-site interview, reviewed a response to a data request, and found:[104]

- The topic of division emergency plans has been on the agenda of all Division Superintendent meetings in 2009
- The discussion in these Division Superintendent meetings has helped in refining the division emergency plan template and the process of plan development
- A sample of a division template (Division V) exhibited a comprehensive, well organized plan structure
- Each division is working on its specific plan and making good progress.

In November 2009, Liberty again conducted an on-site interview, reviewed the Ameren- IL response to a data request, and found:[105]

- The division plan template is available on the Ameren-IL site
- Ameren-IL anticipates that all divisions will have their plan complete by the due date of January 8, 2010
- The EOC will monitor performance during major outage events to ensure compliance by divisions with their plans.

[104] Interview #285, August 12, 2009, and response to Data Request #1248.
[105] Interview #323, November 19, 2009, and response to Data Request #1321.

Ameren-IL reported that all divisions had completed their emergency response plans in accordance with the template developed.[106] As noted above, the EOC will maintain responsibility for continuing review of the division plans to ensure conformity and consistency in the plans and in their execution.

Ameren-IL furnished a copy of the Division 5 Electric Emergency Response Plan (EERP).[107] The plan consists of nine sections:

1. Purpose and Intent
2. Storm Declaration and Response
3. Storm Safety Protocols
4. Division Command Center
5. Operating Centers Information
6. Storm/Outage Response Coordination
7. Emergency Plan Update and Training
8. Logistics
9. Appendix / Miscellaneous Forms

Liberty found this division plan to be comprehensive, concise, and formatted in a way to facilitate quick access to needed information. It provides specific roles and responsibilities information for key responder positions. It is careful to refer to, coordinate with, and be subordinate to the Ameren-IL EERP. This plan demonstrates that Ameren-IL has followed through to develop useful division plans that are coordinated with the corporate plan.

On May 23, 2011, Liberty conducted an on-site interview.[108] In this discussion, several items arose that indicated there is an opportunity for improvement in the level of compliance with all of the procedures set forth in the emergency plan. See the comments providing more detail in the Verification Discussion and Conclusions Section under Recommendation III-1.

Ameren-IL met its implementation plan within the stated timeframe. The efforts addressed the intent of Liberty's recommendation. Liberty has not completed verification work on this recommendation and will follow-up with Ameren-IL to review performance of the operating divisions in future major outage events, to determine whether the divisions followed their emergency plans, and assess the extent to which the plans provided adequate guidance in the restoration effort.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions affected by the May and June storms, with EOC leadership, and with the VP of Operations for Ameren-IL. Liberty also sat in on an Ameren-IL Emergency Response Retreat.[109] Please refer to Liberty's comments under Recommendations III-1, III-2, and III-3. Based on its findings, Liberty now considers that its verification work on this recommendation is complete.

[106] Interview #359, February 11, 2010.
[107] Response to Data Request #1462.
[108] Interview #435B, May 23, 2011.
[109] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.

Recommendation

III-10
Improve the Ameren corporate Communication Plan for Severe Storms.

Background

Liberty concluded that the Ameren Corporate Communication Plan for Severe Storms needed improvement, specifically to tie the plan to the corporate EERP and Ameren's emergency response organization. In addition, the plan did not contain any information regarding the communications emergency response organization or job duties during an event. Ameren-IL should revise the Communication Plan to cover the issues noted and make the plan more comprehensive.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation and provided the following implementation plan summary:

- A detailed, integrated Corporate Communications plan document is under development, at present. When completed, this plan document will be added as an appendix to the overall Ameren Illinois Utilities Emergency Response Plan.
- The role of the Community Relations Coordinator has been established within the Corporate Communications group. These agents, serving under the direction of the Corporate Communications group, are intended to serve as serve as "points of contact" persons to liaise between Ameren Illinois Utilities and external stakeholders at a local level.
- "Roles and Responsibilities" checklists applicable to positions within the Corporate Communications group are under development.
- An information management tool – "PIER site" - is under development to help ensure timely, accurate, & consistent information is available to internal & external stakeholders. Over time, the PIER site is expected to become the primary emergency response information management tool utilized throughout the Ameren Illinois Utilities (notwithstanding the use of an outage management system). The tool facilitates the development of pre-event, event, & post-event communications template libraries, provides functionality to develop external contact / distribution lists and will streamline the process of ensuring timely, accurate, & consistent information throughout the organization to external stakeholders.

Verification Discussion and Conclusions

In May 2009, Liberty found that Ameren-IL's had accomplished a number of actions items intended to improve the Corporate Communications Plan for Severe Storms, including the following:[110]

- Ameren-IL revised its Corporate Communications Plan for Severe Storms.[111] The revised plan delineates key storm response roles and responsibilities and assigns them to members of Ameren-IL's communication organization. It outlines required tasks for each role based on the severity of the storm.

[110] Interview #243, May 5, 2009.
[111] Response to Data Request #1085.

- Ameren-IL hired five Community Relations Coordinators to supplement the Ameren-IL Corporate Communications organization. These individuals support the communication needs of the divisions, day-to-day as well as during a storm.[112]
- Ameren-IL contracted with a vendor to provide hosted, browser-based access to communications information during a storm. The PIER "portal" tool facilitates the dissemination of storm-related information to the media, community leaders, legislators, and other key stakeholders. It also provides a common repository for Ameren employees. Ameren-IL Communications controls the messaging, updates, and distribution frequency.[113]

In November 2009, Liberty found that Ameren-IL had accomplished a number of actions items intended to improve the Corporate Communications Plan for Severe Storms, including the following:[114]

- Ameren-IL replaced the Communication Plan for Severe Storms with the "AIU Community and Public Relations Emergency Communications Plan Summary." This revised plan formalizes the structure and updates references to the new elements of the plan including the Detailed Roles & Responsibilities, the Critical Facilities Report, and the Community & Public Relations Storm Prep Check List.[115]
- Ameren-IL also modified the plan to specify activities based on the level of the storm, using the same criteria as Ameren-IL Regulatory.
- Ameren-IL is in the process of developing a follow-up evaluation of a community after an event.

In August 2010, Liberty learned that Ameren-IL had completed the following activities in response to this:[116]

- The Communications team conducted a very successful mock drill in July 2010.[117]
- Ameren-IL will conduct another mock drill to simulate Communications storm response in the next 6 months.
- Ameren-IL Communications team also conducted twelve 90-minute town hall meetings with customer service employees to explain all the things that Team CPR (Community and Public Relations Department) does during an event and to communicate about what happens in the field.
- Team CPR has become very proactive, and Ameren-IL reported that its customers are starting to notice. The divisions also recognize and value their outreach efforts during an event.

Ameren-IL met its implementation plan and the intent of Liberty's recommendation. Liberty considers this recommendation verified and closed.

[112] Response to Data Request #1197.
[113] Response to Data Request #1028.
[114] Interview #309, November 10, 2009.
[115] Response to Data Request #1296.
[116] Interview #394, August 20, 2010.
[117] Response to Data Request #1442.

Recommendation

III-11

Improve emergency plans by evaluating actual performance.

Background

Liberty found that emergency plan deficiencies and the lack of familiarity and use of the plans had a negative effect on the Ameren restoration effort in the 2006 storms. For example, the corporate EERP details a process for Checkpoints to facilitate the coordination of outside crews coming in to help Ameren. However, Ameren-IL did either not use or made minimal use of this process.

Liberty recommended that Ameren-IL improve emergency plans by evaluating actual performance. Ameren-IL should review all chapters of Liberty's final report and its own critiques of their 2006 storm performance to identify specifically those areas in which it did not follow emergency plans and which resulted in a negative effect on the restoration effort. Ameren-Il should continue these critiques on all future events, and identify and follow specific plans of action to address identified improvement areas.

Ameren-IL's Implementation Plan

Ameren-IL has evaluated its own performance during the 2006 emergency response events. Evidence and examples of the results of this introspective evaluation are in the many areas of improvement that Ameren-IL has already completed and that are in development throughout the organization as reported through these recommendation templates. Ameren-IL has clearly taken a proactive stand in making necessary, fundamental, and wide-ranging changes to its emergency response structure and processes prior to and during the course of the audit investigation.

The efforts of the Liberty Audit team brought to light items missed through an introspective review of Ameren-IL's 2006 performance. Ameren-IL has taken significant, demonstrable steps to begin the implementation of these recommended improvements.

Verification Discussion and Conclusions

Based on discussions at an on-site interview and on the review of the Ameren-IL response to the Liberty recommendations stemming from the 2006 storms, Liberty found:[118]

- Ameren-IL has conducted a thorough review of its response performance during the two 2006 storms and has implemented a number of improvements resulting from the review.
- Ameren-IL is making a comprehensive and thorough effort in developing and executing implementation plans to follow the recommendations made by Liberty.
- Liberty's continuing verification work on a number of these implementation plans will ensure that Ameren-IL follows through to capture all improvements noted in the Liberty recommendations.

[118] Interview #214, January 28, 2009.

Ameren-IL is following its implementation plan. Because Ameren-IL is implementing this recommendation by taking the actions in response to all of the Liberty recommendations, Ameren-IL did not set a specific timeline in their implementation plan for this recommendation. Liberty agrees with that decision. Ameren-IL's approach in responding to this recommendation is in accord with Liberty's intent. With the understanding that Liberty will confirm the final verification of Ameren's implementation of this recommendation by its ongoing verification of the implementation of all other recommendations, Liberty considers its verification work on this particular recommendation as complete.

Recommendation

IV-1

Improve service level agreements with weather service providers. Engage weather service providers more aggressively. (Also, refer to Recommendation II-1)

Background

The weather forecasts and major storm predictions as furnished by Ameren's contracted weather service lacked the specificity and accuracy needed for Ameren to properly prepare in advance for a major outage event. Ameren did not aggressively interact with SSI in an attempt to gain as much information as possible about the probability of a major outage event.

Key Ameren response personnel described the performance of the contracted weather service as "poor," "pretty good," and very "unspecific." The only favorable rating was for the July 21 storm that hit while Ameren was repairing the damage from the July 19 storm. In the case of the July 19 event, SSI forecasted the system to weaken when, in fact, it intensified, and in the November storm, SSI advised Ameren that there would not be significant icing, only to see the system re-organize and bring heavy icing to a larger area than originally forecast. While it is apparent that most if not all weather services did not forecast the severity of the July 19 storm, there is obvious room for improvement in the performance of the contracted weather service.

Ameren may have been able to mitigate this deficiency on the part of the contracted weather service through a more aggressive approach in interacting with the service. The use of conference calls and probing, follow-up questions with weather services is a utility best practice that Ameren should implement.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation and provided the following implementation summary:

- Contract has been executed with DTN/Meteorlogix
- 5-day forecast is received on a daily basis
- Conditions and forecast information is available 24/7/365 via the DTN/Meteorlogix web portal
- On-line consultation with DTN/Meteorlogix takes place whenever the development of severe weather conditions is possible. This service is available 24/7/365
- Historical record of consultative inquiries and responses is maintained.

Verification Discussion and Conclusions

In January 2009, Liberty conducted interviews, reviewed data furnished by Ameren-IL, and found the following:[119]

- The signed contract with weather vendor DTN/Meteorlogix is in place.
- The service provided by DTN/Meteorlogix is not Ameren-specific (i.e., not customized to Ameren-IL's service area exclusively) and is primarily "off the shelf" with some customization.

[119] Interview #214, January 28, 2009, and responses to Data Requests #1005, #1007, #1036, and #1040.

- Weather vendor sends alerts on lightning strikes.
- Ameren does not receive alerts on winter storms. They do receive regular severe weather forecast updates for a 3-day period, which would include winter storms.
- Ameren has implemented a more aggressive interrogation/interaction process with the weather vendor.
- Ameren-IL uses e-mail communications with weather vendor almost exclusively to facilitate documentation. Very seldom do Ameren response team members talk to weather vendors by telephone. Almost exclusively one member of the Ameren-IL EOC team handles contacts with weather vendor.
- The EOC sends copies of e-mail responses from weather vendor to all members of the Ameren-IL response team.
- Dispatchers – who are on duty 24/7/365 – have access to this weather tool and contact supervisor on call upon notification of any significant weather developments.

Due to the similarity between this recommendation and Recommendation II-1, Liberty has combined the review of the implementation progress by Ameren-IL in both of these recommendations. Please refer to the Verification Discussion and Conclusions comments on Recommendation II-1 above.

Ameren-IL has met its implementation plan within its timeframe. The efforts addressed the intent of Liberty's recommendation. See the comments on Recommendation II-1. Liberty considers its work complete on this recommendation.

Recommendation

IV-2

Implement predictive modeling to forecast the scope and severity of potential major outage events.

Background

Liberty's evaluation of Ameren-IL's pre-storm preparations emphasized the need for predictive modeling. As a number of utilities use predictive modeling, have proven it to be very beneficial, and consider it a best practice, Liberty recommends that Ameren-IL implement predictive modeling.

Ameren-IL's Implementation Plan

Ameren-IL agreed to investigate models that are available commercially and to conduct a cost/benefit study of their effectiveness. Furthermore, Ameren-IL agreed to continue internal developmental work on a predictive damage/restoration model and offered the following specifics on the implementation plan:

- Ameren Illinois Utilities will investigate available predictive damage assessment models with the intent of implementing the same, if they prove to be accurate and provide overall benefit to the Corporation.

Work is currently underway within the Ameren Illinois Utilities Distribution Operations group to develop a predictive damage/restoration model.

Verification Discussion and Conclusions

In August 2009, Liberty conducted an on-site interview, reviewed Ameren-IL responses to data requests, and found:[120]

- Ameren-IL has met with the Department of Electrical and Computer Engineering at the University of Illinois with the following result:
    - Work will begin in the fall semester of 2009 at the University of Illinois to develop Phase I of the model. (Phase I will predict the area, extent, and severity of damage by a major weather event.)
    - Ameren-IL is working to "mine" out the needed historical data to help develop the model.
    - It is anticipated that Phase I will be completed early in 2010.
    - Following completion of Phase I, work will begin on Phase II, which will forecast the needed resources to effect restoration of the forecasted damage within the specified timeframe.
- Ameren-IL is committed to following this effort through to completion, resulting in access to predictive model that will be helpful in pre-event preparations.

Liberty learned that Ameren-IL completed Phase I of the predictive model (as described above, this Phase will predict potential damage by a major outage event).[121] Ameren-IL described this first phase as "marginally usable" at this point pending its obtaining and entering more storm-

[120] Interview #285, August 12, 2009, and responses to Data Requests #1250 and #1222.
[121] Interview #359, February 11, 2010.

history data points. Ameren-IL is arranging to have a presentation of Phase I to Liberty during the 6th quarter of this verification process. Ameren-IL plans to move forward with the development of Phase II, which will predict the needed resources to respond the damages as calculated by Phase I of the model.

Ameren-IL is meeting its implementation plan in the timeframe specified. The efforts meet the intent of Liberty's recommendation. Liberty's verification work is not complete on this recommendation. Liberty will:

- Observe a presentation on Phase I of the model.
- Follow-up on the development of Phase II and the usefulness of Phase I.
- Monitor the results of the use of this predictive model in future, major, weather-related outage events.

On August 10, 2011, Liberty observed a presentation of the Ameren-IL predictive model, which it developed in-house and used the model to assist in preparation efforts during spring and summer lightning and windstorms and tornadoes.[122] A young graduate engineer developed the model in cooperation with Ameren-IL as his senior project while at the University of Illinois. Since hired by Ameren, he has continued to refine the model, gathering and using Ameren storm data to help build the model. Using the weather predictions for factors such as wind speed, lightning intensity, and rainfall, and the historical data, the model will predict the amount of damage and labor hours needed to restore within a specified time. This model just became available in early 2011, but in the storms that occurred since then, the model's output was very consistent with that actually experienced. The present model will need more refinement and actual testing during major events. Ameren-IL will develop the model for winter storms as it gathers more history from actual storms. The amount accomplished to date, however, is extremely encouraging and will prove very helpful to Ameren in future major events.

In November 2011, Liberty discussed this recommendation with Ameren-IL.[123] Ameren-IL is using the predictive model for summer windstorms. It needs more history to make the predictions more accurate. The winter model is not yet in use. Ameren-IL will add historical data as future winter storms occur. Liberty encouraged Ameren-IL to use estimated data from the experiences and knowledge of veteran operating personnel who have responded to a number of winter storms.

Based on these findings, it is Liberty's opinion that Ameren-IL has met its stated implementation plan. Liberty's verification work is not complete, and will include:

- A follow-up on the continuing refinement of the models
- Monitoring of the use and results of the model in future major events.

On May 24, 2012, Liberty conducted a telephone interview with Ameren-IL and discussed this recommendation.[124] Ameren-IL is using the predictive model, and has identified and trained

[122] Interview #438, August 10, 2011.
[123] Interview #464, November 7, 2011.
[124] Interview 477, May 24, 2012.

personnel to run the model in major events. Liberty's verification work on this recommendation is complete.

Recommendation

IV-3

Implement a notification process to alert the response organization of the threat or onset of a major outage event.

Background

Liberty found that the process used by Ameren-IL to alert its response organization, while somewhat effective, had room for improvement.

The stated alert process used by Ameren in the 2006 storms was telephone calls from the person responsible for a particular response function to the others involved in that function. All responders "became aware" of the threat or onset of a major event in the 2006 storms through different sources. There were some delays reported in receiving notice, and several interviewees did not recall how someone alerted them. The process used by Ameren is also labor-intensive for key response leaders, who might put their time to better use in the early notification stage of a major outage response.

Liberty recommended that Ameren-IL implement a notification process to alert the response organization of the threat or onset of a major outage event. Ameren-IL should identify notification groups and specific messages sent to each group.

In comments on Liberty's draft report, Ameren-IL indicated that it had established a formal notification process using a broadcast e-mail system to all Ameren-IL emergency response stakeholders' Blackberry devices and personal computers. Ameren-IL said that a minimum of five primary stakeholders in each operating division receive these notices. This process appears to meet the intent of Liberty's recommendation.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation. The "Weather Alert" protocol has been established and is currently in use (section 3 of the plan). This protocol includes the text of interactive consultation with the weather service provider as well as pre-staging advisory information, when appropriate (given the level and certainty of impending severe weather conditions – "yellow" or "orange" weather alert).

Verification Discussion and Conclusions

In January 2009, Liberty conducted an on-site interview and reviewed Ameren's response to a data request concerning this recommendation, and found:[125]

- Ameren-IL has established a formal notification process – the "Weather Alert" protocol and it is now in use for notifying all emergency response team members and other affected Ameren personnel.
- This process consists of e-mails sent to designated recipients with "Return Receipt" to confirm that they received the message.

[125] Interview #214, January 28, 2009, and response to Data Request #1040.

- All key response team members needed for initial response are equipped with Blackberries with e-mail service as well as personal computers to ensure receipt of messages during off-hours.
- Specific information concerning the alert, such as weather vendor e-mail communications are included in the messages sent to recipients.
- Wording describing this process is in the emergency plan Ameren-IL is using, and will be included in the final draft of the Emergency Response Plan.

In August 2009, Liberty conducted an on-site interview, reviewed the Ameren-IL response to a data request, and found:[126]

- Ameren-IL has used the e-mail notification process in responding to actual and potential major outage events during the 2nd quarter of 2009.
- The actual e-mail notification messages sent on May 8, May 13, and June 18, 2009, provided key information needed by responders in a concise and logical format, informing recipients of such things as weather advisories, command center activation, guidance for alerting response resources, and other preemptive storm response activities.
- The process worked well during the major outage events in the second quarter of 2009.
- Ameren-IL has developed the wording that it will insert in the Emergency Plan. It provides complete and helpful information on the notification process.
- Included in the plan wording is a matrix listing:
    - Weather Condition
    - Alert Status
    - Ameren-IL EOC Activities
    - Other Ameren-IL Activities
- Ameren-IL has instituted a coding system to enable it to determine quickly when key response personnel receive the message.

Liberty learned that Ameren-IL is using the e-mail communications process described above under Recommendations II-1 and IV-1 to notify key response personnel.[127] The fact that all of these personnel are equipped with Blackberry cell phones and are reachable in this manner at any time makes this a very effective means of instantly alerting the response team. Through the "receipt response" and coding process, Ameren-IL is able to determine quickly when all of the functional response groups received the message.

Ameren-IL completed its implementation plan within the timeframe stated. The efforts addressed the intent of Liberty's recommendation and Liberty completed its verification work on this recommendation.

[126] Interview #285, August 12, 2009, and response to Data Request #1251.
[127] Interview #359, February 11, 2010.

Recommendation

IV-4

Implement an activation process for the Ameren corporate Emergency Operations Center (EOC) that will ensure that key EOC team members are in place at the EOC in advance of the onset of an outage event.

Background

Liberty found that the process used by Ameren-IL to alert its response organization, while somewhat effective, had room for improvement.

Ameren should identify "core" EOC team members and establish an activation process for notifying and assembling these team members at the EOC at a set time in advance of the anticipated onset of the outage event when adequate advance notice is available.

In comments on the draft report, Ameren-IL proposed an activation process that would have EOC team members "assume their roles" when there is significant, predictable, sufficient, and reliable notification of an emergency event. However, the most efficient way to respond adequately to a possible major outage event under such circumstances is to get key team members together early on at the EOC.

Ameren-IL's Implementation Plan

Ameren Illinois Utilities accepted this recommendation in principle and submitted the following implementation plan:

- Section 3 of the Ameren Illinois Utilities Emergency Response Plan protocols – "Weather Alert Protocol" - is developed and in place. This protocol outlines pre-staging guidance to the organization, based on an assessed level of threat contained in the weather guidance received
- Section 8 of the Ameren Illinois Utilities Emergency Response Plan protocols – "Storm Ramp-Up and Ramp-Down Protocol" - is developed and in place. This protocol defines and outlines responsibilities at the EOC and Division level
- Ameren Illinois Utilities will develop an activation process that will include thresholds of potential threat to guide activation by the EOC staff in advance of future events

Verification Discussion and Conclusions

In August 2009, Liberty conducted an on-site interview, reviewed Ameren-IL responses to data requests, and found:[128]

- Ameren-IL has developed a comprehensive process for activation of the Emergency Operations Center (EOC).
- The emergency plan wording includes the following:
    - A definition of the process
    - When EOC activation will occur (including a matrix showing storm level, number of divisions affected, estimated length of restoration, foreign resources used, and EOC activation status)

[128] Interview #285, August 12, 2009, and responses to Data Requests #1252 and #1112.

  - Who can request activation
- The activation process, including flow charts showing the process during off-duty hours when activation is done by duty supervisor for various reasons
  - Notification of organization
  - Immediate ramp-up activities
- Ameren-IL used this process during both of the major outage events during the second quarter of 2009.

Liberty found that the activation process described above is in place and Ameren-IL has used it several times over the last twelve months in actual outage events and in serious threats of a major outage event.[129]

In a February 16, 2010, letter to Liberty, Ameren-IL said that it might not be able to fund the complete implementation of certain recommendations, including this one, until and if the ICC approves a special funding request. The reason for the funding request on this recommendation involves the expenses associated with having key team members present at the EOC.

Ameren-IL has completed its implementation plan within the timeframe stated. The efforts addressed the intent of Liberty's recommendation. Notwithstanding the open question of funds to staff the EOC, Liberty has completed its verification work on this recommendation.

[129] Interview #359, February 10, 2010.

Recommendation

IV-5

Establish a more proactive, aggressive approach in procuring and mobilizing outside resources in advance of the onset of a major outage event.

Background

Liberty found that the Ameren corporate Electric Emergency Restoration Plan (EERP) should clearly describe an aggressive approach to mobilizing outside resources. Ameren-IL should determine the anticipated number of outside resources needed and make contacts with contractors and Mutual Assistance utilities in advance. Ameren-IL should move resources in advance and stage them near the projected impact area when possible and as appropriate. Despite the unsatisfactory experience encountered by Ameren-IL in July 2006 in seeking outside help, and despite the fact that it had considerable advance warning of the approaching winter storm in the last week in November 2006, it did nothing to contact other utilities and try to line up any help in advance.

Ameren-IL's Implementation Plan

Despite their objections, Ameren-IL expressed willingness to implement the recommendation in principle with the following implementation plan.

- Section 3 of the Ameren Illinois Utilities Emergency Response Plan protocols – "Weather Alert Protocol" – is developed and in place. This protocol outlines pre-staging guidance to the organization, based on an assessed level of threat contained in the weather guidance received.
- Section 8 of the Ameren Illinois Utilities Emergency Response Plan protocols – "Storm Ramp-Up and Ramp-Down Protocol" is developed and in place. This protocol defines and outlines responsibilities at the EOC and Division level.
- Ameren Illinois Utilities will include language within the Ameren Illinois Utilities Emergency Response Plan to initiate a preliminary call with Mutual Assistance partners when exceeding defined thresholds of threat.
- Ameren Illinois Utilities will include within the "Roles and Responsibilities" checklist document for the "Illinois EOC Crew Management Lead" position a provision to initiate preliminary discussions with the Mutual Assistance organization.

Verification Discussion and Conclusions

Liberty found that:[130]

- Ameren-IL established a contract with a weather service providing forecasts and analysis. In conjunction with this, Ameren-IL has taken or is taking the following steps to improve its awareness and response in advance of a pending major outage event:
    - Ongoing "24/7/365" monitoring and communication with the weather service provider
    - Development of a "step-by-step tutorial guide" for interaction with the weather service

[130] Responses to Data Request Nos. 1087, 1113, and 1116.

  - Establishment and implementation of an organizational alert system and protocol in advance of major outage threats, including specific duties and responsibilities set forth in "Roles and Responsibilities" (R&R) documents for positional leads throughout the Ameren-IL response organization
  - Issuance by EOC staff of "preparatory guidance" to the Ameren-IL response organization in advance of a major outage event, including the assessment of available "in-house" resources, and guidance in decisions concerning holding, releasing, and activating resources.
- The Ameren-IL EOC staff will pre-stage Ameren and base-load contractor personnel in advance of a major event as deemed prudent.
- Ameren-IL is actively pursuing the acquisition of predictive model process to provide guidance in making pre-event resource decisions.
- Ameren-IL has established specific procedural steps to guide the acquisition of foreign contractor and Mutual Assistance utility resources in advance of an imminent major outage event as deemed appropriate by the EOC staff.

In August 2009, Liberty conducted an on-site interview and found that:[131]

- During the two major outage events in the second quarter of 2009, Ameren-IL used outside resources from contractors and Mutual Assistance allies. (In the May 2009 event, Ameren-IL deployed 528 contractors and 105 Mutual Assistance resources.)
- The procedures described above were helpful in making early determinations of needed outside resources
- Ameren-IL has developed additional wording to describe the process for recruiting outside resources.

In February 2010, Liberty learned that Ameren-IL is following this process when faced with major outage events that require more resources than are available internally.[132] The Coordinator of Contractors and the personnel responsible for interacting with Mutual Assistance allies participate in all EOC conferences calls and respond proactively.

Ameren-IL completed its implementation plan within the stated timeframe. The efforts have addressed the intent of Liberty's recommendation. Liberty has not completed verification work on this recommendation and will:

- Continue to follow up with Ameren-IL in reviewing how this process is working in accomplishing its intended result in future emergency response situations.
- Confirm that the Ameren-IL Emergency Response Plan contains appropriate wording to describe this process.

[131] Interview #285, August 12, 2009.
[132] Interview #359, February 11, 2010.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions affected by the May and June storms, with EOC leadership, and the VP of Operations for Ameren-IL. Liberty also sat in on an Ameren Illinois Emergency Response Retreat.[133]

Ameren-IL has demonstrated in recent storm responses that it quickly and aggressively procures and mobilizes outside resources. Liberty considers its verification work on this recommendation is complete.

[133] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.

Recommendation

IV-6

Establish clearly the reporting relationship between Ameren corporate management and the response organization for major outage events. Include this in the corporate Electric Emergency Restoration Plan (EERP), and ensure that all members of the response organization are aware of this reporting relationship.

Background

Liberty concluded that Ameren did not make clear the reporting relationship between corporate management and the emergency response organization.

The Ameren-UE Vice President, Service Delivery, was the immediate supervisor of the individual who assumed the role of Emergency Operations Center (EOC) Director for the July 2006 storm. He considered himself the responsible Ameren officer for the storm response. Even after Ameren added a Co-Director of the EOC for the November/December 2006 storm with responsibility for the Ameren Illinois service area, there was no indication of a change in this reporting relationship between corporate management and the response organization. The Ameren-IL Senior Vice President responsible for the Illinois response, and the two Ameren-IL Region Operations heads all stated that they considered the Ameren-UE Vice President, Service Delivery, as the Ameren officer responsible for the Ameren response to these storms.

Liberty found no documentation or communication of the reporting relationship between Ameren corporate management and the Ameren response organization. It was not set out in the Ameren corporate Electric Emergency Restoration Plan (EERP). Significantly, when Liberty asked Ameren to provide the organization chart depicting the overall structure of the response organization for all of the Ameren service area, the response did not set out the reporting relationship between corporate management and the response organization. The majority of managers interviewed indicated that the response effort was the responsibility of the local division and the corporate Emergency Operations Center (EOC) was there to assist and coordinate the division efforts. When pressed to answer who would ultimately be responsible for making a decision in the event of an impasse, most interviewed said they could not see that happening, or said that the EOC would make the call. With the exception of those mentioned above, no managers interviewed ever spoke of the role and responsibility of corporate management in directing the response effort.

With the advent of the Ameren-IL Emergency Operations Center (EOC), the need for clarity in the reporting relationship between Ameren corporate management and the response organization(s) is even more important.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation and provided the following implementation summary:

- Language outlining the reporting relationship between Ameren-IL corporate management and the response organization has been added to the draft document containing the Ameren-IL Emergency Response Plan.

- Introductory training and overview materials outline the role of the Ameren-IL Emergency Operations Center
- Section 6 of the plan outlines the protocol defining responsibilities at each storm level defined within the plan
- Section 7 of the plan outlines the protocol defining the acquisition, deployment, re-deployment and release of emergency response resources
- Repeated affirmations from management outlining the role of the response organization

Verification Discussion and Conclusions

Liberty found:[134]

- Ameren-IL has clearly delineated the reporting relationship between Ameren-IL corporate management and the response organization and has explained it throughout the organization.
- Orientation and overview training conducted throughout Ameren-IL includes review of this reporting relationship.
- Several sections of the emergency plan used by Ameren-IL describe the reporting relationship.
- Ameren-IL upper level corporate management members are reaffirming this reporting relationship on an ongoing basis in discussions of the role of the response organization.

In response to a data request submitted by Liberty as part of its second quarter verification review, Ameren-IL furnished copies of the approved language as found in new sections 2A and 3 in the Emergency Response Plan that deal with the reporting relationship between Ameren-IL corporate management and the response organization.[135] Senior management approved this wording for insertion in the plan effective April 14, 2009. Liberty found the language to be clear and effective in addressing the issue raised in this recommendation.

Ameren-IL completed its implementation plan within the stated timeframe. The efforts addressed the intent of Liberty's recommendation, and Liberty considers its verification work complete.

[134] Interview #214, January 28, 2009.
[135] Response to Data Request #1094.

Recommendation

IV-7

Restructure the organization of the Emergency Operations Center (EOC) to include the function of coordination of Call Centers. Eliminate the broad span of control for the EOC Director.

Background

Liberty concluded that the Ameren Emergency Operations Center (EOC) organization had all of the necessary functions to provide comprehensive control, support, and direction of a major outage event, with the exception of one. The one function not included in the EOC organization was Call Center coordination. This important function is an essential part of the overall response to a major outage event. Ameren-IL should establish a position in the EOC organization to coordinate the activities and issues of the Call Centers.

Liberty also found that the Ameren Emergency Operations Center (EOC) organization had too many direct reports reporting to the Director(s). The organization in place at the Ameren Emergency Operations Center (EOC) had 18 functions reporting to the EOC Director. This was too large a span of control, and could result in the Director being unable to devote full attention to the key aspects of managing the response and in some functions not receiving the needed coordination and direction.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation and provided the following implementation summary:

- The outline of the Ameren-IL Emergency Operations Center team clearly defines the role of Call Center Operations as a member of the EOC team
- The outline of the Ameren-IL Emergency Operations Center team clearly identifies a reduced span of control for the EOC Director.

Verification Discussion and Conclusions

Liberty conducted an on-site interview to discuss Ameren's implementation of this recommendation and found:[136]

- Ameren-IL has addressed the two issues mentioned in this recommendation.
- Call Center Operations is now a functional member of the Ameren-IL EOC and has functioned in this role in recent emergency events.
- Ameren-IL reduced the span of control for the EOC director and used this new organizational concept at the EOC in recent events.
- Wording and organization chart(s) will be included in the final draft of the Ameren-IL Emergency Response Plan establishing these organizational changes at the EOC.

Following-up on its findings in the first quarter, Liberty found:[137]

- Ameren-IL developed specific language that defines the EOC organization and the span of control for the EOC Director.

[136] Interview #214, January 28, 2009.
[137] Response to Data Request #1095.

- Senior management approved this language effective April 14, 2009, for inclusion in the Emergency Response Plan.
- The wording as submitted does not clearly indicate that the Call Center is reporting directly to the EOC.

In August 2009, Liberty conducted an on-site interview, reviewed Ameren-IL responses to data requests, and found:[138]

- The wording in the different emergency plan documents and protocols clearly indicates that the Call Center (included under the heading "Customer Care") reports directly to the EOC during major outage events.
- This organization was in place and worked well during the two major outage events during the second quarter of 2009.

Ameren-IL met its implementation plan within the stated timeframe. The efforts have addressed the intent of Liberty's recommendation. Based on the results of the August 2009 review, Liberty considers its verification of the implementation of this recommendation complete.

[138] Interview #285, August 12, 2009, and responses to Data Requests #1254, #1095, and #1246.

Recommendation

IV-8

Improve the efficiency of Restoration Update Conference Call by transmitting in advance statistical data of restoration status.

Background

Liberty concluded that the Restoration Update Conference Call as used by the Emergency Operations Center (EOC) was a useful and productive tool. There were improvement opportunities to make it even more useful and productive.

Members of the Ameren response organization were unanimous in their positive opinion of the benefit of this call. Such a call is an industry best practice, and Ameren implemented the practice earlier in 2006, before the two 2006 storms that were the subject of Liberty's report. Most of the interviewees thought the length of the call was appropriate, but several indicated that they thought the calls ran too long and that Ameren could shorten or eliminate some of the items. One improvement opportunity would be to transmit in advance statistical updates showing restoration status so that call participants could review this data in advance and expedite the review on the call.

Ameren-IL's Implementation Plan

- Ameren-IL will explore ways to ensure that the emergency response update conference calls are productive and provide for a consistent flow of meaningful communication and, at the same time, do not consume any more time during an emergency event than is necessary
- Ameren-IL will discuss this recommendation with the Liberty Audit team to determine a solution that benefits all stakeholders in the emergency response process. During these discussions, it will be important that the Liberty Auditors fully understand and recognize the tremendous importance that Ameren-IL is placing on consistency throughout the organization during emergency response
- When a suitable approach has been determined, Ameren-IL will incorporate it into the conference call agenda distributed prior to each conference call.

Verification Discussion and Conclusions

Liberty conducted an interview and reviewed Ameren-IL's responses to data requests concerning this recommendation.[139] As part of the interview process, Liberty sat in on an Emergency Event Update Conference Call conducted during the response to a winter storm that had affected Ameren-IL. Liberty found:

- Ameren-IL has taken several steps to ensure that the Emergency Event Update Conference Call is as productive and efficient as possible while meeting the needs of the restoration effort.
- Key guiding principles used by Ameren-IL in structuring this call process are:
    - The use of the Outage Analysis System (OAS) as the primary source of outage data for monitoring restoration progress

[139] Interview #214, January 28, 2009, and responses to Data Requests #1043 and #1061.

  - Structure the call and use data to validate present assumptions concerning restoration progress
  - Use the call to discuss or confirm resource deployment and redeployment decisions
  - Use information from the call to determine restoration trends to help guide future decisions
  - Structure processes to ensure productivity of the call
- Two of the steps taken by Ameren-IL to accomplish this are:
  - The creation and use of an Emergency Event Update Conference Call agenda template, which Ameren-IL communicates to all participants in advance of each call.
  - Establishment of Roles and Responsibilities protocols for certain positional leads at the Division Command Centers that provide for the advance preparation and compilation of information needed to expedite the division's report on these calls.
- Ameren-IL has used these protocols in recent emergency events and they have proved effective in accomplishing the intended results.
- Using OAS data as the primary source of information on restoration status provides all call participants with the opportunity for review in advance of the calls.
- Ameren-IL will incorporate the call agenda template and the above referenced Roles and Responsibilities protocols, along with required wording to describe the Emergency Event Update Conference Call process, in the final draft of the Ameren-IL Emergency Response Plan.

Following-up on its findings from the first quarter, Liberty found:[140]

- Ameren-IL developed a section of the Emergency Response Plan dealing with the specifics of the Emergency Event Update Conference Call process. Information included in this section includes:
  - Purpose of call
  - Scheduling process
  - Invitation and notification process to participants
  - Data collection process in preparation for call
  - Call agenda
  - Post-call communication of information obtained.
- Senior management approved this language effective April 14, 2009, for inclusion in the Emergency Response Plan.
- In addition to this specific wording, the Roles and Responsibilities (R&R) protocols for designated positional leads in the response organization are in use and Ameren-IL will incorporate them in the final version of the new Ameren-IL Emergency Response Plan.

In February 2010, Ameren-IL advised that the conference calls have become more efficient, with participants becoming more familiar with and practicing conference call protocols.[141] The average length of these calls is 20-35 minutes, which is excellent. Ameren also advised that

[140] Response to Data Request #1096.
[141] Interview #359, February 11, 2010.

information is available to participants in advance of the calls, and that it gathers and communicates the needed information during these calls.

Ameren-IL completed its implementation plan within the stated timeframe. The efforts addressed the intent of Liberty's recommendation. Liberty has not completed verification work on this recommendation. Liberty will continue to follow-up with Ameren-IL, sitting in on calls where possible and following-up after events to ensure that the present emphasis on conference call efficiency continues.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the divisions affected by May and June storms, with EOC leadership, and with the VP of Operations for Ameren-IL. Liberty also sat in on an Ameren Illinois Emergency Response Retreat.[142]

Ameren-IL has greatly reduced the length of conference calls. Participants use OAS data so that repetitious reporting of restoration status numbers, such as number of orders and customers, is not necessary. Division managers interviewed agreed that calls are efficient.

Liberty's verification work on this recommendation is complete.

[142] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.

Recommendation

IV-9

Take and retain written notes of key data, milestones, decisions, issues, etc. discussed on Restoration Update Calls.

Background

Liberty recommended that Ameren should resume taking notes of the Restoration Update Conference Calls, capturing key information, and saving it for future reference.

Liberty found that Ameren had begun taking notes on these calls and then had the notes transcribed and transmitted to participants. Ameren discontinued this practice during the July 2006 restoration effort. Ameren said that they found that no one was reading the notes and that it was not worth the time required to take the notes and transcribe them. The proper type of note taking is a very important part of documenting a restoration effort. The notes that Ameren took contained too much detail. A utility best practice followed is to identify key information, milestones, data, etc. and capture them from each call. The utility then archives this information for future reference when needed. It is nonproductive to take notes that provide too much detail, but Ameren should capture and retain key data from each call.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation in principle, noting that most correspondence, data, notes, milestones, etc. is prepared, compiled, and distributed in an electronic rather than in written format. Correspondence of this nature that is prepared and transmitted in electronic format provides the benefit of a "date/time stamp" to authenticate its veracity.

Implementation Plan Summary:

- Ameren-IL Emergency Operation center event logs are compiled (in part) during each emergency response event and are completed as quickly as possible at the conclusion of the event
- Draft event log documents are disseminated for review throughout the Ameren-IL organization to ensure that all entries are accurate
- Completed emergency response event logs are retained at the DDO Website
- Retain additional data/correspondence files for each event during which Ameren-IL activates the EOC.

Verification Discussion and Conclusions

Liberty conducted an on-site interview and reviewed a response from Ameren-IL to a data request concerning this recommendation.[143] As part of the interview, Liberty sat in on an Emergency Event Update Conference Call during Ameren-IL's response to an actual winter storm event. Liberty found:

- Ameren-IL captures all information communicated during the Emergency Event Update Conference Call.

[143] Interview #214, January 28, 2009, and response to Data Request #1043.

- Ameren-IL transcribes the notes taken during these calls in electronic format and communicates them to all call participants and other designated Ameren-IL personnel.
- Ameren-IL creates event logs for every emergency event in which it activates the EOC.
- Ameren-IL archives the electronic call notes and event logs for future reference.

In November 2009, Liberty again conducted an on-site interview, reviewed the Ameren- IL response to a data request, and found:[144]

- Ameren-IL has addressed all aspects of this specific recommendation, and
- The Ameren-IL Emergency Response Plan is now complete; Ameren-IL sent it to the printer in November 2009.

Ameren-IL has met its implementation plan within the timeframe stated. The efforts addressed the intent of Liberty's recommendation. Liberty has not completed verification work on this recommendation and will follow-up with Ameren-IL in reviewing responses to future major outage events to ensure compliance and effectiveness.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions impacted by the May and June storms, with EOC leadership, and with the VP of Operations for Ameren-IL. Liberty also sat in on an Ameren-IL Emergency Response Retreat.[145]

Ameren-IL has developed a good system for taking and archiving notes, and provided examples to review. Based upon its findings, Liberty's verification work on this recommendation is complete.

[144] Interview #323, November 19, 2009, and response to Data Request #1322.
[145] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.

Recommendation

IV-10

Develop processes and matrices to monitor the workload for each state and operating division as compared to the allocated resources.

Background

Ameren should develop a process that would provide matrices comparing workload and allocated resources between states and operating divisions. Ameren should implement the process prior to the onset of the event when there is advance notice, using the event prediction model to furnish anticipated storm impact figures. As actual damages and outage data become available, this should be input into the matrices. Ameren-IL should monitor this information throughout the duration of the restoration and should use it in making decisions for initial allocation and re-deployment of resources. In its comments on the draft report, Ameren-IL described a "Rules of Engagement" document that senior leadership of both Ameren-MO and Ameren-IL signed and agreed to. This document outlines the factors to be included in on-going assessments regarding the allocation of resources during the course of an emergency response event. These same factors are applicable to determine the allocation / reallocation of resources between the various Ameren-IL divisions.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation in principle, noting that most correspondence, data, notes, milestones, etc. is prepared, compiled, and distributed in an electronic rather than in written format. Correspondence of this nature that is prepared and transmitted in electronic format provides the benefit of a "date/time stamp" to authenticate its veracity.

Ameren-IL submitted the following implementation plan:

- The document "Rules of Governance" that outlines interaction between the Illinois and Missouri Emergency Operations Centers is signed and in place. This document outlines the factors Ameren will analyze when it contemplates movement of personnel.
- A "Roles and Responsibilities" document for senior leadership within Ameren will outline the responsibility to ensure that the staffs of both EOCs follow the Rules of Governance.

Verification Discussion and Conclusions

In August 2009, Liberty conducted an on-site interview, reviewed Ameren-IL responses to data requests, and found:[146]

- The "Rules of Governance" document referred to above (a/k/a "Rules of Engagement") provides the structure for the recommended process to monitor the workload and allocated resources of different operating groups during a major outage event.
- This document specifically addresses the interaction between the Emergency Operations Centers for Ameren-IL and Ameren-MO, but the principles also apply to the interaction between operating divisions within one state organization.
- The document addresses the following:

[146] Interview #285, August 12, 2009, and responses to Data Requests #1255 and #141.

- Communications
- Acquisition of Line Worker Resources
- Allocation/Re-allocation of Line Worker Resources

During the two major outage events in the second quarter of 2009, Ameren-IL used this process with the following results:

- During the May outage event, Ameren shifted resources from the southern service area of Ameren-IL to assist Ameren-MO
- During the June outage event, Ameren brought in resources from Ameren-MO to assist Ameren-IL.

Liberty and Ameren-IL discussed the above described "Rules of Engagement" process using a hypothetical event to learn more about how the process would work and to ensure that Ameren-IL was satisfied that the interests of its customers and stakeholders were being adequately served.[147] Ameren-IL described some specific incidents in recent history where Ameren-IL and Ameren-MO coordinated to obtain and deploy outside resources. When it makes requests of Mutual Assistance utilities, Ameren makes just a single, combined request, and then divides the resources acquired between the companies in accordance with the Rules of Engagement. Ameren-IL indicated that this process has been working well without reported problems.

Ameren-IL has completed its implementation of this recommended within the stated timeframe. The efforts have addressed the intent of Liberty's recommendation. Liberty's verification work is not complete. Liberty will continue to follow-up to verify that this process produces effective results during future major outage events.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions affected by the May and June storms, with EOC leadership, and with the VP of Operations for Ameren-IL. In addition, Liberty attended an Ameren-IL Emergency Response Retreat.[148]

Ameren-IL has established a good record of working closely with Ameren Missouri, sending and receiving help in recent storms. They closely monitor workload, resources, and estimated restoration times in affected divisions.

Liberty's verification work on this recommendation is complete.

[147] Interview #359, February 11, 2010.
[148] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.

Recommendation

IV-11

Ensure that the Emergency Operations Center (EOC) Director assumes a stronger role in accomplishing a timely and effective transition from the dispatch center to the operating divisions whenever Ameren activates the Electric Emergency Restoration Plan (EERP).

Background

Liberty found that the Emergency Operations Center (EOC) effectively transitioned the organization to the Electric Emergency Restoration Plan (EERP), initiating the work processes, setting up the conference calls, and establishing reporting processes. However, the transition from the dispatch center to division control was not as strong as it could or should be.

The transition to the Electric Emergency Restoration Plan involves the initiation of EOC work processes and establishing the conference calls and reporting processes in accordance with the plan. Liberty found that the Emergency Operations Center (EOC) performed this role effectively. The EOC team members began functioning in their roles upon arrival at the EOC, and implemented the Restoration Update Conference Calls in a timely and organized manner. However, Ameren-IL did not transition from the dispatch center to division control of dispatching one-man crews in a timely manner. The dispatch center cannot transition the divisions to the EERP; the EOC Director needs to assume a stronger role in accomplishing this transition.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation. Ameren-IL noted that Section 8 of the Ameren-IL Emergency Response Plan protocols outlines "ramp-up" responsibilities within the Emergency Operations Center.

Verification Discussion and Conclusions

Liberty conducted an on-site interview and reviewed Ameren's response to a data request, and found:[149]

- Ameren-IL has developed protocols dealing with EOC "ramp-up" responsibilities during major outage events.
- These protocols for the EOC and the rest of the response organization are set forth in a chart-type format for easy and clear communications of roles and responsibilities for each of the functional units/positions.
- These protocols are presently in use by Ameren-IL in responding to emergency events, and are contained in the present emergency plan. They will be included in the final draft of the Emergency Response Plan.
- Ameren-IL will revise the present ramp-up protocols to provide guidance for the issue in question – i.e. the role of the EOC Director in accomplishing an effective and timely transition of responsibility for dispatching one-man crews from the dispatch center to division control.

[149] Interview #214, January 28, 2009, and response to Data Request #1049.

Following-up on its findings in the first quarter, Liberty reviewed Ameren-IL information that consisted of work process flow-charts depicting decision points and actions Ameren-IL will take as the severity/impact of the major outage event increases.[150] Liberty found these charts helpful when used in conjunction with the final approved wording in the Emergency Response Plan and the "ramp-up" protocols.

In February 2010, Liberty learned that Ameren-IL covered the specific issue addressed in this recommendation in the final Emergency Response Plan, and that no problems related to this issue have arisen in recent outage events.[151]

Ameren-IL met its implementation plan within the stated timeframe. The efforts address the intent of Liberty's recommendation. Liberty has not completed verification work on this recommendation and will:

- Confirm that the Ameren-IL Emergency Response Plan contains appropriate wording to address the issue in question.
- Confirm that the protocols for dealing with the transition of dispatching control over to one-man crews is reaffirmed in future training/drills.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions affected by the May and June storms, with EOC leadership, and with the VP of Operations for Ameren-IL. In addition, Liberty attended an Ameren-IL Emergency Response Retreat.[152]

During the interview on August 9, 2011, Ameren-IL pointed out that the EERP Roles and Responsibilities checklist for EOC Director includes this item. This transition has not been a problem during any major event over the past several years. Based on its findings, Liberty considers that its verification work on this recommendation is complete.

[150] Response to Data Request #1098.
[151] Interview #359, February 11, 2010.
[152] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.

Recommendation

IV-12

Define clearly the role of the Division Manager in the division emergency response organization and implement this consistently in all operating divisions.

Background

Liberty found that Ameren-IL could improve the emergency organization by reaching consensus on the optimal role for the Division Manager during a major outage event.

The division managers had the ultimate accountability for the response of their division. In interviewing all seven of the Illinois Division Managers, Liberty noted that the actual role of the Division Manager in the division emergency organization varied from division to division. Some of the division managers were very "hands on" in running the division's restoration effort, spending the large majority of their time at the division storm command-center. Other division managers saw their role as supporting the Division Superintendent who actually ran the restoration effort in the division. These division managers spent a large portion of their time visiting crews and operating centers, and making contacts with key citizens and elected officials. This difference in approach is common among mid-level utility management, and there are advantages to each approach. Because of the talent and experience level of the incumbents in these division manager positions, Ameren-IL should make an effort to determine the optimal role for the Division Manager during major outage events, and seek consistency in their storm assignment.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation. The following summarizes its implementation plan.

- Section 2 of the Ameren-IL Emergency Response Plan protocols outlines the general composition of the emergency response organization
- Ameren-IL has opted to expand the concept espoused within this recommendation to all lead positions within the Division Command Center team:
    - Division Command Center Director – under development
    - Safety Lead – under development
    - Field Check Lead – complete and in place
    - Crew Management and Dispatch Lead – complete and in place
    - Logistics and Clerical Support Lead – under development
    - Coordination and Work Management Lead – complete and in place
    - Engineering Support Lead – complete and in place
- "Roles and Responsibilities" checklists are under development to serve the organization in the following ways:
    - Training Tool – to facilitate discussions focused on the application of the ICS at the divisional level during an emergency event
    - Activity Guide – to be used by personnel during a response event that uses an easy to read and follow "checklist" format (helps to make the plan more useable during emergency response

  - Cross-Reference Check – by which a team member can help to assure him/herself that he/she has taken the proper steps in the proper order and has notified the proper parties within the ICS structure
  - Diagnostic Tool – by which our co-workers might more objectively evaluate performance during and after an emergency response event
- Exercises with the specific Division Command Center lead positions are being scheduled for the 4th quarter, 2008.

Verification Discussion and Conclusions

During an on-site interview, Liberty discussed with Ameren-IL the present status of its implementation plan for this recommendation.[153] Liberty found:

- Ameren-IL developed roles and responsibilities protocols for all key response leadership positions. It uses these protocols in responding to emergency outage events.
- Ameren-IL has addressed the issue of the optimal role for Division Managers during major outage events and has developed wording to be included in the Roles and Responsibilities protocols within the Emergency Response Plan.
- The Division Manager's roles and responsibilities protocol wording is awaiting final approval by Ameren-IL upper management.
- When approved this wording will be included in the Emergency Response Plan and will be reviewed on an ongoing basis during regularly scheduled training/drills.

Following-up on its findings in the first quarter, Liberty reviewed Ameren-IL information that consisted of an organization chart and a "Roles and Responsibilities" (R&R) document specifically detailing the role of Division Command Center Director.[154] This document sets forth clearly the type of duties expected of the position in charge of the overall division response effort.

Liberty discussed this recommendation with Ameren-IL February 2010.[155] Ameren-IL has clearly set forth the duties of the division manager and there is now consistency between the different operating divisions.

Ameren-IL has met its implementation plan within the commitment timeline. Liberty has completed its verification work on this recommendation.

[153] Interview #215, January 29, 2009.
[154] Response to Data Request #1099.
[155] Interview #359, February 11, 2010.

Recommendation

IV-13

Develop and implement an aggressive approach to the recruitment and training of "non-response" personnel to assist in support functions during a major outage event.

Background

Ameren-IL should develop and implement a specific, structured process through which it identifies "non-response" personnel in advance for potential storm assignments, confirms their availability for such assignments in advance, provides adequate advance training, and keeps a database of such employees for quick reference in advance of a major outage event.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation and submitted the following implementation plan:

- May 29, 2008 Operating Division Emergency Response exercise outlined potential emergency roles for nontraditional personnel as well as necessary skills-sets to successfully fulfill those roles
- Initial training sessions within all divisions have been attended by gas operations supervisory personnel – these personnel are being assigned to roles within the Division Command Center teams
- Division teams are identifying personnel who might serve as Public Safety Advisors and Field Check personnel and are arranging appropriate training for those individuals. Reference IV-46
- Logistical Support team has developed a matrix of available personnel who normally work in the Springfield, Peoria, and Decatur office buildings
- Logistical Support Team is developing a Logistical Support Plan to utilize additional non-traditional personnel
- Illinois Metering group is developing a matrix of available personnel with associated skills-sets
- A skills-sets matrix of all non-bargaining unit personnel was developed as a part of the Ameren Illinois Utilities labor strategy. This matrix has been shared with the Emergency Response organization
- On-going training of work groups throughout the Ameren Illinois Utilities organization
- Develop additional "Roles and Responsibilities" checklists for the positions of "Crew Guide", "Crew Liaison", and "Construction Work Coordinator"

Verification Discussion and Conclusions

In August 2009, Liberty conducted an on-site interview, reviewed Ameren-IL responses to data requests, and found:[156]

- Ameren-IL has pursued, and is continuing to pursue, the implementation plan detailed above.

[156] Interview #285, August 12, 2009, and responses to Data Requests #1256, #1022, #1089, #1106, #1115, and #1258.

- Ameren-IL response team leaders are confident that they have an adequate number of "non-response" personnel identified and trained to assist during major outage events.
- This process produced adequate numbers of "non-response" personnel to assist and worked well during the two major outage events of the second quarter in 2009.
- There is a good cooperative relationship between the response organization and the supervisors of "non-response" personnel selected to assist during major outage events.

Liberty confirmed that Ameren-IL is very actively engaged in the ongoing identification, recruitment, and training of "non-response" personnel who it can use during major outage events.[157] Some of these, such as meter readers and meter service personnel and gas department personnel, are located in the operating divisions and have a good knowledge of the territory.

Ameren-IL has completed its implementation plan in the state timeframe. The efforts are meeting the intent of Liberty's recommendation. Liberty's verification work is not complete; Liberty will continue to follow-up to verify that Ameren-IL is using "non-response" personnel effectively during future major outage events.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions affected by the May and June storms, with EOC leadership, and with the VP of Operations for Ameren-IL. In addition, Liberty attended an Ameren-IL Emergency Response Retreat.[158]

Ameren-IL has identified and trained approximately 150 non-response personnel. They are listed in a database showing the response roles for which they have been trained, their job with Ameren, their supervisor, etc. Ameren-IL has made good use of these personnel in the major events over the last year. Based on its findings, Liberty considers its verification work on this recommendation complete.

[157] Interview #359, February 11, 2010.
[158] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.

Recommendation

IV-14

Develop a quality assurance and review process to ensure Outage Analysis System data integrity.

Background

Ameren needs to ensure the quality of Outage Analysis System data. Ameren performed some information checking following the July 2006 storm, but this effort was not comprehensive. It did not check data quality following the November 2006 storm. Ameren needs a means to safeguard the data from deletion or modification such as a secure historical data warehouse that maintains periodic (monthly) downloads of customers/circuit relationships to establish a history of these data. Retrospective results taken from Outage Analysis System data should be repeatable. Ameren must hold field personnel accountable for Outage Analysis System data during large outage events.

Ameren-IL is in the process of developing a formal process with defined roles and responsibilities for Outage Analysis System Quality Assurance and Quality Control (QA/QC). Ameren-IL should continue pursuing a quality process to improve Outage Analysis System data integrity, including:

- Define the QA/QC goals and objectives
- Define the day-to-day QA/QC process
- Detail major storm QA/QC process
- Identify QA/QC process roles
- Assign responsibility to QA/QC roles, day-to-day and during storms

Ameren-IL's Implementation Plan

This recommendation is dependent upon Liberty Recommendation IV-16. If Ameren-IL decides to move forward with a Distribution Management System (DMS), then the plan below needs to be included as part of the replacement project and its associated timeline. Until Ameren-IL makes that decision, it has identified the following process items that it needs to address:

- Identify subject matter experts
- Define the QA/QC goals and objectives
- Define the day-to-day QA/QC process
- Detail major storm QA/QC process
- Identify QA/QC process roles
- Assign responsibility to QA/QC roles, day-to-day and during storms
- Implement QA/QC processes and organization to improve immediately the quality/integrity of the OAS data
- Initiate project to design, develop, and implement technology changes required to secure historical data.

Verification Discussion and Conclusions

In May 2009,[159] Liberty found that Ameren-IL's had accomplished a number of actions items intended to establish a more formal quality assurance and control process for OAS:

- Ameren-IL assembled an OAS QA team to develop a QA/QC process.[160]
- Ameren-IL created two QA processes, one to review records after a major storm[161] and another for day-to-day outages.[162]
- Ameren-IL developed OAS IT changes to support the new review process and enable the locking and unlocking of OAS data records after a storm.[163]
- Ameren-IL's Dispatch Reliability team implemented their roles in each of the three dispatch offices in Illinois, using an interim OAS QA process, while awaiting the permanent OAS IT changes. Reports are also available on the Illinois DDO web page to aid in this process.
- During April 2009, Ameren-IL reviewed the new OAS QA process with Division engineering supervisors and electric superintendents.
- Ameren-IL expects OAS IT changes to become operational in June 2009.
- It will role out the new process to the divisions in June 2009.

In February 2010,[164] Liberty received the following update on Recommendation IV-14:

- OAS QA process is in place and Ameren-IL has used it on a daily basis by the field for about a year now. The process is working very well and Ameren-IL now has better outage statistics and information.
- Ameren-IL followed the QA storm process during the most recent winter storm (1/20-1/21/2010 in Peoria). The reliability team led the QA process after the storm.
- Ameren-IL continues to investigate lessons learned to find ways to improve the QA process and identify the need for additional training or system changes.
- Ameren-IL has added a QA process requirement to its specifications for a new Distribution Management System.

In November 2010, Liberty learned that Ameren-IL accomplished the following regarding this recommendation:[165]

- Three examples of QA/QC efforts this year to clean up the OAS data:[166]
    - Following the January 20-21 storm, Ameren-IL reviewed and corrected duplicate orders and found that they represented about 1 percent of the total customer-minutes-interrupted for the two days.

[159] Interview #244, May 6, 2009.
[160] Data Request #1132-A.
[161] Data Request #1132-D.
[162] Data Request #1132-B.
[163] Data Request #1132-C.
[164] Interview #356, February 12, 2010.
[165] Interview No. 415, November 10, 2010.
[166] Response to Data Request #1457.

  - Duplicate orders created through normal day-to-day outage events through August 2010 showed only 671 duplicate customer-minutes-interrupted compared to 1,467 through the same time in 2009 and 12, 882 in 2008.
  - Ameren-IL reviewed the worst performing circuits for 2010. It made only one outage-data correction, which reduced that circuit's CAIDI by 10 percent. This also shows that the QA/QC efforts in 2010 have created a much cleaner database.
- Now Ameren-IL can run the worst performing circuit list and not have to do the QA work. It can use this information to do cause investigations and identify training opportunities for dispatchers and the field.
- Ameren-IL performs some field-checker training using mock storm drills with an emphasis on accurate field reporting.
- Ameren-IL delivered two days of OAS training in August 2010 to help Division personnel learn how to use OAS effectively and to split orders to support partial restoration.[167]

Liberty found that the QA process is maturing and in use throughout Ameren-IL. This will continue until Ameren-IL implements the new DMS. Ameren-IL met its commitments and Liberty considers this recommendation verified and closed.

While Ameren-IL completed this recommendation in 2010, Liberty believed it prudent to revisit it and Ameren-IL's performance following a severe weather event. The winter storm of 2011 was such an event. The storm caused widespread damage across Ameren-IL's service territory, creating several days of challenging work for field and office personnel. In May 2011, Liberty met with Ameren-IL personnel to review this recommendation, as part of a wider effort to review Ameren-IL performance during the winter storm of early February, 2011.[168] Liberty found:

- On a daily basis, Ameren-IL dispatchers are doing a good job updating OAS with feeder and transmission outages. There has been steady improvement in this over the last year.
- Led by its reliability group, Ameren-IL followed the OAS QA/QC process during the most recent winter storm.
- Follow-up analysis of OAS storm data indicated very few duplicate orders (0.14 percent) created during the storm.[169]
- Ameren-IL will implement its new Automated Distribution Management System (ADMS) in phases, beginning in the fall of 2011, with a targeted completion in mid-2013.

Ameren-IL's OAS QA process is maturing and in-use throughout Ameren-IL, both on a daily basis and during and following large storms. This will continue until Ameren-IL implements its new Automated Distribution Management System.

[167] Response to Data Request #1443.
[168] Interview #435, May 23, 2011.
[169] Response to Data Request #1502.

Recommendation

IV-15

Implement a multi-tiered process to ensure real-time updates of information into the outage system.

Background

Liberty concluded that Ameren-IL did not train or equip many of its employees to use the Outage Analysis System as intended during the 2006 storms. This possibly slowed restoration and compromised data integrity.

While the Outage Analysis System was operational during both storms, Ameren-IL did not use it as intended. To a large degree, this was due to a lack of experience with the system, primarily in the Ameren-IP territories. This was understandable, considering that Ameren-IP employees had been operating on an entirely different outage management system up until October 2005. While employees had received initial training, none had experience with the Outage Analysis System in a storm situation. Many of the field employees were just not familiar with the system. The addition of foreign crews made it more challenging to update the Outage Analysis System with status and completion information.

Liberty recommended that during large outage events, Ameren-IL should equip its field forces with mobile data terminals or laptops that can communicate and interact with the Outage Analysis System. Alternatively, Ameren-IL should develop a real-time process wherein it communicates outage information from the field to a skilled OAS user in a dispatch office, operating center, or other location using cellular telephone, radio, or other communications device. This will improve the likelihood that Outage Analysis System has updated trouble order data. It will also eliminate a lot of paper.

Ameren instituted annual refresher storm training for employees. Ameren-IL should review its training for effectiveness after each major storm and incorporate any future lessons learned.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation and provided the following implementation plan summary:

- The "Roles and Responsibilities" document for the "Coordination / Work Management" lead position includes a provision to ensure that real-time updates to the outage system are on-going
- Non-traditional resources within the Ameren-IL organization (with the appropriate skills-sets) have been identified
- Outage Analysis System training is on-going

Verification Discussion and Conclusions

In February 2009, Liberty found that Ameren-IL accomplished a number of actions items intended to improve the quality of the data provided to OAS during a storm or large outage event.[170] These include:

- Ameren-IL continues to offer both initial and ongoing OAS training for daily and storm-related users. There has been no real change in training content.[171]
- Ameren-IL has identified more than 100 employees to assist in the update of OAS during an event. These employees have not traditionally supported storm and outage events, but are relatively fluent in OAS (*e.g.*, gas metering, substations). Ameren-IL will now assign these employees to support foreign crew personnel as well as company personnel when requested by the divisions during a storm. They are daily OAS users and are already equipped with or have access to MDTs or laptops. Ameren-IL EOC has formalized a list of these employees and made this available to the divisions.[172] However, during the recent Storm #2009-01-26, the Divisions did not use these resources. Ameren indicated that because foreign crews were not required, Division Operations Support was able to handle OAS updating without requesting assistance.
- Ameren-IL has also emphasized the importance of keeping OAS up-to-date by assigning responsibility to Division Work Management Leads. Work Management Leads are responsible OAS data integrity—making sure that OAS orders are assigned, updated, and closed-out in an orderly and timely manner. Additionally, Ameren-IL assigned a Work Management Lead liaison to the EOC to coordinate and oversee this effort for Ameren-IL.
- Ameren-IL also overhauled its storm roles and responsibilities and formalized this as part of its Storm Plan documentation.[173] The roles and responsibility matrix provides roles, responsibilities, and assignments, and at the same time, serves as a management checklist to make sure everyone is on track. Ameren-IL introduced the concept in April 2008 to all the divisions and formalized it in August 2008. Ameren-IL also delineated the recommended span of control for the Work Management Lead, clarifying the responsibilities while establishing an upper limit on the number of crew resources managed by any individual during an emergency event.
- In early December, EOC personnel walked Division personnel through a paper drill of these and other storm-related procedures. Ameren-IL made additional changes in light of these discussions.[174] Ameren-IL intends to review the process twice a year (spring/fall) to refresh employees in preparation for storm seasons.
- Ameren-IL is developing a storm scorecard that will include a component to measure and track OAS data quality for each storm (in development).

[170] Interview #216, February 4, 2009.
[171] Response to Data Request #1022.
[172] Response to Data Request #1022.
[173] Response to Data Request #1023.
[174] Response to Data Request #1039.

In November 2009, Liberty found that Ameren-IL had accomplished a number of actions items intended to improve the quality of the data provided to OAS during a storm or large outage event, including the following:[175]

- Ameren-IL emphasized the importance of Estimated Restoration Times (ERTs) and the timely updating of OAS order status in several sections of the Emergency Response Plan (ERP).[176]
- Ameren-IL created a recommended storm staffing profile for the Divisions to ensure that the appropriate level of support personnel are in place to administratively support the construction crews and oversee the order completion process (update OAS). Foreign crews will also be assigned support staff to help them navigate the territory and properly account for the work completed during the effort.[177]
- Ameren-IL's storm performance scorecard was approved by leadership and communicated to Division management in April 2009. Scorecards were produced following the two summer storms of 2009 (Inland Hurricane and the May storm). Both scorecards indicate room for improvement regarding this recommendation.[178]
- Ameren-IL re-organized its Division Operations management and personnel, effective December 1, 2009. All Division Operations personnel now report to one Vice President.[179]
- Ameren-IL revised guidelines in the ERP to handle two restoration approaches—by order and by circuit sweep. These guidelines help division personnel understand the strategies of each approach during a storm, as well as the importance of tracking storm progress through order completion. Dispatch operations has also agreed to facilitate this process through the assignment of dispatchers who know how to accommodate the more complicated circuit sweep approach in OAS.
- Ameren-IL will conduct an emergency drill in early 2010 to communicate and test these changes; it will conduct additional OAS training during 2010.

In August 2010, Liberty found the following regarding this recommendation:[180]

- During recent events, Ameren-IL identified additional improvement opportunities in the area of its overall emergency response planning and preparation. Ameren set up a day of refresher OAS training and had scheduled the training for late July 2010.[181] However, the training did not take place as scheduled. After meeting with Division 1 personnel, it became apparent that they needed more than the day of planned training. Division 1 was not updating the information in OAS as required by the new procedures.
- Ameren-IL has decided to start over with OAS training for Division 1 and to reschedule the planned refresher training for Divisions 2 – 6.
- Upper management now plans to kick-off these training sessions to communicate the importance of this effort.

[175] Interview #305, November 10, 2009.
[176] Response to Data Request #1325.
[177] Response to Data Request #1295.
[178] Interview #305, November 10, 2009, and response to Data Request #1337.
[179] Response to Data Request #1336.
[180] Interview #393, August 20, 2010.
[181] Response to Data Request #1431.

- Ameren-IL has also developed a contingency plan to cover Division 1's deficiencies until they are able to use OAS as stipulated by the EOC. The contingency plan has identified back-ups to supplement or takeover until the event is under control.
- The Dispatch organization will set up a dispatch desk to assist the Divisions with partial restorations during any future events, and create new outages, as necessary—to keep OAS data up-to-date and consistent with the restoration process in the field.
- EOC is asking the Divisions to send self-contained crews to assist in events outside their Division—supervisors, crews, and OAS dispatch support—so they can work as a self-contained unit and the home Division would not have to add significant capabilities for them to focus as a team. They know they will have to supplement outside contractors and foreign crews.

In August 2012, Liberty found the following regarding this recommendation:[182]

- Ameren-IL has created a "Learning Moment" that addresses the Estimated Restoration Time process. Ameren-IL placed this "Learning Moment" on the EOC SharePoint site; it is available as computer-based refresher training for all Ameren-IL employees. Whenever Ameren-IL announces a yellow weather alert, a communication is sent from the EOC referring to the learning moment as a suggested short refresher course to help prepare employees ahead of the storm or event.[183]
- In the spring of 2012, Ameren-IL conducted a series of tabletop exercises within each of the operating divisions to drill through a series of scenarios in preparation for a large event or storm. Positional leads of each of the Division Command Center teams and field operations supervisors attended the exercises. The ERT process was a highlighted topic addressed during these exercises.[184]
- Ameren-IL plans to conduct another series of operational exercises/drills after Labor Day (2012) to focus on the roles and responsibilities of a Construction Supervisor during a storm and a blue-sky event. This series of drills will address ERTs.
- In June 2012, Ameren-IL initiated a change to the Outage Analysis System (OAS) to make the ERT be a mandatory update field for any orders that have been assigned to "Dispatch" or "Construction." The orders cannot be completed in OAS for these two service areas without first providing an update to the ERT time. Additionally, it distributed a communication to all Ameren-IL employees affected by this change, further stressing the importance of updating the ERT field with the expected restoration time. Ameren-IL released another "Learning Moment" to support this change.[185]
- Ameren formed a Customer Strategy team as one of Ameren corporate-wide initiatives. This team will focus on reviewing and improving all customer touch points in an effort to improve customer satisfaction.[186]

[182] Interview #488, August 27, 2012.
[183] Response to Data Request #1543.
[184] Response to Data Request #1646.
[185] Response to Data Request #1646.
[186] Response to Data Request #1646.

- Ameren-IL continues to track the accuracy of ERTs on a weekly and monthly basis. Recent data indicate some improvement in the accuracy of ERTs provided by the divisions in both blue-sky events and storms.[187]

Ameren-IL has followed and completed its implementation plan as described above. Storm-related ETR development and updating is a continual process and Ameren-IL EOC will continue its focus on improving performance. Ameren-IL has accomplished the intent of Liberty's recommendation. Liberty considers its verification work on this recommendation complete.

[187] Response to Data Request #1646.

Recommendation

IV-16

Enhance the Outage Analysis System with a user-friendly front-end to make it easier for field forces to interact and update storm critical data.

Background

Ameren should investigate the potential for adding a more user-friendly front-end to the Outage Analysis System to make it easier for field forces to interact and provide critical storm restoration data. Ease of use will encourage better updating of data in the field, especially among infrequent users. These changes should also improve the partial restoration process and the ability to resolve nested outages for infrequent users. If system limitations prevent the addition of a more effective means for field forces to interact with the Outage Analysis System, Ameren-IL should implement more intense training for field forces.

In comments on the draft report, Ameren-IL indicated that it is considering the purchase of a Distribution Management System (DMS) that would include a replacement outage-analysis system. Ameren-IL should either implement a more friendly front-end on the current OAS system within twenty-four months or demonstrate plans for the implementation a DMS system within six months of the date of this report. In its comments on the draft report, Ameren-IL accepted this recommendation.

Ameren-IL's Implementation Plan

Ameren agrees to investigate the feasibility, cost, and benefit of enhancing the existing OAS system with the intent to resolve the issues identified in this recommendation by Liberty. If this investigation determines there is a reasonable cost/benefit to implementing these changes, then Ameren will proceed with making the appropriate system changes. If not Ameren agrees to provide enhanced training for all "casual users", who would be utilized in major storms to update the OAS system as well as refresher training for resources that routinely use OAS.

Ameren is in the process of reviewing the cost/benefits of implementing a new Distribution Management System. A new DMS system would include Outage Management as a part of its functional requirements. If Ameren-IL approves this project, this will negate the need to make the aforementioned OAS changes.

Ameren-IL provided the following implementation plan timetable:

- Decision on Distribution Management System - March 8, 2009.
- Complete High Level Review of potential OAS/Graphical Enhancements - June 1, 2009. (Note that this is only required if DMS does not move forward).
- Decision of whether Cost/benefit warrants OAS enhancements - June 15, 2009.
- Enhanced training to all potential users of OAS during a storm (if no DMS/OAS changes) - October 8, 2010.
- Implement OAS/Graphical Enhancements (if DMS does not move forward and value) - October 8, 2010.

- Train field users in IL on new Graphical Enhancements (If DMS does not move forward) - March 8, 2011

Verification Discussion and Conclusions

In May 2009,[188] Liberty found that Ameren-IL's had accomplished a number of actions items intended to address this recommendation:

- Budget restrictions have delayed the development of a user-friendly front-end for mobile workers as outlined by Liberty in this recommendation. Ameren-IL put the project on hold.
- Ameren established a team to investigate options for a Distribution Management System. This team has also defined system requirements for both states.
- Ameren issued a Request-for-Information from several vendors and awaits their responses.
- This recommendation will become irrelevant if Ameren elects to proceed with a new Distribution Management System.

In February 2010, Liberty found that Ameren-IL's had accomplished the following related to this recommendation:[189]

- Ameren received proposals from three vendors in fourth quarter 2009.
- The DMS Team is currently evaluating the RFP responses, working toward system/vendor selection, cost quantification, and executive approval to proceed in the first quarter 2010.
- In the summer of 2009, Ameren developed and submitted to the Department of Energy an application for the Smart Grid Investment Grant Program (SGIG) for funding the DMS (aka Advanced Distribution Management System) development/deployment at Ameren. Ameren's application, while meeting the technical requirements, was not selected or funded by the DOE.
- Pending the decision on the DMS system, Ameren will spend no additional effort on development of a "friendly front end."

In November 2010, Liberty found that Ameren-IL's had accomplished the following regarding this recommendation:[190]

- Ameren redefined system and interface requirements. It expects the plan to go to the project approval committee in December and has budgeted implementation funds for 2011 and 2012.[191]
- Ameren plans a common system for Illinois and Missouri. It has a disaster recovery plan with hardware in both states. It has a working demonstration version to work with.
- The most significant personnel effect will be with the system operators. It will conduct most of the training in 2012.
- The mobile hardware replacement is expensive. Ameren will use the old OAS system to be the "ticket in the truck" until end of 2012.

[188] Interview #244, May 6, 2009.
[189] Interview #356, February 12, 2010.
[190] Interview #415, November 10, 2010.
[191] Response to Data Request #1458.

In August 2012, Liberty found that Ameren-IL's had accomplished the following regarding this recommendation:[192]

- Ameren is progressing with the implementation of the Advanced Distribution Management System (ADMS) that will replace several operational systems, including OAS. Cycle A of the project, SCADA, went live in early July 2012 for Ameren-IL and Ameren-MO. Ameren scheduled Cycle B, mapping and switching, to go live by year-end 2012.[193]
- The current ADMS implementation schedules the outage management and mobile portion of the system to go-live in June 2013. Training of field forces should begin in April 2013.[194]

Ameren-IL has followed and completed its implementation plan as described above. A new Advanced Distribution Management System is currently under implementation. This system will ultimately replace OAS and provide a user-friendly mobile system for field forces. Ameren-IL continues to ensure that it properly trains employees to use the existing OAS and training for the replacement system (ADMS) should begin in the spring of 2013. Ameren-IL has accomplished the intent of Liberty's recommendation. Liberty considers its verification work on this recommendation to be complete.

[192] Interview #489, August 27, 2012.
[193] Response to Data Request #1647.
[194] Response to Data Request #1647.

Recommendation

IV-17

Continue to enhance and improve the Storm Center website and provide the option for self-reporting outages.

Background

Customers are clearly coming to the Storm Center for information during large storm events. Ameren should continue to enhance the Storm Center website to make the site more functional for customers wishing to report their outage. With the growth in mobile devices, web-capable phones, and Wi-Fi networks, customers have many more opportunities to access Ameren's website during a power outage. Ameren-IL should develop and deploy a self-service, web-based outage-reporting tool on its Storm Center website. Adding a self-reporting feature will provide another way to interact with the company, increasing customer satisfaction, and possibly reducing call volumes. Ameren-IL should implement this recommendation within one year of the date of this report.

Ameren-IL's Implementation Plan

Ameren continues to look for ways to better use its web-based Storm Center. It will add customer self-service outage reporting capability. In addition to basic outage reporting through the website and mobile devices, the project will also explore the implementation of reporting wire downs, street light outages, etc.

Verification Discussion and Conclusions

In August 2009, Liberty learned that Ameren had completed the following activities in response to Recommendation IV-17:[195]

- Ameren implemented mobile outage reporting on June 21, 2009. Customers can access outage information by visiting Ameren.mobi on their mobile phone/PDA.
- Once at Ameren.mobi, customers can report an outage by accessing "My Electric Outage" and answering several prompts.
- There have been six outages since Ameren introduced this service on June 21, 2009. So far, customer feedback has been positive. There have been 2,500 visits since June.
- Ameren has not promoted this service yet but it does mention mobile outage reporting on Ameren.com. Corporate Communications is looking at promoting it in September 2009.
- Eventually, Ameren will deploy these features on the Ameren.com. However, it has not set a target date for this yet.

In May 2010, Liberty learned that Ameren had completed the following activities in response to this recommendation:[196]

- Ameren implemented self-reporting of outages on Ameren.com in January 2010. At the same time, Ameren reworked other aspects of Ameren.com, including "My Electric Outage."[197]

[195] Interview #286, August 13, 2009.
[196] Interview #377, May 20, 2010.

- Since January 2010, Ameren has seen limited usage of Ameren.com outage reporting site.
- After the April 24, 2010 storm, Ameren noted 3,000 views of the Ameren.mobi site.
- Ameren has initial plans to promote these self-reporting services on Ameren.com and Ameren.mobi via bill inserts.

Liberty considers this recommendation verified and closed.

[197] Response to Data Request #1399.

Recommendation

IV-18

Expand efforts with Level One (Health Care / Life Quality) critical care customers to proactively contact these customers prior to planned outages and as soon as possible after unplanned outages when the emergency response plan is activated.

Background

Liberty found that Ameren did not identify critical customers in Outage Analysis System prior to the July and December 2006 storms. As a result, each division had to identify and prioritize critical customers on their own as the storm progressed.

Liberty learned that after the 2006 storms Ameren created a new application that provides a list of critical customers in Outage Analysis System by circuit, based on SIC (Standard Industry Classification) codes. Ameren has identified Health Care / Life Quality facilities, First Responder Agencies, Critical Social Infrastructure, and Emergency Shelter Sites. A Critical Customer List is available by Division, SIC, and Priority that specifies the customer name, SIC, City, Address, Feeder, and Transformer. Another list details any out-of-service Critical Customers, specifying address, Outage Analysis System order #, ERT, and other trouble ticket information. Division personnel are responsible for keeping the Critical Care information up-to-date.

Liberty recommended that Ameren-IL adopt a policy of contacting "critical care customers" prior to all planned outages. During a major storm, Ameren-IL should contact critical care customers at the earliest time it knows the effect and extent of the storm to encourage them to make alternative shelter arrangements. Ameren-IL should also seek customer feedback to determine the most effective means of contacting critical care customers.

Ameren-IL's Implementation Plan

- Process / vehicle to contact customers prior to planned outages is in place.
- Contact with Level One critical community infrastructure customers is in place and implemented as part of an integrated Corporate Communications emergency response plan.
- The role of the Community Relations Coordinator has been established within the Corporate Communications group. The Coordinators reside within the operating divisions across the Ameren Illinois utilities & serve as "point of contact" persons to establish/maintain relationships with these critical care facilities.
- A detailed Corporate Communications plan document is under development, at present. When completed, this plan document will be added as an appendix to the overall Ameren Illinois Utilities Emergency Response Plan.
- "Roles and Responsibilities" checklists applicable to the Community Relations Coordinators as well as to other positions within the Corporate Communications group are under development to further define and standardize the priority of customer contacts during emergency response events.

Verification Discussion and Conclusions

Liberty conducted an on-site interview and reviewed Ameren's response to a data request concerning this recommendation.[198] Liberty found:

- Ameren-IL has established a new role for the Community Relations Coordinators (CRCs) during a storm or large event—contact critical care customers. Ameren-IL expects CRCs to call the emergency management agency and all affected nursing homes, hospitals, and other critical care customers in preparation for a large event. They will visit in person if necessary to relay information if the phones are out of service.
- Ameren-IL expects CRCs to log all contacts in Pier system, routine relationship contacts as well as storm-related communications. Since June 2009, CRCs have logged 64 community visits.
- Ameren-IL also has identified all critical care customers in the Outage Analysis System (OAS). Ameren can initiate an auto-calling feature to notify critical care customers of any situation, including planned outages and storms.
- Ameren-IL has a list of media contacts that it notifies as well as the fire and police. The Pier tool is the repository for all media contacts, mayors, legislators, emergency responders, police, and fire.
- The call center has the responsibility for updating the critical care information in OAS, at the request of customers.

In May 2010, Liberty learned that Ameren had completed the following activities in response to this recommendation[199]:

- Ameren-IL continues to refine its community relations activities as it relates to this recommendation. Community Relations Coordinators (CRCs) are now more familiar with critical care needs within their assigned service territory.
- Ameren-IL now notifies CRCs when there are more than 1,000 customers out, through text/email alerts.
- Ameren-IL continues to build the Pier tool, updating contact information and logging community contacts.
- Ameren-IL has put together an online survey form to collect feedback from community relation contacts and community presentations—IllinoisInteractions.com. It uses this same survey to track feedback following any large outages or storms going forward.
- Ameren-IL attended and presented at the annual Illinois Emergency Alert System conference last fall. As a result, Ameren-IL now has an extensive Pier contact list by county of law enforcement and emergency dispatchers.

Ameren-Il's efforts address the intent of this recommendation. Liberty has completed verification work on this recommendation.

[198] Interview #288, August 11, 2009.
[199] Interview #379, May 20, 2010, and responses to Data Requests #1400 and #1402.

Recommendation

IV-19

Develop an "early" area-specific Estimated Restoration Time to set customer expectations and update Estimated Restoration Times as Ameren-IL learns more about the outage.

Background

Liberty found that Ameren did not provide Estimated Restoration Times (ERTs) nor did it have a process in place to gather and update ERTs during the 2006 storms. The Outage Analysis System turned off the Estimated Restoration Time prediction component to delay providing Estimated Restoration Times until company resources could complete a full damage assessment of the outage. However, Ameren did not provide any area-specific Estimated Restoration Time updates during either 2006 storm.

The lack of Estimated Restoration Times and an ambiguous message was very frustrating for customers and call center agents trying to be responsive to customer inquiries. The lack of storm and restoration information aggravated the capacity constraints of the call center.

Due to the sensitivity relating to the lack of available outage information during the 2006 storms and the difficulties providing timely area-specific estimated times during the August 2007 storm, Liberty recommended that Ameren-IL make a concerted effort to develop an early Estimated Restoration Time, or "Smart ERT," which it can use initially during a large-scale outage. Ameren-IL would build the Smart ERT ahead of time, based on historical restoration performance, and adjusted by storm modeling predictions. The purpose is to present a "best guess" based on all known factors going into a storm so that customers can have an initial, realistic expectation of how the storm will affect their specific area. Ameren-IL can then modify this "best guess" as necessary as it learns more about the specifics of the outage.

Because it relies on predictive methods, Ameren-IL can continue to enhance and improve the Smart ERT process as Ameren-IL employs it. Ameren-IL should create a review and evaluation process to compare estimates to actual for the purpose of improving future estimates.

Ameren-IL should formalize the Smart ERT process in the Electric Emergency Restoration Plan (EERP), including the establishment of an overall Estimated Restoration Time Coordinator and Estimated Restoration Time Monitors within each division. The Coordinator should be responsible for monitoring storm conditions, outage and restoration progress, estimating outage duration, and ensuring that Ameren-IL posts up-to-date restoration times in a timely manner. The Monitors should be responsible for continual posting, monitoring, and revision of customer restoration messaging for specific restoration nodes during a major storm.

The establishment of an Estimated Restoration Time Coordinator in the Emergency Electric Restoration Plan formalizes the process during a large outage event as well as assigns accountability. The process itself manages the development of the early Estimated Restoration Time and monitors in-progress Estimated Restoration Times to ensure better accuracy and ultimately, better information for customers.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation. The following is its implementation plan summary.

- Development of an effective "Initial Damage Assessment" process is underway in order to more accurately and more quickly assess the magnitude of storm damage in the initial hours of the event
- The "Initial Damage Assessment" process will be added as an appendix to the overall Ameren-IL Emergency Response Plan when it is completed
- Development of a "Predictive Restoration" model is underway
- Document outlining the process by which Estimated Restoration Times can be established and amended is in place
- During emergency response events, the establishment of Estimated Restoration Times is accomplished through conference calls attended by the impacted division(s) Command Center Teams, members of the Ameren-IL EOC staff, and staff members of the Corporate Communications group throughout the course of the event
- During emergency response events, information intended to be disseminated to the media or to legislative/regulatory contacts regarding ERTs is discussed and its accuracy is verified with EOC staff members before it is released.

Verification Discussion and Conclusions

In February 2009, Liberty learned that Ameren-IL had completed the following activities in response to this recommendation.[200]

- Ameren-IL established a matrix of roles and responsibilities (as discussed above under Recommendation IV-15). Within this matrix, the Work Management Lead role is responsible for establishing manual ERTs within OAS, both the initial ERT and any subsequent updates.
- Ameren-IL has also begun work on a storm scorecard. Ameren-IL believes this scorecard will instill accountability for OAS data integrity, including ERTs. Specifically, it will record the accuracy of the ERTs that Ameren-IL communicated to customers during the storm.
- Ameren-IL is also committed to discussing estimated versus actual restoration times during twice-daily storm conference calls, to highlight ERT importance to all involved in the storm.
- Ameren-IL indicated that OAS is the public reporting tool, and have communicated this to the field.
- Ameren-IL's "Initial Damage Assessment"[201] process further defines the process for setting ERTs based on the profile of the storm (Level 1, 2, 3, and 4). The Divisions are required to assess the damage, develop ERTs based on available resources, and then quantify how the ERTs would be affected by applying more/less resources. Included in this process is the creation of a "Damage Assessment Template," which facilitates drive-by assessment by Field Checkers.
- Ameren-IL asked the Division Command Center to identify critical circuits and to review this semi-annually, including determining why the circuit is critical, which customers are affected, and what are the key ties to wholesale customers.

[200] Interview #217, February 4, 2009.
[201] Response to Data Request #1025.

- Ameren-IL has begun working on a predictive restoration model, primarily analyzing prior storm data to establish baselines.

During the interview, Liberty also clarified the recommendation with Ameren, specifically the need to develop an "Early ERT" that will be determined through predictive restoration modeling. This Early ERT will serve as a suitable "default" ERT, modeled for each service center (and affected customers) based on predicted storm impact, until Ameren-IL Field Checkers can complete an initial damage assessment to further refine ERTs.

Ameren-IL believes that compliance with this recommendation is partially complete (existence of an ERT process and development of reliable information released to the public). Ameren-IL accepts the time-line suggested by the Liberty Audit team of 12 months (October 2009) for the implementation of an accurate initial damage assessment process and the development of a predictive restoration model.

In August 2009, Liberty learned that Ameren-IL had completed the following activities in response to this recommendation.[202]

- Ameren is working with the University of Illinois to develop a predictive model that will address the intent of this recommendation. One of Ameren's part-time employees (a coop-student with the University of IL) will be working on this project as a senior engineering design project.
- Ameren continues to promote the new initial damage assessment process to Division employees, driving consistency among the Divisions. Emphasis on the Roles & Responsibilities has also helped standardize the response among the Divisions.
- Ameren plans an exercise in the fall to review the process with all field employees.
- Individual Division critiques (in large storms) have also helped communicate the importance of the initial damage assessment and the Roles and Responsibilities.

In May 2010, Liberty learned that Ameren-IL had completed the following activities in response to this recommendation.[203]

- Ameren developed a predictive model in cooperation with the University of Illinois and one of Ameren's part-time employees (coop-student). The model has limited capabilities and requires additional development. The project earned an award at UI and the project report is available on a UI SharePoint site.[204]
- Ameren hired this student to a full-time position and he will continue to develop the model, including tying weather prediction to required resources.
- Ameren continues to emphasize the importance of early ERTs in the field. A full tabletop drill conducted in April further emphasized management commitment to developing early ERTs. Ameren indicates that the EOC will continue to push for early ERTs during all future storms.

[202] Interview #289, August 11, 2009.
[203] Interview #380, May 20, 2010.
[204] Response to Data Request #1374.

- Ameren continues to pursue a new Distribution Management System and a new mobile data system for the field. Ameren is now in the process of defining system requirements.

In May 2011, Liberty met with Ameren-IL personnel to review progress on this recommendation, as part of a wider effort to review Ameren-IL performance during the winter storm of early February 2011.[205] Liberty found:

- Ameren-IL continued to emphasize the importance of early ERTs and OAS real-time update in the field during the recent winter storm.[206]
- Daily EOC conference calls were effective at establishing area-wide ERTs.
- Individual OAS orders were not updated consistently during the storm. OAS order update performance (by Division) ranged from 2.67 percent of total orders updated to 42.5 percent, well below expectations.[207]
- EOC efforts to communicate actual restoration times compared to estimated restoration times (estimation accuracy) have helped focus attention on the importance of ERT updates in the divisions.
- Division 1 has a pilot in place to demonstrate to division personnel the process to update single OAS orders as they work the orders.
- Ameren-IL EOC should continue to report and track OAS update performance and ERT accuracy, especially after storms, and communicate these results to the divisions.

In November 2011, Liberty discussed this recommendation with Ameren-IL personnel to review progress since May 2011.[208] Liberty found:

- Ameren continues to emphasize the importance of early ETRs and OAS real-time update in the field during all events to-date in 2011.
- On August 17, 2011, the Ameren-IL vice president conducted a divisional leadership retreat to reinforce the Incident Command Structure, reinforce expectations, and provide a platform for an organization-wide discussion on advanced performance for future emergency response efforts. ETRs were a topic of discussion at this retreat.[209]
- Ameren-IL held follow-up divisional meetings to discuss storm readiness and ETR updates in September, October, and November 2011. Participants included crew supervisors, support administration, and crews.[210]
- Ameren-IL's EOC continues to keep these issues fresh by including reminders in severe weather alerts issued to employees in the field.
- Ameren-IL's EOC will be reporting and tracking OAS update performance and ETR accuracy, especially after storms, and communicating these results to the divisions on an ongoing basis.

[205] Interview #435, May 23, 2011.
[206] Response to Data Request #1502-A.
[207] Response to Data Request #1502-Summary.
[208] Interview #463, November 14, 2011.
[209] Response to Data Request #1594.
[210] Response to Data Request #1609.

Ameren-IL has followed and completed its implementation plan as described above in the timeframe indicated. Storm-related ETR development and updating is a continual process and Ameren-IL's EOC will continue its focus on improving performance. Ameren-IL has accomplished the intent of Liberty's recommendation. Liberty considers its verification work on this recommendation complete.

Recommendation

IV-20

Develop specific, measurable goals and objectives for improving the accuracy and timeliness of outage related information provided to constituents.

Background

Ameren-IL will undoubtedly experience additional outages in the future and should develop goals and objectives to improve the accuracy of estimated restoration times. Ameren should begin measuring and tracking the accuracy of Estimated Restoration Times (ERTs) as compared to actual restoration time, both on a day-to-day basis and during major outage events.

Ameren-IL should revise outage communication procedures to provide more emphasis on the importance of providing accurate and timely estimates to customers, building upon the "learning moment" that was developed after the 2006 storms. Procedures should include documenting the Estimated Restoration Time originally provided to customers as well as a requirement to provide on-line an updated estimate prior to expiration of any existing estimate. It should offer an explanation to the customer if the estimate changes. During each outage, Ameren should record a complete history of Estimated Restoration Times given to each customer.

Finally, Ameren-IL should implement goals to communicate better with constituents in the aftermath of outages. It should analyze customer complaints to determine whether it is making improvements regarding estimated restoration times. Debriefing sessions should be held with all involved employees, including crews, customer service representatives, and communications personnel. The Company should also hold meetings with city and town officials, other government agencies, and the media.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation but said that it needs to discuss the recommendation with Liberty to understand better the specific intent. Until this discussion takes place, Ameren-IL said that it is not in position to develop a fully detailed implementation plan. However, Ameren-IL indicated that:

- The Estimated Restoration Time process is in place and has undergone modifications to enhance the ability of the Ameren-IL to provide accurate restoration estimates
- A refined initial damage assessment process is under development. This process will enable Ameren-IL to provide more timely and accurate restoration information
- The PIER information management tool is under development.

Verification Discussion and Conclusions

In February 2009, Liberty learned that Ameren-IL had completed the following activities in response to Recommendation IV-20:[211]

- Ameren-IL modified and formalized its ERT process to facilitate more accurate restoration estimates.

[211] Interview #218, February 4, 2009.

- As discussed under Recommendation IV-19, Ameren-IL's "Initial Damage Assessment"[212] process further defines the process for setting ERTs based on the profile of the storm (Level 1, 2, 3, and 4). The Divisions are required to assess the damage, develop ERTs based on available resources, and then quantify how applying more or less resources would affect the ERTs. Included in this process is the creation of a "Damage Assessment Template," which facilitates drive-by assessment by Field Checkers.
- Ameren-IL asked Division Command Centers to identify critical circuits and to review this semi-annually, including identifying why the circuit is critical, which customers are affected, and what are the key ties between wholesale customers.
- The PIER information management tool is under development.[213] This tool will help disseminate storm information internally and externally—a portal that can provide automate messaging to predefined mailing lists such as legislators, print media, and TV. The tool permits the designation of update frequency, the creation of distribution lists, pre-staged messaging, and scheduled delivery of messages. It also serves as a hub for all storm related information, a single point of contact. Ameren-IL Corporate Communications is in the process of defining media contacts and setting up messaging templates.

In November 2009, Liberty found that Ameren-IL had accomplished a number of actions items intended to develop specific, measurable goals and objectives for improving the accuracy and timeliness of outage related information provided to its constituents, including the following:[214]

- Ameren-IL is approaching this recommendation from two ways—externally, through the efforts of the Community Relations Coordinators and internally, by improving OAS and more specifically, ERT updating.
- Ameren-Il continues to develop the role of the Community Relations Coordinators (CRCs). The Coordinators reside within the operating divisions across the Ameren Illinois utilities and serve as "point of contact" persons to establish/maintain relationships with community leaders & municipal officials. CRCs assume a positional role on the Division Command Center Teams during a storm.
- Ameren-IL Communications & Public Relations developed a formal community outreach plan, based on the population and services to better coordinate, assign, and track CRC community involvement.
- Ameren-IL emphasized the importance of Estimated Restoration Times (ERTs) and the timely updating of OAS order status in several sections of the Emergency Response Plan (ERP).[215]
- Ameren-IL will conduct an emergency drill in early 2010 to communicate and test these changes. The drill will emphasize the need to update order status, including the updating of ERTs, if known.
- Ameren-IL already has a process in place to update ERTs by area, on a macro basis after EOC conference calls.

[212] Response to Data Request #1025.
[213] Response to Data Request #1028.
[214] Interview #306, November 10, 2009.
[215] Response to Data Request #1325.

- Ameren-IL recently held a conference with Dispatchers to discuss these issues and encourage them to update ERTs on an order-by-order basis whenever possible. This is something that Ameren-IL needs to continue to pursue.

In August 2010, Liberty learned that Ameren-IL had completed the following activities in response to this recommendation:[216]

- Ameren-IL decided to start over with OAS training for Division 1, and to reschedule the planned refresher training for Divisions 2 – 6, as described under Recommendation IV-15. Better use of the OAS system in the field will improve the quality of OAS data in the EOC and Communications.
- Ameren-IL's Dispatch organization will set up a dispatch desk to assist the Divisions with partial restorations during any future events, and create new outages, as necessary to keep OAS data up-to-date and consistent with the restoration process in the field.
- The Communications team conducted a very successful mock drill on July 13, 2010, in Springfield with their consultant, a videographer, and the full communications team.[217] They played out two different scenarios in a tabletop drill fashion. They reviewed roles and responsibilities, shared best practices, and calibrated their approaches.
- Ameren-IL Communications team also conducted twelve 90-minute town hall meetings with customer service employees to explain all the things that Team CPR (Community and Public Relations Department) does during an event and to communicate about what happens in the field. Ameren-IL reported that these sessions were well received and that Customer Service Representatives are now better prepared to communicate with customers during an event.

Ameren-IL met its commitments and Liberty considers this recommendation verified and closed.

While Ameren-IL completed this recommendation in 2010, Liberty believed it prudent to revisit it and Ameren-IL's performance following a severe weather event. The winter storm of 2011 was such an event. It caused widespread damage across Ameren-IL's service territory, creating several days of challenging work for field and office personnel. In May 2011, Liberty met with Ameren-IL personnel to review this recommendation, as part of a wider effort to review Ameren-IL performance during the winter storm of early February, 2011.[218] Liberty found:

- The Ameren-IL EOC emphasized the importance of early ERTs and OAS real-time update in the field during the recent winter storm.[219]
- Daily EOC conference calls were effective at establishing area-wide ERTs.
- Ameren-IL did not consistently update individual OAS orders during the storm. OAS order update performance (by Division) ranged from 2.67 percent of total orders updated to 42.5 percent, well below expectations.[220]

[216] Interview #395, August 20, 2010.
[217] Response to Data Request #1442.
[218] Interview #435, May 23, 2011.
[219] Response to Data Request #1502-A.
[220] Response to Data Request #1502-Summary.

- EOC Efforts to communicate actual restoration times compared to estimated restoration times (estimation accuracy) have helped focus attention on the importance of ERT updates in the divisions.
- Division 1 has a pilot in place to demonstrate to division personnel the process to update single OAS orders as they work the orders.
- Ameren-IL EOC should continue to report and track OAS update performance and ERT accuracy, especially after storms, and communicate these results to the divisions.

Ameren-IL continues to improve the accuracy and timeliness of outage related information provided to its constituents. While Liberty completed its verification of this recommendation in 2010, this will be a continual process for Ameren-IL. Ongoing efforts to improve OAS skill and use among division personnel, especially during a storm, will have a positive effect on outage information timeliness and accuracy going forward.

Recommendation

IV-21

Create a call-center staffing model to facilitate quick ramp-up and consider staging agents in nearby hotels in preparation for a large storm, especially one that makes travel to the center difficult or unsafe.

Background

Liberty found that Ameren's call centers did not have a call center formal Storm Plan documented at the time of Liberty's final report, nor did they have one prior to the July and November/December 2006 storms. The lack of a plan forced management to ask for volunteers to cover after-hours and weekend needs. Ameren enforced mandatory overtime in the November/December 2006 storm after the weekend staffing proved insufficient. As a result, Ameren-IL was short staffed for the weekend and overstaffed during the following week. In addition, weather conditions made it difficult for employees to report to work during the November/December 2006 storm, further reducing Ameren-IL's available staff. Ameren could not take advantage of its contractor workforce because the contractor had not been trained to handle outage calls, nor had the contract had been established for weekend and after-hour support. In addition, Ameren did not configure the telephony to easily shift call volume to the contractor's facilities.

To prepare adequately for the high volume of calls into its call center during a large outage, Ameren-IL should have adequate and experienced agents on hand to respond. This could be a combination of Ameren employees and third-party agents, if the agents have appropriate access to Ameren information systems and restoration information. In either case, Ameren should be prepared to staff fully centers to be able to respond to customer outage calls.

To assist with the need to ramp up staffing beyond normal staffing levels, Ameren should develop a call-center resource plan that it activates during major storms or large outage events. Integrated with this plan should be a staffing model that will provide guidelines for adding resources, based on the predicted severity of the event, projected call volumes, the timing, and expected duration.

Ameren should consider a pre-storm staging strategy for its call center agents, especially when weather makes travel difficult. Ameren's planning process should ask agents to come to the centers prepared to spend several days away from home, if necessary, and arrange for rooms in a nearby hotel, along with meals and other logistics.

Ameren-IL's Implementation Plan

Ameren-IL is currently working on a (Contact Center Emergency Response) plan specifically for the Illinois Call Centers that will mirror the ICS (Incident Command Structure) model developed and used by Illinois Dispatch Operations. This ICS plan will include items such as:

- Roles and responsibilities of Duty Supervisor, General Supervisors, Quality Assurance Supervisors and data administration personnel
- Staffing plan/ramp up plan (pre storm, during and post storm) (within Ameren, with Outsourcer, with other key personnel)

- Communications roles and responsibilities internally and externally
- Information technology roles and responsibilities related to systems and support
- Logistics for food and beverages
- Overnight accommodations and hotel accommodations
- Safety roles and responsibilities (weather concerns, getting to and from work, etc.)
- Division liaison roles and responsibilities
- Weather alerts (color coded levels of severity)
- Storm classification matrix (different levels for storm severity)
- Ramp down roles and responsibilities

Verification Discussion and Conclusions

In May 2009, Liberty found that Ameren-IL's had accomplished the following actions items intended to address this recommendation:[221]

- Ameren-IL has created a Contact Center Emergency Response plan. This plan has been in place since January 8, 2009.[222]
- Ameren-IL Call Center management now actively participates in the EOC conference calls.

In August 2009, Liberty found that Ameren-IL had accomplished the following action items in response to this recommendation:[223]

- Ameren went back and projected call volumes for different storm scenarios; in conjunction with the ICS model to determine required staffing; Ameren also talked with another utility about its call center storm planning (NSPI).
- Ameren modified the call center staffing plan for storms but it is still a work in progress.
- Ameren used the new staffing model/plan during the Elmwood Storm and another smaller storm in early August. It worked well and formalized the steps.
- Ameren will introduce this to general supervisors and first line supervisors in late August.
- Ameren created an "Outreach Program" for the call center to provide a local presence during storms or large outages. During the Elmwood Storm, the Call Center sent out several supervisors and Customer Service Representatives into the field to provide face-to-face service. This was very successful—customers liked it and employees really liked it. It helped employees get a better understanding of what it is like out in the field during an event. Ameren developed "go bags" with the necessary technology that can be issued to these employees as they are assigned to a field center. Reps are able to log in to the Ameren Customer Information System to pull up information and report outages for customers.
- Ameren's logistics team has become more proactive by checking availability and booking lodging, food, and other support services in preparation for a forecasted event.

[221] Interview #241, May 6, 2009.
[222] Response to Data Request #1053.
[223] Interview #287, August 11, 2009.

- Ameren has also set up recurring weekly meetings to review weekly staffing needs and consider likely impact of forecasted weather.

In May 2010, Liberty found that Ameren-IL's had accomplished the following actions items intended to address this recommendation: [224]

- Ameren has continued to adjust its Contact Center Emergency Response plan, mostly resulting from suggestions and lessons learned from minor events that took place after the plan was in place.
- The plan has worked really well for Ameren in the few incidents in 2010, including the staging of additional staff before the storm.

Ameren-IL has revised its Contact Center Emergency Response plan to specify roles and responsibilities and most recently, incorporated a call center storm-staffing model that projects resources based on forecasted storm impact scenarios. Ameren-IL has completed this recommendation. These efforts address the intent of Liberty's recommendation.

While Ameren-IL completed this recommendation in 2010, Liberty believed it prudent to revisit it and Ameren-IL's performance following a severe weather event. The winter storm of 2011 was such an event. It caused widespread damage across Ameren-IL's service territory, creating several days of challenging work for field and office personnel. In May 2011, Liberty met with Ameren-IL personnel to revisit this recommendation, as part of a wider effort to review Ameren-IL performance during the winter storm of early February 2011.[225] Liberty found:

- Ameren-IL's contact center organization conducted an appropriate level of pre-storm planning in preparation for the early February 2011 winter storm. The team leads for all storm plan elements met ahead of the storm to assure Ameren-IL preparedness.
- Ameren-IL's contact center management followed its storm-staffing model to forecast required staffing. Adequate call center staffing was on hand when the storm arrived in the service territory. It also secured additional resources through its contract call center service provider.
- The contact center's storm logistics team rented 4-wheel drive SUVs to transport contact center personnel to/from company locations and hotels/homes.
- It arranged for appropriate overnight facilities (cots and hotel rooms) for contact center employees working through the storm.
- Ameren-IL's contact centers received adequate support from the IT organization during the storm.
- The after-storm critique identified a few minor issues that have since been resolved.[226] The contact center organization conducts its own storm critiques. They do not participate in the EOC critique.
- Daily storm details and status updates provided by the EOC throughout the storm were helpful and much welcomed by the call center representatives.

[224] Interview #378, May 20, 2010.
[225] Interview #436, May 24, 2011.
[226] Response to Data Request 1503-B and 1503-D.

- Contact center performance throughout the storm was exceptional—less than 4 percent abandoned calls and an average speed of answer below 20 seconds.[227]

Ameren-IL appropriately followed its Contact Center Emergency Response plan during this recent winter storm. As a result, Ameren-IL's contact centers were sufficiently manned and prepared to assist all customers affected by the storm.

[227] Response to Data Request 1503-C.

Recommendation

IV-22

Redesign call center technology to improve communications with customers during a large outage or storm.

Background

While Ameren committed to adding more physical telephone trunks to improve the overall capacity of its call centers, Ameren-IL should reconsider its routing strategies. It should route calls to the high volume IVR provider well before Ameren reaches maximum capacity. This will ensure that enough of Ameren's inbound trunks are available to supplement dedicated emergency trunks to eliminate all blocking on emergency wire-down and gas odor calls.

- Ameren-IL should alleviate the telephony capacity restraints to minimize instances when callers receive busy signals.
- Ameren should implement network-level monitoring services to be able to track the disposition of calls routed outside its centers, to vendors and high-volume overflow service providers.
- Ameren should continually review its call volumes, handle times, and service level performance to ensure the call center is adequately sized (trunks, seats) to deliver responsive service.

Ameren-IL's Implementation Plan

Ameren is looking into the option of routing calls to the high volume IVR provider before Ameren reaches maximum capacity. Ameren will investigate options such as supplying menu options in the AT&T network to direct outage calls to the high volume overflow provider and emergency calls to the Ameren network directly. Ameren will also investigate utilizing time of day routing such that only a percentage of calls will enter the Ameren system when staffing levels are lower to handle better emergency calls and process outages through the high volume overflow provider.

Ameren has and will continue to look for alternatives to lessen the chance that a storm similar to the one in November/December 2006 will cause busies. It will work to alleviate any restraints and consider the cost to implement changes to remove these restraints versus the gains from such changes. However, even with any or all changes it makes, Ameren cannot guarantee the changes will eliminate completely the chance a customer will some day receive a busy signal.

Ameren will work with AT&T to evaluate their service offerings. If the service offerings provide expected service benefits at a reasonable cost, Then Ameren will implement such changes.

Ameren will continually review call volume, handle-times, and service level performance to ensure that it sizes the call center to deliver responsive service. Ameren IT more rigorously monitor systems for issues and problems when the Illinois EOC is activated.

Verification Discussion and Conclusions

In May 2009, Liberty learned that Ameren had completed the following activities in response to this recommendation:[228]

- Ameren-IL implemented Avaya technology to enable its outsourcing vendor to be integrated fully into Ameren-IL's call management system. Additionally, the outsourcing vendor has trained its agents to handle outage and emergency calls. Because of these changes, Ameren-IL is now able to easily route outage and emergency calls to its vendor during a storm, further increasing available work force to handle customer calls.
- Ameren-IL upgraded the Avaya telecommunications software to the current release, improving reliability by increasing the fault tolerance of the system.
- Ameren-IL contracted with AT&T to use some of its advanced network monitoring tools. Since using these tools, Ameren-IL has identified and corrected a routing issue that was causing calls to be lost.
- Ameren-IL is also investigating others product from AT&T to analyze network call flow.
- Ameren-IL fine-tuned its call queuing to optimize call flow within the Illinois call centers.
- Ameren-IL's three call centers now operate as one virtual call center—agents in any Illinois center can handle calls from any Illinois customer. This approach allows call volume to be spread among centers based on resource availability.
- Ameren-IL implemented several "system health" checks to alert management when certain thresholds are exceeded—such as emergency calls backing up in queue, receiving more than X,000 outage reports. This will help Ameren recognize and appropriately address particular situations.
- Ameren-IL recently upgraded its IVR technology to Avaya's current version. However, this will be the final version of this equipment (good through 2010). Ameren will have to revisit its IVR technology next year.
- Ameren-IL is developing a 3- to 5-year telecommunications technology plan to guide its decisions going forward. Ameren will be developing this roadmap over the next few months.

In February 2010, Liberty learned that Ameren had completed the following twelve additional activities in response to this recommendation:[229]

1. Time of Day (TOD) Trunks (September 2009) – Ameren-IL implemented a Time-of-Day Trunk schedule that reduces the number of trunks available during the evening hours, weekends, and on holidays. When it reduces trunk capacity, overflow calls route to the HVCO (High Volume Call Overflow) sooner for call handling. This allows customers to log outage orders versus waiting in queue and helps Ameren gather the outage information quicker. The Ameren-IL NOC (Network Operations Center) has the ability to open more trunks during these off hours if necessary. So far, this approach seems to be working well. Ameren-IL will continue to monitor to make sure that it sizes the trunking appropriately.

[228] Interview #242, May 6, 2009.
[229] Interview #357, February 12, 2010.

2. Virtual Hold software upgrade (September 2009) – This new version fixes problems Ameren was having and added screen pops. Ameren-MO was having problems—the callbacks were being transferred to the agents at the wrong point, before they had completed the menu options to verify that the call was to the right person. The upgrade solved this problem. It has now integrated Virtual Hold's screen pops into the Avaya IC to get screen pops on call-backs. Virtual Hold has adopted Ameren-IL's process to take and use at other Avaya sites. It is now in the process of reviewing the licenses to see if it needs more licenses to support heavier call volumes.

3. Mobile Power Outage Information (Ameren.mobi) (September 2009) – Ameren-IL and -MO customers can report a power outage and view statistics organized by county and zip code from mobile device such as Blackberries, Palm Pilots, iPhones, and other mobile devices. Ameren.mobi is also an easy place for the Call Center to get information.

4. Avaya Agent Skill Templates (September 2009) – Ameren-IL has developed and implemented standard agent skill templates for all Ameren-IL call taker groups. All agent groups in Ameren-IL are now mapped to the same template based on primary responsibilities, regardless of location. Skill templates were set differently among the three operating areas. By using the same templates across Ameren-IL, callers are receiving equal treatment regardless of the company they call.

5. Developed a Call Center Technology Strategy (CCTS) Roadmap (September 2009)
   - Developed a multi-year roadmap and strategy for contact center technologies
   - Identified Business and IT objectives
   - Gap analysis for Business and IT
   - Project estimates for implementing the strategy

   Ameren-IL will review this strategy annually. IVR is on the roadmap for 2010 as well as an upgrade to Avaya Contact Center software (PBX) in the second quarter 2010. Ameren will upgrade from version 3 to 5.

6. Avaya Business Advocate Adjustments (October 2009) – Ameren-IL has adjusted the CMS (Call Management System) Business Advocate settings for all Ameren-IL skills to bring the three Ameren-IL companies in sync from a call treatment perspective. Ameren-IL found that skills were not set the same for the three Ameren-IL companies therefore some callers had an advantage of being answered sooner than other callers from another company during call surplus times. The average speed of answer is now balanced equally between the companies.

7. System Health Checks (November 2009) – Ameren-IL has implemented "System Health Checks" to proactively check systems and send alerts to key IT and/or Ameren-IL Call Center Leaders. Symon health status alerts are triggered based on evaluations of internal Symon status indicators and variables. Some examples of these alerts are:
   - Alert of Potential High Volume Event – When Ameren-IL emergency calls in queue are greater than 100, an email is sent to IT and Ameren-IL Call Center Leaders.

- Ameren 1-800 Hammer Busy Test – The Hammer automatically checks for busy signals. If one occurs, it generates an error message and forwards it to IT personnel for investigation.
- HVCO (High Volume Call Overflow) Hammer Busy Test – The Hammer automatically checks for busy signals. If one occurs, it generates an error message and forwards it to IT personnel for investigation.

8. Symon Alerts (November 2009) – Ameren-IL has reviewed and adjusted the proactive Symon Alerts that are automatically sent via email to Ameren-IL Call Center Leaders when emergency and non-emergency call categories exceed oldest call waiting thresholds.

9. Voice Portal (IVR) Re-write (November 2009 - Ongoing) – Ameren's current IVRs will no longer be supported after December 2010. Ameren is in the process of rewriting the IVRs to a newer version. At the same time, Ameren is considering implementation of Session Initiation Protocol (SIP) for establishing, manipulating, and managing communication sessions. Ameren will investigate this option as it moves forward with the upgrade. Ameren will keep the same functionality, just rewrite to move to the new platform.

10. CLEO Mainframe Interface Replacement (December 2009) – CLEO was used as the interface between the mainframe and the IVR. Ameren has replaced CLEO with a web service that is projected to increase processing speed and reliability and reduce a possible failure point in the outage reporting system.

11. High Volume Call Overflow (HVCO) Services (March 2010) - Ameren-IL is in the process of implementing services from Twenty First Century Communications (TFCC) for overflow inbound calls and proactive outbound outage calls. Ameren-IL scheduled this project to be complete by end of first quarter 2010. This new service will be able to handle inbound overflow calls up to a maximum of 150K calls per hour for the four Ameren companies (CILCO, CIPS, IP, and UE).

12. Local and Long Distance Carrier Contracts (Ongoing 2010)
    - As part of the RFP process for the local and long distance contracts Ameren is considering implementing after hours and emergency routing within the network to allow outage calls to be routed to the HVCO provider well before Ameren reaches maximum capacity. This will allow Ameren trunks to be free to handle emergency wire-down and gas order calls more effectively.
    - Ameren is also reviewing capacities of existing trunks and considering implementing SIP trunking as part of the IVR application rewrite.

In November 2010, Liberty found that Ameren-IL's had accomplished the following regarding this recommendation:[230]

- The IVR is undergoing acceptance testing through December 2010. Implementation will be in January 2011 for both Illinois and Missouri.
- Twenty-First Century Communications High Volume Overflow Service has been in place since the first quarter of 2010. Ameren reported that the system is working well.
- Division managers now give the call center an update on outage causes and status.
- Virtual Hold – Ameren changed the time on hold to 90 seconds from 120 seconds before Virtual Hold kicks in and offers the caller a chance to get a call back.
- Ameren negotiated a new long distance contract with AT&T.
- Ameren went to one toll-free number for all Illinois customers.
- Ameren reported that it continues to look for improvement opportunities in the Call Center organization.

Ameren-IL met its commitments and Liberty considers this recommendation verified and closed.

[230] Interview #413, November 10, 2010.

Recommendation

IV-23

Revise and update Ameren communications policies and develop comprehensive communications procedures related to outage communications.

Background

Communications policies must be comprehensive and should address all aspects of outage-related communications and the organizations and personnel involved. They should include communications intended to prepare customers and their communities for outages, such as media advertisements, mailings, and bill inserts, in addition to emergency communications and information provided while an outage is in effect. They should also include post-outage communications, such as debriefings with city officials, reports to the ICC, and media articles explaining outage causes and remedial activities. Policy documents should cover both internal and external communications, and should establish the roles and responsibilities of all participants in the various processes. This includes not only communications personnel and others in the traditional public affairs functions, but also Operations and Customer Services employees.

Once Ameren establishes and documents revised and updated policies, it should write procedures that clearly identify the actions that responsible individuals should take. Procedures should focus on the communications processes and, as such, should cross department lines. This will mitigate the effect of future organization changes on communications procedures.

Ameren-IL Communications should serve as the "gatekeeper" to coordinate and control of the information released to the media, the recordings placed on the telephone systems, and the information relayed by other personnel in the field, such as the community relations' representatives. Procedures should also address coordination with community-relations officers to ensure that Ameren keeps key customers, government officials, and others informed.

Finally, the procedures should include a requirement and process for a periodic review and update. This should include the processes as well as personnel names, locations, telephone numbers, etc. The review and update process should call for regular interface with personnel outside Ameren, such as customers, government officials, the ICC and the media, in order to ensure that communications policies and procedures are still meeting their needs.

Ameren-IL's Implementation Plan

Ameren-IL provided the following implementation plan summary:

- A detailed, integrated Corporate Communications plan document is under development, at present. When completed, Ameren-IL will add it as an appendix to the emergency response plan.
- Ameren-IL established the role of the Community Relations Coordinator within the Corporate Communications group. These agents, serving under the direction of the Corporate Communications group, will serve as "points of contact" persons to liaise between Ameren-IL and external stakeholders at a local level.

- "Roles and Responsibilities" checklists applicable to positions within the Corporate Communications group are under development.
- An information management tool – "PIER site" - is under development to help ensure timely, accurate, & consistent information is available to internal & external stakeholders. Over time, Ameren-IL expects the PIER site to become the primary emergency-response information management tool utilized throughout the Ameren Illinois Utilities (notwithstanding the use of an outage management system). The tool facilitates the development of pre-event, event, & post-event communications template libraries, provides functionality to develop external contact / distribution lists and will streamline the process of ensuring timely, accurate, & consistent information throughout the organization to external stakeholders.

Verification Discussion and Conclusions

In May 2009,[231] Liberty found that Ameren-IL's had accomplished a number of actions items intended to improve the Corporate Communications Plan for Severe Storms, including the following:

- Ameren-IL revised its Corporate Communications Plan for Severe Storms.[232] The revised plan delineates key storm response roles and responsibilities and assigns them to members of Ameren-IL's communication organization. It outlines required tasks for each role based on the severity of the storm.
- Ameren-IL hired five Community Relations Coordinators to supplement the Ameren-IL Corporate Communications organization. These individuals support the communication needs of the divisions, day-to-day as well as during a storm.[233]
- Ameren-IL contracted with a vendor to provide hosted, browser-based access to communications information during a storm. The PIER "portal" tool facilitates the dissemination of storm-related information to the media, community leaders, legislators, and other key stakeholders. It also provides a common repository for Ameren employees. Ameren-IL Communications controls the messaging, updates, and distribution frequency.[234]

In August 2010, Liberty found that Ameren-IL had accomplished a number of actions items intended to improve the Corporate Communications Plan for Severe Storms, including the following:[235]

- The Communications team established municipal outreach strategies. Ameren-IL split municipals into three tiers, depending on the size and scope of the community. The outreach strategies stipulate the number of visits required by Community Relations Coordinators (CRCs) each quarter and annually. In addition, the team identified annual initiatives in the strategic plan, including municipal outreach.
- The Communications team conducted a very successful mock drill on July 13 in Springfield with its consultant, a videographer, and the full communications team. They played out two

[231] Interview #243, May 5, 2009.
[232] Response to Data Request #1085.
[233] Response to Data Request #1197.
[234] Response to Data Request #1028.
[235] Interview #396, August 20, 2010.

different scenarios in a tabletop drill fashion. They reviewed roles and responsibilities, shared best practices, and calibrated their approaches.[236]

- Ameren-IL Communications team also conducted twelve 90-minute town hall meetings with customer service employees to explain all the things that Team CPR (Community and Public Relations Department) does during an event and to communicate about what happens in the field. Customer Service Representatives are now better prepared to communicate with customers during an event.
- Ameren-IL will conduct another mock drill to simulate Communications storm response in the next 6 months.
- Ameren-IL reported that Team CPR has become very proactive, and customers are starting to notice. The divisions also recognize and value their outreach efforts during an event.

Liberty considers this recommendation verified and closed.

[236] Response to Data Request #1442.

Recommendation

IV-24

Modify the Corporate Communications Storm Plan for Severe Storms to emphasize effective communications and better coordination with the Emergency Operations Center.

Background

Liberty concluded that the Ameren Corporate Communication Plan for Severe Storms needed improvement, specifically to tie the plan to the corporate EERP and Ameren's emergency response organization. In addition, the plan did not contain any information regarding the communications emergency response organization or job duties during an event. Ameren-IL should revise the Communication Plan to cover the issues noted and make the plan more comprehensive.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation and provided the following implementation plan summary:

- Ameren-IL added the position of Corporate Communications as a critical lead on the Emergency Operations Center staff.
- A detailed, integrated Corporate Communications plan document is under development. When completed, Ameren-IL will add this plan as an appendix to the overall emergency response plan.
- An information management tool – "PIER Site" – is under development (refer to Recommendation IV-23).
- During emergency response events, Estimated Restoration Times are established through conference calls attended by the impacted division(s) Command Center Teams, members of the Ameren Illinois Utilities EOC staff, and staff members of the Corporate Communications group.
- During emergency response events, the EOC staff discusses and verifies the accuracy of information planned for dissemination to the media or to legislative/regulatory contacts before it is released.

Verification Discussion and Conclusions

In November 2009, Liberty found that Ameren-IL's had accomplished a number of actions items intended to improve Corporate Communications Plan for Severe Storms, including the following:[237]

- Ameren-IL revised its Corporate Communications Plan for Severe Storms.[238] The revised plan delineates key storm response roles and responsibilities and assigns them to members of Ameren-IL's communication organization. It outlines required tasks for each role based on the severity of the storm.

[237] Interview #308, November 10, 2009.
[238] Response to Data Request #1085.

- Ameren-IL hired five Community Relations Coordinators to supplement the Ameren-IL Corporate Communications organization. These individuals support the communication needs of the divisions, day-to-day as well as during a storm.[239]
- Ameren-IL contracted with a vendor to provide hosted, browser-based access to communications information during a storm. The PIER "portal" tool facilitates the dissemination of storm-related information to the media, community leaders, legislators, and other key stakeholders. It also provides a common repository for Ameren employees. Ameren-IL Communications controls the messaging, updates, and distribution frequency.[240]
- Ameren-IL added the Community and Public Relations Group to the EOC staff as a lead reporting directly to EOC Director in the ERP.[241]
- Ameren-IL expanded the ERP to include a chapter titled "Corporate Communications" that delineates the role of this group during an outage.[242]
- ERP has a chapter titled "Emergency Response Support Activities." Chapter 17 establishes a mechanism to ensure communication between EOC and various support functions, including Corporate Communications. The chapter details the need for a daily support functions conference call to coordinate all the support functions, which includes Communications, a suggested agenda, and format for logging events and actions.[243]

In August 2010, Liberty found that Ameren-IL's had accomplished a number of actions items intended to improve the Corporate Communications Plan for Severe Storms, including the following:[244]

- The Communications team conducted a very successful mock drill on July 13.[245]
- Liberty found that Communications and the EOC have been working closely to make sure they handle events smoothly. Communications has been approaching these events in a much more proactive manner. Ameren-IL reported that its customers are starting to notice of the improvements.

Liberty considers this recommendation verified and closed.

While Ameren-IL completed this recommendation in 2010, Liberty believed it prudent to review it and Ameren-IL's performance following a severe weather event. The winter storm of 2011 was such an event. It caused widespread damage across Ameren-IL's service territory, creating several days of challenging work for field and office personnel. In May 2011, Liberty met with Ameren-IL personnel to revisit this recommendation, as part of a wider effort to review Ameren-IL performance during the winter storm of early February 2011.[246] Liberty found:

[239] Response to Data Request #1197.
[240] Response to Data Request #1028.
[241] Response to Data Request #1297.
[242] Response to Data Request #1297.
[243] Response to Data Request #1297.
[244] Interview #397, August 20, 2010.
[245] Response to Data Request #1442.
[246] Interview #437, May 24, 2011.

- Ameren-IL's Community Relations Coordinators (CRCs) are actively using the PIER system to record community contacts, especially during storms.[247]
- Ameren-IL has streamlined assignment of CRCs to affected areas (by county and operating center) to ensure coverage without duplication of effort.
- Per plan, the Communications group conducted daily storm conference calls among the team to coordinate prior to the daily EOC calls. In addition, CRCs were actively updating division managers and storm leads regarding critical care facilities, infrastructure, and critical medical support customers (life support MER).
- Ameren-IL frequently updated IllinoisOutage.com during the storm to provide information to the media and emergency response personnel.[248]

Ameren-IL appropriately followed its Corporate Communications Plan for Severe Storms during this recent winter storm. As a result, Ameren-IL's communication organization was adequately prepared and able to provide timely and relevant storm communication updates to customers and communities impacted by the storm.

[247] Response to Data Request #1534.
[248] Response to Data Request #1534.

Recommendation

IV-25

Pursue a more coordinated and consistent approach to keeping community leaders and municipal officials better informed of storm restoration status.

Background

Ameren should standardize and coordinate community relations' efforts among the Illinois divisions. The role of a community relations officer should clearly specify duties during major storms as well as day-to-day activities to develop relationships, maintain contact lists, update critical infrastructure records, and educate communities on Ameren's storm response approach. This includes interfacing with all communities, big and small, within the Illinois service territory. Ameren should be more proactive during storms, contacting community leaders regularly before, during, and after the storm to provide an update on restoration progress, so that they can keep constituents informed and make proper decisions. Ameren-IL should complete this improvement within one year of the date of this report.

Ameren-IL's Implementation Plan

In its comments on the draft report, Ameren-IL accepted this recommendation. Ameren-IL indicated that it had accomplished the following in support of this recommendation:

- Ameren-IL will implement this recommendation as part of an integrated Corporate Communications plan.
- Ameren-IL established the role of the Community Relations Coordinator within the Corporate Communications group. The Coordinators reside within the operating divisions across the Ameren Illinois utilities & serve as "point of contact" persons to establish/maintain relationships with community leaders & municipal officials.
- A detailed Corporate Communications plan document is under development. When completed, Ameren-IL will add this plan as an appendix to the overall emergency response plan.
- "Roles and Responsibilities" checklists applicable to the Community Relations Coordinators as well as to other positions within the Corporate Communications group are under development.
- An information management tool – "PIER site" is under development to help ensure timely, accurate, & consistent information is available to internal and external stakeholders. Over time, Ameren-IL expects the PIER site to become the primary emergency-response information management tool utilized throughout the Ameren Illinois Utilities (notwithstanding the use of an outage management system).

Verification Discussion and Conclusions

In November 2009, Liberty learned that Ameren-IL had completed the following activities in response to Recommendation IV-25:[249]

- Ameren-Il continues to develop the role of the Community Relations Coordinators (CRCs). The Coordinators reside within the operating divisions across the Ameren Illinois utilities

[249] Interview #307, November 10, 2009.

and serve as "point of contact" persons to establish/maintain relationships with community leaders & municipal officials. CRCs assume a positional role on the Division Command Center Teams during a storm.

- Ameren-IL's Communications Storm Plan specifies roles and responsibilities for CRCs, including keeping municipal officers and community leaders informed. The plan has evolved over the last year, including the recent addition of follow-up visits with communities following multi-day storms.
- A supervisor has been assigned oversight responsibilities for all CRCs, to formalize the efforts of the group.
- Ameren-IL Communications & Public Relations has developed a formal community outreach plan, based on the population and services to coordinate, assign, and track CRC community involvement. This plan also increases the number of community contacts as part of day-to-day activities.
- Ameren-IL is using the PIER tool to log CRC community involvement and contact.
- Ameren-IL continues to enhance the PIER tool to support the outage process. It expanded the Illinois Outage website (www.illinoisoutage.com) to add storm-related videos, photographs, EOC status updates, articles, storm summaries, and other relevant information. Ameren-IL has also integrated several popular social media tools into the website to make the site more convenient and usable, including Twitter and RSS feeds and YouTube videos and provided links to weather radar and advisories. Through this site, media representatives also have access to stock photos and fact sheets, and can log media inquiries.
- Ameren-IL clarified the CRCs' roles and now expects them to spend 60 to 70 percent of time on community involvement activities. This should strengthen the relationship between Ameren-IL and its communities.
- CRCs attended 2008 and 2009 Illinois Municipal Annual conferences and the Township of Illinois Officials conferences in 2008 and 2009.

In November 2010, Liberty found that Ameren-IL's had accomplished the following regarding this recommendation:[250]

- Team CPR attended the 2010 Illinois Municipal Annual conference in September.
- Ameren-IL sent a letter out to all mayors introducing Ameren-IL and the contact information for the CRC if there were any questions.[251]
- Ameren has drafted a letter for January 2011 that will annually go to all communities providing information such as who to contact, what to expect, and what they can do.
- Ameren-IL invited mayors to update their information in the Pier database site. This should help keep the contact information up-to-date and gather e-mail addresses for future communications.
- The Ameren-IL scorecard includes the results and progress of the community relations group.

[250] Response to Data Request #1476, and Interview #414, November 10, 2010.
[251] Response to Data Request #1456.

- CRCs are participating in the Division mock storm drills and proving to be a valuable resource for the divisions.

Ameren-IL met its commitments and Liberty considers this recommendation verified and closed.

While Ameren-IL completed this recommendation in 2010, Liberty believed it prudent to review it and Ameren-IL's performance following a severe weather event. The winter storm of 2011 was such an event. It caused widespread damage across Ameren-IL's service territory, creating several days of challenging work for field and office personnel. In May 2011, Liberty met with Ameren-IL personnel to revisit this recommendation, as part of a wider effort to review Ameren-IL performance during the winter storm of early February 2011.[252] Liberty found:

- Ameren-IL's Community Relations Coordinators (CRCs) are actively using the PIER system to record community contacts, especially during storms.[253]
- The Communications group conducted daily storm conference calls among the team to coordinate prior to the daily EOC calls. In addition, CRCs were actively updating division managers and storm leads regarding critical care facilities, infrastructure, and critical medical support customers (life support MER).
- Ameren-IL frequently updated IllinoisOutage.com during the storm to provide information to the media and emergency response personnel.[254]
- Ameren-IL has streamlined assignment of CRCs to affected areas (by county and operating center) to ensure coverage without duplication of effort.
- Corporate Communications is exploring additional ways to use the PIER system to proactively communicate with emergency personnel in impacted areas ahead of the storm—to get a consistent message out early and to facilitate more targeted and relevant discussions when CRCs follow-up with these individual.

Ameren-IL appropriately communicated with community leaders and municipal officials during this most recent winter storm. Ameren-IL's Corporate Communications group continues to improve external communications during storms. As a result, Ameren-IL is now more proactive during storms, contacting community leaders regularly before, during, and after the storm to provide updates on restoration progress, helping community leaders keep constituents informed so they can make the proper decisions.

[252] Interview #437, May 24, 2011.
[253] Response to Data Request 1534.
[254] Response to Data Request 1534.

Recommendation

IV-26

Rigorously test call-handling technology to ensure it operates to expectations and specifications.

Background

Ameren owns a HAMMER server from Empirix that allows testing of its call center scripting and applications. However, the HAMMER tool is limited to 48 simultaneous calls and cannot simulate the high volumes needed to test sufficiently Ameren's telephony, such as the volumes received during the peak calling periods of a large storm.

Ameren made changes and improvements to its telecommunications facilities since the 2006 storms, including increasing the capacity of its third-party outage overflow provider. It is critical that Ameren stress test these changes to ensure proper performance during future storms, especially in light of its performance during the 2006 storms. The test should place great demands on Ameren's existing call answering technology, simulating at least 30,000 calls per hour, to demonstrate system performance under extremely high call volumes. This will help Ameren confirm the upper limitations of its customer-facing technology in terms of simultaneous callers, queue build-up, and systems response. The test will also provide important feedback in terms of how the system works as a whole, from the PBX through the IVRs and to an agent as well as the overflow to Stericycle. Many of the problems encountered during the 2006 storms could have been avoided if Ameren had comprehensively stress tested its telephony after each major equipment upgrades or change.

Additionally, Ameren's emergency drills should include scenarios that test the supporting technologies and telephony. This will help Ameren be prepared and more responsive during emergencies.

Ameren-IL's Implementation Plan

Ameren purchased a "Hammer CC Test System." Ameren-IL expects to use it in production readiness testing of the applications when it makes. Ameren has completed an RFP for a stress test of its Telecommunication infrastructure and services. It awarded a contract to IQ Services to provide a stress test simulating approximately 50,000 calls per hour. Ameren expects to complete this test by the end of first quarter 2009. Pending financial analysis and budget approvals, Ameren-IL is investigating an annual external stress test to further test the call center environment. Currently, Ameren individually test the PBX/VRU and Mainframe separately. Since these tests affect the customer's ability to contact Ameren, the company will not implement them very often. Ameren will evaluate the option of completing a single emergency drill that will test the supporting technologies and telephony.

Verification Discussion and Conclusions

In February 2009, Liberty learned that Ameren had completed the following activities in response to Recommendation IV-26:[255]

- Ameren issued an RFP256 to select a vendor to conduct three stress tests of its telephony, including individual tests of IL and MO telephony and a third test of Ameren's choice. Ameren subsequently selected and contracted with IQ Services to conduct the stress tests of its call center and outsourced IVR overflow services and equipment. In preparation for the tests, Ameren conducted a pre-test on February 8, 2009.257 This provided the opportunity for Ameren to run through all the required steps in preparation for the full stress tests, including taking a "snapshot" of its production OAS system data, backing up the data, loading OAS with test data, initiating the stress test, rolling back the snapshot, and then placing the systems back into production mode. Because the stress test must be conducted on the "production" system, the timing of the test must be carefully planned so that it does not interfere with business operations. As such, Ameren conducted the pretest from 1 a.m. to 4 a.m., on a day that represented no weather effects.
- Ameren scheduled the test of IL telephony for March 1, 2009, from 1 a.m. through 6 a.m., and made it subject to cancellation due to bad weather or other events.258 This test will simulate 50,000 calls per hour, delivered over a 2-hour window. Ameren has developed a "virtual agent" to simulate agent handling of calls during the test. Ameren will also be testing the load impact on OAS by running simulated entry and query every second to simulate agent and dispatch inquiry and order entry. Ameren has provided the vendor with 100,000 valid customer phone numbers to use to simulate test calls.

In March 2009, Liberty remotely monitored three stress tests of Ameren-IL's telephony through real-time observation of call handling progress on the vendor's website.[259] Ameren-IL conducted individual stress tests during the early hours of March 1, 15, and 22. Each test simulated 50,000 calls per hour, delivered over a 2-hour window. Ameren-IL developed a "virtual agent" to simulate agent handling of calls during the tests. Ameren-IL also tested the load impact on OAS by running simulated entry and query to simulate agent and dispatch inquiry and order entry.

In May 2009, Liberty learned that Ameren had completed the following activities in response to this recommendation:[260]

- Because of the February 8 pre-test, Ameren-IL learned that the order batch throughput to its vendor, Stericycle, was insufficient to support projected load. Ameren reprogrammed its systems to support the project load and increase the speed of order entry.
- Because of the February 8 pre-test, Ameren-IL also learned that Stericycle's telecommunication-trunk allocation settings were incorrect. These settings were corrected prior to the testing.

[255] Interview #219, February 4, 2009.
[256] Response to Data Request #1031.
[257] Response to Data Request #1052-J.
[258] Response to Data Request #1052.
[259] Interview #226, March 1, 15, and 22, 2009.
[260] Interview #240, May 6, 2009.

- During the stress test, Ameren-IL experienced inconsistent call handling results (long delays, silences, and busies) when it received more simultaneous calls than its IVR capacity. Ameren's current trunk capacity is greater than its IVR capacity. As a result, calls were queuing and overloading while waiting for IVR handling. Ameren-IL is investigating ways to reconfigure its IVR capacity to match better its trunk capacity.
- Ameren successfully tested an Avaya patch during the final stress test.
- Stericycle did not recognize many customer accounts appropriately during the test. Stericycle is investigating this problem.
- Ameren realized discrepancies in the stress test statistics provided by its vendors (AT&T, Stericycle, and IQ Services). Ameren is working with its vendors to clarify the data and reconcile test results.
- Ameren-IL will continue to review the data and work through its list of findings and follow-ups.

In February 2010, Liberty learned that Ameren had completed the following activities in response to this recommendation:[261]

- Ameren is changing its HVCO (High Volume Call Overflow) vendor from Stericycle to Twenty First Century Communications (TFCC). Ameren has scheduled a stress test to provide end-to-end testing of the new TFCC services (using the test environment). As Ameren is also re-writing its IVR applications, it will conduct a more thorough load test on the entire system prior to its release later this year (using the production environment).
- Ameren plans a TFCC "soft" go-live in early February, continuing to use the existing vendor until the TFCC system has been thoroughly tested.
- A small stress test was conducted on February 13, 2010—2,500 calls were pushed to each of the primary residential toll-free numbers (totaling 10,000 calls).
- A larger test is scheduled for February 28—60,000 calls will be pushed to the system in one hour—30,000 calls for Ameren-IL & 30,000 calls for Ameren-MO.
- Ameren-IL is planning to move the TFCC system into production on March 15, 2010, based on a successful testing.

In May 2010, Liberty learned that Ameren had completed the following activities as it relates to this recommendation: [262]

- On February 28, 2010, Ameren conducted a large stress test of the new high volume overflow services through Twenty First Century Communications (TFCC). The stress test pushed 60,000 calls through Ameren's telecommunications network and overflowed into TFCC's IVR services. Very few problems were encountered during the test[263]. Most of the problems were a direct result of the test environment itself, not of the functioning of Ameren/TFCC's telecommunications technology.

[261] Interview #358, February 12, 2010.
[262] Interview #376, May 20, 2010.
[263] Response to Data Request #1397.

- Ameren cut over to the TFCC production system on March 16, 2010. The system has performed well since the cut over. Ameren is closely monitoring the performance of the TFCC system and is pleased with TFCC's monitoring and diagnostic tools.
- Ameren has committed to conducting another stress test of its outage telecommunications technology following the upgrade (and rewrite) of its in-house IVR platform in 2011.

Liberty considers this recommendation verified and closed.

Recommendation

IV-27

Develop and implement a process to identify and train future response function leaders to provide appropriate levels of experience to all who will be in leadership roles in the emergency response organization.

Background

Liberty recommended that Ameren-IL review the roster of employees who are presently serving in lead roles in the emergency response organization to confirm experience level and anticipate the effect of attrition and retirements. Ameren-IL should identify future response-function leaders and employ them in emergency response roles in order to provide the necessary experience and prepare them to assume the leadership role. The goal should be to avoid having to place inexperienced personnel into response lead roles.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation. It said:

- The "Roles and Responsibilities" checklist format has been developed to outline – in sequential manner – the duties, tasks, and activities that must be completed by response function leaders
    - These checklist documents serve the emergency response organization in the following ways:
        - Training Tool – to identify individuals within the organization who have the requisite and preferred skills-sets needed to fulfill successfully positional lead roles within the emergency response organization. The documents will also be used to facilitate discussions focused on the application of the ICS and the emergency response process within Ameren-IL
        - Activity Guide – to be used by personnel during a response event. Uses an easy to read and follow "checklist" format (helps to make the plan more useable during emergency response)
        - Cross-Reference Check – by which a team member can help to assure him/herself that he/she has taken the proper steps in the proper order and has notified the proper parties within the ICS structure
        - Diagnostic Tool – by which the Ameren-IL organization might more objectively evaluate performance during and after an emergency response event.

Verification Discussion and Conclusions

Liberty discussed with Ameren-IL the status of the implementation of this recommendation.[264] Liberty learned:

- Ameren-IL has developed Roles and Responsibilities protocols in checklist format for response function leaders.

[264] Interview #215, January 29, 2009.

- These protocols define duties, tasks, and activities for the different response function leaders. This information is helpful in identifying skill sets, prior experience, and aptitudes that would provide the best fit for a future response leader in a particular function.
- Because the Ameren-IL EOC and response organization has only fairly recently been set up as separate from the Ameren-UE Missouri operation, the primary focus at this time is in focusing on the training and reinforcement of the incumbent response function leaders.
- Ameren-IL has identified back-up personnel for lead positions at the EOC, and the divisions have identified personnel for their primary lead teams.
- As the present Ameren-IL response organization has time to get a little more experience, Ameren-IL will focus more time on the issue addressed in this recommendation – identifying and preparing future emergency response leaders.
- Ameren-IL will revise its implementation plan for this recommendation to include specific wording describing the process it will use to identify these future response leaders.
- Wording describing this process will be included in the final draft of the Emergency Response Plan.

In November 2009, Liberty conducted an on-site interview, reviewed the Ameren- IL response to a data request, and found:[265]

- Ameren-IL has developed a specific plan detailing the process for identifying and training future emergency response leaders
- This plan is included in the new Ameren-IL emergency response plan, which it will soon publish
- Ameren-IL is presently identifying the back-up EOC leadership team.

In November 2010, Ameren-IL furnished a status report on this ongoing process.[266] Liberty found that Ameren-IL has identified specific skill sets required of future emergency response leaders in particular roles. Senior operating leadership is conducting a review to identify potential candidates for consideration. Ameren-IL will bring these candidates in for training and shadowing particular individuals during actual events to help prepare. Ameren-IL is still reviewing the number of teams of future leaders that it should organize. In the meantime, the focus continues on the continuing development of present emergency response leaders.

Ameren-IL has met its implementation plan within the timeframe stated. The efforts address the intent of Liberty's recommendation. Liberty has not completed verification work on this recommendation and will follow-up with Ameren-IL to review this process and ensure compliance and effectiveness.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions affected by the May and June storms, with EOC leadership, and with the VP of

[265] Interview #323, November 19, 2009, and response to Data Request #1323.
[266] Response to Data Request #1464.

Operations for Ameren-IL. In addition, Liberty attended an Ameren-IL Emergency Response Retreat.[267]

Ameren-IL has a full slate of identified, qualified back-ups. Their continuing training plans include job shadowing and allowing them to perform in these roles during an actual emergency. Liberty's verification work on this recommendation is complete.

[267] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.

Recommendation

IV-28

Establish a Safety Support function at the Ameren-IL Emergency Operations Center (EOC) with direct line authority over the safety professionals/representatives working in the Ameren-IL operating divisions during a major outage event.

Background

In the response to the July 2006 storm, the safety professionals/representatives working in the Ameren-IL area reported to the Safety Support Lead, who was part of the corporate Emergency Operations Center (EOC) team. This lead person coordinated all of the activities of the safety professionals/representatives, who Ameren-IL assigned to the different operating divisions. In the response to the November/December 2006 storms, these safety professionals/representatives reported directly to the division manager in their assigned division.

This change in organization had a negative effect on communications among these individuals as well as the coordination of a consistent approach to the safety support function. It affects flexibility, as it becomes more cumbersome to move quickly the safety professionals/ representatives than if they were all reporting to one Safety Support Lead. Now that Ameren-IL has established its own Emergency Operations Center (EOC), it should establish a Safety Support Lead position at the Illinois EOC and have all safety professionals / representatives report to that lead.

Ameren-IL's Implementation Plan

- Ameren-IL established the Safety Support function as a key "seat" or Lead Position on the Ameren-IL Emergency Operations Center staff.
- Ameren-IL amended its organizational structure so that Safety Professionals responsible for distinct division operations now report directly to the respective Division Manager, rather than to a central department.
- During an emergency response event, the Safety Support Lead on the EOC staff serves in a coordination and integration role to insure that the efforts of all safety professional personnel are synchronized across Ameren-IL.

Verification Discussion and Conclusions

Liberty conducted an on-site interview and reviewed Ameren's response to a data request concerning this recommendation.[268] Liberty found:

- Ameren-IL has established a Safety Support function as part of its EOC staff. Ameren-IL implemented and used this change in recent emergency events.
- The emergency response plan presently in use by Ameren-IL includes the Safety Support function as part of the EOC team.
- Ameren-IL plans to centralize the safety function, moving the safety professionals to report to an Operations Vice President rather than to the Division Managers.

[268] Interview #214, January 28, 2009, and response to Data Request #1060.

- This move will facilitate the desired centralized safety support organization described in this recommendation.
- Ameren has revised its implementation plan wording to reflect this pending re-organization.

Following-up on its findings in the first quarter, Liberty found:[269]

- Ameren-IL follows a revised implementation plan that reflects centralization of the safety function. This change provides the direct line authority at the EOC level that was part of the recommendation.
- Ameren-IL developed "Roles and Responsibilities" (R&R) documents and uses them to provide direction for the Safety Support function during major outage events.
- The Emergency Response Plan wording addressing the Safety Support function at the EOC is in draft form.

Liberty reviewed the language in the Ameren-IL Electric Emergency Response Plan (EERP) with Ameren-IL personnel in August 2010.[270] The Safety Support function reports to the EOC Director in accordance with Liberty's recommendation.

Liberty reviewed with Ameren-IL the safety process in the response to three storms occurring from February through April 2011.[271] Division managers identified several areas of potential improvement, including:

1. Can make plan stronger to ensure that safety reps are meeting with people in the mornings. This was identified in the early February storm. It was recognized and the effort to do this was greater in the next two storm responses.
2. Were not consistent in reinforcing the safety message to workers when they are all together.

On a more positive note on safety processes during these storms, all Ameren-IL supervisors are engaged in safety activities. A daily safety note entitled, "Action Matters" is developed and distributed everyday for supervisors to use in their morning "toolbox meeting."

Ameren-IL has met its implementation plan within the commitment timeline. The efforts address the intent of Liberty's recommendation. Liberty has not completed verification work on this recommendation and will:

- Confirm that the centralization of safety is in effect as planned.
- Confirm that the final draft of the Ameren-IL Emergency Response Plan contains appropriate wording to describe the Safety Support function as contemplated.
- Follow up with Ameren-IL to monitor the Safety Support function performance in future major outage events.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions affected by the May and June storms, with EOC leadership, and with the VP of

[269] Responses to Data Request Nos. 1060, 1084, 1087, 1095,and 1101.
[270] Interview #398, August 10, 2010.
[271] Interview #435B, May 23, 2011.

Operations for Ameren-IL. In addition, Liberty attended an Ameren-IL Emergency Response Retreat.[272]

The Safety Support function is working well. The Safety Support lead reports directly to EOC Director and has direct authority over field safety reps. They have established a good balance between this reporting relationship and maintaining responsive to the requests and needs of the divisions where safety reps are assigned. Safety results during major outage events over the past two years have been good. The operating division leadership is pleased with the response and cooperation they are receiving from Safety Support.

Liberty's its verification work on this recommendation is complete.

[272] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.

Recommendation

IV-29

Add a section on safety support, stores/material support, and transportation/fuel support to the Ameren-IL corporate Electric Emergency Restoration Plan (EERP). (Also see Recommendation III-1)

Background

At the time of the two major outage events in 2006, the Ameren Electric Emergency Restoration Plan (EERP) did not contain sections dealing with the support of restoration functions in the areas of Safety, Stores and Material, and Transportation and Fuel. The emergency plan should address these important functional areas. Ameren-IL should add sections to the corporate EERP detailing these three support organizations, and the action steps the function lead personnel and other members of these support organizations should take.

Ameren-IL's Implementation Plan

- Safety Support plan is under development.
- Supply Chain Plan (stores/material support) is in place.
- Transportation / Fuel Support Plan will be developed.
- Ameren-IL will add all three plans to the Ameren Illinois Utilities Emergency Response Plan as appendices upon completion.

Verification Discussion and Conclusions

Liberty reviewed information that Ameren-IL provided and found:[273]

- Ameren-IL has developed and implemented "Roles and Responsibilities" (R&R) documents in the following areas;
    - Regulatory Affairs
    - EOC Coordination / Work Management Lead
    - Crew Management Lead
    - EOC Staff Systems Management Lead
    - Division Command Logistics / Materials Management / Fleet Services Lead
    - EOC Director.
- The development of the R&R document for Safety is in process.
- Ameren-IL did not furnish any Supply Chain (stores/material support) documents in the R&R format, but have developed the following documents: Pre-Storm Checklist, List of Storm Managers with contact information, Process Overview flowchart, Emergency Process Overview narrative, and Materials Management Checklist.
- Ameren-IL has not yet furnished the final approved language for the Emergency response plan, other than the documents referred to above.

In November 2009, Liberty conducted an on-site interview, reviewed the Ameren- IL response to a data request, and found:[274]

[273] Responses to Data Request Nos. 1081, 1084, 1087, and 1116.

- Ameren-IL has addressed all aspects of this specific recommendation, and
- The Ameren-IL Emergency Response Plan is now complete. Ameren-IL sent it to the printer in November 2009.

In March 2010, Liberty attended an Ameren-IL emergency response exercise and reviewed responses from Ameren-IL to data requests.[275] Liberty found that:

- Ameren-IL is putting a strong emphasis on its emergency plan
- The wording in the plan is well thought-out and comprehensive
- Ameren-IL is identifying key issues and implications, and is stressing them in the early training efforts
- Ameren-IL is involving their entire response organization in making presentations and working through issues of interpretation and application
- The exercise was well attended and participation was excellent
- Ameren-IL's top management, the CEO and operations vice presidents, are clearly supportive and involved in the implementation of the new emergency plan. They were all present and participated enthusiastically in the exercise.

Ameren-IL has met its implementation plan within the stated timeframe. The efforts have addressed the intent of Liberty's recommendation. Liberty has not completed verification work on this recommendation and will follow-up with Ameren-IL in:

- Carefully reviewing all wording in the new Emergency Plan to ensure that it is clear and complies with Liberty's recommendations
- Reviewing the use of the plan in future major outage events to ensure compliance and effectiveness, especially with regard to these support organizations.
- Monitor the performance of these three specific support areas during future major outage events.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions affected by the May and June storms, with EOC leadership, and with the VP of Operations for Ameren-IL. In addition, Liberty attended an Ameren-IL Emergency Response Retreat.[276] Chapter 17 of the EERP, "Emergency Response Support Activities," fulfills this recommendation, and the performance of the support groups during the recent major storms, which has been excellent, provides confirmation that Ameren-IL is following an effective plan. Liberty's verification work on this recommendation is complete.

[274] Interview #323, November 19, 2009, and response to Data Request #1321.
[275] Interview #360, March 10, 2010, and responses to Data Request Nos. 1381-1384.
[276] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.

Recommendation

IV-30

Implement daily conference calls for each support function assisting in a major outage restoration effort.

Background

Ameren should revise the corporate Electric Emergency Restoration Plan (EERP) to include the daily conference call procedure as a standard practice among all support functions. Ameren should make this change to the EERP.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation and submitted the following implementation plan:

- This activity/task is written into all roles and responsibilities documents
- A review of outstanding or unresolved support function issues is provided during the emergency response update conference call.

Verification Discussion and Conclusions

In August 2009, Liberty conducted an on-site interview, reviewed Ameren-IL responses to data requests, and found:[277]

- Ameren-IL has followed the implementation plan outlined above
- During the two major outage events in the second quarter of 2009, the Call Center, Logistics, and Corporate Communications held conference calls
- Ameren-IL is continuing to remind all support groups of this process
- Emergency plan wording under development will set forth clearly this process.

Ameren-IL has met its implementation plan in the specified timeframe. The efforts address the intent of Liberty's recommendation. Liberty has not completed its verification work and will:

- Follow-up with Ameren-IL to verify that it conducts support function conference calls during future major outage events
- Review final emergency plan language for these support groups to ensure that the process is clearly set forth.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions affected by the May and June storms, with EOC leadership, and with the VP of Operations for Ameren-IL. In addition, Liberty attended an Ameren-IL Emergency Response Retreat.[278] Chapter 17 of EERP contains this requirement and all support functions are regularly holding these conference calls.

Liberty's verification work on this recommendation is complete.

[277] Interview #285, August 12, 2009, and responses to Data Requests #1257, #'s 1080 – 1086, #1111, #1116, and #1243.
[278] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.

Recommendation

IV-31

Provide necessary details in corporate and division Electric Emergency Restoration Plans (EERPs) to give appropriate guidance to logistic support employees.

Background

Ameren-IL should revise the corporate Electric Emergency Restoration Plan (EERP) and its division plans to include specific details on logistics duties and activities at the EOC, Division, and Operating Center level.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation and submitted the following implementation plan:

- The Logistics Support function plan is under further refinement. When complete, this plan will include a fully outlined process as well as "Roles and Responsibilities" checklist documents for use by those individuals assigned as logistical support positional leads on the various division-command center teams.
- Ameren-IL plans for an exercise that includes logistical support in the fourth quarter 2008.

Verification Discussion and Conclusions

In August 2009, Liberty conducted an on-site interview, reviewed the Ameren-IL response to data requests, and found:[279]

- Ameren-IL has followed its implementation plan detailed above with good results.
- During the major outage event in May 2009, Logistics arranged for two "base camps," one at Marion and one at Carbondale, which consisted of sleep trailers and dining tents.
- The Logistics group had met with a caterer in March 2009, and it was through this meeting that the supplier of the "base camps" was contacted
- The camps were set up in less than 24 hours
- Nurses were provided at the base camps
- This arrangement was so impressive that Ameren-IL has been contacted by the National Anti-Terrorism Committee and the Illinois State Police for consultation on how this was arranged
- Emergency plan language and "Roles and Responsibilities" (R&R) documents have been finalized.

In March 2010, Liberty attended an Ameren-IL emergency response exercise and reviewed responses from Ameren-IL to data requests.[280] This review indicated that the new Emergency Plan provides adequate guidance for logistics support personnel.

[279] Interview #285, August 12, 2009, and responses to Data Requests #1258, #1082, #1118, #1243, and #1246.
[280] Interview #360, March 10, 2010, and responses to Data Request Nos. 1381-1384.

Ameren-IL has completed its implementation within the timeframe specified. The efforts satisfied the intent of Liberty's recommendation. Liberty has not completed its verification work and will:

- Conduct thorough review of final language contained in the emergency plan to ensure that it provides adequate guidance.
- Monitor adherence to emergency plan in future major outage events.
- Follow up with Ameren-IL to review performance of Logistics in future major outage events.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions affected by the May and June storms, with EOC leadership, and with the VP of Operations for Ameren-IL. In addition, Liberty attended an Ameren-IL Emergency Response Retreat.[281]

Chapter 17 of EERP covers this logistics requirement. Ameren-IL held a training session with logistics personnel May 25, 2011. Ameren-IL is handling logistics so well now that it has been asked to make presentations to both the Illinois Emergency Management Agency (IEMA) and the Illinois state police.

Liberty concluded that its verification work on this recommendation is complete.

During a 2012 review, Liberty learned that Ameren-IL is continuing to train and provide guidance to logistics support personnel.[282]

[281] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.
[282] Interview #477, May 24, 2012 and response to Data Request #1635.

Recommendation

IV-32
Improve meal and feeding practices.

Background

Liberty recommended that Ameren-IL:

a. Establish desired staffing levels of Logistics Support employees to assist in the meal function of Logistics Support, based on the number of restoration workers and the meal arrangements necessitated by the profile of the storm response. Ameren-IL should include this provision in the Ameren-IL Emergency Response Plan.

b. Identify caterers and other establishments throughout their service territory that are qualified, willing, and able to provide quality meals in the quantities and conditions that it might require. Ameren-IL should reach and maintain formal agreements with these providers to ensure on-going and short-notice access to their services in the event of future emergency response events. Ameren-IL should include this provision in the Ameren-IL Emergency Response Plan.

c. Implement as the normal meal practice during major outage events the feeding of workers at the staging sites for the morning and evening meals where practical. Ameren-IL should revise the Electric Emergency Response Plan [EERP] to incorporate this change.

d. Implement as normal practice during major outage events the parking of crew trucks at the staging sites where practical. It should provide shuttles to transport workers to and from the staging sites and their lodging. Ameren-IL should revise the Electric Emergency Response Plan [EERP] to incorporate this change.

Ameren-IL's Implementation Plan

1. The Logistics Support team is working to address improvements in the management of the meal function by identifying and training "second tier" Logistical support personnel.
2. The Logistics Support team is currently working to identify additional caterers across Illinois capable of meeting the needs of Ameren-IL during emergency response events. Establishment of formal contracts may not be acceptable to these vendors, in all cases.
3. Ameren-IL is willing to discuss the intent of this proposed recommendation with the Liberty Audit team in order to seek alternative resolutions to specific concerns identified by the Liberty Audit team.
4. Ameren-IL is willing to discuss the intent of this proposed recommendation with the Liberty Audit team in order to seek alternative resolutions to specific concerns identified by the Liberty Audit team.

Verification Discussion and Conclusions

Based on discussions during an on-site interview, Liberty found:[283]

[283] Interview #215, January 29, 2009.

- Ameren-IL has been working on improving on their Logistics Support function in order to support the requirements for meals for a large restoration workforce. Specifically, it has identified additional personnel to assist with this function. Training these people is in process.
- Ameren-IL will continue work in this area, focusing on the establishment of targeted staffing levels for meal support for various size events.
- Ameren-IL has been working and continues to work to identify caterers and eating establishments across their service area that are capable of providing the meal service needed during major outage events.
- Ameren-IL has taken steps to get firm commitments from qualified meal vendors to ensure their availability before a major event occurs.
- Most of these vendors are unwilling to enter into a firm written contract, but are willing to commit to provide the requested services.
- Ameren-IL is unwilling to commit to making it their "normal practice" to feed workers and park vehicles overnight at staging sites where practical, but they are willing to consider such arrangements.
- Ameren-IL will revise its implementation plan for this recommendation based on the discussions and agreements reached during this on-site interview.

Following-up on its findings in the first quarter, Liberty found:[284]

- Ameren-IL developed and implemented "Roles and Responsibilities" (R&R) documents providing guidance in the area of Logistics Support, which is involved in the implementation of this recommendation.
- Ameren-IL is developing a matrix that will provide guidance regarding the needed staffing level of Logistics Support personnel.
- Ameren-IL held a meeting with agents of their primary emergency response food service vendor to re-affirm the existing relationship and explore the potential to expand those services. Ameren-IL stated that it is satisfied with the capability of this vendor and its associated nationwide network to meet their meal needs during any major outage event.
- Ameren-IL completed a list of alternative local vendors/suppliers that it can call on for various logistic services during major events.
- Ameren-IL will include in its final approved wording in the appropriate section(s) of the new Emergency Response Plan encouragement for local response teams to consider feeding crews and parking vehicles at staging sites where applicable.

In February 2010, Liberty learned that, during its response to a significant outage in May 2009, Ameren-IL used some of the meal practices referenced in this recommendation with good results.[285] Since then, there have not been any events large enough to warrant this type of meal process, but Ameren-IL is committed to the implementation that it outlined in the response to this recommendation.

[284] Responses to Data Request #1102 and #1118.
[285] Interview #359, February 11, 2010.

Ameren-IL has met its implementation plan within the commitment timeline. The efforts address the intent of Liberty's recommendation. Liberty has not completed verification work on this recommendation and will:

- Follow up with Ameren-IL in after-action review on future outage events to monitor performance in the specific meal support functions addressed in this recommendation.
- Confirm that the final wording in the Ameren-IL Emergency Response Plan reflects the implementation action taken in response to this recommendation.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions affected by the May and June storms, with EOC leadership, and with the VP of Operations for Ameren-IL. In addition, Liberty attended an Ameren-IL Emergency Response Retreat.[286]

This recommendation had four separate issues, and Liberty finds the following disposition of each:

- Adequate logistics staffing – a large slate of trained logistics personnel is listed in tiers. Ameren-IL activates tiers as the number of outside workers increases.
- Food providers – Ameren uses local vendors when they can, but has a catering vendor who has proven the ability in actual storms to be able to set up quickly and serve up to 1,000 workers at a meal.
- Staging sites (feed workers there) – Ameren does this as necessary, but prefers to use local restaurants.
- Staging sites (park trucks overnight, fuel them there) – preference is to keep trucks at lodging place and fuel there. They provide security.

Based on its findings, Liberty's verification work on this recommendation is complete.

[286] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.

Recommendation

IV-33

Implement a process to confirm that all line and support function lead personnel have been alerted when the initial event alert has been sent. (Also, see Recommendation IV-3, Section IV.B, Pre-Storm Preparations.)

Background

Liberty found that nobody notified the Stores/Material Support lead of the fact that a major outage event had occurred until July 20, the day after the initial impact. A call to dispatch a material storm trailer to E. St. Louis was the method of his notification.

Liberty recommended that Ameren-IL develop and implement a process to have all lead personnel – both line and support functions – in the Ameren-IL emergency response organization to respond confirming receipt after Ameren transmits a major outage event alert. This process should be included in the Ameren-IL Electric Emergency Restoration Plan (EERP).

Ameren-IL's Implementation Plan

- Section 3 of the Ameren-IL Emergency Response Plan, the "Weather Alert" protocol is in place
- At the time a "yellow" or "orange" weather alert is sent to Ameren-IL emergency response stakeholders, appropriate pre-staging guidance is also issued in the same correspondence
- Effective immediately, the EOC staff will mark all such correspondence as "Receipt Requested" and will track the responses.

Verification Discussion and Conclusions

During the first quarter of 2009, Liberty learned that:[287]

- Ameren-IL established a formal notification process – the "Weather Alert" protocol – that is now in use for notifying all emergency response team members and other affected Ameren personnel.
- This process consists of e-mails sent to designated recipients with "Return Receipt" to confirm that they received the message.
- All key response team members needed for initial response are equipped with Blackberries with e-mail service as well as personal computers to ensure receipt of messages during off-hours.
- Specific information concerning the alert, such as weather vendor e-mail communications are included in the messages sent to recipients.
- Wording describing this process is already in the emergency plan that Ameren-IL is using and will be included in the final draft of their Emergency Response Plan.

In August 2009, Liberty conducted an on-site interview and reviewed the Ameren-IL response to a data request.[288] Liberty conducted another interview in February 2010.[289] Due to the similarity

[287] Interview #214, January 28, 2009, and response to Data Request #1040.
[288] Interview #285, August 12, 2009, and response to Data Request #1259.

between this recommendation and Recommendation IV-3, Liberty has combined its verification work for these two recommendations. Please see the comments under "Verification Discussion and Conclusions" for Recommendation IV-3 above.

Ameren-IL has completed its implementation plan within the timeframe stated. The efforts addressed the intent of Liberty's recommendation. Liberty has completed its verification work on this recommendation.

[289] Interview #359, February 11, 2010.

Recommendation

IV-34

Revise corporate Electric Emergency Restoration Plan (EERP) to ensure that Ameren-IL assigns separate individuals to head up the division storm response and the response at a local operating center.

Background

Liberty found that in at least one instance during the July 2006 storm response, one individual headed up the restoration effort at both the division level and at the local operating center at the division headquarters. This was too large of an assignment for one person.

As part of the overall effort to improve the corporate Electric Emergency Restoration Plan (EERP), and clarify the different storm roles in the division response organization, Liberty recommended that Ameren clearly communicate that the roles of heading up the division response and heading up the local operating center response at division headquarters will be with separate individuals.

Ameren-IL's Implementation Plan

- "Roles and Responsibilities" checklists are under development to serve the organization in the following ways:
  - Training Tool – to facilitate discussions focused on the application of the ICS at the divisional level during an emergency event
  - Activity Guide – to be used by personnel during a response event that uses an easy to read and follow "checklist" format (helps to make the plan more useable during emergency response
  - Cross-Reference Check – by which a team member can help to assure him/herself that he/she has taken the proper steps in the proper order and has notified the proper parties within the ICS structure
  - Diagnostic Tool – by which our co-workers might more objectively evaluate performance during and after an emergency response event
- The concept espoused in this recommendation will be added to the "Roles and Responsibilities" document applicable to the Division Command Center director position.

Verification Discussion and Conclusions

In its January 2009 review, Liberty found:[290]

- Ameren-IL has worked to define the roles and responsibilities of response team leaders, develop protocols, and prepare checklists for each leader.
- The "Roles and Responsibilities" protocol for the Division Command Center director position addressed the specific issue covered in this recommendation.
- These protocols and checklists are in the present emergency plan and Ameren-IL has followed them during recent emergency events. Ameren-IL will incorporate them into the final Emergency Response Plan.

[290] Interview #215, January 29, 2009.

In August 2009, Liberty conducted an on-site interview[291] and found that the protocols and checklists referenced above, including organizational charts, clearly address this issue. Liberty also found that during the two major outage events of the second quarter of 2009, there were no instances of the same individual assuming the dual role of division and local operating center lead.

Ameren-IL has met its implementation plan within the timeframe stated. The efforts address the intent of Liberty's recommendation and Liberty's verification work on this recommendation is complete.

[291] Interview #285, August 12, 2009.

Recommendation

IV-35

Inspect all Ameren-IL divisions to ensure that the facilities to be used as command centers can be transitioned from normal business operations to emergency response quickly and effectively so as to facilitate a timely ramp-up of emergency response within the organization.

Background

Liberty found that in some instances, the areas used as command centers in the divisions and local operating centers during the two 2006 major storm outage events did not provide the best arrangements to operate efficiently under emergency conditions.

Some possible items to consider include, but are not limited to the following:

- provide quick accessibility to and set-up of the storm room
- provide the protection of all sensitive storm-room computer equipment on an Uninterruptible Power Supply (UPS)
- locate all key support function coordinators in close proximity to the storm room staff
- furnish all necessary equipment such as computers, fax machines, printers/plotters, land-line telephones, cellular telephones, satellite telephones, company radio, and commercial radios and televisions
- isolate the storm room from unnecessary traffic (personnel located at that facility or those from outside)

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation and submitted the following implementation plan:
In accordance with discussions conducted with the Liberty Auditors on September 23, 2008,

- Ameren Illinois Utilities will develop a checklist of necessary items that are to be available at each facility where command and control of emergency response is anticipated to take place
- When the checklist has been developed, each division will be provided with that checklist and instructed to ensure that all items are made available and maintained in proper working order in the event that a particular site must be activated for an emergency response event
- Verification of each division's compliance will be conducted

Verification Discussion and Conclusions

In August 2009, Liberty conducted an on-site interview, reviewed the Ameren-IL response to a data request,[292] and found:

- Ameren-IL has followed the implementation plan as outlined above
- All divisions have completed their review and report that all designated command center facilities are ready for quick access in the event of a major outage event
- Ameren-IL considers that all facilities are in a state of readiness. Ameren-IL has no plans for modifications, but does plan to continue to monitor for compliance.

[292] Interview #285 and response to Data Request #1260.

In November 2010, Ameren-IL suggested that Liberty plan to conduct a follow-up inspection of a division command-center facility during its audit of an Ameren-IL drill in the first quarter of 2011.[293] In the meantime, Ameren-IL reviews this issue whenever it holds training meetings, drills, or post-event critiques.

Ameren-IL has completed its implementation of this recommendation in the specified timeframe. The efforts satisfied the intent of Liberty's recommendation. Liberty has not completed its verification work; Liberty will conduct a follow-up inspection of some of these facilities.

Based on Liberty's assessment of the response of the Ameren-IL response organization during outage events over the past several years, Liberty is confident that each field command center is adequate in size, location, and provisions to respond quickly when events occur. Liberty considers its verification work to be complete.[294]

[293] Response to Data Request #1465.
[294] Interview #477, May 24, 2012.

Recommendation

IV-36

Identify and contractually secure potential-staging sites not owned by Ameren for each operating center area.

Background

Liberty found that Ameren-IL should secure contracts for potential staging sites. Liberty also recommended a semi-annual review of these contracts to ensure that they remain current and that the sites will be available when Ameren-IL needs them. In its response, Ameren-IL accepted this recommendation in principle, and stated that identification of sites and the maintenance of temporary occupancy agreements are on-going activities. Ameren-IL stated however, that in most instances property owners are unwilling to commit to a firm contract, as Ameren-IL is not in a position to negotiate for full-time occupancy. In most cases, property owners are only willing to commit to contingent agreements stipulating that Ameren-IL can use the property if it is available and unoccupied at the time of the emergency event.

Ameren-IL's Implementation Plan

- Work to identify appropriate staging sites is an on-going activity
- This work will continue; agreements will be reached (where possible)
- Language to "identify potential staging sites and negotiate with property owners for their use" to be included in the Ameren Illinois Utilities Emergency Response Plan
- Language to "review availability of identified sites" on a recurring basis to be included in the Ameren Illinois Utilities Emergency Response Plan

Verification Discussion and Conclusions

In August 2009, Liberty conducted an on-site interview, reviewed the Ameren-IL response to a data request, and found:[295]

- All six of the Ameren-IL operating divisions have a number of staging sites identified for use.
- Of the above, signed license agreements cover some and verbal agreements cover others.
- During the two major outage events in the second quarter of 2009, all affected divisions used staging sites with no problems reported.
- The license agreement is well structured and covers the mutual interest of both the utility and the property owner.

Ameren-IL has completed its implementation plan in the timeframe specified. The efforts addressed the intent of Liberty's recommendation. Liberty has not completed its verification work. Liberty will follow-up with Ameren-IL on how well this process serves in future major outage events.

[295] Interview #285, and response to Data Request #1261.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions affected by the May and June storms, with EOC leadership, and with the VP of Operations for Ameren-IL. In addition, Liberty attended an Ameren-IL Emergency Response Retreat.[296]

The Ameren-IL real estate group is taking the lead on securing staging sites and is doing a good job. They have a number of sites under a contract or with a signed agreement. They check with the owners periodically to be sure that they will be available in the next restoration effort. Ameren-IL has been able to set up quickly staging sites during major outage response efforts.

Liberty's verification work on this recommendation is complete.

[296] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.

Recommendation

IV-37

Install the new voice radio system that will have all of the Ameren-IL service area operating on the same system.

Background

Liberty found that Ameren-IL's radio systems could not all communicate with each other. Communications between field workers and between the field command centers and field workers during the 2006 storms were almost entirely by cellular telephone.

Section 13.4 of the Ameren corporate Electric Emergency Restoration Plan (EERP) in use at the time of the 2006 storms detailed the limitation of the existing voice radio system in which there was no interoperability between any of the four separate radio systems in use in the Ameren-IL service area. As Ameren-IL brought in repair crews using these different radio systems to affected areas, the field command centers could not communicate with them, nor could local crew guides. For this reason, Ameren-IL almost exclusively used cellular telephones for communications during the restoration efforts. This is not desirable because cellular telephone towers can be damaged or otherwise lose service during major storms. In addition, in urban areas in times of emergencies, cellular traffic can be extremely heavy causing problems getting a call through. Ameren-IL was actively pursuing the installation of a new radio system for its service area and expected the project to be complete by November 1, 2008.

Ameren-IL's Implementation Plan

Implementation of the new Starcomm statewide radio system is already underway. Rollout is complete at Ameren-CILCO and expected to be complete at Ameren-IP and Ameren-CIPS on 11/17/2008.

Verification Discussion and Conclusions

Based on discussions during an on-site interview and information received from Ameren-IL's responses to data requests, Liberty found that Ameren-IL completed installation of the StarComm radio system throughout their service area on December 15, 2008.[297]

Ameren-IL met its implementation plan and its efforts satisfied the intent of Liberty's recommendation. Liberty verification work on this recommendation is complete.

[297] Interview #215, January 29, 2009, and responses to Data Requests #1045 and #1056.

Recommendation

IV-38

Establish as normal operating procedure regularly scheduled conference calls between the division and field command centers during major outage events. Revise the corporate Electric Emergency Restoration Plan (EERP) accordingly.

Background

Liberty concluded that the communications between the Ameren-IL division and field command centers worked well during the two 2006 restoration efforts, but there was an opportunity for improvement.

The upward communications from the field command centers to the division command center normally used telephone conversations numerous times during the day as the need arose. Some divisions held conference calls on an occasional, as-needed basis, but this was not a common practice at Ameren-IL. Liberty found that these communications worked well, but recommends that Ameren-IL consider a more structured, scheduled approach to the telephone communications between the division and field command centers. There will always be the need for unscheduled communications between these command centers, but by scheduling regular conference calls and/or specific times for status calls, there is an opportunity to gain efficiency in the operation of the division and field command centers. This more structured and scheduled approach to communications is widely used by electric utilities to good effect, and is best practice.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation. Specific communication requirements are outlined in the Division Command Center "Roles and Responsibilities" documents. Ameren-IL will add this concept to the Emergency Response Plan document that is under development.

Verification Discussion and Conclusions

Liberty discussed with Ameren the status of their implementation plan for this recommendation during an on-site interview and found:[298]

- Ameren-IL has established these division conference calls as normal operating procedure, and has used it in the divisions during recent emergency events.
- Wording establishing these conference calls as normal procedure are included in draft form in the Division Command Center Director "Roles and Responsibilities" protocols. It is awaiting final approval by upper management of Ameren-IL.

Following-up on its findings in the first quarter, Liberty found:[299]

- Ameren-IL developed "Roles and Responsibilities" (R&R) documents and uses them to provide guidance to the Division Command Center Director for daily "briefings" to be held with other work centers operating in the division during a major outage event.

[298] Interview #215, January 29, 2009.
[299] Responses to Data Request Nos. 1087, 1099, and 1105

- Ameren-IL still considers this R&R document a draft and awaits final senior management approval.

Ameren-IL met its implementation plan within the timeframe they stated. The efforts addressed the intent of Liberty's recommendation. Liberty has not completed verification work on this recommendation and will:

- Confirm that the final draft of the Ameren-IL Emergency Response Plan contains appropriate wording to establish as normal operating procedure division conference calls during major outage events.
- Follow up with Ameren-IL in the aftermath of future major outage events to confirm that these calls are working as intended.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions affected by the May and June storms, with EOC leadership, and with the VP of Operations for Ameren-IL. In addition, Liberty attended an Ameren-IL Emergency Response Retreat.[300]

Liberty reviewed copies of call notes from divisions during the 2011 May and June storms. There was good compliance with the plan in holding these calls and following the format. Divisions hold these calls prior to EOC Restoration Update Call to help prepare for participation.

Liberty's verification work on this recommendation is complete.

[300] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.

Recommendation

IV-39
Improve field restoration practices.

Background

Liberty recommended that Ameren-IL:

a. Establish as normal procedure for major outage response the advanced identification of circuits serving critical customers. This process should be included in the Ameren-IL Emergency Response Plan. Ameren-IL should have established lists, and periodic reviews, of the circuit designations for critical customers and loads.

b. Make better use of the "sweeping" of circuits approach to power restoration.

c. Have advanced identification of and training for employees who do not have a role in major outage response to assist in the deployment and coordination of outside crews.

d. Make more use of members of local crews as guides and coordinators for outside crews.

Ameren-IL's Implementation Plan

1. Advanced identification of circuits serving critical customers
   a. This activity has been included in the "Roles and Responsibilities" checklist document for the Division Command Center Engineering Support lead position
2. Make better use of the "sweeping" of circuits approach to power restoration
   a. The "sweeping" of circuits is only a part of establishing a coordinated work plan to address restoration needs and priorities. The development of a daily plan is identified as a responsibility for the Division Command Center Engineering Support lead position
3. Identify and train employees whose role is to assist in the deployment and coordination of foreign crews
   a. Requisite and preferred skill-sets for these employees was developed during the May 29, 2008 exercise
   b. Identification of these employees is underway within each operating division
4. Use members of local crews as coordinators for outside crews
   b. Insert language in the division emergency plans to address this approach.

Verification Discussion and Conclusions

Liberty conducted an on-site interview and reviewed Ameren-IL's response to a data request dealing with this recommendation.[301] Liberty found:

- Ameren-IL has a process in place to identify customers with critical needs as well as critical infrastructure. Ameren-IL can access these data by circuit or other criteria.
- Ameren-IL has a process to keep the critical customer/load database current.

[301] Interview #215, January 29, 2009, and response to Data Request #1062.

- Ameren-IL is using this information in restoration planning in emergency events.
- The process for identifying, updating, and using this critical customer information is included in the "Roles and Responsibilities" contained in the Ameren-IL emergency plan.
- Ameren-IL is making optimal use of the circuit "sweeping" approach as follows:
    - A coordinated daily work plan is prepared in advance of each workday to optimize the productivity of the restoration workforce.
    - The "Roles and Responsibilities" protocols for the positional leads in the divisions provide for the development of a coordinated work plan that will:
        - Prioritize circuit restoration for the following day – using both field check data and critical customer/circuit listings
        - Split up circuits as required in restoring service in order to restore the most customers and to ensure that the OAS outage data is updated accurately
    - Ameren-IL performs line switching and "hold tag" installation during off-hours to reduce restoration crew down time.
- Ameren-IL is progressing in accordance with their implementation timeline in the identification and training of employees for outside crew coordination.

Following-up on its findings in the first quarter, Liberty found:[302]

- Ameren-IL developed and implemented "Roles and Responsibilities" (R&R) documents for the Engineering Support positional lead at the Division Command Center with specific wording setting forth the responsibility for establishing, maintaining, and updating lists of circuits serving critical customers.
- Ameren-IL addressed the issue of "sweeping" circuits through R&R documents for the Engineering Support and Coordination & Work Management positional leads at the Division Command Center. Specifically, as set forth in the R&R document for the Engineering Support positional lead, it is the responsibility of that position to develop a daily work plan in which the use of the "sweeping" process will be considered.
- Ameren-IL identified non-response personnel who have the "tools and skill sets" necessary to assist in the deployment and coordination of outside crews. Ameren-IL reports that they have a "'ready to serve' corps of 219 trained co-workers" to assist in this task.
- Ameren-IL will include the use of local crew personnel as guides and coordinators as a part of the division emergency response plans.

Ameren-IL met its implementation plan within the timeframe stated. The efforts addressed the intent of Liberty's recommendation. Liberty has not completed verification work on this recommendation and will:

- Follow-up with Ameren-IL in an after-action review of future emergency events to determine how these changes have affected restoration performance.
- Confirm that the final draft of the Ameren-IL Emergency Response Plan contains appropriate wording to describe adequately and accurately these restoration processes.

[302] Responses to Data Request Nos. 1022, 1062, 1083, and 1106.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions affected by the May and June storms, with EOC leadership, and with the VP of Operations for Ameren-IL. In addition, Liberty attended an Ameren-IL Emergency Response Retreat.[303]

This recommendation had four main topics. Liberty determined the following disposition of each:

- Identify critical customers and circuits, keep list constantly updated, and prioritize restoration for these circuits/customers: Ameren-IL has very comprehensive lists of these customers/circuits and keeps them updated. It presented the lists for review during the interview. It also discussed the way in which it assigns priority, having developed four different levels of criticality.
- Use the restoration approach of "sweeping circuits" (as opposed to working by OAS orders) where appropriate: Liberty and Ameren-IL had good discussion on this topic. The EOC staff has a good feel for the pros and cons of this approach and manages accordingly. It uses the "circuit sweeping" approach initially in areas where there is major destruction and damage. It is desirable to switch back to restoration by OAS orders as soon as possible in order to be able to keep up with where each crew is, and to have more up-to-date information on restoration status.
- Identify and train employees not normally engaged in restoration for use as crew guides: Ameren-IL has done this in all divisions. Ameren-IL made good use of gas personnel to help with this effort.
- Break up line crews and use members of crew as outside crew guides as appropriate: This is being done whenever a large amount of outside crews are brought into an operating center area.

Based on its findings, Liberty considers its verification work on this recommendation complete.

[303] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.

Recommendation

IV-40

Negotiate changes in labor contracts to allow more flexibility in responding to major outage events.

Background

Ameren-IL has only recently completed labor negotiations on the existing contracts between the legacy companies and the unions. Any gains made in these negotiations in the area of more flexibility in emergency response should be managed carefully in order to realize the maximum benefit possible in improved service response. Ameren-IL should continue discussions with the unions to address issues affecting the ability to respond to major emergencies. If possible, Ameren-IL should seek mid-term agreements to gain more flexibility prior to renegotiating the contracts. Ameren-IL should report to the Illinois Commerce Commission (ICC) on the results of the recently negotiated changes in improving service response, and on the status of ongoing discussions with the unions to gain more flexibility.

Ameren-IL's Implementation Plan

In its response, Ameren-IL accepted this recommendation in principle and stated that it would add this provision to the divisional plan template. Ameren-IL accepted the implementation time-line suggested by Liberty for the preparation of the report to the ICC but stated that it is not in position to agree to a defined time-line for the successful negotiation of additional changes that will add flexibility to emergency response.

Verification Discussion and Conclusions

In August 2009, Liberty conducted an on-site interview, reviewed the Ameren-IL response to a data request, and found:[304]

- Ameren-IL reported that it implemented 18 separate provisions resulting from most recent negotiations that improve flexibility and efficiency in outage response.
- A recent arbitration ruling resulted in a mid-term change of a provision regarding assigning of personnel to perform damage assessment. This change improves flexibility, response time, and efficiency.
- Mid-term negotiations are ongoing between Ameren-IL and the labor units to gain the flexibility of having union repair crews report to duty with personal effects packed when there is a likelihood of their being dispatched to another location for a multi-day restoration assignment.
- Ameren-IL has submitted the report to the ICC.

In November 2010, Ameren-IL advised that it has implemented all of the new labor provisions negotiated in the last negotiations with no negative impact on labor relations.[305] These new provisions aid Ameren-IL in a more prompt outage response during both normal and after-hour calls in particular situations. Ameren-IL also provided a copy of the mid-term agreement reached with affected local unions that clarifies and enhances the process of bringing workers in with

[304] Interview #285 and response to Data Request #1262.
[305] Response to Data Request #1466.

clothes packed and prepared to respond to an out-of-area emergency assignment. This will help Ameren-IL in responding to moderate and major level storms in their service area, and in response to mutual assistance allies in major events elsewhere.

Ameren-IL has completed the implementation of this recommendation in the timeframe specified. The efforts satisfied the intent of the recommendation, which Liberty considers verified and closed.

Recommendation

IV-41

Work with the Illinois Emergency Management Agency (IEMA) to use the remote Unified Command Center during major outage events.

Background

Liberty found that based on the experience in the 2006 storms, Ameren-IL should work with IEMA and establish a clear understanding when they will use this remote center and the procedure to coordinate Ameren-IL's role in its opening and operation. Ameren-IL should report to the Illinois Commerce Commission (ICC) providing details of the understanding reached between Ameren-IL and IEMA. Ameren-IL should complete this report to the ICC, the revision of the corporate and division Electric Emergency Restoration Plans, and the communication of the changes to the plan.

Ameren-IL's Implementation Plan

In its comments on the draft report, Ameren-IL accepted this recommendation and submitted the following implementation plan:

- In practice, Ameren Illinois Utilities has developed a positive, supportive relationship with IEMA. In emergency response events, the Corporate Communications and regulatory groups maintain close and on-going contact with IEMA officials. Personnel have been assigned as liaisons to command centers, as requested.
- A detailed, integrated Corporate Communications plan document is under development, at present.
- When completed, this plan document will be added as an appendix to the overall Ameren Illinois Utilities Emergency Response Plan.
- An information management tool – "PIER site" - is under development to help ensure timely, accurate, & consistent information is available to internal & external stakeholders. Over time, the PIER site is expected to become the primary emergency response information management tool utilized throughout the Ameren Illinois Utilities (notwithstanding the use of an outage management system). The tool facilitates the development of pre-event, event, & post-event communications template libraries, provides functionality to develop external contact / distribution lists and will streamline the process of ensuring timely, accurate, & consistent information throughout the organization to external stakeholders.
- The role of the Community Relations Coordinator has been established within the Corporate Communications group. These agents, serving under the direction of the Corporate Communications group, serve as "point of contact" persons to establish/maintain relationships with community leaders & municipal officials.
- "Roles and Responsibilities" checklists applicable to positions within the Corporate Communications group are under development.

Verification Discussion and Conclusions

In August 2009, Liberty conducted an on-site interview, reviewed the Ameren-IL response to a data request, and found:[306]

- The Ameren-IL Division Community Relations lead is responsible for contacting the local and regional Emergency Management Agencies to provide a single point of contact for that division for the duration of the emergency event.
- Upon request, the Communications Management Lead will dedicate an Ameren-IL communications liaison on-site to local or regional community-based command centers set up to coordinate community recovery efforts.
- In the event of activation of the Unified Command Center at the state level, the Regulatory Affairs lead will commit to providing an Ameren-IL representative to be located at the remote center to help coordinate needed information and assistance as necessary.
- Ameren-IL will be meeting with the IEMA in the near future to gain an understanding of when IEMA will use remote centers and the coordination efforts with Ameren-IL. After that meeting, the Ameren-IL will issue a report to the ICC.

In November 2009, Liberty again conducted an on-site interview, reviewed the Ameren- IL response to a data request, and found:[307]

- Ameren-IL has addressed all aspects of this specific recommendation
- Ameren-IL met with representatives of the ICC and IEMA to discuss coordination and support between Ameren-IL and the agencies
- Ameren-IL sent a report to the ICC detailing the understanding and Ameren-IL's commitment to coordinate with IEMA

Ameren-IL has met its implementation plan within the timeframe specified. The efforts satisfy the intent of Liberty's recommendation. Liberty has not completed its verification work. Liberty will follow-up with Ameren-IL to review the results of this coordination in future major outage restoration efforts and ensure compliance and effectiveness.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions affected by the May and June storms, with EOC leadership, and with the VP of Operations for Ameren-IL. In addition, Liberty attended an Ameren-IL Emergency Response Retreat.[308]

Ameren-IL has developed a very good relationship with IEMA, which asked Ameren-IL to make presentations on its logistics organization and process, and to help with an emergency drill this fall. IEMA has not used the Unified Command Center out in the field since the 2006 storms. This Center is now permanently located in Springfield. IEMA does set up remote centers in affected areas and Ameren-IL works very closely with them, communicating regularly on status

[306] Interview #285 and response to Data Request #1263.
[307] Interview #323, November 19, 2009, and response to Data Request #1324.
[308] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.

and various issues, providing any support requested, and furnishing an Ameren representative at these centers if so requested.

Ameren-IL implemented this recommendation and Liberty's verification is complete.

Recommendation

IV-42

Implement the necessary procedures to ensure that outside contractors brought in to assist in the response to major outage events do not have a disproportionate number of "non-climbing" personnel.

Background

Ameren-IL raised a possible issue that new contractors may have brought in too many "non-climbing" personnel (*e.g.*, equipment operators, support personnel). Ameren-IL was in the process of investigating this matter. This issue is familiar to all utilities that have had to bring in large numbers of outside contractors. Ameren should follow through to ensure that this is not a problem for them in the future.

Ameren-IL's Implementation Plan

- In principle, this recommendation is already in place as the Asset Management group requests a specific number of qualified "journeymen" when requesting foreign resources
- Ameren-IL will confirm this process with the Asset Management group and will ensure that a written document is developed outlining this requirement, if none exists

Verification Discussion and Conclusions

Based on information received during an on-site interview, Liberty found: [309]

- Ameren-IL is addressing the issue through contacts with contractors by the Ameren Asset Management group.
- Ameren-IL will ensure that these contacts address the issue raised in this recommendation.
- Ameren-IL will include wording describing this process in the "Roles and Responsibilities" protocols for the Illinois Operations Support group in the emergency plan.

Following up on its findings in the first quarter, Liberty found:[310]

- Ameren-IL developed and is following a "Roles and Responsibilities" (R&R) document for the Foreign Crew Manager position, which is part of the Ameren-IL Operations Support group. The language in this R&R document specifically addresses the issue raised in this recommendation.
- Ameren-IL reports that the status of the approval and inclusion of this document in the Emergency Response Plan is "in process."

In August 2009, Liberty conducted an on-site interview, reviewed the Ameren-IL response to a data request, and found:[311]

- Ameren-IL developed the R&R document and followed it during the two major outage events in the second quarter of 2009.
- As a result, the complement of the outside contract line resources were as follows:

[309] Interview #215, January 29, 2009.
[310] Responses to Data Request Nos. 1086, 1087, and 1107
[311] Interview #285, August 12, 2009, and response to Data Request #1264.

- In May, Ameren-IL used 617 outside contract line resources, 87 percent were climbing personnel
- In June, Ameren-IL used 202 outside contract line resources, 93 percent were climbing personnel.

Ameren-IL has completed its implementation plan within the stated timeframe. The efforts are addressing the intent of Liberty's recommendation. Liberty has not completed verification work on this recommendation. Liberty will continue to follow-up with Ameren-IL in its after-action review of future emergency events to see if this issue has been completely resolved.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions affected by the May and June storms, with EOC leadership, and with the VP of Operations for Ameren-IL. In addition, Liberty attended an Ameren-IL Emergency Response Retreat.[312]

Ameren-IL resolved this matter. It designated one specific person who is doing a good job heading up the contractor coordination for Ameren. Ameren-IL presented a chart showing the total number of personnel and the number of non-climbing personnel on each contractor team that worked for Ameren in the May and June storms. A typical example was a team that had 50 members with only four non-climbing personnel. Based on its findings, Liberty considers that its verification work on this recommendation is complete.

[312] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.

Recommendation

IV-43

Review the practice of managing the work and rest hours of field restoration workers that results in employees remaining on premium pay during the entire major emergency restoration.

Background

In its review of the Ameren-IL response to the two 2006 storms, Liberty noted the practice of managing the work and rest hours of field restoration workers in such a way as to result in employees remaining on premium pay during the entire major emergency restoration. Ameren-IL should review this practice to ensure that it serves the best interests of both employees and customers during major outage restoration efforts. Ameren-IL should report the results of this review as well as planned action (if any) to the Illinois Commerce Commission (ICC).

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation and submitted the following implementation plan:

- Ameren Illinois Utilities will conduct an internal review of its current practices in this area of personnel management
- Ameren Illinois Utilities will place inquiries with other Midwest utilities to determine their practice in this area of personnel management
- Ameren-IL will submit to the ICC a report of the findings from the internal review and inquiries.

Verification Discussion and Conclusions

In August 2009, Liberty conducted an on-site interview, reviewed the Ameren-IL responses to data requests, and found:[313]

- Ameren-IL has conducted an internal review of its practices and has surveyed the practices of contractors and other Midwestern utilities
- Based on this review, Ameren has reached the following conclusion: "Ameren Illinois Utilities' pay practices are competitive and in keeping with its objective of managing emergency restoration events in a proactive and aggressive manner. No change in this practice is warranted."
- Ameren-IL transmitted a report to this effect to the ICC.

Ameren has completed its implementation plan in the specified timeframe. The efforts satisfied the intent of Liberty's recommendation. Based on the findings in this latest review, Liberty considers its verification work on this recommendation to be complete.

[313] Interview #285, August 12, 2009, and responses to Data Requests #1265 and #1120.

Recommendation

IV-44

Establish and implement a specific procedure for daily reports from field restoration repair crews during major outage events.

Background

Liberty found that there was no set procedure for the local operating centers to communicate with field-restoration repair crews at the end or beginning of the workday. Ameren-IL should review the practices used to gather information from and give information to field-restoration repair crews during major outage events. Ameren-IL should decide on the best procedure to follow to ensure that this daily reporting is timely, accurate, and effective. Ameren-IL should then establish the procedure in the corporate and division Electric Emergency Restoration Plans (EERPs) and communicate it to all appropriate employees.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation and stated that its implementation will be incorporated as part of the development of consistent Divisional emergency response plans (reference recommendation III-9)

Verification Discussion and Conclusions

In August 2009, Liberty conducted an on-site interview, reviewed the Ameren-IL responses to data requests, and found:[314]

- Ameren-IL is accomplishing the implementation of this recommendation through the development of the division emergency plans, which set forth the requirement for daily reporting by field-restoration crews.
- The draft text developed for insertion in the Ameren-IL emergency plan addresses this issue clearly and adequately
- The Division Superintendents are addressing this and other emergency response issues on an ongoing basis to ensure a consistent and effective process
- This process was not in place in time for use during the two major outage events in the 2nd quarter of 2009

Ameren-IL met its implementation plan in the timeframe specified. The efforts satisfied the intent of Liberty's recommendation. Liberty's verification work is not complete and Liberty will:

- Review the final language in the corporate and division emergency plans to verify that the plans adequately address this issue
- Follow up with Ameren-IL to see if this process is used and works as anticipated in future major outage events.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions affected by the May and June storms, with EOC leadership, and with the VP of

[314] Interview #285, and responses to Data Requests #1266 and #1246.

Operations for Ameren-IL. In addition, Liberty attended an Ameren-IL Emergency Response Retreat.[315]

Ameren-IL's implementation of this recommendation is complete. Guidelines covering the daily report are included in the Electric Emergency Restoration Plan (EERP), Ameren-IL has conducted and reinforced training of all affected employees, and it has covered this topic repeatedly in post-event critiques. The same is true for the daily work plan, which is dependent on the daily crew reports. Liberty will keep its verification open for the present in order to continue to follow the compliance by the operating divisions. This is one of a few areas where operating divisions' compliance lags.

In November 2011, Liberty discussed this recommendation with Ameren-IL.[316] During the August 2011 emergency response retreat, Ameren-IL covered this topic and identified specific action items. Since then there have been no outages over 2,000 customers, so it is too early to be able to assess results. Liberty will follow-up on this after future storms.

In a May 24, 2012, review of the Ameren-IL response to recent storms, Liberty learned that the performance in this area has greatly improved.[317] Ameren-IL made an organizational change and filled a position to provide direct supervision over division operating response. This particular area has been a focus of attention, with good results. Liberty considers verification of this recommendation complete.

[315] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.
[316] Interview #464, November 7, 2011.
[317] Interview #477, May 24, 2012.

Recommendation

IV-45

Implement the Checkpoint provisions in the corporate Electric Emergency Restoration Plan (EERP) during major outage restoration efforts.

Background

Liberty found that the "Checkpoint" process for orienting outside crews that come in to assist during major outages was not consistently followed during the two 2006 storms. Ameren-IL should identify and secure Checkpoint sites in advance for use during major outage events. Ameren-IL should pre-identify and train employees to perform the various Checkpoint roles. Ameren-IL should use annual drills and refresher training on these roles and keep the designations and training current each year.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation and submitted the following implementation plan:

- Ameren Illinois Utilities will review the "checkpoint" provisions that exist in the AmerenUE Electric Emergency Response Plan and will incorporate them (as appropriate) in the Ameren Illinois Utilities Emergency Response Plan
- As appropriate, specific responsibilities will be developed for Ameren Illinois Utilities co-workers who will be expected to fill this emergency response role

Verification Discussion and Conclusions

In August 2009, Liberty conducted an on-site interview, reviewed the Ameren-IL responses to data requests, and found that Ameren-IL has:[318]

- Pursued its implementation plan and is making good progress
- Identified sites for Checkpoints in the different geographical "entry" areas of its service area
- Identified staffing for the Checkpoints
- Identified logistical support staffing for the Checkpoints
- Determined the needed orientation material and has it under development

In March 2010, Liberty attended an Ameren-IL emergency response exercise and reviewed responses from Ameren-IL to data requests.[319] The review included one specific chapter in the emergency plan dealing with managing crews brought in from outside the Ameren-IL operating area and using the Checkpoint process. Liberty found that Ameren-IL has taken the necessary steps to use effectively the Checkpoint process during future major outage events.

Ameren-IL has met its implementation plan in the specified timeframe. The efforts are satisfying the intent of Liberty's recommendation. Liberty's verification work is not complete; Liberty will:

- Review the orientation material and staffing structure of the Checkpoints

[318] Interview #285, and responses to Data Requests #1267 and #1256.
[319] Interview #360, March 10, 2010, and responses to Data Request Nos. 1381-1384.

- Follow-up with Ameren-IL to determine if this process is used and how it performs in future major outage events.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions affected by the May and June storms, with EOC leadership, and with the VP of Operations for Ameren-IL. In addition, Liberty attended an Ameren-IL Emergency Response Retreat.[320]

This process is in place and working well. Ameren-IL meets all outside workers upon arrival, at a designated location away from the work headquarters. Ameren-IL has developed a number of orientation pamphlets to assist in this process. Liberty's verification work on this recommendation is complete.

[320] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.

Recommendation

IV-46

Identify and train in advance an adequate number of employees to serve as Field Checkers and Public Safety Advisors (PSAs) during a major outage restoration.

Background

Ameren-IL should thoroughly review the number of personnel that it may need to fill the roles of Field Checkers and Public Safety Advisors. Ameren-IL should identify in advance people who could fill these roles and train them to do so. In addition, Ameren-IL should review and respond to the issues concerning field checking and damage assessment noted in the critiques of the 2006 storm restorations.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation and submitted the following implementation plan:

- Operating Divisions are identifying nontraditional emergency response resources along with the skills-sets they possess.
- May 29, 2008 Operating Division Emergency Response exercise outlined potential emergency roles for non-traditional personnel as well as necessary skills-sets to successfully fulfill those roles
- Initial training sessions within all divisions have been attended by gas operations supervisory personnel – these personnel are being assigned to roles within the Division Command Center teams
- Division teams are identifying personnel who might serve as Public Safety Advisors and Field Check personnel and are arranging appropriate training for those individuals. (Reference IV-46)
- Illinois Metering group is developing a matrix of available personnel with associated skills-sets
- A skills-sets matrix of all non-bargaining unit personnel was developed as a part of the Ameren Illinois Utilities labor strategy. This matrix has been shared with the Emergency Response organization
- Training is on-going for individuals and work groups throughout the Ameren Illinois Utilities organization

Verification Discussion and Conclusions

In August 2009, Liberty conducted an on-site interview, reviewed the Ameren-IL response to a data request, and found:[321]

- Ameren-IL has identified and trained adequate numbers of personnel
- The "Roles and Responsibilities" (R&R) documents effectively address the tasks of response personnel filling these roles
- Ameren-IL believes that the training provided to field check personnel and those whose role is public safety advisor is appropriate and effective

[321] Interview #285, and response to Data Request #1268.

- Ameren-IL believes the opportunities for improvement in this area include:
  - Continue to identify personnel who have the basic skills-sets to perform effective field checking services
  - Continue initial and refresher training for these personnel
  - Work toward consistent application of the processes defined within the emergency response initiative
  - Strive toward consistent execution of the emergency response plan as it has been, and continues to be developed

In a May 23, 2011, interview, Liberty learned that many of the field checkers brought in from other areas of the company were not doing an adequate and timely job in assessing damage and reporting back.[322] There also seems to be some confusion as to where ultimate responsibility lies for this function. See comments on Recommendation III-1. The emergency plan clearly sets out the field checking process; Ameren-IL will address this issue, and Liberty will continue to monitor this performance.

Ameren-IL has completed its implementation plan in the specified timeframe. The efforts satisfied the intent of Liberty's recommendation. Liberty's verification work is not complete; Liberty will:

- Follow-up with Ameren-IL to review its progress in addressing improvement opportunities mentioned above
- Follow-up with Ameren-IL in future major outage events to review how well Field Checkers and Public Safety Advisors performed.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions affected by the May and June storms, with EOC leadership, and with the VP of Operations for Ameren-IL. In addition, Liberty attended an Ameren-IL Emergency Response Retreat.[323]

Several years ago, Ameren developed lists of employees who it trained to assist as PSAs and Field Checkers. Liberty has recognized the implementation as completed for some time. However, Liberty will continue to consider its verification as open for the purpose of further follow-up and review to determine if there is a consensus regarding the expectations of Field Checkers, and better use of these available resources, as well as the performance of the Field Checkers. Field Checking has been a weak area after each major outage response.

In a May 2012 telephone interview, Liberty reviewed with Ameren-IL the status of this recommendation. Ameren-IL has continued to aggressively identify and train personnel as Field Checkers and Public Safety Advisors, and Liberty now considers its verification work on this recommendation complete.[324]

[322] Interview #435B May 23, 2011.
[323] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.
[324] Interview #477, May 24, 2012.

Recommendation

IV-47

Design and implement acceptable options that are compatible with Workman Protection Assurance for more timely switching during major outage restorations.

Background

Liberty found that there were delays during restoration efforts in the two 2006 storms related to issuances of clearances and switching instructions. A number of these were related to the process inherent in the Ameren-IL Workman Protection Assurance program. Ameren-IL should review the procedures followed by other utilities, design, and provide for alternative switching and clearance options that will protect worker and public safety and minimize switching delays during major outage restoration.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation and submitted the following implementation plan:

- Ameren-IL plans to review other utilities worker protection programs to determine how they implement OSHA 1910.269 (Ameren's Workers Protection Assurance program) with the intent to look for best practices during large storms.
- Ameren expects to have this review complete by 6/8/2009 and if any changes are warranted, implementation will occur by 10/8/2009.
- Ameren sent a representative of the Dispatch Office to EPRI's 12th annual "Switching Safety and Reliability Conference" held Sept. 15-16, 2008 to gain insights and contacts with other utilities around their WPA programs.
- Ameren-IL also believes that switching delays can be minimized in large storms by techniques that have been utilized in Illinois since the two storms of 2006.
- These techniques involve the creation of work plans (advance plans for the next day), pre-written switching and Clearance orders, and the use of switchman in the evening hours/early morning hours to provide switching and place hold-off's in anticipation of the crew's needs once work is started in the morning.
- This process will be detailed in Ameren-IL's revised Emergency Restoration plan.

Verification Discussion and Conclusions

In August 2009, Liberty conducted an on-site interview, reviewed the Ameren-IL response to a data request, and found:[325]

- Ameren-IL has been aggressively pursuing options that will provide more timely switching without compromising the safety of workers or the public
- Ameren-IL identified a cross-functional team that is meeting regularly to recommend acceptable options
- The team has reviewed the different approaches to restoration including "sweeping the circuit" (repairing all damage and restoring all power on a given circuit as the crews move through that area) and restoring the "backbone" of each circuit or feeder only on the first pass

[325] Interview #285, and response to Data Request #1269.

through the area. The team is considering how each of these approaches will affect the switching process

- Ameren-IL experienced delays in switching during the two major outage events in the second quarter of 2009
- Ameren-IL believes it will have reached an acceptable conclusion within the timeframe specified for this implementation

In November 2009, Liberty again conducted an on-site interview, reviewed the Ameren- IL response to a data request, and found:[326]

- Ameren-IL has developed a process to address this issue, using the daily work plan as a means to facilitate safe and efficient switching and providing details of switching, tagging, and hold procedures during different restoration approaches
- Ameren-IL incorporated this plan as a chapter in the Emergency Response Plan, which is now complete in printing.

Liberty discussed the status of the switching process with Ameren-IL in an on-site interview held in February 2010.[327] Ameren-IL advised that there have not been any outage events large enough since it implemented this process to put it to a test. Ameren-IL is confident that this will improve the switching process while not compromising safety.

Ameren-IL has met its implementation plan in the specified timeframe. The efforts satisfied the intent of Liberty's recommendation. Liberty's verification work is not complete and Liberty will follow-up with Ameren-IL in future major outage events to ensure compliance and effectiveness.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions affected by the May and June storms, with EOC leadership, and with the VP of Operations for Ameren-IL. In addition, Liberty attended an Ameren-IL Emergency Response Retreat.[328] Liberty will continue to leave the verification open for further follow-up on the divisions' compliance with the process of coordinating with the Distribution Dispatch Office (DDO) on a daily work plan (see Recommendation IV-44 above). The daily work plan is necessary so the DDO can arrange for advance switching, line tag placement, etc. overnight so there will be no delay the next day.

In November 2011, Liberty and Ameren-IL discussed this recommendation.[329] However, because there had been no recent significant outages, Liberty could not review actual performance. However, Liberty reviewed this recommendation again in a May 2012 interview.[330] There have been no problems in this area in the responses to recent storms. Liberty considers their verification work complete.

[326] Interview #323, November 19, 2009, and response to Data Request #1325.
[327] Interview #359, February 11, 2010.
[328] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.
[329] Interview #464, November 7, 2011.
[330] Interview #477, May 24, 2012.

Recommendation

IV-48

Develop a formal written ramp-down plan to provide guidance in releasing resources and de-activating command centers and include it in the corporate Electric Emergency Restoration Plan (EERP). (Also, see Recommendation III-3)

Background

Liberty found that Ameren-IL had no formal written plan to provide guidance and ensure that it handled the ramp-down process in an appropriate, safe, timely, and effective manner. Without such formal written guidance, there is no assurance that Ameren-IL will follow the procedure used in the 2006 storms, which was reasonable, in subsequent major outage events.

The EERP should include specific steps Ameren-IL will take with responsibility assigned by position for carrying out these steps. A specific priority order for the release of outside resources should be included in this plan. The plan should address the steps Ameren-IL will take in the closing down of command centers to ensure that it communicates properly to the appropriate individuals and groups and that it identifies off-hours on-call individuals for each deactivated command center.

Ameren-IL's Implementation Plan

- Section 8 of the Ameren-IL Emergency Response Plan outlines a ramp-down protocol that includes defined procedures to follow in the release of resources, de-activation of division command centers, and employing an orderly return to normal business operations.
- Specific tasks related to the ramp-down of emergency response and return to normal business operations are defined in the various Division Command Center "Roles and Responsibilities" checklist documents
- Ameren-IL will incorporate the Section 8 protocol in the final Emergency Response Plan document.

Verification Discussion and Conclusions

Liberty found:[331]

- Ameren-IL has addressed the ramp-down process and has developed some protocols to provide guidance.
- Ameren-IL has assigned responsibility for the decision to release restoration resources to the Division Manager in Level 1 Storms, and to the EOC for all larger events.

Following-up on its findings in the first quarter, Liberty found:[332]

- Ameren-IL developed a "Storm Ramp-up and Down Protocol" to be included as Section 8 of its Emergency Response Plan.
- Ameren-IL developed a "firm definition" of the "end" of an emergency restoration event to be used in providing guidance in the ramp-down process.

[331] Interview #215, January 29, 2009, and response to Data Request #1049.
[332] Responses to Data Request Nos. 1083, 1087, 1091, 1098, 1108, and 1116.

- Ameren-IL developed a "Roles and Responsibilities" (R&R) document for the Ameren-IL EOC Director. This document provides guidance in assigning responsibility for "stand down" (ramp-down) decisions to the EOC Director.
- Ameren-IL developed a "Roles and Responsibilities" (R&R) document for the Ameren-IL EOC Crew Management positional lead that provides guidance for an orderly release of outside and local resources.
- Ameren-IL developed a "Roles and Responsibilities" (R&R) document for the Ameren-IL Operations Support Foreign Crew Manager positional lead that provides specific guidance in ramp-down protocols for foreign contract resources.
- Ameren-IL uses all of the above protocol documents major outage events.
- The template for division emergency plans calls for the inclusion of specific ramp-down provisions.
- Ameren-IL identified on-call contacts within the divisions that it will use to help in the ramp-down process.

In November 2009, Liberty conducted an on-site interview, reviewed the Ameren- IL response to a data request, and found:[333]

- Ameren-IL has addressed all aspects of this specific recommendation, and
- The ramp-down process is included as a chapter in the Ameren-IL Emergency Response Plan, which is now complete and in printing.

Ameren-IL has met its implementation plan within the stated timeframe. The efforts have addressed the intent of Liberty's recommendation. Liberty has not completed verification work on this recommendation and will follow-up with Ameren-IL on after-action review of future emergency events to ensure compliance and effectiveness.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions affected by the May and June storms, with EOC leadership, and with the VP of Operations for Ameren-IL. In addition, Liberty attended an Ameren-IL Emergency Response Retreat.[334] This plan is in place and an assigned employee carefully monitors it from the EOC level. None of the interviewees expressed any concerns about the plan as set forth in the EERP, and there has been good compliance by the EOC and the operating divisions. Based on its findings, Liberty considers its verification work on this recommendation complete.

[333] Interview #323, November 19, 2009, and response to Data Request #1326.
[334] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.

Recommendation

IV-49

Develop a formal process to solicit feedback from contractors and Mutual Assistance utilities furnishing outside resources concerning all aspects of their experience with the Ameren-IL restoration effort, but especially the ramp-down process in which their resources were released. (Also, see Recommendation III-3)

Background

Liberty found that Ameren had no procedure for soliciting feedback from those sending outside resources to help in restoration. In the absence of any formal effort to seek and capture feedback, a utility is obviously unable to learn from any mistakes or oversights or to act on any suggestions for improvement. Ameren advises that a questionnaire for contractors has now been developed and implemented. From interviews, Liberty learned that Ameren made some informal contacts with some Mutual Assistance utilities seeking feedback, but they recalled nothing significant from those contacts.

Specific forms to be sent to contractors and Mutual Assistance utilities should be a part of this plan, as well as the assigned responsibility to send out these forms and follow up to ensure that responses are received. This plan should also include the resolution process whereby feedback gained is analyzed, action steps developed and assigned, and final resolution reached timely and completely. Any questionnaires or other forms developed and implemented since the two 2006 storms should be incorporated in this plan.

Ameren-IL's Implementation Plan

- In principle, this recommendation is already in place. The Asset Management conducts an annual conference with foreign contractors who have been engaged in emergency response at Ameren-IL. In part, the goal of that conference is to obtain specific feedback from these companies regarding their experience on Ameren property and to identify improvement areas.
- Ameren-IL will confirm this process with the Asset Management group
- Ameren-IL will confirm that an exit survey process is used by the Asset Management group at the conclusion of each emergency response event
- Ameren-IL will procure a summary of such surveys.

Verification Discussion and Conclusions

In its verification work, Liberty found:[335]

- Ameren-IL is addressing the issue with contractors by the Ameren Asset Management group.
- Ameren-IL will ensure that this is being done in a manner to address the issue raised in this recommendation and will secure a summary of all input received.
- Ameren-IL will include wording describing this process in the "Roles and Responsibilities" protocols for the IL Operations Support group in the emergency plan.

[335] Interview #215, January 29, 2009.

Following-up on its findings in the first quarter, Liberty found:[336]

- Ameren-IL developed a "Roles and Responsibilities" (R&R) document employed for the Foreign Crew Manager in the Ameren-IL Operations Support group. This document details the responsibility for this position to implement a survey process and follow up to encourage input from outside contractor and Mutual Assistance utility crews.
- Ameren-IL will incorporate this document into the Ameren-IL Emergency Response Plan.

In November 2009, Liberty conducted an on-site interview, reviewed the Ameren- IL response to a data request, and found:[337]

- This feedback process is in place and being used
- A comprehensive survey has been developed to gather meaningful input from contractors and Mutual Assistance utilities
- This process and the survey are included in a chapter of the Ameren-IL Emergency Response Plan, which is now complete and in printing.

Ameren-IL has met its implementation plan within the stated timeframe. The efforts address the intent of Liberty's recommendation. Liberty has not completed verification work on this recommendation and will follow-up with Ameren-IL in after-action review of future emergency events to ensure compliance and effectiveness.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions affected by the May and June storms, with EOC leadership, and with the VP of Operations for Ameren-IL. In addition, Liberty attended an Ameren-IL Emergency Response Retreat.[338] Liberty reviewed a summary of responses received from both contractors and Mutual Assistance utilities from the May and June storms. Ameren-IL has developed a good process for soliciting and summarizing this feedback, and is following this process after each event where it uses these outside resources.

Liberty completed its verification work on this recommendation.

[336] Responses to Data Request Nos.1086 and 1109.
[337] Interview #323, November 19, 2009, and response to Data Request #1327.
[338] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.

Recommendation

IV-50

Develop a formal written clean-up plan to guide activities in the aftermath of all major outage events. Incorporate this plan into the Ameren-IL Electric Emergency Restoration Plan (EERP). (Also, see Recommendation III-3)

Background

Liberty found that Ameren-IL did not have a clean-up plan in place to guide them in the aftermath of the two 2006 storms. This plan should specifically define the different aspects of the clean-up process with assigned responsibilities and general timelines for accomplishment. The plan should provide some guidance to help determine what should be considered appropriate as "clean-up" of damaged facilities, trees, and tree limbs. Additionally, the plan should provide guidance as to the possible use of additional tree-trimming resources in the aftermath of the storm beyond the cleanup of damaged and potentially outage-causing trees and tree limbs.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation and submitted the following implementation plan:

- The Asset Management group has developed and uses a post-storm circuit patrol process
- Ameren Illinois Utilities division operations identifies outage orders on which permanent repairs are needed
- Ameren Illinois Utilities will include specific language in the Ameren Illinois Utilities Emergency Response Plan document and relevant appendices to outline items to be included in a "clean-up" plan, *e.g.*, stubbed poles.

Verification Discussion and Conclusions

In August 2009, Liberty conducted an on-site interview, reviewed the Ameren-IL responses to data requests, and found:[339]

- Ameren-IL has followed the implementation plan detailed above
- Responsibility for overseeing the clean-up process at the EOC during a major outage event lies with the Crew Management Lead
- Ameren-IL has developed "Roles and Responsibilities" (R&R) documents addressing the action steps necessary for effective "clean-up" following a storm
- There were some problems experienced in the major outage events in the second quarter of 2009, but nothing widespread or major
- Ameren-IL will formalize clean-up responsibilities in the division emergency plans.

In March 2010, Liberty attended an Ameren-IL emergency response exercise and reviewed responses from Ameren-IL to data requests.[340] The review included one specific chapter in the emergency plan dealing with the clean up process at the end of a major outage event. Based on this review, Liberty found that Ameren-IL has taken the necessary steps to effectively establish and use the clean-up process during future major outage events.

[339] Interview #285, and responses to Data Requests #1270, #1256, and #1266.
[340] Interview #360, March 10, 2010, and responses to Data Request Nos. 1381-1384.

Ameren-IL has completed its implementation of this recommendation in the specified timeframe. The efforts satisfied the intent of Liberty's recommendation. Liberty has not completed its verification work and will:

- Review the final approved language in the corporate and division plans to ensure that they address adequately this issue
- Follow-up with Ameren-IL in future major outage events to monitor the performance of the clean-up process.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions affected by the May and June storms, with EOC leadership, and with the VP of Operations for Ameren-IL. In addition, Liberty attended an Ameren-IL Emergency Response Retreat.[341] Corporate and division plans adequately address the clean-up issue and process. Ameren-IL has scheduled and completed clean-up work without undue delay. There may be some confusion about which actions are "ramp-down" and which ones are "clean-up," but they are all being performed well. Based on its findings, Liberty considers that its verification work on this recommendation is complete.

[341] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.

Recommendation

IV-51

Revise the EERP to establish the process that will ensure that Ameren-IL performs post-event critiques and captures and tracks action items to completion. (Also, see Recommendation III-3)

Background

Liberty found that the Ameren-IL post-event critique process as contained in the corporate Electric Emergency Restoration Plan (EERP) during the two 2006 major outage events did not ensure that Ameren-IL would perform these post-event critiques. There was no process to ensure capturing and tracking action items to completion. Ameren-IL did not consistently follow the process for post-event critiques for the 2006 storms.

Liberty recommended that the EERP clearly communicate the expectation of Ameren-IL top management that every individual emergency response function at the corporate, state, and division level should hold a critique with notes from those critiques submitted in writing to a designated coordinator, and that this should be done within a time specified in the EERP. Furthermore, the process as outlined in the EERP should clearly set out how Ameren-IL will collect critique items in a database and track action items to completion.

Ameren-IL's Implementation Plan

- A "Parking Lot" document is maintained to capture feedback on needed changes and updates that are identified during:
  - Training sessions
  - Exercises
  - After-Action critiques
- This document to be moved to the DDO website to provide visibility throughout the Ameren-IL organization
- "After-Action Critique" survey form is in place as Section 12 of the Ameren-IL Emergency response Plan protocols
- "After-Action Critique" survey is utilized following emergency response events during which the Emergency Operations Center is activated – mailed to all Ameren-IL emergency response stakeholders listed on EOC distribution lists
- Ameren-IL compiles summaries of all written comments received within the completed survey forms and distributes them to primary emergency response stakeholders.

Verification Discussion and Conclusions

Liberty conducted an on-site interview and reviewed the Ameren responses to data requests concerning this recommendation.[342] Liberty found the following:

- Ameren is using the after-action critique process, including the "After-Action Critique" survey form and the "Parking Lot" document process to capture critique items for action.

[342] Interview #215, January 29, 2009, and responses to Data Requests #1041, #1042, and #1057.

- To particularly focus on the issue of this recommendation – i.e. critique items dealing with the emergency plan itself, Ameren-IL has added four questions to the "After-Action Critique" survey form to address these issues:
    - Any items that were not found in the emergency plan that should have been
    - Any items in the plan that were executed according to the plan but did not work
    - The extent to which the respondent used the plan, with explanation required if the plan was not used
    - Any suggested changes to the plan
- Ameren-IL has and will revise this template as necessary to gather information to make the critique process more comprehensive.
- After information is gathered using this template, a follow-up meeting is held involving Division Managers, Division Superintendents, Division Supervising Engineer, Operations VPs, Operations Managers, and EOC staff.
- There is not a specific timeframe to have these critique templates completed and returned in a timely manner.
- The "Parking Lot" document is located on the Distribution Dispatch Operations web site to give it high visibility to everyone in the Ameren-IL organization.
- The "Parking Lot" provides the following information:
    - A description of the critique issue to be addressed
    - The date of origination of this issue on the Parking Lot
    - The current status of resolution of this issue
    - A "Comments" section which includes:
        - The functional group or individual responsible for resolution of the issue
        - Any specific information related to this issue or its resolution
        - Next Steps to be taken
- Ameren will include wording in its Emergency Response Plan to define the after-action critique process.

Following-up on its findings in the first quarter, Liberty found:[343]

- Ameren-IL developed a specific section – Section 73 – in the Emergency Response Plan that sets forth the post-event critique process.
- The wording in this section sets up a timeline for the critique to be completed and follow-up begun.
- The process calls for representatives of Ameren-IL senior management to be present at the critique review sessions.
- Senior management approved the wording in this section for inclusion in the Emergency Response Plan.

Ameren-IL completed its implementation plan within the stated timeframe. The efforts were in accordance with the intent of Liberty's recommendation. Liberty has not completed verification

[343] Responses to Data Request #1091 and #1110.

work on this recommendation and will follow-up with Ameren-IL in after-action review of future emergency events to determine if the critique and follow-up processes are working and to monitor the type of issues that are surfacing in the after-action input.

In August 2011, Liberty conducted follow-up interviews with the response leaders from the three divisions affected by the May and June storms, with EOC leadership, and with the VP of Operations for Ameren-IL. In addition, Liberty attended an Ameren-IL Emergency Response Retreat.[344] The critique and follow-up processes are very obviously active at Ameren-IL. (See the comments on Recommendation III-8 for a discussion of some of the significant issues identified in following up to the responses in the May and June storms of 2011.) There is room for improvement, but Ameren-IL clearly recognizes the value of this process and it is working to improve it.

Liberty considers this recommendation verified and closed.

[344] Interviews #438, #452, and #453, August 8-10, 15, and 17, 2011.

Recommendation

V-1

Develop consistent sub-transmission planning standards.

Background

Liberty found that Ameren-IL's sub-transmission planning standards were inconsistent across the operating companies. Ameren-IP, Ameren-CIPS, and Ameren-CILCO all had standalone sub-transmission planning standards. Although Ameren-IL uses a common fault scenario in the system planning of these systems, the standards have many areas where differences exist. Examples of differences are the Ameren-CIPS equipment maintenance requirement and the Ameren-IP load power-factor requirement. Ameren-IL would benefit from a consistent set of planning standards. Liberty recommended that Ameren-IL standardize its sub-transmission planning standards, including all the design basis assumptions such as power ratings and conductor temperatures.

Ameren-IL's Implementation Plan

Ameren-IL indicted that its Illinois Distribution System Planning Criteria Team completed a review of the legacy Ameren-CIPS, Ameren-CILCO, and Ameren-IP 34.5 KV and 69 KV system-planning criteria in July of 2008 and outlined proposed uniform Ameren-IL sub-transmission system planning criteria and guidelines. The team also outlined a transition plan that included fully using the new standards in performing system-planning studies within two years.

Ameren-IL accepted this recommendation and committed to standardizing its sub-transmission planning standards, including all the design basis assumptions such as power ratings and conductor temperatures. It will complete the development and documentation of the common standards by October 8, 2009. Ameren-IL will update load flow models, databases, and supporting documentation for use in performing system-planning studies using the new standards by October 8, 2010.

Verification Discussion and Conclusions

Ameren-IL drafted the plan to implement consistent sub-transmission standards in the latter part of 2008 and scheduled completion of the process including management approval for October 8, 2009. Ameren-IL completed the standards document and obtained management approval on October 6, 2009.[345] It is using the new standards in performing system-planning studies.[346]

Legacy companies were consistent in requiring the use of an N-1 basis design (*i.e.*, normal system conditions with one failure) and Ameren-IL will keep it as the sub-transmission design basis. Ameren-IL settled on the following design basis parameters:[347]

- N-1 at peak load without the loss of non-radial load; radial load limited to 40 MVA or 10,000 customers with a 3-hour outage time after switching

[345] Response to Data Request #1299.
[346] Interview #297, November 5, 2009.
[347] Response to Data Request #1143.

- A generator loss and a line loss at 80 percent of peak load
- Either the loss of a bulk power transformer plus a generator or line at 65 percent load level or the loss of a bus at 65 percent load level
- All switched capacitors off at a 20 percent load level.

In addition, Ameren-IL standardized required voltages to comply with the Illinois Administrative Code, Part 410, Standards of Service. Liberty cautioned that the Illinois voltage requirements were at the customer interconnection and that firm procedures should be in place within the standard to ensure that allowed voltages during a study allow for service voltage drop. Liberty noted that Ameren-IL increased the maximum system voltage to 1.08 per unit and that the increase in voltage can have an effect on NESC clearance requirements for voltages above 22kV. Liberty also noted that the proposed standards did not cover stability requirements.[348] Ameren-IL uses both criteria and guidelines throughout the design document. Liberty suggested that the document be clear as to which are mandatory and which are voluntary.[349]

Liberty discussed these matters with Ameren-IL and learned that:[350]

- It provided for the line voltage loss between the transformer low side and the allowable customer voltage per the Illinois Administrative Code.
- It studied the effect on line clearances considering the maximum system voltage and found no problems.
- It assured that the standard covered voltage stability.
- The standard was clear as to what were criteria that planners had to meet compared to guidelines that indicated preferred, but not necessary, conditions and constraints.

In a February 16, 2010, letter to Liberty, Ameren-IL said that it might not be able to fund the complete implementation of certain recommendations, including this one, until and if the ICC approves a special funding request. The reason for the funding request on this recommendation involves staff to continue to implement the planning standard. However, Ameren-IL met its commitments and the intent of Liberty's recommendation. Despite the matter of an open funding request, Liberty considers this recommendation verified and closed.

[348] Response to Data Request #1143, and Interview #253, May 8, 2009.
[349] Response to Data Request #1145, and Interview #253, May 8, 2009.
[350] Interview #297, November 5, 2009.

Recommendation

V-2

Revise the transmission planning load forecast probability to 90/10 weather basis.

Background

Liberty found that Ameren-IL's 2008 transmission load forecasting processes were proper except for the use of a 50/50 weather-based design. The use of a 50/50 forecast is not conservative. The industry trend for summer-peaking power systems is to design systems using a 90/10 weather basis.

Liberty recommended that Ameren-IL plan its transmission system to a load forecast for which extreme weather has only a 10 percent chance of causing load to exceed the forecast. Liberty recommended that Ameren-IL make this revision immediately and apply it in its 2009 load forecast.

Ameren-IL's Implementation Plan

Ameren-IL objected to this recommendation. A conversion to 90/10 load forecast assumptions in the Ameren-IL transmission planning process is inconsistent with several facets of the planning process. Such a change is not consistent with regional and inter-regional planning power-flow model building procedures. Using a different forecast load level would introduce inconsistencies between the Ameren-IL transmission planning process and these efforts. The Ameren-IL planning process includes various sensitivity analyses in performing reliability studies. Included in these sensitivity studies are load levels consistent with 90/10 load conditions. Variations in load conditions help determine any volatility in the timing of proposed network upgrades.

After development of its implementation plan, Ameren-IL formalized its use of the one-in-ten load level.

Verification Discussion and Conclusions

Ameren-IL described the transmission planning process that it currently conducts. Long-term transmission planning is the system planning done to determine if additional system equipment is required to meet expected loads. Ameren-IL conducts long-term system planning in a timeframe that is one year, five years, and ten years into the future. The timeframe for operational planning is up to 12 months.[351]

The transmission-planning group performs long-term system planning using a 50/50 load forecast.[352] Ameren-IL stated that it must use the 50/50 load forecast for the long-term transmission planning to be consistent with the variety of information and data supplied to other organizations such as Federal Energy Regulatory Commission and the electricity and transmission markets.[353]

[351] Interview #254, May 11, 2009 and Interview #362, May 4, 2010.
[352] 50/50 load levels are those that have a probability of being reached or exceeded once in two years. A 90/10 forecast load level is that expected of being reached or exceeded once in ten years.
[353] Responses to Data Requests #1146 and #1148.

Ameren-IL identifies trends in the long-term analysis, and develops mitigation plans when equipment loadings reach 95 percent of ratings. If mitigation is required, Ameren-IL will perform sub-regional analysis. It performs sub-regional analysis with a 90/10 non-coincident peak load. If the sub-regional analysis shows an approximate 2- to 3-year shift in the required in service date of facilities, Ameren-IL will move the in-service date to the extent that it can be achieved by the construction schedule. The sub-regional analysis was not a formally required process.[354]

Ameren-IL now also performs near-term (operational) studies using a 90/10 weather basis to model system loads for operational studies and for specific local-area bulk supply studies. Ameren uses a 90/10 load forecast for an area as a sensitivity to adjust the scope and timing for a transmission project. This is a required practice as documented in Ameren's FERC filing (FERC 715, Part 4, TPRC), "Ameren's Transmission Planning Criteria and Guidelines," latest revision March 25, 2010.[355]

Ameren-IL has met its commitments and the intent of Liberty's recommendation. Liberty considers this recommendation verified and closed.

[354] Interview #254, May 11, 2009.
[355] Interview #362, May 4, 2010, and response to Data Request #1411.

Recommendation

V-3

Benchmark ("back-cast") the transmission-planning load forecast.

Background

Liberty found that Ameren-IL did not benchmark its transmission load forecast. Benchmarking the transmission forecast is a good check for reasonableness and is good utility practice. Therefore, Liberty recommended that Ameren-IL back-cast its transmission-planning load forecast to verify its validity for predicting future loads. Ameren-IL should then adjust the model for any discrepancies and repeat this process on a fixed schedule to be determined.

Ameren-IL's Implementation Plan

Ameren-IL accepted the recommendation and indicated that it would augment its planning process to review peak seasonal substation loads and compare them with those included in reliability study power-flow models.

Ameren-IL assigned a transmission-planning engineer to develop a procedure and method to perform a "back-cast" to compare power flow assumptions included in planning studies to historical values captured by the SCADA system. It would use the results of this analysis to refine the assumptions used in model building as well as provide insights into sensitivity analysis to recognize variations between operations and planning. Ameren-IL said that it would complete a basic evaluation of forecasts to actual loads by January 8, 2009, and would continue to develop procedures and analysis with a targeted completion date of the end of the first quarter of 2009.

Verification Discussion and Conclusions

Ameren-IL developed a procedure to back-cast the transmission load forecast using actual SCADA load data, temperature correction to design temperature by region, and matching and comparing 2008 forecasted loads from the planning model to the actual 2008 summer loads.[356] Ameren-IL then ran a power flow model using the temperature corrected historic loads and compared the flows of the new model to those of the model used in the planning analysis.[357]

Liberty acknowledged that the process appeared to be a good one for a back-cast of the transmission/system representation, but that Liberty's concern was on the accuracy of the load forecast. It was Liberty's expectation that Ameren-IL would take 2008 actual load and econometric values such as housing starts, population, and mean temperatures that occurred and use them in the load forecast model to see if the model could predict actual observed 2008 load using actual 2008 data. If the model could not do so in an accurate fashion, Liberty expected that Ameren-IL would determine the reason for the inaccuracies and develop corrective measures. Ameren-IL stated that the recommendation was misunderstood and that responsibility reassignments would include personnel responsible for econometric load forecasting.[358]

[356] Response to Data Request #1152.
[357] Response to Data Request #1153.
[358] Interview #255, May 11, 2009.

In November 2009, Liberty revisited this recommendation with Ameren.[359] It described the process it now uses to determine the accuracy of peak forecasts and improve the predictive ability of models. Ameren used its corporate load forecast model using actual data (e.g., temperatures on the day of the peak) for 2008. Overall, it found the actual peak was 3.8 percent greater than the simulated peak using actual data. The differences among the three operating companies ranged from 3.3 percent to 5.2 percent.[360] Ameren indicated that it would now do this comparison each year. Ameren will investigate possible reasons for differences between the actual and simulated such as checking with large industrial customers on their use of co-generation. Ameren did not find any reason at this stage to change its model.

Liberty concluded that Ameren-IL met the intent of Liberty's recommendation, and considers the recommendation verified and closed.

[359] Interview #298, November 5, 2009.
[360] Response to Data Request #1335.

Recommendation

V-4

Develop area load forecasts for transmission studies.

Background

Liberty concluded that Ameren-IL's transmission load forecasts did not consider individual areas within the total system. Ameren-IL uses a system-wide load forecast for its transmission planning studies. Specific areas within the system are relatively independent from a transmission-planning point of view and the loads may peak at different times than the total system. Good utility practice requires the use of area peak loads for these studies. Therefore, Liberty recommended that Ameren-IL refine its existing transmission load ratio process to include transmission-planning areas within the Ameren-IL system.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation, saying that it recognized that this concept is an additional option for sensitivity analysis in performing network reliability studies. This approach may have the potential to contribute to the determination of the timing of future reliability based network upgrades. Ameren-IL indicated that the Ameren planning process has included localized area load forecasts/adjustments as one of several sensitivity measures. Ameren-IL does not believe that is appropriate to modify the baseline planning process to recognize sub-area load forecasts. A method in which it models the non-coincident loads representing geographical subsets of Ameren-IL as the total coincident load would lead to a significant increase in load levels above those that it expects to occur in actual operations. Ameren-IL will consider how it could integrate this approach into the wide range of sensitivity analysis used to assess system reliability.

Ameren-IL committed that the planning group will review substation load information in the Ameren-IL footprint to determine whether there are load clusters that demonstrate reasonable, coincident load factors. If it identifies such coincident sub-area load clusters, Ameren will investigate ways of incorporating these sub-areas into the range of sensitivity analyses used to evaluate network reliability. It will perform this during calendar year 2009.

Verification Discussion and Conclusions

Ameren-IL stated that transmission planning starts with the 90/10 non-coincident loads developed by the bulk and distribution system planners. It identifies non-varying loads on a substation-by-substation basis. It scales the remaining substation loads to a 50/50 corporate load forecast using separate coincidence factors for each substation.[361]

Ameren-IL stated that it discussed options to address the issue of coincidence of non-coincident substation loads. Ameren-IL decided to address the issue from an operational viewpoint. Short-term operational planning would model the near-term system peak with all substations modeled at their respective non-coincident peak loads. The resultant load would be an approximate 5 to 10 percent increase over the total Ameren-IL load modeled in the current 50/50 system load forecast

[361] Interview #256, May 11, 2009.

that Ameren-IL refers to a "super peak" model. A 90/10 load forecast represents an approximate 3 to 5 percent increase over the total Ameren-IL load modeled in the 50/50 system load forecast. Current transmission planning procedures would not change.[362]

Liberty and Ameren-IL discussed the dates and times of various substation peaks in relation to geography and available local transmission. Liberty pointed out that the intent of the recommendation was to improve the scaling process and distribution of the load modeled to address natural transmission weaknesses and non-linear load distribution in the planning process and not to address the scaled load level. Ameren-IL stated that it would revisit the recommendation following this discussion.[363]

In November 2009, Liberty again discussed this recommendation with Ameren personnel, including the Manager of Transmission Operations and the Supervising Engineer of Transmission Planning.[364] They indicated that for seasonal studies (*i.e.*, six months out) Ameren would use the total non-scaled loads, a very conservative approach. For the more traditional planning work, such as the evaluation of the need and schedule for new or upgraded facilities, Ameren now considers peak area loads.

Liberty concluded that Ameren fully understands Liberty's recommendation, met its commitments, and uses a process that appropriately considers transmission area loads. Liberty considers this recommendation verified and closed.

[362] Response to Data Request #1154 and Interview #256, May 11, 2009.
[363] Response to Data Request #1156 and Interview #256, May 11, 2009.
[364] Interview #299, November 5, 2009.

Recommendation

V-5

Develop and use a 10-year weather-based design temperature for the distribution-planning load forecast.

Background

Liberty concluded that Ameren-IL's distribution load forecasting processes were proper except for the use of a 100-year weather-based design temperature. Distribution load forecasts use 100 years of weather data. Starting in 2008, the transmission load forecast appropriately used a rolling average 10 years of data to capture the change in climate observed in the service territory. Distribution planning should change its weather-based design criteria as well.

Liberty stated that using a 100-year weather database could skew the weather-based design temperature because of lower historical temperature data. Liberty recommended that Ameren-IL develop a weather-based design temperature using 10 years of data and use that temperature in its distribution load forecasts.

In its comments on the draft report, Ameren-IL suggested only a study of the effect of using a 10-year temperature basis. Ameren-IL also stated that 100 years of weather data is more reasonable for a long-term forecast.

Ameren-IL's Implementation Plan

Ameren-IL objected to this recommendation. Ameren-IL believes that determining a design temperature based on the most recent 10 years is too short a timeframe that does not recognize the wide fluctuations in recorded temperatures.

Ameren-IL said that it was willing to consider and evaluate alternative methods for determining the design temperatures that might better reflect any climate change trends and will appropriately minimize the risk of experiencing summer peak loads that exceed the capability of the system.

Ameren-IL's implementation plan said that it had already initiated the development of the distribution load forecast using summer 2008 peak load data and temperatures. The next distribution load forecast for which it could implement a revised method was the load-forecast update cycle beginning in the fall of 2009 using the summer 2009 peak load data and temperatures.

Verification Discussion and Conclusions

Ameren-IL believes that the use of a 10-year rolling design temperature would not reflect the probability of extreme temperatures and that design temperatures would constantly vary. Ameren-IL analyzed the 1900-2008 maximum annual daily mean temperatures at the Olney, IL weather station and found that the 109-year 90/10 temperature was 90°F, its current design standard. If it used the most recent 50 years, 30 years, 20 years, or 10 years of data, the calculated 90/10 temperature was 88°F. Ameren-IL provided the historical peak temperatures for all eleven of the weather stations that it uses. Three had upward trends, seven had downward

trends, and one had a level trend.[365] Liberty's initial concern was that if temperatures were increasing in the Midwest, as they are in other areas of the United States, design temperatures may be too low and that equipment ratings may be overstated.

Ameren-IL stated that it completed the implementation of this recommendation on time. Liberty verified the acceptance dates on the electronic documentation.[366] Ameren-IL has followed and completed its implementation plan. Liberty considers this recommendation verified and closed.

[365] Response to Data Requests #1002, #1159, and #1204.
[366] Response to Data Request #1205.

Recommendation

V-6
Centralize the short circuit model.

Background

Liberty reported that Ameren starts the annual model cycle with a common short circuit model and both Ameren-MO and Ameren-IL make continuous updates to their copy of the model throughout the year. Ameren performs a data lock step annually. The Ameren short circuit conditions do not drastically change over the course of a year, and because the Mississippi River separates Ameren-IL and Ameren-MO, changes generally do not measurably affect each other's systems. However, the use of a single model would eliminate the need for annual lock step adjustments and allow both Ameren-IL and Ameren-MO to use up-to-date models throughout the year.

Liberty recommended that Ameren centralize the short circuit model so that both Ameren-IL and Ameren-MO can make continuous updates to the same model. In this fashion, a current model is always available to both Ameren-IL and Ameren-MO and there is no need for an annual lock step.

Ameren-IL's Implementation Plan

Ameren-IL objected to this recommendation. It said that short circuit conditions do not drastically change over the course of a year. Ameren-IL and Ameren-Mo have greatly different service territories, are separated by the Mississippi River and do not measurably affect each other's systems. The maintenance of each system with an annual update is reasonable and practical.

Verification Discussion and Conclusions

Initially, Ameren-IL believed that the recommended change to the process of updating the Ameren-UE and Ameren-IL short circuit models was not necessary, as either was efficient. Upon additional review, Ameren-IL made a process change whereby system protection engineers continuously update the model. Ameren-IL assigned the responsibility to a specific senior level engineer to update the model on a regular basis. The process change provides for a single, up-to-date model for both Ameren-IL and Ameren UE to use throughout the year and eliminates the need for annual data lock step adjustments.[367] Ameren-IL provided documentation of its reviews and its closure of this recommendation.[368]

All Ameren legacy companies used the Advanced System for Power Engineering (ASPEN) short circuit model software for sub-transmission and transmission system application. The software is in wide use across the industry. The older update process started with two identical short circuit models for Ameren-UE and Ameren-IL. Ameren-UE and Ameren-IL engineers could download their model for use and upload system changes that were determined to be necessary. The result was two models at the end of the year that required a data lock step adjustment to start the

[367] Response to Data Request #1163.
[368] Response to Data Request #1207.

process over again. Simplistically, the new process uses a centralized model that both Ameren-UE and Ameren-IL engineers can access and update as they did in the past. The use of the centralized model eliminates the need for the data lock step adjustment. Liberty noted that the process used for the centralization of data here might have other applications within the Ameren organization as the mergers of the legacy companies continues.[369]

To verify the proper implementation of the corrective actions, Ameren directed the responsible system protection engineer to file a report on or before July 1, 2009, on the effectiveness of these changes. Specifically, the report will demonstrate that Ameren-IL maintains the short circuit model current.[370] Liberty verified that Ameren-IL completed this work prior to July 1, 2009.[371]

Ameren-IL completed the implementation of this recommendation, which Liberty considers verified and closed.

[369] Interview #258, May 8, 2009.
[370] Response to Data Request #1163.
[371] Response to Data Request #1206.

Recommendation

V-7

Evaluate the transmission and distribution systems for a total-loss-of-substation event.

Background

Liberty concluded that Ameren-IL had not systematically evaluated the total-loss-of-substation event. Ameren-IL's planning with regard to a total loss of a substation is typical of other utilities. Ameren-IL knows in very general terms how it would cope with such an event. However, that general planning relies on load transfer ties that do not exist in many locations, portable equipment that may be in use or not readily available, spare equipment carried for reasons other than a loss of a substation, and on-the-spot troubleshooting and problem solving.

Liberty recommended that Ameren-IL perform a systematic analysis of an event involving the catastrophic destruction of any substation, where restoration of the substation may take weeks. The objectives of the analysis should be to:

- Determine whether any particular substations may cause special problems such as extended outages or lengthy outages to critical customers.
- Determine whether any particular substations need additional protection or pre-event preparation.
- Determine whether the supply of mobile equipment and spare equipment is sufficient.
- Generate preliminary contingency plans.

Liberty did not mean that this evaluation requires 1,500 individual assessments and plans. Ameren-IL could group many similar substations and contingency plans for most single-transformer substations could be very general.

Ameren-IL's Implementation Plan

Ameren-IL accepted the recommendation.

With regard to the transmission system, Ameren-IL indicated that its planning already includes an assessment of the complete loss of a transmission substation consistent with a North American Electric Reliability Corporation (NERC) standard. The operational planning group has developed and maintains a procedure to analyze post-contingency system conditions to mitigate loading and voltage concerns. Ameren-IL would use this process to evaluate operational solutions to address adverse conditions following the loss of any transmission substation. Planning participates in the NERC STEPS program to augment spare EHV transmission transformers in the Ameren inventory. Ameren-IL could use these to replace failed units in the event of a catastrophic outage. Emergency procedures are in place, and Transmission Operations conducts drills to address a myriad of possible emergencies, including the loss of a transmission substation.

With regard to distribution, sub-transmission, and bulk supply substations, Ameren-IL indicated that it would perform a systematic analysis to develop contingency plans as recommended with

the purpose of minimizing the risk of extended customer outages from the catastrophic destruction of a substation.

Verification Discussion and Conclusions
(Part A – Transmission)

Ameren-IL's initial response generally followed system planning design requirements for the loss of a total transmission substation and the operational reaction to such an event. After reviewing the intent of Liberty's recommendation and the direction taken by the sub-transmission and distribution group, Ameren-IL stated that it wished to reassign responsibilities for the transmission portion of the recommendation and revise the implementation schedule accordingly.[372]

In November 2009, Liberty again discussed this recommendation with Ameren, who reported that personnel from transmission operations joined with and started to use the same approach taken by the distribution substation group.[373] That is, they reviewed each substation for failure risk and the consequences to customers of a complete failure. Ameren reported that for all transmission substations that did not also serve customer load, there were no cases in which Ameren-IL would not be able to serve load with the total loss of one substation. There was one case in which there could be a low voltage problem, and Ameren-IL will be adding capacitor banks. (In May 2010, Ameren reported this addition complete.[374]) In general, they found that peak load situations were not most limiting. Rather, high load-through flow situations could cause the most difficult operational cases. Transmission operations will document the results of its evaluation in reference documents (*i.e.*, not procedures) that may give operators guidance as to possible recovery sequences for a substation loss event. Ameren-IL hoped to complete this documentation by the end of 2009. Ameren-IL also reported that the exercise of evaluating each substation was worthwhile and consistent with other company efforts to review possible disaster events and learn what risks the company faced.

Liberty reviewed Ameren's progress in May 2010.[375] Ameren developed a process that simulates the loss of any transmission substation. Ameren provided a description of the process, including the model and programming language. Ameren also provided the results of a May 2010 Illinois substation outage study.[376] In addition to simulating each substation, the process evaluates some locations that are actually tap points, not individual substations. In the most recent study, Ameren considered a total of 439 transmission substation (or tap point) losses.

Only two of these cases resulted in significant thermal overloads or under-voltage situations. One resulted in the loss of one distribution substation and one feed to an electric cooperative. Assuming the distribution substation evaluation considers plans for the loss of that one substation, and an operational back-up feed to the cooperative, this contingency is manageable. Ameren could rectify the second potential problem with straightforward switching.

[372] Interview #259, May 11, 2009.
[373] Interview #300, November 5, 2009.
[374] Interview #363, May 4, 2010.
[375] Interview #363, May 4, 2010.
[376] Response to Data Request #1410.

Because the process is "mechanized," Ameren has the capability to perform these studies on a repetitive or ad-hoc basis, considering a variety of system conditions.

Ameren-IL stated that there is one customer that takes service directly from a transmission substation. However, that customer has alternative supplies. It also indicated that it has informed those performing the analysis of distribution substations about the cases in which the loss of a transmission substation would cause the loss of multiple distribution substations.[377]

Liberty concluded that Ameren has met the intent of Liberty's recommendation with regard to transmission substations.

(Parts B & C – Sub-Transmission, Bulk Supply, and Distribution)

The Ameren-IL approach is to group similar substations and develop general contingency plans for each category using circuit ties with the goal of being able to pick up all customers at a 70 percent load level with additional evaluation required if it cannot pick up all load within 48 hours.[378] In an August 2010 interview, Ameren-IL indicated that this was more a general guideline than a hard criterion.[379]

Ameren-IL will classify substations as follows:[380]

1 – Single unit distribution substation (138 or 69 or 34.5kV to 12 or 4kV)
2 – Multi-unit distribution substation (138 or 69 or 34.5kV to 12 or 4kV)
3 – Bulk substation without distribution transformers (138/69 or 138/34.5kV)
4 - Bulk substation with distribution transformers (138/69 or 138/34.5kV)
5 - Switching station – distribution
6 – Transmission substation (345/138 or 230/161 or 230/138 or 161/138kV)
7 - Transmission substation with bulk and/or distribution transformers (345/138 or 230/161 or 230/138 or 161/138kV)
8 – Power plant substation

Ameren-IL identified the following list of events that could cause the total loss of a substation:[381]

- Fire
- Flood
- Tornado
- Rail car accident
- Industrial explosion
- Power plant fire or explosion
- Earthquake

[377] Response to Data Request #1416.
[378] Response to Data Request #1165.
[379] Interview #392, August 18, 2010.
[380] Response to Data Request #1165.
[381] Response to Data Request #1165.

- Motor vehicle accident

In general, Ameren-IL indicated that it moves spare transformers up to 140 MVA by specialized hauling equipment. It does not allow one-half of the spare transformers to be in service for maintenance conditions. Ameren-IL stated that it looks at the number of spares, their location, and compatibility with legacy equipment every two years. Ameren-IL is also pre-purchasing transformers and using them as spares until their installation is required.[382]

Liberty suggested that Ameren-IL include proximity to airport approaches and sabotage on the loss of substation event list. In August 2010, Ameren-IL indicated that it also considers proximity to airports.[383] Liberty also reminded Ameren-IL that part of the reason for the analysis was to identify unknown conditions that could hamper restoration efforts such as the inability to get trailers inside substations, bridges lower than thought due to repaving, bridges where weight limits were reduced, or where transformer or generator hooks might be made. Such information would also be useful in the determination of the required number of spares and their location.[384]

Ameren-IL indicated that it had conducted several team meetings regarding the risks and potential mitigation strategies for the complete loss of any substation. Ameren-IL sought input on these issues from field personnel.[385] The request to division supervising engineers, substation maintenance superintendents, and distribution dispatch supervisors asked for relevant information based on their experience.

Ameren-IL also developed an emergency procedure.[386] However, the procedure was a "draft," and there were instances of missing information. Later, Ameren-IL provided a completed and approved procedure dated February 2012.[387] The "Loss of Substation Contingency Plan and Procedure" provides operational guidance for responding to the catastrophic loss of any substation and the resulting customer impacts. It covers responsibilities, immediate actions, damage assessment, near-term restoration, load curtailment, vendor contact information, inventory of mobile and spare equipment, and other relevant topics.

There have been some positive steps taken because of Ameren-IL's work on this recommendation. These include a more thorough look at spare equipment, the purchase of two more mobile transformers, acquisition of mobile battery trailers, contingency plans for a temporary building, mobile regulator trailers, and consideration of older, orphan-type equipment in certain substations.[388]

It was apparent that Ameren-IL has given thought to risks to substations, including proximity to highways, lack of spare land to place temporary equipment, transformer separation, and at least informal contingency planning. However, Ameren-IL could not identify specific locations that

[382] Interview #260, May 8, 2009.
[383] Interview #392, August 18, 2010.
[384] Interview #260, May 8, 2009.
[385] Response to Data Request #1439.
[386] Response to Data Request #1440.
[387] Response to Data Request #1648.
[388] Interview #392, August 18, 2010.

presented unusual or severe problems, and had not discussed the potential loss of multiple distribution substations because of the loss of a single transmission substation.

Ameren-IL met its initial commitment date for the assessment criteria.

In November 2011, Liberty and Ameren-IL discussed progress on this recommendation.[389] Ameren-IL described two team meetings, or tabletop drills, conducted late in 2010 and early 2011. The meetings considered the loss of two particular substations under various accident scenarios. Ameren-IL had developed a list of substations that could have a higher risk of failure. The two studied were among those on the list. The assessments and analyses that resulted from these meetings were exactly in line with the intention of Liberty's recommendation. In addition, the results provide a tool that Ameren-IL can use in deciding where and how to spend funds on system improvements.

In November 2012, Ameren-IL indicated that it has now completed five tabletop drills to evaluate a total loss of substation.[390] The most recent review was of the Ridge substation. It is a large, three-transformer (138/34.5 kV, 100 MVA) bulk supply substation serving about 20 distribution subs. It was formerly in the UE system and has a phase difference with surrounding supplies. Ameren-IL classified it as an "island" because of the lack of interconnections. Due the analysis of Ridge and other substations, Ameren-IL decided to purchase a mobile substation control building. The control building has an in-service date of December 2014.

A total loss of Ridge would create a difficult situation for Ameren. It would have to bring in a large amount of mobile equipment and generation to re-supply the loads served. Ameren-IL does not plan to take any action other than the mobile control building to help for this low probability event.

Ameren-IL plans to review another substation in March 2013 and may perform additional reviews annually. Liberty was not completely satisfied with Ameren-IL's reasoning for why this frequency of review was sufficient. However, Ameren-IL also explained that it includes the loss-of-substation item in its quarterly review with the Board of items in the Business Risk Management.

Prior to Liberty's audit, Ameren did not analyze the total-loss-of-substation event. The type of analysis and risk assessment that it is now doing is a significant improvement. The fact that Ameren-IL includes this low probability but high consequence event in its overall business risk management is indicative of the importance placed on the recommendation. Therefore, while there remains continuing work for Ameren-IL to perform, Liberty considers its verification complete.

[389] Interview #460, November 3, 2011.
[390] Interview #497, November 7, 2012, and response to Data Request #1657.

Recommendation

V-8

Formalize the transmission-line quality assurance and quality control process.

Background

Liberty concluded that the transmission-line design process was adequate, but that quality assurance was informal. Liberty recommended that Ameren-IL develop a more formal process to assure the quality of its transmission line projects.

Ameren-IL's Implementation Plan

Ameren-IL accepted the recommendation. It said that merging three utilities in Illinois with a long-term expansion commitment of Ameren-IL's transmission system has made necessary the development of design guidelines. The purpose of these guidelines will be to ensure consistent designs and quality in transmission projects. These guidelines will summarize how Ameren-IL plans to design transmission projects going forward to ensure quality of its transmission line system in compliance with the National Electrical Safety Code, reliability regarding lightning performance, grounding criteria, etc. Ameren-IL will write them to provide guidance for new facilities as well as projects where it is upgrading the existing system. Ameren-IL will also use them as a training tool for new engineers in the Transmission Line Design group.

Ameren-IL committed the resources of a Principal Engineer in the transmission-line design group for the next two years to focus on developing Ameren's design guidelines. He will consider past practices of Ameren-IL's legacy companies in the development of these guidelines. The guidelines will consolidate and document transmission line design processes.

Ameren-IL anticipates that it will take two years to implement these guidelines. Phase 1 will be to summarize the required design guidelines, research past practices of Ameren, and outline guidelines for the future. These guidelines will include documenting Ameren-IL's design protocols for such items as lightning performance, grounding criteria, code clearances for various voltages, where to use various shield wire types including fiber optic wire, conductor types, insulators, etc. Ameren-IL estimates this first phase to take one year with a goal of completing 50 to 75 percent of the design guidelines. Phase 2 will focus on completing the remainder of the guidelines, developing some details as required, and publishing them so that the entire transmission-line design group can use them going forward. It will complete the second phase in the second year of this initiative.

Verification Discussion and Conclusions

Ameren-IL identified 23 guidelines and 14 design criteria for its transmission design document. Ameren-IL expects to complete 14 guideline documents and 8 design criteria documents in 2009 and the remainder in 2010. As of April 15, 2009, there are no known schedule difficulties.[391] Ameren-IL provided a listing of the guidelines and criteria.[392]

[391] Response to Data Request #1166.
[392] Response to Data Request #1209.

As part of the transmission-line design document, Ameren-IL developed an extensive inspection list/check sheet for use during the final inspection. Liberty questioned whether it performed any formal inspections during construction, specifically for items that may be out of the normal such as foundations for angle structures. Ameren-IL stated that it does not inspect beyond adherence to the print specifications. Liberty suggested that Ameren-IL consider such inspections requiring construction engineer sign-off.[393] Ameren-IL provided an example of a final inspection summary document.[394]

Ameren-IL uses at least one construction engineer per transmission project depending on the project's size. Prior to starting the job, Ameren-IL reviews the construction requirements of the job with both the contractor and the construction engineer. To help construction engineers understand their responsibilities, Ameren-IL recently held training sessions with all Ameren-IL construction engineers.[395]

To ensure that Ameren uses correct materials, the transmission design engineer orders materials. The transmission-line design engineer, in conjunction with the operations and the construction engineers, also performs the final construction inspection for acceptance into service.[396]

In a November 2010 interview, Ameren described an organizational change that became effective in August 2010. The transmission-line design group now reports to the Manager – Transmission Operations instead of the T&D Design group of Ameren–Missouri.[397] As of this interview, Ameren has completed 21 of the planned 23 transmission design guidelines and 12 of the 14 planned design criteria documents.[398] Liberty reviewed a sample of the new Guidelines.[399] Liberty also reviewed a detailed schedule document that Ameren uses to identify all likely steps in a transmission line project, including a new, "green field," line.[400] Liberty discussed with Ameren the process it uses in transmission line projects and the steps taken to ensure engineering quality control.

In July and August 2011, Ameren-IL provided and Liberty reviewed the final design guideline and design criteria documents.[401]

Ameren-IL met its commitments and the intent of Liberty's recommendation. Liberty considers this recommendation verified and closed.

[393] Interview #261, May 12, 2009.
[394] Response to Data Request #1208.
[395] Interview #261, May 12, 2009.
[396] Interview #261, May 12, 2009.
[397] Interview #409, November 8, 2010, and response to Data Request #1473.
[398] Interview #409, November 8, 2010, and response to Data Request #1453.
[399] Responses to Data Requests #1453 and #1475.
[400] Response to Data Request #1474.
[401] Responses to Data Requests #1572 and #1587.

Recommendation

V-9

Design new ACSR transmission and sub-transmission lines to a 140°C operating temperature. Determine higher design operating temperatures for other conductors used in transmission and sub-transmission line construction

Background

Liberty concluded that transmission design operating temperature was too low for Aluminum Conductor Steel Reinforced (ACSR) conductor and perhaps other conductor types. Ameren uses 120ºC (Centigrade) for the design operating temperature for ACSR conductor. Many utilities use 140ºC to facilitate the use of short-time power ratings that allow for dispatcher action during contingencies. Ameren may be building limits into its transmission lines that will require future construction that may be unneeded.

Liberty recommended that Ameren-IL design new ACSR transmission and sub-transmission lines with a 140ºC operating temperature. Currently, Ameren designs its transmission system to long-time emergency ratings and uses short-time emergency ratings for short-term operations. Ameren should be building the ability to plan to short-term ratings to defer future construction. Ameren-IL should implement this recommendation for any new transmission and sub-transmission lines. In conjunction with this change, Ameren-IL should determine higher operating temperatures for other conductor types for the same reasons.

In its comments on the draft report, Ameren-IL indicated that connector material specifications call for 115ºC or 120ºC and that specifying 140ºC might cause suppliers to fail test requirements. Liberty believes that acceptable industry practice is to have the conductor, not connectors, be the limiting component in line design. All legacy companies incorporated this principal into their sub-transmission designs.

Ameren-IL's Implementation Plan

Ameren-IL objected to this recommendation.

Ameren connector material specifications call for conformance to American National Standards Institute (ANSI) C119.4 Class A connector requirements. C119.4 standard requires connectors to pass successfully a thermal cycling test. This test requires the test conductor (the conductor the test connector is attached to) to reach a specified temperature range of 115°C to 140°C. Ameren-IL's present conductor ratings allow for minimal risk on the low end of the connector-test temperature range. However, to rate conductors at the maximum test temperature assumes greater risk that Ameren-IL determines is not acceptable. The reasons include: 1) reliability concerns prohibit the use of currently available connectors that do not meet the maximum temperature requirements, 2) Ameren-IL would need to specify and purchase unique (higher cost) connectors that have been tested to the higher temperature, and 3) Requiring non-generic connectors could impede storm restoration efforts due to restrictive connector availability. The Ameren-IL design philosophy of operating conductors, with generic connectors, within manufacturers' ratings will ensure that the Ameren-IL sub-transmission circuits continue to operate in a reliable manner that is not detrimental to the life of the conductors and connectors.

For these reasons, Ameren believes that the maximum conductor operating temperature for ACSR should remain at 120ºC. For the same reasons, Ameren-IL's other conductor operating temperatures should not be increased.

Verification Discussion and Conclusions

Ameren-IL initially responded to this recommendation with a transmission component (V-9A) and a sub-transmission component (V-9B). The issue is identical in both cases. Liberty combined the scheduled interviews and report on them as a single recommendation.

Ameren-IL reviewed the operating temperatures of its sub-transmission and transmission line and recently adopted new allowable conductor temperatures under normal and emergency conditions as part of its implementation plan requirements under Recommendation V-1. The new allowed normal operating temperature for ACSR conductor is 90°C, which Ameren considers a continuous rating. The new long-time emergency allowed conductor temperature is 120°C for 8 hours, which Ameren applies only during system design contingencies for one or up to a few load cycles.

Ameren-IL does not use short-time emergency ratings on its transmission equipment in its system planning design analyses to allow for manual intervention to reduce overloads above the long-time emergency rating. In other words, Ameren-IL designs its transmission system to remain below the long-time emergency component ratings when testing required contingencies. Ameren-IL does use a 30-minute short-time emergency rating in its operational planning studies that would allow for manual intervention or re-dispatch of the system. Ameren-IL states that its reasoning is the actual operating state of the system (stress factors) such as gas prices to the west or south and the nuclear maintenance schedule to the north are too difficult to forecast. Any additional capability for this short-term rating does not come from the conductors because Ameren-IL maintains its 120°C conductor limit when calculating this rating. Ameren gains additional capability for the short-term operational rating in other equipment connected to the line such as switches and breakers. The other equipment generally limits the line and their 8-hour emergency ratings are the nameplate of the equipment. By allowing short-term excursions above nameplate equipment ratings, Ameren obtains additional line capability.

Ameren-IL also allows for the loss of load when designing its transmission system. It does not allow loss of load for single event contingencies; it relies on the sub-transmission system to provide support under those conditions. Maintaining service to load for first contingency conditions relies on transmission capacity for the most part with dependence on sub-transmission limited to those conditions when an N-1 event results in the outage of a single transmission supply to a bulk or distribution substation. For double event contingencies, Ameren-IL allows for the loss of load up to the Federal Energy Regulatory Commission (FERC)/North American reliability Corporation (NERC) reporting threshold load loss requirements of 300 Megawatts (MW) of direct consequence lost load as a result of the event and 100 MW for intentionally curtailed load related to the event. Ameren-IL was unable to provide similar data for the sub-transmission system.

Ameren-IL stated that, as a part of the review of elevated line temperature operation, it found areas in their connector specifications that it could improve. Ameren-IL also stated the intent of the ANSI connector standard C119.4 was to qualify connectors up to 93°C operation. There is a current industry effort to develop a standard for connector operation above 93°C that will be complete in approximately two years and will become ANSI standard C119.7.[402] Ameren-IL also believes that, although not tested for such, its connectors are adequate for 8-hour operation at 120°C for emergency operation. Ameren's primary connector supplier includes the 120°C rating in its product catalog.[403] Ameren-IL believes it is prudent to continue with their present practice and review when ANSI C119.7 is developed and approved.

Ameren-IL provided a discussion of industry efforts regarding connectors. This included an IEEE Overhead Conductor Working Group, on which Ameren-IL is a task force member, the development of new standard ANSI 119.7, and EPRI planned testing.[404]

Ameren-IL has a material specification (numbered 2.1.107 and dated August 4, 1998) for automatic copper and aluminum splices. This material specification requires connectors to conform to the latest version of ANSI C119.4 and requires that the supplier conduct electrical tests at a maximum mechanical tension of 10 percent of the conductor's rated strength.[405] ANSI C119.4 does not require electrical tests while the connector is under full tension. Liberty will explore more fully with Ameren-IL exactly what and how its connector suppliers performed testing.

Ameren-IL requested the test results from the manufacturers, but did not query the manufacturers if their splices were capable of short excursion operation up to 140°C. Ameren-IL provided copies of the manufacturers' test reports.[406]

Ameren-IL has not had a significant number of recent transmission or sub-transmission connector failures for any reason.[407] A query and review of OAS data showed only one sub-transmission outage definitely caused by a connector failure.[408]

Ameren-IL objected to this recommendation and developed no implementation plan. Ameren-IL has therefore met its commitments regarding this recommendation. Liberty is satisfied that Ameren-IL's method of rating its transmission and sub-transmission components is safe. Liberty considers this recommendation verified and closed.

[402] Response to Data Requests #1167 and #1169.
[403] Response to Data Request #1212.
[404] Response to Data Request #1211.
[405] Response to Data Request #1178.
[406] Response to Data Request #1210.
[407] Response to Data Requests #1172 and #1177.
[408] Response to Data Request #1213.

Recommendation

V-10

Analyze conductor galloping on existing sub-transmission and transmission lines.

Background

Liberty concluded that the legacy companies did not adequately design older sub-transmission and transmission lines to prevent outages due to conductor galloping. Conductor galloping was a recognized problem on the Ameren-IL sub-transmission system.

For transmission lines, Liberty recommended that Ameren-IL perform a data search for line trips and try to determine if they related to conductor galloping. If conductor galloping is determined to be a problem, Ameren-IL should develop a remediation program.

For sub-transmission lines, Liberty recommended that Ameren-IL analyze the various existing sub-transmission configurations and determine which designs are subject to outages due to conductor galloping. Conductor galloping is dependent on the level of wind and its direction when compared to the longitudinal direction of the sub-transmission or transmission line. Ameren should study wind direction and velocity in its service territory in relation to its sub-transmission lines to determine what lines are prone to conductor galloping conditions.

Ameren-IL's Implementation Plan

For the transmission system, Ameren-IL indicated that Operations would evaluate the outage history and operating logs to determine if galloping caused outages, or at least had been reported as a cause, during a three-year period. To the extent an outage or report was identified, the line (section) affected would be referred to the engineers to determine if conventional anti-galloping measures can be applied. If Ameren could not apply conventional measures, it would refer the issue to the design department for potential mitigation. Ameren-IL indicated that this work would be complete by October 8, 2010.

For the sub-transmission system, Ameren-IL indicated its agreement in principle with the recommendation. However, when considering sub-transmission structure types, span lengths, wire tensions, wire sizes, ice thickness, potential wind directions and velocities, all key variables that contribute to galloping, the analysis of every potential combination of these variables quickly mounted into thousands of potential configurations. Ameren-IL reported that it planned to determine common structure types and configurations and then assess these designs in terms of their propensity to gallop under industry-accepted criteria for galloping. Ameren-IL indicated that this work would be complete by October 8, 2010.

Verification Discussion and Conclusions

(Part A – Transmission)

Ameren-IL completed its review of transmission records to determine if galloping had in fact caused outages. The period reviewed was January 1, 2006, through March 25, 2009, a period slightly longer than the three-year commitment. Ameren-IL chose this review window because the data and record keeping prior to that period was suspect. The review consisted of a review of

outage records, system operator logs, and other records that engineering possessed on galloping conductors.[409]

Ameren identified the six circuits for engineering and design review from twelve distinct galloping conductor events that occurred during the review period. These lines included those built by IP, CIPS, and CILCO.[410]

Line 1366 – East Galesburg-East Kewanee (138kV – IP)
Line 1362 – Havana-Galesburg Monmouth (138kV – IP)
Line 4545A – Oreana tap section of Clinton-Goose Creek (345kV – IP)
Pana North- Taylorville South (138kV – CIPS)
Line 1386 – Sidney-North Champaign (138kV – IP)
Line 1354 – Tazewell-Eastern (138kV – CILCO)

Ameren-IL reported that all of the 138kV lines were single structure designs and located in urban areas north of highway I-70.[411]

Ameren-IL said that it will check the design of these lines (relative to the current Ameren-IL requirements regarding galloping) to determine if and what mitigation is required. Ameren-IL stated that information from legacy personnel indicate that transmission line galloping was only a concern north of I-70 and that it will inspect lines north of highway I-70 similar to those known to have experienced galloping to determine if galloping might have caused hardware wear or other mechanical problems without causing outages, and if the installation of airfoil spoilers is necessary for the affected lines.[412]Ameren-IL provided a copy of an e-mail indicating completion of the transmission line galloping conductor analysis, dated April 1, 2009.

Liberty found that Ameren-IL completed its analysis of galloping transmission conductors by its commitment date. Liberty will verify the follow-up corrective actions to the lines that experienced galloping and to those of similar design under Recommendation V-11. Liberty's verification of Part A of this recommendation is complete.

(Part B – Sub-Transmission)

Using dispatch supervisor records, Ameren-IL identified sections of 18 sub-transmission circuits that it suspected of experiencing galloping conductor-caused outages.[413] As with the transmission lines, all but one sub-transmission lines experiencing galloping were located north of highway I-70. Ameren-IL reported that "galloping" is an outage cause-code included in the current outage management system. The affected division engineering group will inspect the 18 lines for galloping damage (including conductor damage and loose crossarms), to analyze the design of the affected lines, to determine if conductor galloping actually occurred, and to take remedial actions to minimize conductor galloping on these lines.

[409] Interview #264, May 11, 2009, and Response to Data Request #1179.
[410] Response to Data Request #1179.
[411] Interview #265, August 6, 2009.
[412] Interview #264, May 11, 2009, and Interview #265, August 6, 2009.
[413] Response to Data Request #1274, and Interview #265, August 6, 2009

Because of the complexity of the task, Ameren-IL did not "determine common structure types and configurations and assess them in terms of their propensity to gallop under industry-accepted criteria for galloping," as indicated in its response. Rather, it identified those sub-transmission lines that reportedly experienced outages because of conductor galloping, and reported that it would inspect those lines for galloping damage and review for the need of remedial actions.

In August 2009, Liberty found that Ameren-IL's actions for identifying sub-transmission galloping problems are appropriate. Ameren-IL is on track for completing the engineering evaluations of galloping sub-transmission lines for remedial actions.

Liberty will continue its verification of V-10B until after the division engineers have reviewed the 18 sub-transmission circuits, due by October 8, 2010. Liberty will verify sub-transmission galloping conductor corrective actions under Recommendation V-11.

Liberty continued its verification in November 2010.[414] Ameren-IL uses a mathematical method based on conductor type and size, span lengths, etc. to determine whether galloping could occur on a particular configuration. Ameren-IL reported that by its commitment date, October 8, 2010, Divisions 1, 3, and 6 had begun the galloping analyses of six sub-transmission circuits. They analyzed:

- Line 6918, but it has not completed the analysis work.
- Line 6947, but found that no galloping should have occurred for this configuration. In the future, Ameren-IL will lower under-build cross arms to allow for 12-foot separation for this line.
- Line 6920 and rebuilt 8.25 miles of the line using type "T-2" twisted conductors (anti-galloping conductor). After it builds the Germantown Hills substation, Ameren-IL will replace an additional 4.95 miles of conductor with larger type T-2 conductor, and is considering adding airfoil spoilers on the 2-mile long Metamora Tap section. However, project funding was not provided because of budget restraints.
- Line 6606 and installed spoilers on a 2-mile long section where galloping was identified.
- Line 6612, Ameren-IL analyzed this line in 2006, after the ice storm that exceeded design ice and wind criteria. The design of subsequent structure replacements included addressing possible galloping conditions.
- The 69kV feed to Cairo, and determined that it had not galloped. Ameren-IL concluded that the reported outage cause was incorrect.

Ameren-IL did not report any galloping in Division 5. Divisions 2, 3, and 4 have yet to analyze the remaining 12 sub-transmission lines. Ameren-IL reported that funding constraints prevented completing sub-transmission galloping analysis work within its time commitment. It will continue to work on the analyses within resource limitations, but will accelerate the engineering work if funding for this purpose becomes available.

In November 2010, Liberty found that Ameren-IL did not complete the sub-transmission galloping analysis work by its commitment date because of funding limitations. By October 8,

[414] Interview #399, November 3, 2010, and response to Data Request #399.

2010, Ameren-IL had begun analyzing the sub-transmission lines that reportedly had galloped during the 2006 to 2009 period. However, it analyzed only 6 of the 18 lines before its commitment date. Ameren-IL has until October 8, 2013, to complete the analysis (under this recommendation) and all mitigation work (under Recommendation V-11). In March and May 2011,[415] Liberty investigated the February 1, 2011, outage of the Ameren-IL (CIPS) 10-mile long 69 kV line #V18732, and its under-built 12 kV feeder #V14579, which feed to and from the New Berlin substation. The resulting extended outage affected 1,133 customers in and around New Berlin and Loami, Illinois.

Ameren-IL reported that a floating[416] 69 kV conductor caused the outage early in a storm. It de-energized the 12 kV line fed by the 69 kV line. Ameren-IL found no evidence indicating that the 69 kV line contacted the under-built 12 kV line, at least while they were energized. These lines run mostly north-south and pass mostly unsheltered open farmland. Ameren-IL indicated that the east-west section, the portions protected by woodland, and the 5-mile section of 12 kV line protected with anti-gallop spoilers sustained less damaged than the remaining sections.

Ameren-IL reported that storm-caused vibrations and loads on the line hardware eventually caused the failure of two 69 kV suspension insulator conductor clamp pins and bolts (resulting in floating conductors), caused four 12 kV insulator pins to pull out, and caused some cross-arm brace failures.

Ameren-IL believed that the 69 kV and 12 kV hardware on these lines was damaged by two back-to-back storm events. Galloping conductor movements stressed line hardware early in the storm. Ice on the conductors (adding weight and airfoil area to wind) in steady, but moderate, transverse winds contributed to the galloping. Additional damage to line hardware occurred later by the additional loads on the lines during an extended period of high winds and blizzard conditions following the galloping conditions.

Ameren-IL said that it conducted a galloping study for these lines and concluded that the lines were of lengths that would not come into contact during galloping, unless some conductor support hardware failed. However, Liberty concluded that because support hardware did fail, at least in part, by the forces and vibrations from conductor galloping, it is possible that the 69 kV and 12 kV lines could come together, under similar weather conditions.

In fact, these lines did contact with each other during a similar wind and ice storm in 2004, which also caused line hardware damage and a sustained outage for New Berlin customers. The two galloping events indicate that these lines do gallop when exposed to certain moderate transverse wind and icing conditions.

Following the 2004 outage, Ameren-IL installed anti-gallop spoilers on about 5 miles of the 10-mile long 12 kV under-built line. Ameren-IL did not install spoilers on the 69 kV line. Ameren-IL reported that, although it is more expensive to do so, it could install anti-gallop spoilers while the 69 kV and 12 kV lines are energized.

[415] Interview #426, March 17, 2011, and Interview #428, May 11, 2011.
[416] "Floating" means that the conductor had disconnected from its insulator clamp.

For the 69 kV line, some of the poles have legacy-design Z-cross arms (with suspension insulators) and the remaining poles have current-design standoff insulators.[417] The suspension insulators have two types of suspension clamp designs. For one type, the conductor is supported by the insulator via a clamp held by a bolt with a cotter pin. In the two cases of floating conductors, the bolts vibrated out after the cotter pins failed. Although clamp failures caused the fault, the work of changing out the bolt-and-pin clamps with another type of clamp would require lengthy 69 kV outages. It might be better to minimize the galloping that caused the clamps to fail, rather than changing the clamps, by installing anti-gallop spoilers on the sections that the storm damaged.

In May 2011, Ameren-IL reported that it will determine, before the end of 2011, whether it will mitigate the hardware-damaging galloping by:

- installing more anti-gallop spoilers,
- reconductoring the lines with Type T2 anti-gallop conductor, or
- providing additional reliability and capacity to New Berlin by installing a 69 kV tie line, by installing another substation near New Berlin, or by increasing the capacity of the 12 kV tie circuits.

The extent of Ameren-IL's methods and ability to mitigate the galloping problem, or otherwise improve reliability to New Berlin, depends of Ameren-IL's ability to fund the projects.

Liberty suggested that even if Ameren-IL adds additional capacity to improve reliability to New Berlin, it should at least install anti-gallop spoilers on the portions of the 69 kV and 12 kV lines damaged during this storm. Although the lines might be damaged by accumulated ice and high transverse wind loads, they will less likely damaged by galloping forces.

This verification remains open. In 2012, Liberty will conduct a follow-up interview regarding Ameren-IL's mitigation actions for the New Berlin line, and Liberty will monitor Ameren-IL's progress in analyzing the other sub-transmission lines covered by this recommendation with a history of suspected galloping.

In May 2012, Liberty conducted interviews at each of the six divisions. Division II reported that it had completed its galloping remedial actions for the New Berlin 69kV tap line and the under-built 12kV lines. Ameren-IL installed airfoil spoilers on the entire 69kV tap line (while de-energized) and on the 12 kV line (while energized).[418] Division I reported that it investigated three galloping conductor reports. One was a false report and Ameren-IL installed spoilers on two 69kV lines.[419] Division III reported that it investigated three galloping conductor reports, one of which was false. It improved grounding on one 69kV circuit, and installed spoilers on the third circuit.[420] Division IV reported that it investigated four galloping conductor reports and

[417] Ameren-IL replaced about 90 poles in 2006, using 69 kV standoff insulators, following a tornado crossing.
[418] Interview #472, May 17, 2012.
[419] Interview #471, May 16, 2012.
[420] Interview #473, May 15, 2012.

plans to install spoilers on those circuits.[421] Divisions V and VI had no reports of galloping sub-transmission conductors.[422]

Liberty concluded that Ameren-IL's actions to identify and correct sub-transmission conductor galloping was consistent with its commitment and with good utility practices. The verification of this recommendation is complete.

[421] Interview #474, May 15, 2012.
[422] Interviews #475, May 14, 2012, and #476, May 18, 2012.

Recommendation

V-11
Determine conductor galloping corrective measures.

Background

Liberty concluded that the legacy companies did not adequately design older sub-transmission and transmission lines to prevent outages due to conductor galloping. Conductor galloping is a recognized problem on the Ameren-IL sub-transmission system.

Liberty recommended that Ameren-IL determine the most cost effective manner to prevent conductor galloping on the sub-transmission and transmission line configurations that are in areas prone to conductor galloping.

Ameren-IL's Implementation Plan

Ameren-IL indicated that the Transmission Maintenance Engineering group would review the line (sections) in question. If conventional anti-galloping can be applied, they will be. If not, engineering will refer the matter to the design department for further evaluation.

For the sub-transmission system, Ameren-IL indicated that, depending on the results of the study proposed under Recommendation V-10, it would determine proper corrective action for common sub-transmission structure types identified in the study as major problems and implement those across the system.

Transmission Lines – Ameren identified sections of six Ameren-IL transmission circuits that appeared to have galloped during a 3-year period. Ameren said that it will determine conductor galloping mitigation measures (Recommendation V-10, Phase II) by October 8, 2010, and it would complete mitigation measures (Recommendation V-11, Phase III) by October 8, 2013.

Sub-Transmission Lines – Ameren-IL identified sections of 18 sub-transmission circuits that exhibited possible galloping. Ameren-IL said that it would determine galloping mitigation measures (Recommendation V-10, Phase II) by October 8, 2010, and it will complete mitigation measures (Recommendation V-11, Phase III) by October 8, 2013.

Verification Discussion and Conclusions

(Part A – Transmission)

By October 8, 2010, Ameren had analyzed sections of six Ameren-IL transmission lines identified as having galloped, and completed mitigation actions.[423] When it suspected galloping, Ameren transmission engineers use mathematical methods for determining if galloping "should have occurred," based on conductor type, size, span length, etc. Ameren evaluated six Ameren-IL transmission line segments and conducted mitigation actions as follows:

- Installed airfoil spoilers on a tower on two line segments.
- Attributed trips on two line segments to broken shield wires, not galloping.

[423] Interview #400, November 1, 2010, and response to Data Request #1445,

- Did not determine the cause of trips on two line segments, but the line spans were either too long (too heavy) or too short to have been galloping.

Ameren reported that out of about 4,800 miles of Ameren-IL transmission lines, it had only two confirmed galloping locations (it installed airfoil spoilers on those two transmission line spans). Ameren and Ameren-IL will continue to monitor transmission line galloping, using its modern programmable distance relays to help locate line faults.

In November 2010, Liberty found that Ameren transmission line galloping analysis and mitigation actions complied with Recommendation V-11. Ameren identified galloping-caused transmission line faults and conducted mitigation actions on the sections where galloping was confirmed. By October 8, 2010, Ameren had installed airfoil spoilers on those a spans. Ameren and Ameren-IL will monitor the other transmission lines where it did not confirm galloping. Ameren-IL completed this recommendation before its October 8, 2013, commitment date. Liberty considers this part of the recommendation verified and closed.

(Part B – Sub-Transmission)

Please refer to Verification and Conclusions section of Recommendation V-10. In May 2012, Liberty found that Ameren-IL's actions to identify and to correct sub-transmission conductor galloping was consistent with its commitments and with good utility practices. The verification of this recommendation is complete.

Recommendation

V-12

Verify that the transmission and sub-transmission pole depths used by Ameren-IL comply with the new NESC "Extreme Ice with Concurrent Wind' loading guidelines.

Background

Liberty recommended that Ameren-IL review transmission and sub-transmission pole loading requirements and pole set depths to assure that they comply with recent changes in the NESC loading requirements.

Ameren-IL's Implementation Plan

Ameren-Il reported that by April 8, 2009, it would have evaluated new transmission and sub-transmission structure designs using NESC standards, including "Extreme Ice with Concurrent Wind"[424] loadings to determine whether it needed to revise pole set depths. It also reported that it would also analyze the recent changes to the NESC and determine whether new loading requirements require changes in to pole set depths guidelines for its sub-transmission lines.

Verification Discussion and Conclusions

(Part A – Transmission)[425]

The Ameren Transmission Line Design group consists of electrical, civil, and structural engineers who are responsible for the design of transmission lines, poles, and foundations for Ameren-IL. The group specifically designs each transmission structure and foundation for the application using engineering methods and calculations to comply with the 2007 NESC requirements. The group specifies and orders each transmission pole from suppliers based on 2007 NESC loading requirements. Ameren reported that it is not allowed by Illinois law to construct new H-frame structures in Illinois.[426] It reported that the vast majority of new transmission constructions are single shaft structures using engineered concrete foundations. The use of direct-embedded wood or steel poles for new transmission construction is limited. Most new transmission poles will be steel poles mounted on concrete foundations.

Ameren-IL reported that by April 2007 it had made transmission-line design requirements and standards consistent across the company and meeting 2007 NESC guidelines.

Ameren-IL provided a "cable data sheet" document[427] for a steel pole mounted on a foundation. This sheet indicated the calculated loadings according to NESC Heavy Loading[428] standard as well as the new Extreme Ice and With Concurrent Wind Loading (NESC 250D) requirements. Ameren designs poles and foundations to whichever of the two NESC standards ("Heavy" or "Extreme Ice with Concurrent Wind") indicated the higher loadings for the application. For ground-embedded wood or steel transmission poles, Ameren calculates the loadings and moment

[424] For poles with conductors over 60 feet above the ground with 1 inch of ice and 4 pound per square inch of wind force.
[425] Interview #281, August 2, 2009, and responses to Data Requests #1033 and #1240.
[426] Response to Data Request #1033.
[427] Response to Data Request #1240.
[428] For pole with conductors with 0.5 inch of ice and 25 pound per square inch of ice.

at the pole base for the standard pole set depths of 10 percent of the pole length plus 2 feet, or 10 percent plus 3.5 feet (for larger class poles). Ameren provides pole suppliers with loading and moment specifications and requires that each metal or wood transmission pole meet the specific loading requirements. Ameren-IL reported that it might order a special pole with a required set depth greater than the standard depths to meet NESC guidelines. Ameren also examines soil conditions and it might increase rock backfill embedment or increase the pole diameter to meet design requirements.

Liberty verified that Ameren-IL is complying with the new NESC Section D250 "Extreme Ice with Concurrent Wind" requirements and is verifying that it applies the new transmission pole designs for the pole depths Ameren-IL uses. Liberty's verification of this part of the recommendation (V-12A) is complete.

(Part B – Sub-Transmission)[429]

The Ameren-IL's Standards group is responsible for sub-transmission and distribution pole and line designs. The Standards engineers verify that the sub-transmission and distribution construction standards used by the Ameren-IL divisions comply with the NESC guidelines, including the 2007 NESC Standard 250D "Extreme Ice with Concurrent Wind" [430] loadings requirements. Ameren-IL reported that the new NESC guidelines are good utility practice and Ameren-IL modified its standard designs accordingly, even though the ICC has not yet adopted the ICC. Ameren-IL provided documents dated April 30, 2008, with tables[431] showing that the Standards group calculates, based on pole heights, conductor size, and span lengths, the loadings on the pole and the moment forces at the pole base. Ameren-IL demonstrated that the calculations indicate that for under either the NESC "Heavy Loading"[432] requirements or the "Extreme Ice with Concurrent Wind" loading requirements that its standard setting depths of 10 percent plus 2 feet for standard poles, and 10 percent plus 3.5 feet for H1 thru H4 class poles are appropriate to meet NESC guidelines. From the documents, it appeared that the new loadings based on Extreme Ice with Concurrent Wind were often less than the NESC Heavy Loadings because of a greater built in safety factor multiply for the Heavy Loading.

Ameren-IL reported that the Standards Group provides engineering assistance when required by the divisions for specific cases where there are non-standard configurations or conditions, such as poor soil.

By April 8, 2009, Ameren-IL verified that loads and moments on its new sub-transmission poles based on the 2007 NESC guidelines did not affect standard pole depths. The Standards group verifies pole set depths for any specific conditions not covered by the standards.

Liberty's verification of this recommendation is complete.

[429] Interview #282, August 10, 2009, and response to Data Request #1241.
[430] For poles with conductors over 60 feet above the ground with 1 inch of ice and 4 pound per square inch of wind force.
[431] Response to Data Request #1241.
[432] For pole with conductors with 0.5 inch of ice and 25 pound per square inch of wind force.

Recommendation

V-13

Check all Ameren-IL transmission and sub-transmission lines for NESC clearances.

Background

Liberty concluded that older sub-transmission and transmission lines, designed manually with a template, may not meet NESC clearance requirements. Therefore, Liberty recommended that Ameren-IL check all sub-transmission and transmission lines for NESC clearance with new software.

If any sub-transmission or transmission line segment was not designed with the new iterative ruling span software and three feet of constriction variation clearance, Ameren should analyze that line segment to determine its maximum operating temperature (and power rating) while maintaining 2007 NESC clearances and three feet extra clearance for construction deviations. If Ameren-IL bases its calculations on actual field conditions, it may omit the construction deviation allowance. Liberty understands that the NESC requirement has not materially changed in the last 25 years in this regard.

In its comments on the draft report, Ameren-IL said that is disagrees with this recommendation because NESC requirements are not retroactive. However, Liberty's experience is that the older templates were inaccurate and that good utility practice requires correction of known clearance violations of the standards that existed at the time of construction.

Ameren-IL's Implementation Plan

Ameren-IL said that it is confident that initial designs of sub-transmission and transmission lines met the intent of the NESC in effect at the time of construction. It was acceptable practice to use an assumed ruling span with a template to determine clearances at the time of design and construction of these lines. Ameren's tools improve over time but unless it modifies a line for some reason, it does not feel it necessary to go back and verify code clearances because design methods and tools have improved. Ameren-IL indicated that its normal inspection programs would catch any instances where clearances appear to be inadequate.

Liberty indicated that it would consider eliminating or changing this recommendation if Ameren-IL demonstrated that the clearance checks in this recommendation are unnecessary. Ameren-IL will provide documentation of the processes used for the design and construction of transmission and sub-transmission lines, both current and prior to the Ameren-IL utilities becoming part of Ameren. This action was due by October 8, 2010.

Verification Discussion and Conclusions

(Part A – Transmission)[433]

In November 2010, Ameren reported that its engineers use airborne LIDAR (light detection and ranging) surveys for gathering data for site and design of its new transmission lines, and for replacement of conductors on existing lines. However, Ameren determined that it would cost

[433] Interview #401, November 3, 2010, and response to Data Request #1446.

$22-$25 million to conduct similar LIDAR surveys and associated engineering work to verify NESC clearances under all operating conditions on Ameren-IL's approximately 4,800 miles of transmission lines. Ameren indicated that using Ameren-IL's limited resources and funds for a system-wide study to verify that all of its transmission lines comply with NESC worst-case thermal clearances is unreasonable and is not necessary for these reasons:

- Ameren maintains a library of it past transmission line designs. Transmission engineers have ready access to original and updated transmission-line design information, dating back to when the lines were constructed or modified. The companies designed legacy lines to applicable NESC standards.
- The legacy transmission-line design clearances included a contingency of at least 3 feet.
- Ameren limits the line loadings to within original design ratings. Many of Ameren-IL's legacy transmission lines were designed with operating ratings different from the current standard ratings. However, where required to maintain clearances, Ameren and Midwest Independent Transmission System Operator (MISO) transmission system operators appropriately limit loading of legacy transmission lines, as established by Transmission Engineering and as applied to the transmission data book and the Ameren transmission SCADA system. These limits form the basis for operating practices, SCADA information, various alarms, and information provided to MISO. The ratings used are within the design capabilities of the legacy lines.
- Ameren's transmission line construction quality control process confirms that the construction of new and modified transmission lines conform with designs that in turn conform to NESC standards.
- Ameren's routine transmission-line inspection practices and outage-investigation inspection practices are sufficient to identify NESC clearance issues (including clearances to under-built lines) that might arise. For example, in one case, it lowered under-built cross arms to provide extra clearance on a line suspected of galloping. Transmission line inspectors identify NESC clearance problems, such as right-of-way encroachments.

(Part B – Sub-Transmission)[434]

In November 2010, Ameren-IL indicated that at least over the last 40 or so years, the legacy companies designed sub-transmission lines using sag templates or software by in-house engineers, or by engineering contractors, consistent with NESC guidelines. However, among the three companies, appropriate NESC and under-build clearances depended on using a variety of thermal ratings. They added contingency clearances to nominal design clearances. Ameren-IL also indicated that:

- Ameren-IL maintains a library of past sub-transmission line designs. Ameren-IL engineers have access to original and updated sub-transmission line-design information, dating back to when the lines were constructed or modified. The companies designed lines to applicable NESC standards (at least for over 50 years).
- Ameren-IL operates its sub-transmission lines within original design ratings, even though many of the Ameren-IL's legacy transmission lines were designed with operating ratings

[434] Interview #402, November 1, 2010, and response to Data Request #1447.

different from the current standard ratings for new Ameren designs. SCADA alarms prevent Ameren-IL dispatchers from operating the sub-transmission system in excess of thermal design ratings preventing excessive conductor sag. As a measure to prevent unacceptable sag when lines are operated in parallel, Ameren-IL engineers conduct load flow studies for the dispatchers to prevent exceeding design ratings when sub-transmission lines are in closed loop configurations or when loops are formed when tie switches are closed.

- Ameren-IL routinely inspects its sub-transmission lines. Sub-transmission patrol inspectors are required to identify NESC clearance and under-build violations. Ameren-IL has a quality control procedure in place that verifies that the inspectors are properly identifying clearance violations.
- Ameren-IL verifies that attachments, proposed and placed under Ameren-IL lines by other utilities or private parties, do not violate NESC clearance and pole strength requirements. It does not allow attachments until agreements are in place and all remediation work is complete. In addition, when a customer calls JULIE for locates, any changes that might cause clearance violations related to grade changes or new structures being erected are examined to verify that all clearances comply with the NESC standards.
- Ameren-IL has quality control procedures in place to verify compliance to NESC clearances for new construction and modification projects.

Liberty agreed that Ameren and Ameren-IL should not conduct costly LIDAR or visual field surveys and subsequent engineering calculations for every span of Ameren-IL's transmission and sub-transmission systems just to verify that no span is violating NESC clearances. This work is essentially the same as redesigning the systems. Ameren and Ameren-IL both have NESC violation inspection programs, construction quality control practices, and operations controls in place to identify appropriately NESC clearance violations and to prevent line sagging that would violate NESC clearances. Liberty considers this recommendation verified and closed.

Recommendation

V-14

Check all Ameren-IL transmission and sub-transmission lines for NESC under-build clearances.

Background

Liberty concluded that under-building on sub-transmission and transmission lines could cause outages during system contingency events. Ameren has no written policy on installing or rebuilding distribution lines under sub-transmission or transmission lines. While Ameren states that it maintains NESC clearances during the design and review of the under-builds, questions remain regarding foreign under-builds and historic legacy company practices.

Liberty recommended that Ameren-IL identify and profile all distribution and foreign under-builds of its sub-transmission and transmission line segments. Ameren-IL should ensure that it maintains NESC clearances while the sub-transmission or transmission line is at its maximum operating temperature, or in the alternative, restrict the sub-transmission or transmission line segment to a different maximum operating temperature that does maintain NESC clearances. The work performed in the above recommendation and the design records of newer properly design lines can be used.

Ameren-IL's Implementation Plan

Ameren-IL objected to this recommendation, saying it is confident that initial designs met the intent of the NESC in effect at the time of construction. Transmission Maintenance reviews requests for under-building existing lines 100kv and above. Engineers check the lines for structural and clearance issues caused by new facilities along the same alignment or on the same poles as transmission conductor. Transmission Maintenance has knowledge of the maximum operating temperature of the transmission conductors and applies this information when doing the review.

The distribution engineers responsible for the designs know the maximum operating temperature for the sub-transmission conductors and apply this when doing their reviews. To implement this recommendation would be like laying out new sub-transmission and transmission lines. For the transmission system alone, it would require aerial surveys of many miles of line, and input of this data into PLS CADD to model, plan and profile the lines to determine clearances. This effort would be substantial and high cost. The effort and cost to implement this recommendation for all of Ameren-IL's sub-transmission lines would be even greater since there are more sub-transmission lines with under-build than transmission. This recommendation is an unnecessary expense for our ratepayers. Checking the clearances to under-build circuits is only required if the operating temperatures of the sub-transmission or transmission lines are increased. Ameren-IL's normal inspection programs will catch any instances where clearances appear to be inadequate.

Verification Discussion and Conclusions

Liberty included transmission and sub-transmission under-build clearances in the November 2010 verification of Recommendation V-13. Based on that verification, Liberty found that Ameren-IL's inspection, construction, and operating controls are appropriate to identify and to

prevent under-build clearance violations. Liberty considers this recommendation verified and closed.

Recommendation

V-15

Revise the transmission transformer purchasing specification.

Background

Liberty concluded that the purchasing specification for Ameren-IL's transmission transformers was inadequate. Ameren should require that it could load transmission transformers in accordance with nationally accepted overload guides. While not being able to load transformers to industry accepted overload guides poses no risk to the transformers themselves, overly restrictive transfer limits or unneeded construction with negative economic consequences may result. This is not an acceptable industry practice. Liberty recommended that the specification should specify that the transformer and all ancillary-equipment loading capabilities would be in accordance with IEEE Standard C57.91, IEEE Guide for Loading Mineral-Oil-Immersed Transformers.

Ameren-IL's Implementation Plan

Ameren-IL said that it meets this recommendation with Standard 9, Supplemental Specification 1.12, including the requirements.

Verification Discussion and Conclusions

Ameren-IL committed to make the required revision by November 1, 2008. Ameren-IL supplied a copy of Ameren-Il Standard 9, Supplemental Specification – Power Transformers Rated 138kV and Above – Revision 6 dated July 22, 2008.[435] Section 1.12 of the supplemental specification requires that all ancillary equipment and construction features shall not restrict loading. Ameren-IL met its commitments and completed them within the stated timeframe. Liberty's verification of this recommendation is complete.

[435] Response to Data Request # 1034.

Recommendation

V-16

Determine the overload capabilities of existing transmission transformers

Background

Liberty recommended that Ameren-IL determine the overload capabilities of those existing transformers that do not have manufacturers' overload ratings by obtaining data from manufacturers. It then should load its transmission transformers in accordance with IEEE Standard C57.91. By allowing the short time overloading of all transformers, Ameren-IL might save money by delaying the replacement of some existing transmission transformers with larger transformers.

Ameren-IL's Implementation Plan

Ameren-IL declined this recommendation and did not implement a plan. Ameren-IL did not agree to spend the approximately $300,000 required to conduct the engineering required to develop short-term ratings on all transmission transformers because it does not intend to overload the older transformers not rated for overloading by the manufacturers. It was Ameren-IL's policy not to allow loss-of-life and to increase the risk of failure for these aged transmission transformers.

Verification Discussion and Conclusions[436]

Some of Ameren-IL's approximately 65 transmission transformers have manufacturer-rated overload capability, but many do not. Ameren-IL is specifying that manufacturers construct its new transmission transformers with specific overload ratings.[437] Ameren-IL's transmission transformers are large, expensive transformers, ranging from 500 MVA to 700 MVA, and many are aged. Some are over 35 years old. In addition, Ameren-IL would load transmission transformers near nameplate ratings in very few situations.

As a general policy, Ameren-IL will not operate its transmission transformers in excess of nameplate ratings. Ameren-IL's concern is that overloading its aged transmission transformers might cause premature failure resulting in financial and reliability risks, and increased maintenance costs. However, it has been specifying new transmission transformers from manufacturers with short-term (4-hour) overload ratings (refer to Recommendation V-17). Where transmission planning determines that conditions might exist requiring the short-term overloading of a specific transformer with a manufacturer-overload rating, Ameren provides instructions for transmission operators. For example, Ameren allows a 345 MVA transformer located at a specific location, rated at 400 MVA, to operate at 492 MVA for 4 hours under specific system conditions.[438]

Ameren-IL reported that it complies with NERC regulations that requires Ameren-IL to take actions necessary to ensure transmission system reliability, including loading transformers to

[436] Interview #283, August 5, 2009, and responses to Data requests #1271 and #1273.
[437] See Recommendation V-17.
[438] Response to Data Request #1273, MISO Emergency Operating Guide, Rev. 1.

their nameplate ratings, or where available, to their engineered or manufacturer rated, short-time overload ratings where and when conditions exist that might lead to system collapse.

Liberty found that Ameren-IL's policy of allowing overloading of those specific transformers with manufacturer overload ratings under specific circumstances, but not overloading its aged, non-overload rated (by the manufacturer) transmission transformers, although conservative, is appropriate for Ameren-IL. Liberty considers this recommendation verified and closed.

Recommendation

V-17

Ameren-IL should develop less conservative transmission transformer ratings.

Background

Liberty recommended that after Ameren-IL obtained information on transmission-transformer overload capabilities (Recommendation V-16), it should develop new overload ratings for those transformers to maximize the economic flow of power, and for planning studies to prevent needed construction.

Ameren-IL's Implementation Plan

Ameren-IL declined this recommendation and did not implement a plan. Ameren-IL stated that loading the older large transmission transformers above nameplate ratings increases risk.

Verification Discussion and Conclusions[439]

Although Ameren-IL indicated that it would not modify its ratings for its older, non-overload rated (by manufacturer) transmission transformers because it does not intend to operate these transformers in excess of nameplate ratings, it has been specifying overload ratings on its new transmission transformers. For example, the specifications for its new 560MVA transmission transformer require that Ameren can operate with a peak overload of 125 percent during one hour during one-24-hour overload cycle.[440]

Liberty verified that although Ameren-IL will not provide less-conservative ratings on its older transmission transformers, it does require that manufacturers build overload capability into its new transmission transformers. Liberty found that Ameren-IL's response to this recommendation was appropriate. Liberty's verification of this recommendation is complete.

[439] Interview #284, August 5, 2009, and response to Data Request #1272.
[440] Response to Data Request #1272.

Recommendation

V-18

Revise substation grounding adequacy review process.

Background

Liberty recommended that Ameren-IL develop an on-going process for periodically reviewing and upgrading, where necessary, substation grounding adequacy. Ameren-IL's Substation Engineering group should perform a review of the grounding adequacy of each substation on a 10-year cycle. In addition, it should review grounding at each substation where system expansion or adding generation changes fault duties, and where environmental conditions might affect substation grounding performance. Ameren-IL should enhance or upgrade substation grounding where it identifies deficiencies. In addition, Ameren-IL's routine substation inspections should include and record gate, fence, and equipment grounding deficiencies, when substation crushed stone is inadequate, and when vegetation conditions might affect grounding performance. This recommendation is similar to Recommendation V-19, which also recommended that Ameren-IL should verify substation grounding grid continuity and integrity at a specific interval.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation and committed to (A) conducting substation engineering grounding reviews and (B) inspecting the substation grounding systems as part of regular substation maintenance procedures.

Part A Grounding Reviews

Ameren-IL agreed with the recommendation and committed its T&D Engineering Design Group to develop a plan in 2009 to define grounding adequacy, to prioritize the substation review cycle, to establish documentation and filing methods, to begin a pilot program to review draft documents and filing method, and to assign, mentor, and train new staff. It said that the first substation grounding cycle would begin in 2010.

Part B Grounding Inspections

Ameren-IL said that the Substation Maintenance Engineering Group, working with the Design Engineering Group, would define grounding adequacy and implement generic inspection templates and specification fields in EMPRV and in the future handheld recorders. The substation inspectors will document grounding deficiencies and problems. Substation Engineering will review inspection data and initiate corrective job orders.

Verification Discussion and Conclusions[441]

Part A Substation Grounding Studies

In August 2011, Liberty found that Ameren-IL conducts grounding-grid adequacy studies, as part of new or modified substation capital projects, on substations where system changes might affect the performance of ground grids, and on substations where poor relaying, fault locating, and lightning performances indicate possible grounding problems. Ameren-IL has been conducting formal software-driven substation-ground grid-adequacy studies based on these

[441] Interviews # 446 and #447, August 18, 2011, and responses to Data Requests #1579 and #1580.

criteria since 2009. As of July 29, 2011, Ameren-IL engineering completed grounding reviews on 88 (6.4 percent), of its 1,373 substations. It completed most of the reviews as part of capital improvement projects at the substations. Ameren-IL hired a student intern under Ameren-IL supervision for much of the analysis work to demonstrate its commitment to completing station reviews.

Ameren-IL intends to continue the review of substation grounding adequacy as part of capital substation construction and modification projects, whenever fault duty changes, or other related issues occur. However, Ameren-IL said that it does not repeat substation grounding adequacy reviews on a periodic maintenance basis, nor does it conduct substation-grounding reviews on existing unmodified substations where it has not identified grounding-related operational issues. Ameren-IL determined that analysis of the grounding in substations on a regular basis is not cost effective.

Part B Substation Grounding Inspections

In August 2011, Liberty found that Ameren-IL's Substation Maintenance group instructed its substation inspectors to report damaged or missing substation ground conductors during their monthly inspections. Ameren-IL also included inspecting substation equipment grounds in its written checklist for the more inclusive twice-a-year seasonal substation inspections. Equipment-ground conductor inspections are necessary because theft of copper grounding conductors is an issue that affects all electric utilities. Ameren-IL does not conduct maintenance testing on a regular basis for substation-ground grid continuity and for step potentials, because it has not been proven that this labor intensive testing is cost effective.

Liberty found that Ameren-IL met its commitment for this recommendation. However, as indicated in a February 16, 2010, letter to Liberty, Ameren-IL said that it might not be able to fund the complete implementation of certain recommendations, including V-18, until and if the ICC approves a special funding request. The reason for the funding request on this recommendation involves the need for an additional design engineer and an additional substation maintenance engineer to implement fully the recommendation.[442] Despite the matter of an open funding request, which Ameren-IL indicates is to continue its current efforts, Liberty considers this recommendation verified and closed.

[442] Response to Data Request #1600.

Recommendation

V-19

Revise substation grounding adequacy review process.

Background

Liberty recommended that Ameren-IL develop a procedure that allows for substation grounding design data retention for future use. Ameren should revise its substation grounding review process such that whenever it adds new equipment to the system, it can verify grounding for adequacy at both the equipment addition location and locations remote to the equipment location. Ameren-IL should verify grounding grid continuity and integrity at a specified interval.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation and committed to taking actions as outlined for Recommendation V-18.

Verification Discussion and Conclusions

Please refer to Recommendation V-18, Part A. In August 2011,[443] Liberty found that Ameren-IL conducts grounding-grid adequacy studies, as part of new or modified substation capital projects, on substations where system changes might affect the performance of ground grids, and on substations where poor relaying, fault locating, and lightning performances indicate possible grounding problems. Ameren-IL has been conducting formal software-driven substation-ground grid-adequacy studies based on these criteria since 2009. As of July 29, 2011, Ameren-IL engineering completed grounding reviews on 88 (6.4 percent), of its 1,373 substations. It completed most of the substations reviews as part of capital improvement projects at the substations. Ameren-IL hired a student intern under Ameren-IL supervision for much of the analysis work to demonstrate its commitment to completing station reviews.

Ameren-IL intends to continue the review of substation grounding adequacy as part of capital substation construction and modification projects, whenever fault duty changes, or other related issues occur. However, Ameren-IL said that it does not repeat substation grounding adequacy reviews on a periodic maintenance basis, nor does it conduct substation-grounding reviews on existing unmodified substations where it has not identified grounding operational issues. Ameren-IL determined that periodic analysis of the grounding in substations is not cost effective.

Liberty found that Ameren-IL met its commitment for this recommendation as discussed under Recommendation V-18, Part A. Liberty considers the verification work for this recommendation complete.

[443] Interview # 447, August 18, 2011, and response to Data Request #1580.

Recommendation

V-20

Implement the uniform distribution construction standards as planned for early 2008.

Background

Liberty found that the Ameren-IL companies used different construction standards. However, the construction standards were evolving into a single standard for application across the three operating companies and should result in acceptable and up-to-date engineering practices when complete.

Ameren-IL introduced new distribution design standards in early 2008; they will apply to all new distribution construction. Ameren-IL will base all new distribution construction on these standards and that should result in common acceptable industry practices.

Ameren-IL's Implementation Plan

Ameren-IL indicated that it introduced new distribution construction standards in April 2008; they will apply to all new distribution construction. Ameren-IL said that the implementation of this recommendation is complete.

Verification Discussion and Conclusions

Ameren-IL provided the new standards book (March 2008) and documentation showing that each division had implemented the standards (January 2009).[444] In November 2009, Liberty and Ameren-IL discussed the implementation, responsibilities, and content of the Ameren-IL construction standards.[445] To a large degree, the standards are common for all three Ameren-IL companies. There are some company-specific standards for matters like street lighting and to cover repairs or additions to company-unique arrangements.

Ameren-IL met its commitments related to this recommendation. The Ameren-IL companies will benefit from having common distribution construction standards. Liberty considers this recommendation verified and closed.

[444] Response to Data Request #1035.
[445] Interview #301, November 5, 2009.

Recommendation

V-21

Develop a common and up-to-date engineering manual for the entire Ameren-IL territory.

Background

Liberty concluded that Ameren-IL did not have an acceptable and up-to-date engineering manual. The engineering manuals for Ameren-CIPS and Ameren-CILCO were incomplete at the time of their mergers and remain out-of-date. The Ameren-IP engineering manual contains quality and complete engineering information but is now over five years old and needs updating. Ameren-IL issued a set of engineering guidelines called the PS Guidelines. These guidelines cover various engineering topics. The process of issuing these guidelines began in 2003 but Ameren-IL placed it on hold in the spring of 2006.

Liberty recommended that Ameren-IL immediately begin the process of updating engineering design tools for field personnel. This update would include common technology, current software packages, and a common engineering manual.

Ameren-IL's Implementation Plan

Ameren-IL agreed to begin the process of updating engineering design tools in the first quarter of 2009, with the intention of completing a common, comprehensive Ameren-IL engineering manual within five years. The scope of this recommendation is different from, and a much greater effort than, the accomplishments that have been achieved in developing a single set of distribution construction standards. Construction standard consistency supports Strategic Sourcing and results in purchasing efficiencies, and cost savings, through standardization of materials. Although recognized as valuable, updating engineering design tools on common technology and software packages can result in significant expenditures and time commitments that require cost-benefit prioritization. The additional time is necessary to ensure that Ameren-IL can develop a roadmap to prioritize the order and expenditures necessary to accomplish this recommendation.

Verification Discussion and Conclusions

During a November 2009 interview, Ameren-IL presented and described the outline (or planned table of contents) for two engineering manuals.[446] One of these would be for electric engineers and the other for electric estimators. These outlines appeared to be comprehensive. For some topics (e.g., overhead conductor use and ratings), the outlines contained links to existing procedures or guideline documents. Others still required development. The intent would be to have common and up-to-date manuals available by computer to engineers and estimators throughout Ameren-IL. Ameren-IL also presented and discussed two flow charts that showed the process for creating the manuals and for updating them.[447] Any manual users would have the ability to comment or suggest changes.

[446] Interview #302, November 4, 2009, and responses to Data Requests #1331 and #1332.
[447] Responses to Data Requests #1333 and #1334.

In November 2010, Ameren-IL indicated that aside from the development of a draft project plan and improvements to the categorization of the manual, it had made very little progress developing the engineering manual.[448] Ameren-IL indicated that it does not have the funding to pursue this project and its schedule does not call for substantive progress until the beginning of 2012. Liberty will review Ameren-IL's status in the future, but it appears likely that Ameren-IL will accomplish little on this effort until after Liberty's verification work is complete.

In November 2012, Liberty and Ameren-IL reviewed the progress on this recommendation.[449] Ameren-IL received the funding for the project in early 2012, and restarted its planning. Key matters reviewed with Ameren-IL included:

- In the second quarter of 2012, Ameren-IL hired two standards engineers for the project management team.
- There is a "Project Charter" that sets out the objective, sponsors, scope, deliverables, and schedule for development of the engineering standards.
- On October 1, 2012, the president of Ameren-IL sent a written message to all employees emphasizing the importance of the Electric Distribution Design Standards project. This level of clear executive support bodes well for success of the project.
- There is also a written statement of policy signed by the Ameren-IL VP of Operations and the Ameren-Missouri VP of Energy Delivery indicating "these standards define the manner in which the Ameren Electric Distribution System shall be designed and constructed in order to provide safe, reliable and cost effective electrical service to out customers."
- On October 5, 2012, Ameren (both states) conducted a project-planning meeting for the designated sponsors and delegates. Topics covered included the project organization, progress to date and schedule, responsibilities, and action items.
- Liberty and Ameren reviewed the latest list of standards for both design and estimating, the schedule for each, and one completed design standard (on cable ratings).

Overall, the project is about 10 percent complete. The schedule calls for Ameren to complete all of the standards by late 2014. With the planning and work accomplished through November 2012, and the explicit executive support, Liberty is confident that Ameren should be successful in creating a quality set of common engineering standards. Liberty's verification work on this recommendation is complete.

[448] Interview #410, November 8, 2010, and response to Data Request #1454.
[449] Interview #498, November 7, 2012, and response to Data Request #1658.

Recommendation

V-22
Develop uniform distribution design processes.

Background

Liberty concluded that Ameren-IL would benefit from standardization and uniformity across the three operating companies in its distribution design processes. The evolution of the distribution divisions with the three operating companies resulted in overlapping geographical boundaries and process differences within each division. Each division developed complex reporting and technical review relationships in its design process. The Ameren-IP Distribution Design Center concept appears to offer a model for efficiency and standardization that Ameren-IL should consider for other parts of its territory. In addition, Ameren-IL should investigate upgrading some of the tools used by the Distribution Design Center to a Windows-based environment.

Ameren-IL's Implementation Plan

Ameren-IL agreed with this recommendation and said that it is currently in the process of evaluating the engineering design practices of Ameren-IP, Ameren-CILCO, and Ameren-CIPS. Ameren anticipates developing a model to ensure consistency and improved customer satisfaction throughout the Ameren Illinois service territory.

Ameren is also currently upgrading its Graphical Information System and will expand the upgraded system throughout the Ameren Illinois companies by the end of 2009. Ameren will also investigate newer, more user-friendly tools as well.

Verification Discussion and Conclusions

Ameren-IL provided a description of the overall process of receiving and implementing customer requests for new business. Three general phases are taking customer requests, performing the engineering work, and scheduling and reporting the change.[450]

Ameren-IL is working toward common methods of taking customer requests. The web site http://www.ameren.com/BusinessPartners/Construction/Pages/ConstructionServicesHome.aspx provides three options for a customer to initiate a request to add or change electric or gas service for a residential or commercial property. These are:

- Initiate a request online
- Fax in the application to 217.424.6758
- Call 888.659.4540 to talk with a representative

In the Ameren-IP area, nearly 50 percent of recent requests have come through the on-line method. Ameren-IL hopes to use this method more in the future. Requests from all three options go to a centralized location (Decatur) and customer requests from any source go to a common database. It is part of a tool called Illinois Construction & Optimization Tool (ICOT), which is

[450] Interview #364, May 11, 2010.

under development. Ameren-IL indicated that it implemented this tool in 2010, and said it now calls it the Customer Request Tracking System (CRTS).[451]

During a November 2009 interview, Ameren-IL provided and discussed a document titled "Ameren Illinois Utilities Engineering and Design Process Alignment," dated May 19, 2009.[452] Ameren-IL's conclusion after considerable study and internal discussion was that it was not able to implement a standard, uniform design process. It does plan to make some changes, but ingrained practices and some union/non-union issues prevented a complete change. Liberty aimed its recommendation as something that could benefit the company, but did not base it on existing problems. Liberty viewed Ameren-IL's inability to implement a uniform process as a missed opportunity for improvement and efficiency, but not a problem from any safety or reliability perspective.

In November 2010, Ameren-IL indicated that with the merging of the three Illinois companies into the new legal entity, Ameren Illinois, there has been an increased emphasis on having a more uniform distribution design process.[453]

Ameren-IL plans to centralize electric planning, sub-transmission project work, reliability program work, and some other functions in a group based in Peoria. This allows the divisions to focus more on customer-specific work. In general, most small jobs would stay with the field office and the non-union design center in Peoria or the union design center in Belleville would handle larger jobs. These appear to be logical and reasonable organizational changes.

The second phase, performing the engineering work, remains similar to that described to Liberty in November 2009.[454] Because of the personnel reduction programs in the fall of 2009, the unknowns associated with Ameren-IL's rate case, and the lay-offs of some contractors, Ameren-IL has not fully implemented the changes suggested by the May 2009 report on engineering and design process alignment,[455] which among other things called for a distribution engineering organization with some unfilled positions. Ameren-IL indicated that it would re-visit that report in the coming months and make decisions on what changes to implement. Some differences around the state involving the degree to which engineering is centralized and which engineering functions are unionized will likely remain.

Ameren-IL reported that the third phase, scheduling and reporting engineering changes, has common tools and reports in all divisions.[456]

Ameren-IL also explained some of the problems it is having in upgrading and standardizing its GIS.[457] It had planned to complete this effort by the end of 2009, but reported that it would not happen by then. In May 2010, Ameren-IL reported that its GIS upgrade project is close to full

[451] Interview #410, November 8, 2010.
[452] Interview #302, November 4, 2009, and response to Data Request #1330.
[453] Interview #410, November 8, 2010.
[454] Interview #364, May 11, 2010.
[455] Response to Data Request #1330.
[456] Interview #364, May 11, 2010.
[457] Interview #302, November 4, 2009, and response to Data Request #1329.

implementation, but some issues and training remain.[458] In November 2010, Ameren-IL indicated that the system, GTECH, is operational in some areas but not in others.

Liberty's overall conclusion is that the common engineering manuals (Recommendation V-21) and the partial organization changes are positive steps. Liberty will re-visit Recommendation V-22 in 2011.

In November 2011, Liberty reviewed documents and discussed Ameren-IL's progress on this recommendation.[459] Liberty learned that Ameren-IL has fully implemented uniform distribution design processes. Ameren-IL indicated that the changes brought about by this recommendation were among the most valuable transformations coming out of the audit. Ameren-IL now has two design centers, a non-union center in Peoria and the existing union shop in Belleville. It has implemented new technology for consistency in areas such as customer billing and mapping. It now has consistent standards, calculations, performance measures, identification of field-only jobs, and other aspects to a distribution system change from initial customer contact to final job closeout.

Liberty considers this recommendation verified and closed.

[458] Interview #364, May 11, 2010.
[459] Responses to Data Requests Nos. 1618-1621, and Interview #461, November 3, 2011.

Recommendation

V-23

Develop short-time emergency ratings for the sub-transmission and transmission components.

Background

Liberty recommended that Ameren-IL develop short time (30-minute) overload ratings for its transmission and sub-transmission system components. Liberty believed that the general use of short-time component ratings might be useful for:

(1) transmission and sub-transmission systems planners to possibly defer new transmission construction if using short-time ratings would temporarily resolve loading problems requiring the new construction, and

(2) transmission and sub-transmission systems operators to know the maximum 30-minute loadings that can applied to transmission equipment, under specific ambient conditions, during the switching of loads that would otherwise require shedding loads to prevent exceeding the 8-hour loading limits.

Ameren-IL's Implementation Plan

Ameren-IL did not accept the recommendation to apply 30-minute short-time emergency ratings on its transmission lines and transformers for deferring construction costs. However, Ameren planning and operations do routinely review the need for applying short time, 30-minute ratings to some transmission transformers on a case-by-case basis to allow time to implement operational guides to mitigate possible operational issues with the specific equipment.

Ameren-IL did not accept the recommendation to apply 30-minute short-time emergency ratings on its sub-transmission lines and transformers for deferring construction costs. Conductors reach maximum temperatures within 30 minutes after peak loads based on the 8-hour emergency ratings. Therefore, 30-minute emergency ratings would not be greater than 8-hour emergency conductor ratings. For its bulk supply (sub-transmission) transformers, Ameren-IL uses normal ratings, long-term emergency ratings, and 24-hour short-term emergency ratings in its planning studies. The loading profile for the 24-hour transformer ratings are based on reaching the peak load for a limited period once during the day, which would essentially be the same as 30-minute ratings, if applied.

Verification Discussion and Conclusions

Liberty discusses uniform bulk-supply transformer rating parameters under recommendations V-1 and V-24.

Part A – Transmission[460]

Ameren transmission system planners base transmission line and transformer ratings on line design parameters, the design of the MISO security-constrained economic dispatch market, and the contingency conditions specified by NERC. Ameren maintains the ratings in its Data Book and reports the ratings to MISO in the Energy Management System databases and in a standardized electronic form. Both submissions include summer and winter, long-time, and 8-hour ratings for each circuit at specific ambient temperatures of 40°C and 10°C. Ameren-IL

[460] Interview #311, November 3, 2009, and responses to Data Requests #1300 and #1301.

indicated that some utilities include 30-minute ratings in the their planning studies and in MISO data books because those utilities have temporary system problems making their systems less thermally stable under some MISO market design conditions. Ameren-IL's position was that it is risky to have a planned need to use 30-minute ratings, as this leaves no margin in operations for conditions outside of "normal" planning criteria. It is Ameren's policy to maintain a dependable transmission system, for which it would rarely need 30-minute ratings.

Ameren transmission operations use dynamic ratings to maximize the Ameren-IL transmission system emergency capability based on actual, real-time ambient temperatures. Planners use long-time and 8-hour emergency ratings at 40°C and 10°C for the summer and winter ratings. Therefore, operators can exceed planned summer ratings when the actual ambient temperatures are much lower than 40°C. Transmission operators use a computer program to determine actual conductor ratings under various conditions. In addition, planners assigned to the transmission operations group calculate loads and ratings for planned maintenance and construction outages, and assist operators with determining specific line, substation, and transformer emergency ratings under switching and emergency conditions, which might include in a few cases 30-minute transformer ratings.

For operating purposes, Ameren-IL has identified short time, 30-minute ratings for a few transmission transformers (nine transformers in seven substations) where the suitability (transformer age, condition, and construction) for 30-minute transformer ratings exist. These 30-minute ratings are available to operators until they implement measures to mitigate operational issues with specific equipment.

A few years ago, Ameren planners began identifying transmission substations and transformers in the planning process where having 30-minute ratings might be useful under some switching situations. The planners continue to do so via the annual planning process. Additionally, Ameren transmission operators may add substations to the list where real-time operations reveal that it is desirable to have additional opportunities for 30-minute transformer ratings. Ameren does not calculate these 30-minute ratings for transmission lines because it might violate necessary line clearances. Ameren bases line designs and tree-trimming clearances on long-time and 8-hour line ratings, not on 30-minute ratings.

In November 2009, Liberty found that Ameren-IL met its commitment. Ameren-IL's method of using only long-time and 8-hour transmission system emergency ratings at specific summer and winter temperatures is consistent with good utility practice. This method complies with NERC contingency requirements and with MISO stable market design requirements. Purposely planning to operate with 30-minute emergency ratings on transmission lines and on old multi-million dollar transmission transformers to defer construction costs is risky and inappropriate. In general, the need for Ameren-IL to use 30-minute ratings for planning purposes is unnecessary.

Liberty also found that Ameren-IL's method of operating its transmission system using dynamic ratings, and in a few cases including 30-minute transformer ratings, maximizes the thermal capability of the Ameren-IL transmission system and is good utility practice. Liberty considers this part of the verification closed.

Part B – Sub-Transmission[461]

Ameren-IL planning applies normal and emergency conductor ratings, based on predetermined temperatures for the summer, spring and fall, and winter seasons, and other parameters such as conductor annealing temperatures and line ground and tree clearances. Ameren-IL does not provide a 30-minute conductor rating because a conductor generally attains steady state temperature within 30 minutes of applying the 8-hour rated load, and a 30-minute rating would be no greater than the 8-hour rating. Loading conductors in excess of the emergency ratings to defer construction costs would risk conductor annealing and excessive sag.

Ameren-IL planning applies emergency ratings to its bulk supply (sub-transmission) transformers that generally allow loading up to 130 percent (more or less)[462] of the nameplate rating for a short time during a 24-hour period, or for several short times during a long-time emergency. Therefore, a 30-minute transformer rating is unnecessary.

Actual emergency ratings are determined by factory heat run tests, or from heat run calculations based on IEEE Standard C57.91-1995 (2004), that consider transformer top oil temperature limits, winding hot spot temperature limits, and the percent of transformer insulation life lost limits (generally 2.5 percent). Current transformer and relay ratings or settings sometimes limit transformer emergency ratings. Ameren-IL determines the emergency rating of each transformer by whichever parameter is the most restrictive.

Ameren-IL sub-transmission dispatchers use the ratings that planning uses for its studies, and dispatchers do not use a dynamic rating method based on actual ambient temperatures, as transmission system operators do. However, Ameren-IL reported that planners might assist dispatchers, using conductor rating software and specific transformer loading capability data, to help make emergency loading decisions for specific equipment outages and switching situations under specific ambient temperature conditions.

In November 2009, Liberty found that Ameren-IL met its commitment. Ameren-IL planners appropriately apply emergency ratings for its sub-transmission planning studies, consistent with good utility practice. Planners have no need to implement 30-minute ratings on its sub-transmission system because conductors tend to reach steady-state temperatures within 30 minutes after the 8-hour rated load is applied and transformers generally can be loaded up to 130 percent (more or less) of the nominal rating for a short time.

Liberty found that Ameren-IL dispatchers' use of Planning's emergency ratings to operate the sub-transmission system is consistent with good utility practice. Ameren-IL could maximize the sub-transmission system emergency capability if dispatchers used a dynamic rating method, as used by transmission system operators, to determine real-time temperature-based emergency ratings for line conductors and transformers. Liberty considers this part of this verification closed.

[461] Interview #312, November 12, 2009.
[462] The default maximum rating is 130 percent if Ameren-IL does not have the data to run the heat run calculations. Ameren-IL may use a higher limit if supported by the transformer heat-run calculation and no more restrictive limits, such as relays, exist.

Recommendation

V-24

Make design basis assumptions the same in power ratings of the transmission, sub-transmission, and distribution systems.

Background

Liberty recommended that Ameren-IL use the same design basis assumptions (parameters) for developing power ratings for the same equipment used on the transmission, sub-transmission, or distribution systems.

Ameren-IL's Implementation Plan

Ameren-IL indicated that by March 24, 2009, it will have standardized its design assumptions used for transmission, sub-transmission, or distribution conductors, and will start applying the same ratings for the same conductors, whether used on the transmission, sub-transmission, or the distribution systems. It will include the modified distribution design parameters for rating conductors and the new ratings in the distribution conductor-rating standard used in the sub-transmission planning standards as discussed in Ameren-IL's response to Recommendation V-1.

Because of different modes of operation, Ameren-IL uses and will continue to use different design bases and ratings for transmission, sub-transmission, and distribution transformers, as discussed in Ameren-IL's response to Recommendations V-16, V-17, and V-23.

Verification Discussion and Conclusions[463]

Ameren-IL indicated that in cases where both transmission and sub-transmission/distribution planners use the same conductors, some load ratings were different because design parameters (emissivity and absorptivity factors, operating temperature limits, and design-to seasonal temperatures) used by transmission planning and by distribution planning groups among the three companies were different. Since transmission planners must use design parameters and conductor ratings as reported to MISO, they use transmission-conductor rating parameters as the basis for the revised sub-transmission and distribution rating parameters. Distribution planners modified the sub-transmission and distribution-system design parameters and conductor ratings to meet the transmission design standards. Ameren-IL developed the modified summer, spring/fall, and winter normal and emergency conductor ratings, based on the now common parameters, on February 18, 2009, and issued them in the Ameren Distribution Construction Standards, Rev. No. 1, dated May 19, 2009.

Ameren-IL indicated that distribution planners and design engineers are now starting to use the new ratings and Ameren-IL is in the process of updating the line loading limits and load flow studies, reflecting the new standardized conductor ratings. The implementation plan for Recommendation V-1 calls for Ameren-IL to be fully using the new standards in performing system-planning studies by October 8, 2010.

[463] Interview #310, November 12, 2009, and responses to Data Requests #1299 and #1302.

In November 2009, Liberty found that Ameren-IL met its commitment. Ameren-IL standardized its conductor rating methods and its conductor ratings by March 24, 2009, and started using the standardized ratings in its planning studies. Liberty considers this recommendation verified and closed.

Recommendation

V-25

Separate outdoor substation design guidelines from indoor urban substation design guidelines

Background

Liberty found that Ameren-IL should separate its indoor substation switchgear protection schemes used in urban areas from its outdoor bus protection schemes used in rural areas.

Ameren-IL's Implementation Plan

Ameren-IL reported that it would include a clear distinction in these protection configurations in its Standard 14G by 10/8/09.

Verification Discussion and Conclusions[464]

Ameren-IL's revised T&D Design Standard No. 14G now includes new Section 7.0 "Outdoor Substation Design," which distinguishes design and protection guidelines specific for outdoor substations from general substation guidelines. Ameren-IL dated the revision to the design Standard No. 14G October 9, 2009.

The contents of Sections 2.0 through 6.0 of the T&D Design Standard No. 14G provide guidelines to engineers for bus designs, feeder, bus, and transformer protection schemes, automatic transfer schemes, and automatic load reduction schemes that generally apply to both indoor and outdoor substations. The new Section 7.0 refers only to outdoor substations and adds guidelines for coordinating tripping and reclosing of old-style hydraulic reclosers with feeder and transformer fuses, automatic transfer schemes, and SCADA usage.

Liberty found that Ameren-IL has separated protection guidelines specific for outdoor substations from protection guidelines for indoor substations. Ameren-IL met its commitments related to this recommendation. Liberty considers the recommendation verified and closed.

[464] Interview #334, January 26, 2010, and response to Data Request #1340.

Recommendation

V-26

Establish a defined period for system-wide review of transmission and sub-transmission coordination.

Background

Liberty recommended that Ameren-IL formalize its goal of conducting system-wide reviews of its relay coordination between the transmission system and the sub-transmission systems within 10 years.

Ameren-IL's Implementation Plan

Ameren-IL indicated that it would develop a plan and tracking database for the 10-year relay transmission and sub-transmission coordination studies program by April 8, 2009.

Verification Discussion and Conclusions[465]

On February 10, 2009, Ameren-IL implemented the formal plan and schedule for its 10-year system-wide transmission and sub-transmission protective device coordination program. The program includes approximately 300 Ameren-IL transmission and bulk power substations. To complete the overall program within 10 years, the system protection group must conduct at least 30 coordination studies per year. By November 2009, Ameren-IL conducted 51 studies, and it plans to conduct a similar number in 2010. System protection engineers in Decatur conduct most of the studies for Ameren-IL and St. Louis system protection engineers conduct some.

Ameren-IL triggers (or moves ahead on the schedule) coordination studies when required by planning for proposed projects that might affect system fault duties and when annual planning studies indicate the need. In addition, the coordination studies include the effect on fault duties by the changes made to the sub-transmission conductor ratings indicated in the recently revised Ameren Construction Standard.

In the past, Ameren-IP used an assumed ground resistivity basis for calculating zero-sequence currents (ground fault currents) that was different than the basis used by the other the Ameren-IL companies. Ameren-IL standardized its assumed ground resistivity parameter, resulting in about an 8 percent change in zero-sequence fault duties for Ameren-IP's systems. In its response to Recommendation V-27, Ameren-IL indicated that by 2014 it would complete ground coordination studies for the Ameren-IP relaying. Therefore, Ameren-IL has required that the transmission to sub-transmission relay coordination studies (which will include ground coordination studies) for Ameren-IP would be complete by the end of 2014.

In November 2009, Liberty found that Ameren-IL met its commitment. Ameren-IL implemented a formal plan and schedule for conducting transmission to sub-transmission relay-coordination studies. It prioritizes substations based on the date of previous studies, annual planning needs, and as required to comply with Recommendation V-27. This verification remains open. Liberty will review coordination program progress later.

[465] Interview #313, November 12, 2009, and response to Data Request #1303.

In February 2011, Ameren provided documents showing that it completed 46 coordination studies for Ameren-IL in 2009 and 16 studies in 2010.[466] It had scheduled 36 studies for 2010. However, because two of its engineers left Ameren employment in 2010, Ameren could not complete all of its scheduled studies. It was still on the 10 percent per year completion rate track by completing 21 percent of all program studies durng 2009 and 2010. To maintain the completion rate, Ameren has since hired a new engineer who has completed five more studies in January 2011. It scheduled and plans to complete 75 studies for 2011. Liberty will revisit Recommendation V-26 later to monitor program compliance.

In November 2011, Ameren-IL reported that as of October 17, 2011, it completed 40 of the 75 planned coordination reviews scheduled for 2011.[467] It also conducted 14 other transmission/sub-transmission coordination reviews not scheduled for 2011, in connection with other engineering projects or other studies. Ameren indicated that it would not complete all of the remaining 35 studies during 2011, but that it will complete any remaining 2011 studies in early 2012. It scheduled 33 new studies for 2012.

Ameren-IL indicated that it would complete all reviews on the Ameren-IP system using the new standard ground resistivity assumption by 2013, consistent with its commitment. It will have completed reviews for all transmission/sub-transmission locations at least once by 2019. Ameren-IL scheduled coordination reviews at least through 2020, but indicated that it plans to continue the reviews, on 10-year cycles, indefinitely.

Ameren-IL reported that although it has not found any critical coordination problems, it has recorded the locations of those protective devices and settings that are not in accordance with current Ameren design, but which are adequate for reliable coordination. When installed, these devices and settings had been in accordance with the legacy companies' designs. This library of devices will help facilitate where it may make upgrades in the future.

In November 2012, Ameren-IL reported that it had completed 61 percent of the coordination studies scheduled for the 10-year period from 2009 to 2019, and will complete the Ameren-IP studies by the end of 2013 per its commitments.[468] As of November, it completed 68 of the 71 studies scheduled for 2012 and will complete the remaining studies before the end of 2012. Ameren-IL hired and reassigned several engineers to assure that it completes the studies as scheduled. It found only a few lines for which the as-found protective device settings may have caused coordination problems.

Ameren-IL complied with its schedule to complete its transmission/sub-transmission coordination studies to date, and it has the plan and resources to continue to complete the studies on at least 10-year cycles. Liberty found that Ameren-IL complied with its commitment and considers the verification of this recommendation closed.

[466] Interview #417, February 15, 2011, and response to Data Request #1477.
[467] Interview #455, November 10, 2011, and response to Data Request #1603.
[468] Interview #490, November 6, 2012, and response to Data Request #1650.

Recommendation

V-27

Use the same ground resistivity in the calculation of system impedances and relay settings in all legacy companies.

Background

Prior to the mergers, the ground resistance assumption used for calculating relay settings by the legacy companies was different. Ameren-IP had used 30 ohm-meters for its ground resistivity assumption for calculating zero-sequence impedance of its lines operating at 34.5-kilovolts and higher. The other legacy companies used 100 ohm-meters. Ameren indicated that this difference caused an 8 percent difference in calculated line zero-sequence impedances. Ameren's initial review of Ameren-IP at the time of its merger indicated that possible protection coordination problems existed between the legacy companies because of the difference between the two assumed ground resistivity values. Ameren-IL found that Ameren-IP had not conducted comprehensive ground coordination studies, but rather performed local area ground-coordination studies with system growth. Liberty recommended that Ameren determine the appropriate standard value to use for ground resistivity, and within five years, recalculate the zero sequence impedances of all affected lines.

Ameren-IL's Implementation Plan

Ameren-IL reported that it began to use 100 ohm-meters as its standard system-wide ground resistivity before October 8, 2008, and that it would recalculate the line impedances on all Ameren-IP lines within 5 years. It also agreed, under recommendation V-28, to review protective device coordination (and relay settings) on all Ameren-IP lines within 5 years.

Verification Discussion and Conclusions[469]

By November 1, 2008, Ameren-IL had reviewed the legacy companies' practices for applying ground resistivity. It determined that it should use 100 ohm-meter ground resistivity company-wide. By September 28, 2009, Ameren-IL had recalculated all Ameren-IP's 34,500-kilovolt and higher lines' zero-sequence line impedances, based on 100 ohm-meters ground resistivity. Furthermore, Ameren-IL formalized the use of 100 ohm-meters in its Standard No. 15G "Design Guide for Transmission and Bulk Substation Relay and Control," dated December 16, 2009.

Ameren-IL uses 100 ohm-meters ground resistivity because neighboring utilities also use this value, and because, based on reviews of coordination problems and outages, Ameren-IL found that the zero-sequence impedances derived from 100 ohm-meters resistivity had been appropriate.

When Ameren-IL recalculated the Ameren-IP line impedances in 2009, it found that in many cases Ameren-IP had used ground resistivity values other than 30 ohm-meters. For about one-half of its lines, Ameren-IP had used 100 ohm-meters. Therefore, line impedances did not change for those lines.

[469] Interview #335, February 12, 2010, and response to Data Request #1341.

In February 2010, Liberty found that Ameren-IL's actions were consistent with its response. Ameren-IL formalized its system-wide use of 100 ohm-meters ground resistivity and recalculated the zero sequence impedances of all Ameren-IP lines, well within its time commitment. Liberty will keep the verification of this recommendation open to check later that Ameren-IL has completed associated work such as updating relay databases.

In February 2011, Ameren provided examples from its Construction Editor and ASPEN Oneliner line impedance model, demonstrating that it had been using 100 ohm-meters conducting coordination studies for the Ameren–IP lines.[470] Ameren indicated and demonstrated to Liberty that it has been using the standard 100 ohm-meters for calculating zero sequence impedances in its 5-year coordination studies for legacy Ameren-IP lines. Recommendation V-27 is closed.

[470] Interview #417, February 15, 2011, and response to Data Request #1478.

Recommendation

V-28

Perform a ground coordination study on the legacy companies whose assumed ground resistivity changes.

Background

Depending on the results of the investigation recommended in V-27, Ameren-IL should conduct a ground coordination study on any legacy company whose assumed resistivity is different from that historically used as latent coordination issues may exist. Ameren-IL should complete the analysis within five years of the date of this report.

Ameren-IL's Implementation Plan

Ameren-IL reported that Ameren-IP was the only company affected, and it will evaluate (review protection coordination) and change all ground relay settings, where appropriate, by October 8, 2013, based on the line impedance changes identified in the investigation conducted.

Verification Discussion and Conclusions[471]

Ameren-IL's Standard 15G dated September, 24, 2007, revised December 16, 2009, covering Ameren's relay and control standards and philosophies indicates that it is Ameren standard practice to analyze protective device coordination and fault detection prior to all known system modifications and installations. In addition, depending on workload, it performs coordination studies on a 10-year cycle, on a per terminal (substation) basis (See recommendation V-26). The coordination review program includes lines terminating at 296 substations. It maintains a system-fault study model and relay database for this purpose. The system model includes the positive, negative, and zero sequence models. It uses a ground resistivity of 100 ohm-meters when calculating zero-sequence line impedances.

According to Ameren-IL's line-protection coordination schedule, it will conduct coordination reviews on all Ameren-IP lines by 2013. This includes 162 lines (terminating in 87 substations). It scheduled coordination reviews, based on the modified line impedances reported in recommendation V-27, completed at 11 of those substations in 2009. The schedule calls for 27 substation reviews in 2010, 3 in 2011, 5 in 2012, and 41 in 2013.

In February 2010, Liberty found that Ameren-IL's actions are consistent with the recommendation. Ameren-IL is on-track toward completing the coordination reviews of the Ameren-IP lines by October 8, 2013. Liberty will continue the verification.

In February 2011, Ameren reported that the 5-year Ameren-IP ground coordination studies program is a subset of the 10-year overall Ameren-IL coordination program.[472] The loss of two engineers in 2010 affected the progress of this program, and it completed only 12 out of 27 planned studies. Ameren provided a list of the lines modified and the status of the coordination reviews. It has reviewed 14 percent (12 out of 87) of the affected lines. Ameren provided a list of

[471] Interview #335, February 12, 2010, and response to Data Request #1342.
[472] Interview #417, February 15, 2011, and response to Data Request #1479.

the lines modified and the status of the coordination reviews. However, Ameren is back on schedule with the hiring of a new engineer. It completed five studies in January 2011. Ameren said that it would complete all Ameren-IP studies by the end of 2013, per its commitment. Ameren found that the change in the standard ground resistivity to 100 ohm-meters had not substantially changed any relay settings and Ameren is confident that the previous ground relay settings were adequate. Liberty will revisit Recommendation V-28 to monitor compliance to this program.

In February 2012,[473] Ameren-IL updated the status of its ground-coordination studies on circuits at the 87 substations affected by the change of Ameren-IP ground resistivity. Ameren-IL completed 31 studies in 2011, bringing the total completed to 57. Ameren-IL plans to complete the remaining 30 studies by the end of 2013.

Consistent with its commitment, Ameren-IL is on track to complete the ground-coordination studies on the affected Ameren-IP circuits by the end of 2013. It completed about the same number of studies in 2011 alone that it needs to complete during the next 2 years. Because there will not be an opportunity to revisit this recommendation in 2013, Liberty considers this verification closed.

[473] Response to Data Request #1624.

Recommendation

V-29
Complete the sub-transmission-equipment event database.

Background

Ameren-IL has established effective processes for the review of system protection performance in response to transmission system operations. Ameren-IL should replicate and extend these practices to include the review of sub-transmission operations because of the significant number of distribution customers ultimately served from sub-transmission facility sources. Ameren-IL recognized the need to complete the equipment event database, but had placed the process on hold.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation. It said that the effort would either create a new database, replacing the SIR, Resume, and MOR systems presently used to track sub-transmission relay operations or modify one of the existing systems used by Relay Design Engineering. Ameren-IL will define and implement a cross-functional process with roles and responsibilities to identify relay miss-operations and significant relay events requiring further analysis and resolution.

Verification Discussion and Conclusions

In December 2008, Ameren-IL presented its plan for developing a sub-transmission event analysis and reporting system that would be common to all three Ameren-IL companies.[474] During 2009, Ameren-IL in fact developed and tested a software application for sub-transmission and substation events. The application is a database that replaced the SIR, Resume, and MOR systems.[475] The system became operational on January 1, 2010. Ameren-IL provided and Liberty reviewed the Users Manual for the system, "screen-shot" reports demonstrating the operational nature and usefulness of the system, and a sample of the database entries.[476]

During November 2010, Liberty reviewed Ameren-IL's progress in maintaining the SED (sub-transmission event database).[477] During the first ten months of 2010, Ameren-IL collected about 2,000 events in the SED. About 25 of these related to suspected relay problems that required some type of maintenance, adjustment, or replacement. The database allows Ameren-IL to analyze trends and common problems.

In a February 16, 2010, letter to Liberty, Ameren-IL said that it might not be able to fund the complete implementation of certain recommendations, including this one, until and if the ICC approves a special funding request. The reason for the funding request on this recommendation is additional staffing to maintain the event database. Ameren-IL met its commitments, and Liberty considers this recommendation verified. However, Liberty will keep the recommendation open

[474] Response to Data Request #1003.
[475] Interview #346, February 4, 2010.
[476] Responses to Data Requests #1371 and #1372.
[477] Interview #411, November 10, 2010.

to confirm later that Ameren-IL continues to capture and analyze sub-transmission equipment events.

In October 2012, Ameren-IL provided the status of the sub-transmission event database.[478] It includes over 5,000 records, about 1,300 of which came in 2012. Ameren-IL assured that there were no funding issues with this now mature and stable system, which has become part of the normal work process of Distribution Operations.

Liberty considers this recommendation verified and closed.

[478] Response to Data Request #1656.

Recommendation

V-30

Meet all distribution-substation transformer damage curves for downstream coordination.

Background

Liberty found that Ameren was aware of inadequacies in the protection of some 12,000-volt and 4,000-volt distribution substation transformers where the transformer-damage curve requirements for adjacent faults were not met due to lack of training and knowledge. Engineers only looked for these inadequacies when they changed line-device settings.

The legacy companies placed a priority on coordination with downstream devices over coordination with the distribution-substation transformer damage curve. Ameren-IL should complete a thorough coordination review including checking the damage curves for all distribution substation transformers for compliance.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation and indicated that it would review all distribution substation coordination in the next five years. It would review approximately 960 substations, about 192 per year. Ameren-IL refers to the review stage of this recommendation as Part A and the implementation stage as Part B.

Verification Discussion and Conclusions

This recommendation is identical with Part 6 of Recommendation VI-16. See that verification for discussions up to August 2011. The 960 substations indicated in this recommendation contained the 2388 circuits discussed in the Recommendation VI-16.

In August 2011,[479] Ameren-IL's System Protection group was on track to complete its substation coordination reviews scheduled for completion by the end of 2012. As of August 1, 2011, Ameren-IL completed 69 percent (1603 out of 2388 total circuits) of the planned reviews. From the 1603 circuit reviews, Ameren-IL has or will make changes on 876 circuits. Currently, Substation Maintenance made changes on 143 circuits. Ameren-IL indicated that Substation Maintenance funding and work force restrictions would likely cause the completion of required changes in the substations to extend past 2013.

Liberty found that Ameren-IL met its commitment and Liberty's intent for this recommendation. However, as indicated in a February 16, 2010, letter to Liberty, Ameren-IL said that it might not be able to fund the complete implementation of certain recommendations, including V-30, which is the same as Recommendation VI-16 Part 6, until and if the ICC approves a special funding request. The reason for the funding request on this recommendation involves additional capital and labor costs required for substation equipment modifications and additions required to implement the changes resulting from the coordination reviews.[480] Despite the matter of an open funding request, Liberty considers this recommendation verified and closed.

[479] Interview #454, August 18, 2011, response to Data Request #1581.
[480] Response to Data Request #1600.

Recommendation

V-31
Review the coordination of division personnel training requirements.

Background

Liberty recommended that Ameren-IL review the training given to division personnel regarding protection coordination. Training related to the comprehensive application of current and ongoing distribution-system protection design principles is required to protect system equipment from premature failure.

Ameren-IL's Implementation Plan

Ameren-IL agreed with this recommendation. It said that the training was complete in four of the six divisions with completion expected by January 2009.

Verification Discussion and Conclusions

During a November 2009 interview, Ameren-IL presented and discussed the course outline and training materials, both of which were based on Standard PS-50, Distribution Feeder Protection.[481] Ameren-IL also provided records of attendance for the training given at each division on the following dates: 4/28/08, 5/5/08, 5/8/08, 6/10/08, 11/5/08, and 11/6/08. The Supervising Engineer, System Protection, was the instructor at all of the training sessions.

Ameren-IL met its commitments related to this recommendation. Liberty considers the recommendation verified and closed.

[481] Interview #303, November 4, 2009, and response to Data Request #1328.

Recommendation

V-32

Perform a cost-benefit study of expanding auto-sectionalizing into the distribution system.

Background

Liberty concluded that the installation of auto-sectionalizing and auto-transfer devices in the distribution system could result in reliability improvements. Ameren-IL planned to consider distribution circuit auto-sectionalizing along with auto-transfers and manually SCADA controlled switches after the sub-transmission circuit program's estimated completion in 2009. Ameren-IL should develop a plan for a prioritized distribution-system auto-sectionalizing and auto-transferring program after the completion of the sub-transmission program in 2009.

Ameren-IL's Implementation Plan

Ameren-IL agreed with this recommendation, saying that it would conduct a study to determine the cost-benefit of expanding auto-sectionalizing on the distribution system.

Verification Discussion and Conclusions

In a November 2009 interview, Liberty discussed the progress on this recommendation with Ameren-IL.[482] Ameren-IL described the process it used to make this study. First, it determined those locations within the distribution system in which feeders had ties, or could be tied to alternate substations. Then Ameren-IL looked at the number of customer interruptions and customer-interruption minutes on each candidate, allowing a ranking by division of the optimal places to install automatic switching devices.

Ameren-IL attempted to get federal "stimulus" money to help finance these and other "smart grid" installations. That effort was unsuccessful. Ameren-IL reported that it submitted a "rider" in recent rate filing with the ICC, hoping to get funds to allow the installation of distribution auto-sectionalizing. The degree to which Ameren-IL will be able to add auto-sectionalizing depends to a large degree on available funds. A typical and simple installation involving two feeders costs in the neighborhood of $150,000 to $200,000.

Ameren-IL also refers to the program as "flisr," which stands for fault locating isolation service restoration. Ameren-IL indicated that the usefulness of such installations is dependent on an improved outage management system, which it hoped to get with the "DMS" replacing "OAS" at some point in the future. (In November 2010, Liberty learned that Ameren-IL plans to implement ABB's DMS system over the course of 2011 and 2012.)[483]

Ameren-IL described a pilot installation in Decatur that involves four circuits. The hardware for the installation is in, and Ameren-IL plans to add the software and testing before the end of 2009.

In November 2010, Ameren-IL confirmed that the Decatur installation is in service. While there have not been any incidents that required switching an entire feeder, the added isolation

[482] Interview #304, November 5, 2009.
[483] Interview #412, November 10, 2010.

capabilities have avoided customer interruptions. An additional installation in Edwardsville included one of Ameren-IL's 2009 worst performing circuits.

In August 2011, Ameren-IL described the advanced circuitry installations on and planned for its system.[484] Ameren-IL also described a June 2011 incident in which the Decatur installation worked as designed following an animal intrusion.[485] The automatic circuit transfer saved about 12,000 customer-interruption-minutes. Further emphasizing the value of the installation, another adjacent and affected circuit that did not have the installation resulted in customer interruptions.

Liberty found that Ameren-IL met its commitments related to this recommendation. Ameren-IL's analysis of auto-sectionalizing and other advanced circuit controls show significant reliability benefits. Liberty considers this recommendation verified and closed.

[484] Interview #441, August 2, 2011.
[485] Response to Data Request #1589.

Recommendation

V-33

Improve lightning protection performance of older 138,000-volt, single-pole structures.

Background

Liberty recommended that Ameren-IL improve the lightning performance of its older single-pole 138,000-volt lines. Ameren-IL should evaluate these lines to determine which lines are not within lightning performance industry standards, and take actions that could include lowering tower footer resistance, providing better shielding, redesigning structures, or a combination of all three.

Ameren-IL's Implementation Plan

Ameren-IL indicated that it would identify lightning-caused line trips on its existing single pole 138,000-volt lines by reviewing transmission line fault data and verifying them by using the FALLS lightning analysis database. Ameren-IL will review the results for impact on the Ameren-IL system, and based on this impact, identify corrective measures required. It will complete the review by October 8, 2011.

Verification Discussion and Conclusions[486]

Ameren-IL reviewed its single-pole, 138,000-volt transmission line faults occurring from 2000 through 2008, and using the FALLS lightning location and intensity program, identified which faults were lightning caused. It also evaluated the lightning-caused faults to identify locations exceeding the acceptable rate of two lightning-caused faults per 100 miles per year. Ameren-IL identified only six short line segments (each approximately ½ mile in length) on three lines that experienced lightning-caused faults in excess of the acceptable rate. Ameren's inspection contractor will inspect the six line segments by December 1, 2009, for conditions that might affect lightning performance, including broken insulators, and loose and broken ground connectors. Ameren-IL provided inspection sheets, specially designed for this inspection, to the contractor. Ameren-IL reported that it would conduct repairs on the line segments, as needed, based on the results of the inspections.

Using the Multi-Flash[487] lightning performance computer-model program, Ameren also evaluated the typical single-pole, 138,000-volt line design that uses a single shield wire and braced-post insulators. Ameren concluded from this study that the 138,000-volt rated braced-post insulators and the single shield wires used in this design did not provide the desired level of lightning protection. Based on these conclusions, Ameren revised its typical design for new single-pole, 138,000-volt lines. It will typically be using 161,000-volt rated braced-post insulators rather than 138,000-volt braced-posts insulators, and it will install two shield wires, rather than one. Ameren-IL reported that it is not planning to update Ameren-IL's existing single-pole, 138,000-volt lines to the new design standards because, other than the six segments identified as poor performers, the lines have been performing within Ameren criteria.

[486] Interview #314, November 12, 2009, and response to Data Request #1304.
[487] Ameren-IL is replacing the Multi-Flash program with a more sophisticated EPRI lighting design program called T-Flash (see Recommendation V-36).

In November 2009, Liberty found that Ameren-IL met its commitment. Ameren reviewed lightning performance on Ameren-IL's single-pole, 138,000-volt lines, identified six line segments that exceeded transmission line lightning performance criteria, and plans to identify and repair physical deficiencies that might contribute to the poor lightning performance exhibited by the line segments.

Ameren upgraded the single-pole, braced-post insulator 138,000-volt line design with higher voltage insulators and two shield wires. However, Ameren-IL did not commit to upgrading single pole lines currently in service because, other than the six lines segments identified as poor lightning performers, the old design is performing within Ameren-IL criteria.

In November 2009, Liberty indicated that it would continue its verification to report on the inspection findings and corrective actions taken to improve the lightning performance of the six line segments.

In February 2011, Ameren indicated that the six Ameren-IL single-pole, 138,000-volt lines that might have exceeded transmission line lightning performance criteria were:[488]

- East Galesburg-Galesburg Monmouth -1392
- Havana-Galesburg Monmouth-1362
- Havana-Springfield-1422
- Jacksonville Industrial-Meredosia, East-1612
- Mattoon, West-Neoga, South-1
- Springfield-Tazewell-1384

Ameren indicated that in 2009 it conducted detailed inspections, including pole-ground resistance readings, on the two lines with the strongest evidence, the Galesburg and Jacksonville lines. It identified and corrected minor deficiencies that might affect lighting performance. Ameren indicated that the inspections did not reveal any systematic issues related to lightning performance.

Liberty will revisit Recommendation V-33 later to report on lightning performance for these lines since 2000, and on inspections and corrective actions made to the other four Ameren-IL 138 kV single-pole transmission lines.

In February 2012, Ameren-IL reported that for 2010 and 2011 lightning performances of the six line segments listed above were at or better than the lightning performance expectations for the Ameren transmission system.[489] During this two-year period, only the Jacksonville line was ascribed a lightning-caused interruption. Ameren-IL indicated that this one interruption might not have been lightning caused because no lightning stroke was reported by the National Lightning Detection Network near this line at the time of the interruption. Ameren concluded that no additional corrective actions were necessary.

[488] Interview #418, February 15, 2011, and response to Data Request #1480.
[489] Response to Data Request #1625.

Liberty found that Ameren complied with its commitment to analyze lightning performances of Ameren-IL's single-pole 138kV lines, and to identify and to conduct mitigation actions to assure that the lines' lightning performances are within expectations. Liberty considers this verification closed.

Recommendation

V-34

Analyze overall lightning protection for older substations. (Also, see Recommendation VI-26)

Background

Liberty recommended that Ameren-IL analyze overall lightning protection for older substations.

Ameren-IL's Implementation Plan

In its responses to this recommendation and Recommendation VI-26B, Ameren-IL indicated that, by June 30, 2009, it will identify lightning-caused distribution substation outages occurring over the past 5 years and will develop a plan to analyze lightning protection design of all Ameren-IL distribution substations built prior to 2003. By October 31, 2011, it will have completed lightning protection design analysis for all older substations and will have developed recommendations and cost estimates for improving lightning protection at those substations that do not meet current Ameren standards.

Verification Discussion and Conclusions

Ameren-IL reported that its review of substation lightning protection in underway. It completed the project scope and schedule, as well as the assessment criteria and outage data for the last 5 years. It is analyzing the data and comparing them to the utility industry. Ameren-IL also reported that it would review lightning protection (arresters, masts, and shield wires) in all distribution substations (about 1,000) before the end of 2011. It is developing an Ameren-IL Lightning Protection Guide, based on IEEE 998, Direct Stroke Lightning Protection. Ameren-IL indicated that this guide would be finished by the end of 2009. Ameren-IL indicated that it has improved lightning protection in a few substations recently by upgrading or moving 12kV lightning arresters closer to transformer bushings. Liberty noted that the 12kV sections of some substations it had recently inspected appeared to be protected adequately with lightning masts or shield wires and some were not protected.[490]

In November 2009, Liberty found that Ameren-IL is complying with it responses to these recommendations. Ameren-IL is progressing on its development of a Lightning Protection Guide, which is to be finished by the end of 2009, and it is conducting some substation lighting protection improvements. It plans to continue review of all Ameren-IL substations for need of lightning protection improvements until completed by October 3, 2011. Liberty will revisit Ameren-IL's progress in improving lighting protection on its distribution substations in about one year.

In August 2010,[491] Ameren-IL reported that it conducted a study to determine lightning protection performance for its distribution substations. It compared the theoretical distribution substation susceptibility to lightning strikes (based on VAISALA Cloud-to-Ground Strike Flash Densities records) to the actual number of lightning-caused distribution substation outages experienced from 2004 through 2008 (derived from OAS data).

[490] Interview #321, November 3, 2009, and response to Data Request #1311.
[491] Interview #382, August 9, 2010, and response to Data Request #1396.

Theoretical Lightning Exposure

Based on VAISALA Data from 1996 to 2008, the lightning flash density in Illinois averaged about 14 lightning strikes per square mile each year. Therefore, using an average distribution-substation size of 150 feet by 150 feet, about 0.0114 lighting strikes should occur in a distribution substation each year. Said another way, one would expect lightning to strike structures, equipment, or shield wires in an average Ameren-IL distribution substation about once every 87.5 years. Without shielding protection, one could expect a lightning-caused outage for each substation once every 87.5 years.

Actual Ameren-IL Distribution Substation Outages Caused by Lightning Strikes

Ameren-IL recorded seven lightning-caused outages at its 1,221 distribution substations from 2004 through 2008, or 0.00115 lightning-caused outages per substation per year. This is an average of one lightning-caused outage per substation every 870 years.

Lightning Performance

About one out of every ten lightning strikes within a substation actually results in an outage. On average, one would expect each of the 1,221 substations to experience a lightning-caused outage about every 870 years. Note however that some of the distribution substations have shielding.

IEEE 998 Design Guideline

IEEE 998 indicates that substation shielding should reduce the exposure rate to one outage for every 100 lightning strikes occurring within a substation.

Ameren-IL Distribution Design Guide, Dated December, 28, 2009

This guide requires that Ameren-IL use masts, from 50 to 60 feet in height, and if necessary, shield wires to provide lightning protection for equipment located in its new distribution substations, in compliance with IEEE 998 guidelines.

Ameren-IL indicated that installing shielding where applicable in its existing 1,221 distribution substations might reduce lightning-caused outages from one outage per 10 strikes to one outage per 100 strikes in each substation. However, the actual outage incident rate of one outage per substation per 870 years is too low to justify the costs to retrofit the older distribution substations with up-to-date lightning shielding designs. Ameren-IL indicated that it would not conduct additional investigations for this recommendation. However, Ameren-IL did update its lightning protection design guide to comply with the one outage per 100 strikes IEEE 998 recommendation. All future distribution-substation designs will include lightning strike shielding.

In August 2010, Liberty concluded that data indicate that Ameren-IL should not retrofit its older distribution substations to improve lightning performance, nor should it continue the analysis of lightning-caused substation outages. Even if OAS missed a few lightning-caused outages, the lightning-caused distribution-substation outage incident rate still is extremely low. Because Ameren-IL's substation maintenance group investigates lightning-caused substation outages, it continues to address lightning performance issues in specific substations.

Ameren-IL's actions complied with its implementation plan and Liberty considers this recommendation verified and closed.

Recommendation

V-35

Perform switching surge studies for the 230,000-volt and 345,000-volt transmission system for off-normal conditions.

Background

Liberty concluded that Ameren conducted switching surge studies for normal conditions, but not for off-normal conditions. Liberty recommended that Ameren perform switching surge studies for Ameren-IL's 230,000-volt and 345,000-volt transmission system for off-normal conditions to assure that lightning arrester placement is adequate and equipment will not be damaged by over-voltages under contingency conditions more severe that design requirements, and under black start conditions.

Ameren-IL's Implementation Plan

Ameren-IL objected to this recommendation. In its response, Ameren-IL indicated that it sizes and installs surge (lightning) arresters according to its Substation Design Guide 10G and IEEE Std. C62.22, verifies the energy capacities for the extra high voltage systems and unusual applications, such as when arresters are located near transmission level capacitor banks, using a conservative method based on IEEE standards and various technical papers. Ameren completed a transient switching surge study on the last Ameren-IL 345,000-volt line built, the Sioux-Roxford -5 line. Finally, switching surges have not caused any known adverse consequences on Ameren-IL transmission lines.

Verification Discussion and Conclusions[492]

Ameren indicated that it includes "off-normal conditions" when conducting switching surge studies for Ameren-IL's transmission system. A large circuit breaker manufacturer with expertise in conducting switching surge studies conducted the last studies. Sources of excessive switching surges (transient over-voltages) include excessive trapped charges, excessive differences in circuit breaker contact closing times, and system configurations that might cause voltage surge back-feed. The studies include design contingency conditions. Ameren routinely conducts design switching surge studies, relay settings, and circuit breaker timing tests to prevent excessive switching surges.

Although installing closing resisters in high-voltage circuit breakers can control switching surges, Ameren determined from its most recent studies, with input from Mitsubishi (circuit breaker manufacturer), that closing resisters are not needed in its existing 230,000-volt and 345,000-volt circuit breakers. Switching surges have not been problematic on Ameren-IL transmission lines.

In November 2009, Liberty found that Ameren-IL met its commitment. It appropriately includes off-normal conditions in its switching surge studies when it designs or modifies transmission circuits. Switching surges are a function of system design and circuit breaker operation. Lightning arresters do not control switching surges, but they do limit equipment exposure to

[492] Interview #315, November 16, 2009, and response to Data Request # 1305.

switching surges. Ameren studies verify that normal and off-normal switching surges do not exceed standard lightning arrester capacities. Liberty considers this recommendation verified and closed.

Recommendation

V-36

Obtain updated lightning software and data for transmission lightning performance analysis.

Background

Ameren reported that it currently performs lightning performance analysis for new transmission line designs using "Multi-Flash" software program and using the recently updated isokeraunic levels published in the latest (3rd) edition of the EPRI Red Book. This software package, while dated, has served them well. However, Ameren believes that it is prudent to be proactive and use the latest up-to-date software and input data to assure that it obtains the most accurate results for analyses of transmission line lightning performance.

Ameren-IL's Implementation Plan

Ameren committed to implementing the use of the updated lightning analysis software, purchased revision 5.0.03 of EPRI's "T-Flash" software, and will use it going forward over the next year for lightning performance analysis. It will create a one page "Quick Users Guide" to aid its engineers in the use of the program by 1/1/2010.

Verification Discussion and Conclusions[493]

Ameren-IL's documents indicated that Ameren received the T-Flash program in May of 2008 and provided a user's guide for its transmission engineers began at the beginning of 2010. The user's guide indicated input data differences between the legacy "Multi-Flash" program and the new "T-Flash" program. Individual structure designs, line characteristics, grounding specifics, soil data, tall nearby objects, and terrain features not included in Multi-Flash are included in T-Flash calculations. The T-Flash program is also more user friendly, and has a more up to date graphical interface.

Ameren reported that it used the Multi-Flash program for more than 35 year. It began using the EPRI T-Flash program with up to date lightning data in October 2009. Although Ameren designs for two lightning-caused outages per year per 100 miles of transmission line, it shoots for one outage per year per 100 miles. If the program determines that the design exceeds this value, Ameren makes changes to the structure, shielding, insulation, or grounding (adding counterpoise) in the design to meet the lightning performance criteria. So far, Ameren found that the lightning performance for the one line using T-Flash was 1.3 outages per year per 100 miles compared with 1.0 outage per year, using the old Multi-Flash program. In 2009, Ameren used the T-Flash program to improve the lightning performance of its standard 138kV single-pole transmission line design.

Ameren reported that the new T-Flash more accurately predicts line design lightning performance than did the old Multi-Flash program. It will continue to use the new program when it designs new transmission lines in the future.

[493] Interview #336, January 26, 2010, and response to Data Request #1343.

Liberty found that Ameren is now using the latest up-to-date software and input data for the most accurate results for its analyses of transmission line lightning performance. Ameren-IL met its commitments related to this recommendation. Liberty considers the recommendation verified and closed.

Recommendation

V-37

Verify lightning performance characteristics of transmission and sub-transmission line configurations

Background

Liberty found that some older transmission configurations did not conform to industry standards, using outdated lightning data. Current transmission configurations perform to industry standards using the older data and software. Newer data suggests that lightning performance will be worse than currently projected. In addition, Ameren should specifically model the surge impedance of the static ground down lead in subsequent analyses. Ameren should verify that the lightning performance of current and legacy transmission and sub-transmission configurations is adequate, and correct problems discovered if economical and practical to do so.

Part A: Verifying Transmission Line Configurations for Lightning Performance

Ameren's Implementation Plan

By October 2010, Ameren will review trip-outs of Ameren-IL single-pole transmission lines to determine if lightning-related configuration issues cause poor lighting performance.

Verification Discussion and Conclusions

In February 2011, Ameren reported that it had identified the following Ameren-IL single-pole transmission lines as having a "potential design-issues related to lightning performance":[494]

- Rantoul Line - Rising line #1554 – Ameren determined that the ground resistance was excessive. Ameren indicated that it would install additional ground rods to the entire line in 2011.
- Wallace - Keystone Line #1396 – Ameren discovered stolen ground conductors. It will inspect the entire line and replace all removed grounds with Copperweld® grounds in 2011.

Ameren conducted lightning-related design and operation reviews (also see Recommendation V-33) on Ameren-IL's single-pole transmission lines with poor lightning performance. Liberty will revisit V-37 after Ameren completes improvements and repairs on the two lines.

In November 2011, Ameren reported and provided documents indicating that its contractor had completed the grounding work on the Rantoul-Rising Line #1554.[495] Its contractor has started the project to inspect and replace any stolen grounds on the Wallace-Keystone Line #1396. It will complete this work by December 31, 2011.

[494] Interview #418, February 15, 2011, and response to Data Request #1495.
[495] Interview #456, November 10, 2011, and response to Data Request #1604.

Part B: Improve Sub-Transmission Lightning Performance

Ameren's Implementation Plan

Ameren-IL indicated in its original response that complying with reviewing all sub-transmission line configurations for best lighting performance would not be cost effective. Ameren-IL believed a better approach would be to analyze only those sub-transmission circuits that have a record of poor performance. If there appears to be a benefit in making changes on those and the cost is justified, then it would consider and prioritize the work based on all other projects. It said it would form a team to identify and then review the lightning performance data to sub-transmission configurations after the review of transmission configurations is complete and only if the review of the transmission configurations shows there is value in doing so.

Verification Discussion and Conclusions

In February 2011, Ameren-IL indicated that no broad review of sub-transmission lightning performance data has been conducted for all Ameren-IL sub-transmission lines.[496] However, both before and after Liberty's audit, in the course of performing other reviews or inspections, Ameren-IL occasionally encountered a lightning-related matter on a sub-transmission line that it needed to address to improve lightning performance. Ameren-IL indicated that it dealt with such matters on a case-by-case basis.

Ameren-IL reported that it does not know of any systematic lightning-related sub-transmission performance problems. Ameren-IL reported that all legacy Ameren-IP sub-transmission lines are shielded. However, based on lightning-caused outage data, Ameren-CIPS identified some specific lighting-related problems and, to improved lightning performance, installed shield wires where necessary, installed lightning arresters on four lines, rebuilt the Joppa to Grand Tower 69 kV line, and replaced 3,200 feet of shield wire in 2007. Division 4 installed lightning arresters and raised shield wires on lines some time ago.

Liberty found that although Ameren-IL has not conducted an overall sub-transmission design review for improving lightning performance, it has been monitoring sub-transmission lightning performance and is taking appropriate corrective actions.

Ameren-IL complied with its commitments and met the intent of the recommendation. Liberty's verification work on this recommendation is complete.

[496] Interview #419, February 15, 2011, and response to Data Request #1481.

Recommendation

V-38

Conduct initial selection and budget estimates with finer grade cost estimates when satisfactory alternatives have costs of the same order of magnitude.

Background

Liberty concluded that initial budget estimates might be inadequate for proper project selection when satisfactory alternatives have costs of the same order of magnitude. Ameren-IL's project-selection estimate process uses a low accuracy estimate of 25 to 30 percent for budgetary review and selection. This may not be appropriate in all cases.

Ameren-IL's Implementation Plan

Ameren-IL objected to this recommendation. It said that from a design perspective, seldom do competing alternatives exist that will satisfy the system requirements that are so close in cost that lack of estimate accuracy will result in improper alternative selection. Even with a finer grade cost estimate, it more than likely will not change the decision on the project. Design Engineering experiences too many variables that have major impact on final cost to provide a more accurate budget estimate at initial conception. These include public opposition to proposed location, the time required to obtain a certificate to construct, environmental factors that have to be resolved, price of commodities over the time span from initiation to construction, and construction labor costs. For planning and selection purposes, industry practice is to use a 30 percent estimate.

Verification Discussion and Conclusions

Ameren-IL provided support for its position and expanded on the reasoning given in the implementation plan for its current cost estimating practice. The support included an excerpt from a Department of Energy Guide for cost estimating. Most of Ameren-IL's argument relates to situations in which there is only one satisfactory alternative when it considers relevant cost and non-cost factors. Ameren-IL agrees that when two options are essentially equal in all respects, it "will take an even harder look at the costs and benefits of the various options" to make the best decision.[497] This satisfies the intent of the recommendation and, therefore, Liberty considers this recommendation verified and closed.

[497] Response to Data #1353.

Recommendation

V-39

Change final project variance review triggers and process to provide effective and independent cost review.

Background

Liberty concluded that Ameren-IL's final project cost reviews lacked adequate independent oversight for the majority of major projects. The impetus for disclosure of systemic labor and material over-estimation rested on in-house clerical personnel.

Liberty recommended that Ameren-IL adjust review triggers to better identify proper thresholds for meaningful and independent cost reviews. Ameren-IL should base final project cost reviews on revised thresholds by personnel of authority and independence to preclude conflicts of interest. Results of cost reviews should go to appropriate stakeholders for corrective action.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation. It indicated that it was in the process of implementing a new Oracle based financial system on January 1, 2009, called Project First. The system would create new management project reports that would include those for cost overruns. Ameren-IL planned to phase in the reports during the 2009 calendar year and create overrun reports with a tolerance of $100,000 instead of the current $250,000 level. This tolerance would only apply to Illinois distribution reliability and line work projects. Variance explanations would be required for projects exceeding the $100,000 tolerance.

Verification Discussion and Conclusions

Ameren-IL explained that for financial reasons, it had to place the new Oracle system on hold until the beginning of 2011.[498] However, it plans to use its existing systems to catch distribution reliability and line work projects that exceed cost estimates by more than $100,000. Ameren-IL still intends to complete the implementation of this by the end of 2010.

In November 2011, Liberty discussed with Ameren-IL its progress on this recommendation.[499] Ameren-IL indicated that it has updated some modules in its financial reporting systems, but it will not implement the new general ledger until late 2012. Ameren-IL provided materials related to its review of projects that had a cost variance of over $100,000.[500] Ameren-IL had reviewed only three projects. In one, it discovered an accounting error. Otherwise, the variances to budget were the result of actual field conditions different from assumed and differences in assumed contractor labor rates. Ameren-IL has not done enough project analyses to ascertain whether its current practice is worthwhile. In addition, Liberty found that Ameren-IL should provide input from its actual project estimators when Liberty reviews this recommendation again.

[498] Interview #348, January 20, 2010.
[499] Interview #462, November 3, 2011.
[500] Response to Data Request #1608.

In November 2012, Liberty learned that Ameren had pushed back the implementation of the new general ledger until about March 2013.[501] However, this change has not affected Ameren-IL's work on this recommendation. At the controller level, Ameren-IL continues to generate reports for any project with a variance of $100,000 or more. In 2012, there have been seven such cases, but the resulting reviews have not provided valuable information. Reasons for the variances were typical causes such as project timing, customer requests, project scope increases, and not needing the contingency included in the original estimate. Ameren-IL is considering changing its criteria for these variance reviews. Liberty concluded that Ameren-IL should continue or modify its approach to these reviews insofar as they produce meaningful results.

In the Distribution Design area, Ameren-IL began reviewing projects with a final variance of 10 percent or more from the project estimate.[502] This process appears to yield good value in not only providing for more accurate estimates in the future, but also in identifying particular efficiencies in projects and in classifying reasons for significant variances. In the interview, Liberty reviewed documents showing, as examples, an inaccurate estimate because of not identifying whether Ameren-IL worked the job hot or cold, and a cost overrun due to higher than expected pole retirement costs.

Liberty concluded that Ameren-IL's analysis of project costs in the Distribution Design area meets the intent of Liberty's recommendation, has the potential to be a valuable tool, and is an improvement on Ameren-IL's original implementation plan. Liberty's verification work on this recommendation is complete.

[501] Interview #499, November 6, 2012.
[502] Interview #499, November 6, 2012.

Recommendation

V-40

Improve the process for contingency funding of large unexpected projects.

Background

Liberty found Ameren-IL lacks general contingency funding for large unexpected projects. Ameren-IL budgets contingency funds to replenish spare circuit breaker and transformer inventories as it deploys them to replace failed units. Ameren has in place a CRC and checkbook process for transmission and substation projects that allows for adjustments in spending due to unexpected projects. Ameren should review alternatives for funding and budgeting in the most cost effective and compliant accounting method.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation, saying that the E46 Distribution Line Work budget group has contingent dollars budgeted each year. While it will combine most of these funds with the standing work order starting in 2009, in response to this audit recommendation, $1 million will be set aside at each of the Ameren-IL for unexpected line and substation work projects. If 2009 contingency requirements exceed of the three million set aside, it will use the "check book process."

Verification Discussion and Conclusions

Ameren-IL indicated that in 2009 it placed the funds under projects in the E46 Distribution Line Work budget group.[503] For 2010-2014, the budget contained contingency funds under projects using activity SRER – Emergency System Repair in the E42 Electric Reliability budget group. The data request response provided the specific amounts for each of the three utilities.

Ameren-IL explained the budgeting and use of contingency funds. Ameren-IL will continue this practice, but will re-evaluate it after determining whether it is the best way to plan for unexpected projects.[504]

Liberty concluded that Ameren-IL met its commitments on this recommendation, and considers it verified and closed.

[503] Response to Data Request #1354.
[504] Interview #349, January 20, 2010.

Recommendation

V-41

Implement the new Quality Assurance program for construction projects.

Background

Liberty reported that Ameren-IL's overall construction process lacked a Quality Assurance function in 2006. Although Ameren-IL established a Quality Assurance program in late 2007, Liberty did not determine whether the program was effective. Ameren-IL indicated that it already met this recommendation, and Liberty documented it for follow-up during the verification phase of this investigation. This recommendation is a part of Recommendation I-1 in Chapter I of Liberty's final report.

Ameren-IL's Implementation Plan

Ameren-IL indicated that the QA program for construction was in effect. There is one auditor in place, a vacant auditor's position is in the process of being filled, and it will add a third auditor's position by the end of 2009.

Verification Discussion and Conclusions

Ameren-IL met its implementation plan. Liberty considers this recommendation verified and closed as documented in the construction QA section of Recommendation I-1 above.

Recommendation

VI-1

Evaluate whether inspection and maintenance functions under Ameren Services' responsibility would be more effective if Ameren-IL managed them directly.

Background

Liberty found that the organization of Ameren-IL's inspection and maintenance work was complex and presented unique management challenges. Liberty recommended that Ameren evaluate whether inspection and maintenance functions under Ameren Services' responsibility would be more effective if Ameren-IL managed them directly.

Liberty indicated that there are clear advantages to centralized management of some inspection and management functions. However, too much centralization may not provide enough focus on particular, local issues, and problems. For example, assimilation of the three Illinois companies and their union agreements brought inconsistencies and weaknesses to the substation inspection processes. Bringing substation inspection and maintenance directly under the responsibility of Ameren-IL could expedite the resolution of these inconsistencies and the elimination of weaknesses.

Ameren and Ameren-IL should conduct and report on an organizational evaluation of inspection and maintenance functions. The evaluation should specifically consider the substation and relay inspection, testing, and maintenance functions, and the maintenance engineering support functions, assigned to the Ameren-IL substation areas. It should document programs aimed at eliminating inconsistencies. The results of the evaluation should provide a specific timetable for implementation of any changes that Ameren and Ameren-IL decide to make.

Ameren-IL's Implementation Plan

Ameren-IL indicated that it supported this recommendation and evaluated moving a number of inspection and maintenance functions to Illinois. It will continue to monitor the organizational structure for improvement opportunities going forward.

Ameren will move management of substation relay construction and maintenance for Illinois from Ameren Service to Ameren Illinois at the start of 2009. It will move management of vegetation management for Illinois to Illinois in early 2009 and will move management of distribution inspections to the Illinois operation support group in early 2009. Ameren will continue to manage centrally transmission to assure compliance with all applicable FERC/NERC regulations, MISO, and overall grid operations.

Verification Discussion and Conclusions

Ameren transferred the responsibilities for most Illinois inspection and maintenance functions from Ameren corporate to Ameren-IL by January 1, 2009.[505] It moved Ameren-IL responsibilities, including inspection and maintenance responsibilities for Ameren-IL equipment,

[505] Interview #231, May 7, 2009, and response to Data Request #1071.

other than for transmission lines, to the Ameren-IL groups, which are Technical Services, Distribution Dispatch Operations, and Operations Support.

In May 2009, Liberty learned that Ameren transferred the responsibility for Illinois substation and relay construction, inspection, and maintenance from Ameren's Energy Delivery Technical Support group (corporate) to the Ameren-IL's Technical Services group (Illinois).[506] Ameren-IL's substation and relay inspection, maintenance, and construction work is now under the Ameren-IL Technical Services manager, who reports to an Ameren-IL vice president. Liberty also discusses the transfer of substation and relay inspection and maintenance responsibility under Recommendation VI-3.

Ameren transferred the responsibility for Illinois' distribution and sub-transmission line inspections from Ameren Services (corporate) to Ameren-IL's Operations Support group (Illinois).[507] The lines patrol and ground-line inspections are now under the Ameren-IL Operations Support manager, who reports to an Ameren-IL vice president. Since the change, Ameren-IL hired an expert to assist with NESC compliance inspections.[508] Liberty also discusses this transfer under Recommendation VI-3.

Ameren transferred the responsibility for Illinois distribution and sub-transmission vegetation management from the Ameren Resource Management group (corporate) to the Ameren-IL's Operations Management group (Illinois).[509] Ameren-IL reported that since the change, it now has one superintendent responsible for all distribution and sub-transmission vegetation management work in Illinois. In addition, Ameren-IL placed a supervisor and more crews in the heavily wooded southern area of Illinois.

The responsibility for Ameren-IL fleet management also changed to Ameren-IL by January 1, 2009.[510] Prior to 2009, Ameren had moved the responsibility for reliability programs, distribution dispatch, and emergency operations and support to Ameren-IL's Dispatch Operations group. The Dispatch Operations manager reports directly to an Ameren-IL vice president.

Ameren determined that it needs to maintain central control of the Ameren transmission system and will retain responsibility for the transmission lines inspection and maintenance work.

In its response to the recommendation, Ameren-IL indicated that it would transfer the responsibility for the inspection and maintenance of substations and relays by April 8, 2009. In May 2009,[511] Liberty found that Ameren completed the transfers by January 1, 2009.

Liberty concluded that the transfers of responsibilities for all Ameren-IL distribution and sub-transmission line, substation and relay construction, inspection, and maintenance work from

[506] Interview #234, May 7, 2009
[507] Interviews #231 and #233, May 6-7, 2009.
[508] Interview # 231, May 7, 2009.
[509] Interview #233, May 6, 2009.
[510] Interview #233, May 6, 2009.
[511] Interview #233, May 6, 2009.

Ameren corporate groups to Ameren-IL groups comply with Liberty's recommendation and with Ameren-IL's implementation plan. Liberty will continue review of Ameren-IL various inspection and maintenance practices under Recommendation VI-3. Liberty's verification of Recommendation VI-1 is complete.

Recommendation

VI-2

Make the distribution divisions accountable only for the portions of service reliability goals for which they are responsible.

Background

Liberty concluded that accountability of electric service reliability did not align with the responsibilities for inspections and maintenance that affected reliability. The Ameren-IL distribution divisions were accountable for service reliability (*i.e.*, the number and duration of service interruptions). However, a different part of the Ameren organization, Ameren Services, was responsible for inspection and maintenance of the transmission system and substations, both of which affect service reliability.

Ameren-IL's Implementation Plan

Ameren-IL agreed to separate division and company interruption-frequency reliability goals in terms of distribution, forestry, and substations. Ameren-IL said that it previously tracked reliability measures at a lower level of detail breaking out transmission, substation, and distribution. Recently the measures rolled back up to an overall measure to enhance teamwork, match the IEEE metric to be used for benchmarking purposes as well as being the desired format for ICC reporting. Going forward while maintaining the overall measure, Ameren-IL will also break the metric out in the fashion described above. It will then alter division goals to match the distribution and substation measure. Another aspect of this recommendation was the concern over substation management not reporting up through Ameren-IL. At the beginning of 2009, Ameren will make an organizational change, moving these resources to Ameren-IL.

Verification Discussion and Conclusions

In May 2009, Ameren-IL reported that it modified its performance scorecards beginning in 2009 such that division managers are directly accountable for only distribution reliability in their divisions.[512] Liberty reviewed the 2009 scorecard reliability and other goals for the company and for various operating units, and found that Ameren-IL bases employee incentive compensation on a combination of each business unit and overall company attainment of reliability and other goals such as safety, customer satisfaction, O&M budget control, and energy-reduction program performance. Even the union personnel have an incentive program based on the attainment of reliability, customer satisfaction, safety, and accident reduction goals.

Liberty found that the Ameren-IL division and company scorecards indicated separate SAIFI[513] goals for distribution, substation, and forestry. The overall company SAIFI goal is 1.1, not including major storms and planned maintenance outages. Each distribution and substation unit is accountable for only its assigned portion of the overall goal for its type of unit by division (in terms of distribution, substation, and forestry). Ameren-IL has a CAIDI[514] goal of 125 minutes for the company. However, it does not break down the CAIDI goal by division nor is it included in the employee incentive-compensation program.

[512] Interview #232, May 12, 2009, and response to Data Request #1072.
[513] SAIFI is an interruption frequency index.
[514] CAIDI is an interruption duration index.

Ameren-IL agreed that the length of an interruption experienced by customers affects customer satisfaction scores and indicated that it is reducing its CAIDI by installing more system automation. Liberty commented that Ameren-IL should consider including the attainment of CAIDI goals in the management and union incentive program because the timeliness of employee response to customer interruptions can reduce CAIDI. Liberty also suggested that Ameren-IL identify work on outage response methods for reducing its CAIDI.

In its response to the recommendation, Ameren-IL indicated that it would change the responsibility for reliability goals for the division managers by April 8, 2009. In May 2009, Liberty found that Ameren-IL completed the change in reliability goals by January 1, 2009.

Liberty continued its verification work in February 2010.[515] Scorecards for 2009 and 2010 indicate that the performance goals for management personnel include overall distribution SAIFI goals, overall substation/relay SAIFI goals, overall forestry SAIFI goals, and overall company CAIDI goals. However, Ameren-IL bases management-personnel incentive compensation in part on attainment of the company's overall SAIFI goal, and not on specific distribution, substation, or forestry SAIFI goals. Ameren-IL indicated that the strategy for scoring and incentives encouraged management of each general group (distribution, substation, and forestry) to be accountable for specific SAIFI performance and overall CAIDI performance, but financially rewarded for working together to meet overall SAIFI performance. For 2009, the overall SAIFI target (excluding major event days and maintenance) was 1.1 and the actual SAIFI was 0.99. The 2009 CAIDI target was 125 minutes, but the actual CAIDI was 153 minutes. Other goals for management-personnel incentive compensation include safety, customer satisfaction, and completions of reliability and NESC programs. Ameren-IL indicated that it had not yet determined how to apply fairly CAIDI goals to the management incentive-compensation program.

The strategy for applying goals for union personnel is to reward each group for good performance. Ameren-IL bases union-personnel incentive compensation (except for union dispatchers) in part on attaining SAIFI goals for each division or group. It bases union-dispatcher incentive compensation in part on attaining an overall CAIDI goal. Other goals for union-personnel incentive compensation include safety, customer satisfaction, and in some cases, work performance. To provide incentive for goals needing the most attention for a specific year, Ameren-IL changes the weight on some goals and changes the goal objectives from year to year.

Liberty concluded that Ameren-IL's scorecard, and accountability and incentive compensation programs, are reasonable for monitoring and providing incentives for improving performance. Liberty considers this recommendation verified and closed.

[515] Interview #340, February 1, 2010, and response to Data Requests #1347 and #1373.

Recommendation

VI-3

Formalize the responsibilities of organizations outside of Ameren-IL that manage inspection and maintenance of portions of Ameren-IL's electric delivery system. (See related Recommendation VI-1).

Background

Ameren and Ameren-IL should clearly document the responsibilities of Ameren Services in policy statements and organization charts. Ameren Services should be accountable to Ameren-IL for the timely completion of inspection and maintenance tasks. Ameren Services should provide periodic reports to Ameren-IL on the status of inspections, maintenance, testing, and repairs for which it is responsible. For example, Ameren-IL management should know the status of transmission system line and pole inspections and the status of any deficiencies detected by these inspections. Ameren Services should also report to Ameren-IL on the status of distribution line and pole inspections that it manages.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation. Transmission Operations, Construction, Maintenance, and Forestry will develop operating procedures and protocols to address the inspection and maintenance interrelationships with, and work products for, Ameren-IL. For the distribution system, Ameren has implemented the majority of this recommendation. Ameren Services, Energy Delivery Technical Services, Asset Management Group is currently providing these services to Ameren-IL. Ameren-IL will formalize the responsibilities of Asset Management (for distribution) in policy documents and/or service level agreements, including clear expectations on activities, timelines, and communication

Ameren-IL provided three parts to its implementation plan for this recommendation – transmission lines, distribution lines, and substations.

Verification Discussion and Conclusions

Part A. Transmission Line Inspections[516]

Ameren indicated that transmission operations, construction, maintenance, and forestry would develop operating procedures and protocols to address the inspection and maintenance interrelationships with, and work products for, Ameren-IL. Ameren provided a document (Ameren Services Transmission Circuit Inspection and Maintenance Responsibilities, dated June 6, 2008) indicating that the Ameren Services' Transmission Operations group is responsible for the inspection, construction, maintenance, and forestry work on Ameren-IL transmission lines. It indicated that the Transmission Operations group was responsible for conducting the work, including making repairs, based on the formal programs. Transmission Operations provides Ameren-IL with semi-annual reports on the status of all inspections and on outstanding repairs.

[516] Response to Data Request #1073.

The Ameren Transmission Line Inspection Program indicates that Ameren conducts aerial patrols of all Ameren-IL transmission lines at least two times per year. Where flying is not practical, it will conduct ground-based patrols at least once a year. It conducts detailed inspections, where people inspect lines from the ground and climb if necessary, or inspect from a hovering helicopter, on 10-year cycles on lines over 20 years old.

The Ameren Transmission Ground Line Inspection Program indicates that Ameren conducts ground-line inspections on all Ameren-IL's wood transmission pole lines on 10-year cycles, on lines over 20 years old. All wood poles are sounded, test bored, excavated, and chemically treated according to its specifications.

Ameren Transmission Operations is also required to complete vegetation management activities in compliance with the current program, which complies with NERC Standard FAC-003.

In May 2009, Liberty found that the relationship and the assignment of responsibility Ameren's inspection and maintenance of Ameren-IL transmission lines is appropriate and was formalized in the document provided. Liberty will follow up later to verify that Ameren is providing semi-annual status reports to Ameren-IL. Verification of Recommendation VI-3A remains open.

In August 2010,[517] Ameren-IL provided documents indicating that Transmission Operations submitted a semi-annual transmission inspection report for each Ameren-IL company to Ameren-IL management in mid-year 2009. It then began submitting quarterly reports. These reports included completion rates for System Patrols, Detailed Inspections, Ground Inspections, and repair jobs originated, completed, and pending. The quarterly reports also included vegetation ground and aerial trimming and herbicide work completions and details.

In 2009, Ameren patrolled the transmission systems for all three Ameren-IL companies two times each, and completed all Detailed Inspections and Ground-Line Inspections. In 2009, Ameren originated 189 repair/maintenance jobs and completed 131 jobs. At year-end 2009, there were 157 jobs pending.

Ameren and Ameren-IL determined that quarterly report submittals were more appropriate than semi-annual reports for tracking transmission inspection, repair, and vegetation-management work completions. Ameren reported that it also submitted reports for the first two quarters of 2010. The quarterly reports go to the appropriate Ameren-IL vice president.

Ameren indicated that it still conducts the twice per year aerial inspections by airplane slow flights. Transmission inspection work is on track for 2010. It typically conducts ground line inspections in the winter months because there are of fewer crops in the fields.

In August 2010, Liberty found that Ameren-IL complied with its commitment of requiring Ameren Transmission Operations to submit transmission-system inspection reports at least every six months to Ameren-IL management. The verification of Recommendation VI-3A remains

[517] Interview #386, August 10, 2010, response to Data Request #1427.

open until Liberty is able to observe a sample of transmission ground-line inspections, planned for February 2011.

In February 2011, Liberty observed transmission ground-line inspection, testing, and pole treatment activities performed by a 3-man contractor crew on two two-pole wood transmission structures and on one three-pole wood structure.[518] Liberty also interviewed the contractor's supervisor and lead man.

The inspection crew activities included:

- Inspecting the structures, grounds, guys, anchors, and hardware for defects
- Measuring pole ground resistance
- Removal of a few inches of soil to inspect pole butts for surface decay. Where surface decay existed, the worker removed soil down to about 30 inches, scraped off decay, and applied an anti-decay treatment to scraped surface.
- Inspecting the poles for deep cracks and surface decay. They sounded the pole up to about 8 feet to locate any internal voids; and drilled holes downward into the butt, at various locations up to about 6 feet, and into the areas where the soundings indicated voids. They removed insects, small animals, and nests.
- Drilling out old inspection plugs and injected fungicide into the pole
- Inserting a measuring rod into holes drilled into voids to determine shell thickness
- Inserting a fungicide and anti-decay chemical treatment into voids to prevent further decay and deterioration
- Appling tags indicating the inspection, and if treatment was applied
- Entering inspection, testing, and treatment data, and shell thickness data into a computer to determine whether the pole has acceptable strength, if it can be reinforced, or if it should be rejected and replaced.
- Photographing defects needing attention, if necessary. They call in any critical problems that require immediate attention.

The contractor's supervisor reported that he reviews reports, periodically monitors the quality of the work conducted by his seven 3-man crews, and submits the computer-generated reports at the end of each week.

Liberty found that Ameren's contractor is inspecting, sounding, drilling, treating, and evaluating wood poles consistent with Ameren's formal procedures. Liberty will revisit Recommendation VI-3A later.

In February 2012, Liberty found that Ameren had conducted ground-line inspections on almost 11 percent of Ameren-IL's transmission poles in 2011, and that it has now ground-line inspected and maintained all Ameren-IL transmission poles at least one time, in compliance with its inspection program.[519] It was now in the second 10-year ground-line inspection cycle. Ameren

[518] Interview #422, February 17, 2011.
[519] Interview #466, February 17, 2012, and response to Data Request #1626.

reported that this program is effective and it will continue to conduct ground-line inspections on Ameren-IL's transmission system on the program's 10-year cycle.

Ameren also conducted aerial inspections by fixed-wing aircraft on each of Ameren-IL's transmission lines twice during 2011. Ameren will continue using an airplane for regular semi-annual inspections.

Liberty found that Ameren complied with its commitments to Ameren-IL to continue transmission system ground-line inspections on a 10-year cycle, and aerial inspections on a semi-annual cycle. Liberty considers this verification as closed.

Part B. Distribution and Sub-transmission Line Inspections[520]

Ameren-IL reported that it transferred the responsibility for managing distribution and sub-transmission inspections, construction, maintenance, and forestry work from Ameren to Ameren-IL at the beginning of 2009. Rather that formalizing the arrangement between the Illinois and Missouri groups as recommended, Ameren-IL decided to transfer responsibility for Illinois distribution and sub-transmission line patrol and ground-line inspection work, and vegetation management work, from the Ameren Resource Management group in Missouri to the Ameren-IL Operations Support group. The Operations Support group manager reports directly to an Ameren-IL vice president. Ameren-IL (and not to Ameren corporate) personnel are now directly accountable for all distribution and sub-transmission inspection work conducted in Illinois.

Up until July 2008, Ameren Resource Management (also called Asset Management) in Missouri supervised contractors conducting electric and gas distribution construction inspections for Ameren-IL. Ameren transferred these functions to the Ameren-IL Operations Support group in Decatur on July 1, 2008. Until November 2008, the Ameren Resource Management group in Missouri was also managing the electric distribution and sub-transmission system patrol and ground line inspection contractors used on Ameren-IL property and it was managing the distribution vegetation management work conducted in Illinois. Although some of the Ameren Resource management supervisors were located in Illinois, they reported to the Ameren staff in Missouri.

On November 1, 2008, the Ameren-IL Operations Support group in Illinois began taking over the distribution and sub-transmission line inspection and vegetation management responsibilities for Ameren-IL. The transition was complete by the end of 2008.

Although there is no direct line of control between the Operations Support group in Illinois and the Resource Management group in Missouri at the manager level, the Ameren-IL substation/relay construction supervising engineer indicated that he works with his equivalent in Missouri to determine best contractor work and safety practices.

[520] Interview #233, May 6, 2009, and response to Data Request #1074.

Ameren-IL reported that agreements with the local unions now allow for contractor-conducted line inspections in all areas of Ameren-IL territory. The line inspection contractor now conducts all Ameren-IL distribution and sub-transmission lines patrol and ground-line inspections. Electronic maps provided to engineering supervisors in each division identify line deficiencies. Critical conditions are reported immediately. Ameren-IL conducts circuit patrol inspections for deficiencies and NESC 2002 violations on a 4-year cycle for distribution lines, including tap lines, and on a 2-year cycle on sub-transmission lines. It conducts ground-line inspections on all poles at least 15 years old on a 12-year cycle. Sub-transmission poles and three-phase distribution poles are sounded, bored, and chemically treated. Two-phase and single-phase line poles are sounded and bored, but not chemically treated. Liberty had previously found that these pole inspection and treatment procedures were appropriate.

In May 2009, Liberty found that the transfer of responsibility for Ameren-IL distribution and sub-transmission line-inspection work from Ameren corporate to Ameren-IL provides appropriate direct control of line inspection work and satisfies the recommendation.

In about one year, Liberty will review Ameren-IL's performance in conducting its distribution and sub-transmission patrol and ground line inspections in compliance with Ameren-IL programs. Liberty's verification of Ameren-IL's response to Recommendation VI-3B remains open.

In May 2010, Liberty confirmed that an inspection contractor directly managed by Ameren-IL conducts Ameren-IL's circuit patrol and the ground-line circuit inspections; and that Ameren-IL's had not changed its ground-line inspection program 12-year cycle.[521] However, beginning in 2010, Ameren-IL temporarily changed its first 4-year distribution circuit patrol inspection cycle to a 5-year cycle because it lacked sufficient resources to correct all NESC items identified (more than originally estimated) within the originally specified period, as indicated in correspondence to the ICC Staff, dated July 10, 2009. Ameren-IL subsequently changed to a 5-year cycle on an on-going basis. In addition, based on the results of the completed first cycle of sub-transmission circuit-patrol inspections, Ameren-IL determined that the 2-year cycle for its sub-transmission system circuit patrol inspection program was excessively intensive. Ameren-IL extended its sub-transmission ground-line inspection program to a 5-year cycle for 2010. Ameren-IL also indicated that as a cost-saving measure resulting from a recent Illinois rate case decision, it stopped its contractor's practice of inserting chemical preservative rods into holes bored into poles during ground-line pole inspections.[522]

Liberty suggested that Ameren-IL consider returning to a 4-year cycle for its distribution and sub-transmission circuit patrol inspection programs after it completes its NESC program commitment to the ICC. Liberty will continue to verify Ameren-IL's circuit patrol and ground-line inspection program completions, cycles, and content under Recommendations VI-9 and VI-10. Liberty found that Ameren-IL is appropriately managing its circuit patrol and ground-line inspection programs and considers this verification as closed.

[521] Interview #367, May 4, 2010, and response to Data Request #1417.
[522] Interview #366, May 13, 2010.

Part C. Substation and Relay Inspection and Maintenance[523]

Ameren-IL reported that it transferred the responsibility for managing substation and relaying inspections, construction, and maintenance work, except for Ameren-CIPS relay maintenance for Alton and East St. Louis, from Ameren Services' EDTS (Energy Delivery Technical Services) to Ameren-IL at the beginning of 2009. It reassigned Alton and East St. Louis relay work in April 2009. Ameren-IL provided organizational charts that clearly indicate the line of accountability from the Ameren-IL Technical Services relay and substation construction and maintenance supervisors to its manager, and on to one of the Ameren-IL vice presidents. All responsibility and accountability for substation and relay construction and maintenance work is now within the Ameren-IL organization, except for a few special in-progress power plant substation projects.

Ameren-IL reported that its Technical Services group is applying substation maintenance practices in compliance with its Substation Maintenance Strategy Committee, and is investigating relay events in compliance with its Relay Events Strategy Team. Each group meets once a month to identify problem areas and develop solutions. Technical Services is currently developing a relay maintenance strategy for Ameren-IL to improve the effectiveness of its relay maintenance practices.

Ameren-IL reported in its response to the recommendation that the interrelationship procedures and protocols between Ameren and Ameren-IL for the inspection and maintenance of Ameren-IL transmission lines will be complete by April 8, 2009. Liberty found that the transmission lines inspection and maintenance agreement was completed June 6, 2008, and the transfer of the inspection and maintenance responsibilities for distribution and sub-transmission lines, and for substations, was completed by January 1, 2009.

In May 2009, Liberty found that Ameren-IL complied with its response and with Liberty's recommendation by reassigning responsibility from the corporate EDTS group to the Ameren-IL Technical Services Group. In about one year, Liberty will review the performance of the Technical Services group in conducting Ameren-IL substation and relay construction and maintenance work in compliance with the its programs. Liberty's verification of Ameren-IL's response to Recommendation VI-3C remains open.

In May 2010, Liberty reviewed Ameren-IL's Technical Services Group performance for timely completion of its relay and substation maintenance work scheduled for 2009.

Relay Maintenance[524]

Liberty found that Ameren-IL met its 2009 relay maintenance completions goals. However, insufficient staffing prevented it from completing all scheduled relay-related work. In 2009, company-wide, Ameren-IL completed 100 percent of its scheduled transmission relay maintenance work and 93 percent of its scheduled distribution relay maintenance work. Its goal for distribution-relay maintenance completions is 90 percent. Ameren-CILCO was the only Ameren-IL company that substantially missed its distribution relay maintenance goal in 2009

[523] Interview #234, May 7, 2009, and response to Data Request #1075.
[524] Interview #368, May 11, 2010, and response to Data Request #1386.

with a 72 percent completion rate. Ameren-IL completed nearly all of the Ameren-CILCO carryover distribution-relay maintenance work within the first quarter of 2010. In addition to relay maintenance (service and calibration tests), Ameren-IL conducts "load tests" to verify proper potentials and currents on relay circuits, as well as to verify that these circuits are properly grounded. In 2009, Ameren-IL completed 91 percent of its transmission load tests and 56 percent of its distribution load tests. Ameren-IL said that it was not able to complete all distribution relay maintenance and load tests on schedule because it has insufficient field relay staffing. Although it plans to increase its field relay staffing, the recent Illinois rate case decision will limit its ability to do so. Additionally, Ameren-IL is formulating plans to comply with upcoming NERC transmission protective equipment operational testing requirements. The new NERC requirement will likely require Ameren-IL to hire additional relay engineers and technicians dedicated for that work. Liberty will revisit the completion of relay maintenance tasks again in one year.

In February 2012, Liberty found that Ameren-IL completed 100 percent of scheduled transmission relay testing work during 2009, 2010, and 2011.[525] It completed nearly all scheduled distribution relay testing work by the end of the first quarter of the following year. Ameren-IL did not have sufficient work force in 2009 and 2010 to complete its scheduled distribution load and trip checks. In 2011, because of NERC requirements to conduct transmission load and trip checks, Ameren-IL did not have sufficient labor to conduct scheduled distribution load and trip checks. Liberty noted that distribution load tests might not be necessary, if Ameren-IL had already conducted voltage and current circuit load testing at least one time. However, Liberty recommended that Ameren-IL should conduct distribution trip checks periodically, at least every 10 years, when resources are available. Ameren-IL reported that it complied with the new NERC transmission relay testing, load testing, and trip checking requirements.

Ameren-IL's relay testing, and transmission load and trip testing work have been consistent with its program. However, because of insufficient work force, its distribution load testing and trip checking have not been consistent with its program. Recent rate changes should provide funding so that Ameren-IL can eventually provide sufficient numbers of trained relay technicians needed to complete the distribution trip checking work. Ameren-IL essentially complied with its commitment to complete its relay testing in compliance with its program (distribution trip checking was affected by funding and NERC transmission maintenance requirements). Liberty considers this verification as closed.

Substation Preventive Maintenance[526]

Liberty found that Ameren-IL met its 2009 substation maintenance completions goals. However, insufficient staffing prevented it from timely completion of all scheduled substation maintenance work. Ameren-IL's annual substation preventive maintenance completion goal is 90 percent. It completed about 94 percent of its 10,749 preventive maintenance work orders for 2009, and about 56 percent of its backlog of 472 preventive maintenance work orders. Ameren-IL also has a specific reliability program addressing the overhauling of circuit breaker mechanisms (these

[525] Interview #467, February 17, 2012, and response to Data Request #1627.
[526] Interview #368, May 11, 2010, and response to Data Request #1408.

mechanisms have a history of poor performance). It completed 67 percent of the 287 overhauls scheduled for 2009, and completed 54 percent of its backlog of 63 overhauls. Ameren-IL used a contractor to reduce substantially the substation maintenance and breaker overhaul backlogs by the end of the first third of 2010. However, Ameren-IL will release the contractor on May 28, 2010, as a cost saving measure resulting from the recent Illinois rate case decision. Before releasing its contractor, Ameren-IL was on track to eliminate its substation preventive maintenance and breaker overhaul backlogs by the end on 2010. Liberty will revisit the completion of substation maintenance and breaker-mechanism overhaul tasks again in one year.

In November 2010, Ameren-IL updated its progress in completing circuit breaker overhauls.[527] It had planned to conduct the program (replace bearings) during 2008, 2009, and 2010. However, it delayed program completion because of funding limitations. Ameren-Il reported that it has been catching up on its rebuilds, and it will complete about 96 percent of all work on this project by the end of 2010. It will complete the project in 2011. Liberty will continue this verification work.

In August 2011,[528] Liberty found that Ameren-IL's documents indicate that it completed about 90 percent of its 2010 scheduled circuit breaker preventive maintenance This is consistent with its substation maintenance strategy. Ameren-IL reported that it is on-track to complete at least 90 percent of its 2011 scheduled circuit breaker maintenance work. Ameren-IL also reported that it would have all 2010 backlogged circuit breaker mechanism overhaul jobs completed in 2011. It added 65 new, specialized mechanism overhaul projects for 2011. There are six backlogged specialized mechanism overhauls outstanding from 2010.

Liberty found that Ameren-IL's on-going circuit breaker maintenance practices are consistent with its commitment. This part of Recommendation VI-3 is closed.

Substation Corrective Maintenance[529]

Liberty found that Ameren-IL did not timely track all substation-maintenance work orders and the available data was insufficient to determine Ameren-IL's performance. According to printouts from Ameren-IL's substation computerized maintenance management system (EMPRV), Ameren-IL completed less than 50 percent of its 127 corrective maintenance work orders listed with required completion dates in 2009. Ameren-IL indicated that these records were not timely because it did not always close work orders upon completion. In addition, it did not assign completion dates to some open work orders and therefore did not track them as backlogged in the EMPRV system. Ameren-IL indicated that although all operating centers are now using EMPRV, the inadequate timeliness of the recordkeeping was due to staffing problems and to the difficulty of manually processing and closing completed work orders. Ameren-IL indicated that it would resolve these problems when it implements the handheld computer program. Opening work orders, applying completion dates, and closing work orders will then become automatic. Adequate funding may further delay the handheld computer system program. Until the new handheld computers are ready, Ameren-IL substation operating centers should work on timely closing work orders using manual methods and on assigning firm completion

[527] Interview #407, November 4, 2010.
[528] Interview #450, August 19, 2011, and response to Data Request #1583.
[529] Interview #368, May 11, 2010, and response to Data Request #1408.

dates for all open work orders (based on recent substation maintenance strategy). Liberty will revisit completion of substation maintenance tasks again in one year.

Please refer to Recommendation VI-5, Part C. In August 2011,[530] Ameren-IL indicated that it recently began to roll out its handheld computers to substation inspectors. The handhelds allow substation inspectors and maintenance personnel to identify personnel-specific jobs due and past-due in their work areas. Liberty will revisit the substation corrective maintenance section of this recommendation in 2012, after the use of handheld computers has been in place for substation maintenance personnel.

In August 2012, Liberty confirmed that Ameren-IL implemented the use of handheld computers to replace the use of paper inspection forms and corrective maintenance repair forms.[531] Nearly all substation inspectors who are substation electricians (called one-man truck crews) were using the devices. Liberty found that Ameren-IL met its commitment by effectively implementing the use of handheld computers as remote terminals for EMPRV software for providing checklists for substation inspections, for tracking inspection data, for automatically opening and closing job orders, and for reducing supervision costs. Please refer to the discussion under Recommendation VI-5 for more information on Liberty's findings on this matter.

Liberty's verification of this part of the recommendation is closed.

[530] Interview #449, August 19, 2011.
[531] Interview #478, August 6, 2012; Interview #481, August 7, 2012; Interview #483, August 8, 9, and 10, 2012; Interview #484, August 13, 2012; Interview #485, August 15, 17, and 20; Interview #486, August 21, 2012; and Interview #487, August 22 and 23, 2012; and response to Data Request #1640.

Recommendation

VI-4

Implement work management tools or change existing tools to show clearly inspection and maintenance work-task completions and past due work tasks.

Background

Liberty indicated that all inspection and maintenance work tasks should have assigned completion dates and priorities consistent with defined programs. Work management tools should be capable of reporting on tasks completed on time and tasks that are past due or backlogged. Management should receive regular reports on the status of task completion. Ameren-IL should develop meaningful performance measures for the timely completion of inspection and maintenance tasks. Organizations responsible for inspection and maintenance tasks should be accountable for completing those tasks on time.

Ameren-IL's Implementation Plan

Ameren-IL provided two parts to its implementation plan for this recommendation. The first part (4A) was the planning (identifying team members and requirements), the development, and the implementation of the electronic program by the IT group. The second part (4B) was to identify, develop, and implement the process so that the technology supports the required actions in the field.

Verification Discussion and Conclusions

Liberty verified progress only for Part 4A.[532]

Ameren-IL indicated that it would continue to use its CDIS (Circuit and Device Inspection System) maintenance program for distribution and sub-transmission equipment and pole inspection and maintenance work. CDIS integrates with the DOJM (Distribution Operational Job Management) work planning and management system. DOJM covers all work conducted outside of substations. Ameren-IL will continue to use its electronic materials database called EMPRV[533] to plan and track all inspection and maintenance work conducted in substations and on transmission lines.

Ameren-IL is currently working on implementing a "dashboard" that provides visibility to inspection, maintenance, repair backlog, and past due jobs from the DOJM, CDIS, and EMPRV systems. The dashboard will provide information for management review. DOJM specifically allows a change in a job "required date" and this can distort the representation of the job backlog. The dashboard will provide visibility to this effect by using the job creation date, which it cannot change, to represent a backlog. Ameren-IL expects to use the dashboard to evaluate potential system changes and policies to ensure that it accomplishes inspection, maintenance, and repair work within the required and necessary timeframes.

[532] Interview #235, May 12, 2009.
[533] EMPRV is "EDS Maintenance Process Reengineering Vision."

Ameren-IL reported that the design of the dashboard program is currently about 50 percent complete. The development of the program into the current systems will begin on June 1, 2009, and Ameren will implement the program the system by March 1, 2010.

In May 2009, Liberty found that Ameren-IL is on-track in complying with its response to Recommendation VI-4 and with the intent of Liberty's recommendation. Implementation of dashboard should identify to management the true amount of all types of jobs past due. Liberty will continue its verification until Ameren-IL fully implements the new dashboard program. Verification of Recommendation VI-4 remains open.

In November 2011, Ameren-IL reported, and documents confirmed, that it had implemented its "Divisional Orders and Reliability Status" electronic dashboard (DORS), which the IT group developed working with the three managing supervisors.[534] Ameren-IL implemented DORS in the distribution divisions and the substation areas in August and September 2010. Managing supervisors provided training.

DORS along with other work-management performance reports graphically displays NESC, reliability-related, inspection, outage, load and growth, and other open, completed, and overdue job data for each of the distribution divisions and the substation areas. Using data from OAS, DOJM, CDIS (via OAS), and EMPRV, it displays both weekly figures and long-term trends.

The project execution reports, which support Ameren-IL's work planning and scheduling process, also indicate the job completion performances for each responsible group within each division. Ameren-IL indicated that Ameren-IL management uses DORS to identify visually job completion trends and to initiate discussions about overdue jobs with division and substation management. Division and substation management primarily use the project execution reports, along with other work-management performance reports, to manage job completion performance within their division or area. However, all groups have access to DORs to monitor and compare job completion performances.

Liberty found that Ameren-IL complied with its commitment. Liberty will close this recommendation. In visits with the divisions in 2012, Liberty will review the use of the multiple reports used to track work.

In May 2012, Liberty visited each division.[535] Liberty found that all divisions were fully using the new DORS, project execution reports, CDIS, and other software tools for effectively planning and tracking reliability, maintenance, and other work to their completion. The software tools and communication methods provided convenient methods for work completion review by management. Liberty's verification of this recommendation is complete.

[534]Interview #457, November 10, 2011, and responses to Data Requests #1605 and #1622.
[535] Interviews # 471 through #476, May 14-18, 2012.

Recommendation

VI-5

Improve substation inspection practices.

Background

Liberty concluded that there were weaknesses in the substation inspection and maintenance processes. Because of these weaknesses, Liberty recommended that Ameren-IL improve substation inspection practices, and more specifically:

(1) To the extent possible under local bargaining agreements, personnel performing substation inspections should report inspection results and be accountable to substation supervisors. If union agreements prevent this and until Ameren-IL can change those agreements, implement supplementary substation inspections.

(2) Substation maintenance engineers should review the quality and content of substation inspection results. These engineers are substation equipment specialists and should be responsible for the quality of the inspection process. They should personally conduct periodic follow-up substation inspections.

(3) Implement electronic data gathering for substation inspections to improve data gathering accuracy, reduce data submittal time, provide a means to process the data, and allow easy management and engineering review of the data. Ensure that inspection items identify observations and readings that are unique to particular substations.

Ameren-IL's Implementation Plan

A. Ameren-IL indicated that the current organizational structure prevents most substation inspectors from reporting directly to substation maintenance supervisors. Union agreements prevent substation maintenance personnel from performing these inspections. In lieu of these organizational and union contract changes, Ameren Substation Maintenance will perform a 6-month "Seasonal Service" at all Illinois substations, as a means to supplement the inspections currently assigned to other groups. Ameren-IL will make significant progress by November 8, 2009, and will implement changes by April 8, 2011.[536]

B. In the short term, substation maintenance engineers will review completed Seasonal Service job orders. In the long term, substation maintenance engineers will review all inspection reports collected with electronic handheld recorders. Ameren-IL will complete implementation by December 31, 2011.[537]

C. Ameren-IL will develop an inspection program using electronic handheld recorders that communicate with the EMPRV maintenance management system. Ameren-IL will develop a variety of automated exception/variance reports to make substation maintenance engineers aware of problems in a timely and efficient manner. Ameren-IL reported that it would develop the team and high-level plans by the fall of 2008, implement a pilot program in 2009, and conduct plan

[536] Completion date modified May 2009.
[537] Completion date modified May 2009.

rollout and implementation in 2010. During a February 2009 interview, Ameren-IL indicated that it would need to defer the implementation of this recommendation because of financial conditions.[538] Ameren-IL will implement by December 21, 2011.[539]

Verification Discussion and Conclusions

Part A – Supplementary Semi-Annual Inspections

In February 2009,[540] Liberty found that Ameren-IL is conducting semi-annual inspections by substation personnel to supplement the regular weekly and monthly substation inspections conducted by both substation and distribution personnel. Ameren-IL generally schedules these semi-annual inspections during slack times in the spring and fall months. Liberty did not learn whether Ameren-IL conducts the semi-annual inspections using one or two people. Ameren-IL had conducted these inspections only on critical substations, but now conducts them on all substations.

The primary purposes of the inspections are to blow down tanks (remove condensation) on pneumatic breaker mechanisms, to test operate voltage regulators, and to conduct control building HVAC inspections. Ameren-IL does not intend the semi-annual inspections to verify the quality of the regular weekly and monthly inspections. The sample blank inspection form provided, dated January 22, 2007, included these items, as well as inspection of fences and gates, of equipment grounds, and for damaged insulators. It also included inspecting fire extinguishers and normal and emergency lighting. The form was generic and not designed for each specific substation. Although not directly addressed on the inspection form, Ameren-IL said that semi-annual substation inspectors would look for other abnormal conditions and would take corrective actions, or initiate a repair order, if needed.

Ameren-IL provided an updated blank inspection form, dated January 28, 2009. The new form is similar to the older form except that it included spaces for checking off items on the inspection list, added inspecting transformer pressures, changing the desiccant in transformer compartments when necessary, and checking the substation fuse inventory. Liberty plans to review completed substation inspection forms during the next quarter. Ameren-IL may replace this form with the electronic handheld data-gathering device that Ameren-IL plans to implement in the coming years.

The semi-annual substation inspectors do not receive any training specific for conducting the inspections. The inspectors provide all completed forms to the local substation supervisors, and Ameren-IL tracks inspection completions (but not findings) for review on the substation job-management system called EMPRV.[541]

The intent of Liberty's recommendation to supplement the regular weekly and monthly substation inspections with semi-annual inspections was to provide some quality control of the

[538] Interview #223, February 4, 2009.
[539] Completion date modified May 2009.
[540] Interview #201, February 3, 2009, and response to Data Request #1009.
[541] EMPRV is "EDS Maintenance Process Reengineering Vision."

regular inspection process and to verify that Ameren-IL identifies and corrects abnormal conditions. Based on Liberty's initial meeting and the response to a data request, Liberty verified that Ameren-IL is conducting supplemental semi-annual inspections, and that the inspections include important substation maintenance-inspection activities not conducted by the regular inspectors. However, Liberty could not determine how effectively the inspections verify the quality of the regular inspections and how they generally improve substation conditions because many regular inspection items are not on the semi-annual inspection forms.

To evaluate further the semi-annual inspection process, Liberty will request examples of completed inspection sheets, will request an interview with a substation supervisor knowledgeable of the inspection program, and will inspect selected substations while a semi-annual inspection is in progress.

In May 2009, Ameren-IL confirmed at a follow-up interview[542] that one substation electrician (one-man truck) generally conduct the semi-annual substation inspections. It indicated that Ameren-IL uses about 30 to 40 substation electricians company-wide to conduct the inspections. Ameren-IL will not use hand-held electronic data recording devices until 2010, although one legacy company, Illinois Power, successfully used hand-held data recording devices prior to its merger with Ameren. Liberty also reviewed examples of completed Ameren-IL semi-annual substation inspection sheets,[543] Liberty commented that:

- indicating details about defects appeared to be inconsistent among the inspectors
- one inspector failed to indicate the date of last inspection of a fire extinguisher
- not all inspection sheets were the same. Ameren-IL indicated that all divisions would eventually use the same inspection sheet for the semi-annual substation inspections.

Liberty Substation Audits and Inspections

In April 2009, Liberty spent one day in the south substation area (Belleville) auditing a (semi-annual inspection) substation inspector,[544] one day auditing a linemen substation (monthly inspection) inspector,[545] and one day inspecting substations for defects that had been recently inspected by semi-annual inspectors.[546] Liberty reviewed a blank copy of the current substation inspection report,[547] selected substations for inspection that had been recently inspected[548] and compared any substation defects found with open repair job orders.[549] Liberty found that the two inspectors were competent and thorough. The semi-annual substation inspector repaired damaged grounds, worked on oil leaks, and pressurized transformers. He did not have materials for correcting rust spots, nor did he verify that the transformers pressurized during the inspection

[542] Interview 225, May 7, 2009.
[543] Response to Data Request #1055.
[544] Interviews #227 and #228, April 13, and 14, 2009.
[545] Interview # 229, April 15, 2009.
[546] Interview # 230, April 16, 2009.
[547] Response to Data Request #1054.
[548] Response to Data Request #1185.
[549] Response to Data Request #1184.

actually maintained pressure prior to leaving the substation. The lineman inspector could report defects, but could not repair defects because of working agreement limitations.

The following text provides details from the three days of inspection.

A. Liberty audit of four semi-annual substation inspections by a substation electrician in the South Area on April 14, 2009.

Liberty observed that the substation inspector:

- inspected equipment oil levels, temperatures, and other gauges, station batteries, panel lights, the complete fence, and all equipment grounds for abnormal conditions
- recorded and reset voltage regulator/LTC tap operating range indicators
- verified positive transformer nitrogen pressure, and added nitrogen to normal pressure
- conducted minor repairs to grounds, oil leaks, and panel lights
- exercised voltage regulators and LTCs to verify proper operation
- verified transformer fan operation and reported fans that did not operate
- removed bird nests and picked up trash
- had a truck that contained spare signs, nitrogen gas with hose reel, oil sample bottles, a storage container for flush oil, oxygen detector, and miscellaneous materials to conduct one-man substation repairs
- completed a substation inspection report, including the items that needed repair (to be entered into the maintenance system by his supervisor)
- did not repair rusting spots on equipment or carry a wire brush and paint.

The inspector reported that at other times he inspects and tests batteries, exchanges fire extinguishers, takes oil and dissolved gas samples, and tests oil for dielectric strength and acid in the Belleville shop. He also assists other substation and test crews remove leads and conduct repairs with his articulated bucket truck.

Liberty found that all four substations in the South Area inspected during the semi-annual inspection were clean, tidy, and without major defects. Liberty observed:

- oil levels on oil circuit breakers and regulators were below the minimum level indication. Low oil levels were not indicted on any open work orders the substation in maintenance system log.
- there were places where grounds had been cut and stolen. Ameren-Il reportedly has problems with stolen copper ground wire and it checks all grounds during the seasonal inspections.
- fences damaged by a mower, by a contractor in the substation, and by intruders.
- that fences were well grounded. However, some gates did not have proper grounds.
- some rusted spots
- no old oil spots on equipment, concrete, and stone. Only one of the substations had active oil leaks. The inspector repaired one oil leak (tightened lose sample valve) and wrapped the

other oil leak with oil absorbent sheets to contain the minor leakage until a maintenance crew could repair the leak (at a large radiator flange).

Liberty concluded from the April 14, 2009, audit that:

1. Ameren-IL should train substation seasonal inspectors in proper and safe spot painting technique and be provided with proper surface preparation equipment, brushes, and paint; and be required to appropriately paint rusted spots on equipment.
2. Ameren-IL should determine why equipment had abnormal oil levels and why the regular monthly inspections did not note the low oil levels.

Liberty also noted:

- Ameren-IL had installed animal protectors on most 12000-volt bushings and equipment.
- Overhead-grounded shield wires protected the 12000-volt equipment in the 138000-volt substations. However, the 12000-volt equipment in the 34000-volt substations were not protected with shield wires or lightning masts. Ameren-IL should determine why lightning masts did not protect 12000-volt equipment in 34000-volt substations or shield wires.
- Although all fences were well grounded, some gates did not have bonds to the fence. Ameren-IL should require semi-annual substation inspectors to verify that gates have bonds to fences, and to install bonds when needed. The National Electric Safety Code (NESC) requires gate bonding.

B. Liberty audit of five monthly substation inspections by a lineman in the South Area on April 15, 2009.

On April 15, 2006, Liberty observed that the regular substation (lineman) inspector

- inspected equipment oil levels, temperatures, and other gauges, station batteries, panel lights, the complete fence, cabinet heaters, and equipment grounds for abnormal conditions
- recorded panel meter readings
- recorded and reset voltage regulator/LTC tap operating range indicators
- verified positive transformer nitrogen pressure, but could not add nitrogen if needed
- exercised voltage regulators and LTCs
- verified transformer fan operation and reported fans that did not operate
- removed bird nests
- completed a substation inspection report (weekly for large transmission substation, monthly for all others)
- reported that he would call substation supervisor if he observed critical defects.

Ameren-IL holds weekly inspection sheets at one transmission substation in the substation until the first inspection of the following month. The inspector calls in serious problems when appropriate. He completes monthly inspection sheets. He writes one month's readings onto the next month's sheets for comparison.

Liberty found that all five substations were clean, tidy, and without major defects. All nitrogen pressures and oil levels were normal. However, Liberty observed:

- at one substation that gravel had washed out, or freezing had raised the fence, leaving a gap at the fence bottom
- poor paint (rusted) on the top of a transformer radiator.

Liberty also noted:

- two of the substations had electric animal fencing around the 12 kV substations with animal guards on the incoming lines
- Ameren-IL had installed animal protectors on most of the 12000-volt bushings.
- overhead lightning shield wires protected the 12000-volt equipment in the newer 34000-volt substations but not the older 34000-volt substations. Ameren-IL should determine why the 12000-volt equipment in older 34000-volt substations is not protected with either a mast or shield wires
- All gates and fences were grounded.

C. Liberty inspection of six substations (recently semi-annually inspected) in the South Area on April 14, 2009.

Liberty inspected six substations (three transmission and three distribution) where Ameren-IL had recently conducted semi-annual inspections by inspectors other than the one audited on April 14, 2009. The purpose of this audit was to identify abnormal substation conditions not identified/corrected by the previous substation inspections. All conditions observed were generally acceptable. However, Liberty observed some defects that Ameren-IL had not scheduled for repair. These were:

Substation #1: Last Inspected on March 31, 2009

- bird nest in transformer radiator
- one voltage regulator was very noisy
- near zero nitrogen pressure on transformer
- damaged gate.

Substation #2: Last Inspected on March 22, 2009

- low oil level in OCB
- bird nest in SF6 circuit breaker
- stone not pushed back to fill small gap at bottom of fence
- dead vegetation not removed at fence.

Substation #3: Last Inspected on April 2, 2009

- nitrogen bottle had low pressure should have been replaced
- old leakage under large transformer and on small transformer not cleaned up
- retired conduit and wire in yard should have been removed
- Ameren-IL should have placed non-PCB labels on old leaking transformers.

Substation #4: Last Inspected on April 2, 2009

- bird nest in switch handle
- rust in switch mechanism
- oil leakage not cleaned up and no PCB labels on leaking transformers.

Substation #5: Last Inspected on March 25, 2009

- protective tape, warning sign, or plastic chain not placed around regulators with lack of necessary safe clearance
- a pile of debris in corner of substation
- one set of voltage regulators should be placed on stands to provide safe clearance
- OCB heater burning paint from control cabinets.

Substation #6: Last Inspected on 3/25/2009

- no bonding strap on gate
- rust on voltage regulator and transformer radiators
- need to complete animal protection installations since protectors can be installed energized

Liberty concluded from the April 16, 2009 inspections that the substations were generally in good condition, except for a missing gate ground, low oil level in an oil circuit breaker, and rust on a radiator. Liberty suggests that Ameren-IL maintain proper oil levels and not allow rust build-up on transformer radiators.

Liberty will continue to audit substation inspectors and inspect substations and will verify that Ameren-IL is using data gathered by these audits and inspections to improve its inspection and repair practices and training programs.

D. Liberty inspection of 29 substations during August 2012.

During August 2012, Liberty accompanied substation inspectors while they were inspecting 29 substations in all three Ameren-IL substation areas (South, East, and West).[550] The purposes of these trips were to observe the effectiveness of the inspections, to verify the use of the newly implemented handheld computer program, and to evaluate the physical conditions of Ameren-IL's substations and substation equipment. Liberty found that the inspections were thorough, the inspectors were knowledgeable, and that the use of the handhelds improved inspection and corrective repair accuracy and timeliness.

Liberty also found that all 29 substations were in good condition, without major issues. Ameren-IL has:

[550]Interview #483, August 8, 9, and 10, 2012; Interview #485, August 15, 17, and 20; Interview #487, August 22 and 23, 2012.

- Added crushed stone in substations where needed and generally sealed gaps at the bottom of fences with crushed stone or hardware cloth (a closely spaced fencing) to minimize animal intrusions. Liberty only found a very few spots that required additional attention. Inspectors identified these gaps and prepared corrective work orders.
- Improved its vegetation management in and around substations. Liberty did not find weeds in any of the substations.
- Improved removing of debris in the substations from weather, vandals, and contractors. Inspectors remove debris as part of the inspection process.
- Improved the condition of equipment paint. Ameren-IL funded and has been painting substation equipment. Liberty found only one or two transformers with possible paint issues.
- Repaired broken insulators. Liberty did not observe any broken insulators.
- Improved the urgency to replace leaking bushings. Ameren-IL classifies leaking bushings as requiring urgent attention by the maintenance engineer, who decides whether the bushing should be immediately replaced. Inspectors and Liberty found two leaking bushings that were replaced appropriately.
- Improved maintaining nitrogen gas blankets on its transformers. It has been identifying transformers leaking nitrogen and has been effectively repairing nitrogen leaks. Liberty did not find any transformers with nitrogen leaks.
- Improved animal protection. All of the 29 substations had animal guards on recloser and voltage regulator bushings. Nearly all had animal guards on switch insulators and animal spinners on incoming overhead lines. Some had electric animal fences. There were very few spots were animals could enter in gaps under fences, and Ameren-IL was addressing these. The inspectors indicated that the animal protection efforts have been fruitful, with reduced animal-caused outages.
- Improved oil leakage containment and repair. Ameren-IL contains small oil seepage (no dripping observed) using absorbent pads until it can make repairs. Liberty found only a couple of very minor oil leaks, which the inspectors cleaned and contained.
- Improved maintaining equipment oil levels. Liberty did not observe low oil levels in any equipment, except for the two bushing mentioned above.

Liberty brought some minor issues to Ameren-IL's attention:

- Several substation gates were not bonded to the fences. Liberty suggested that Ameren-IL provide bonding kits to inspectors so that they can install bonding where required.
- One fence did not appear to be grounded. Although not grounding a fence might be acceptable, depending on the design and condition of the substation ground grid, Liberty suggested that Ameren-IL include a check whether a substation fence is grounded solidly on the inspectors' checklists. The maintenance engineers should audit those substations without grounded fences and have the engineering group verify, by step and touch potential study, if not already conducted, whether a fence should be solidly connected to the substation ground grids.
- Newer substations and some older substations with buildings have fire extinguishers. Liberty suggested that fire extinguishers be mounted in all substations. Truck-mounted fire

extinguishers might not be available or sufficient to stop a small fire from propagating into a major fire.

- Several substations did not have signage indicating the name of the substation so that the public could identify a substation to emergency services. Ameren-IL reported that it has funded the installation of Ameren-IL signs with substation name and geographic coordinates.

Liberty found that the condition of Ameren's substations were good, and have improved since the previous Liberty inspections conducted in 2009. Liberty's verification of Ameren-IL substation conditions is closed.

Part C – Electronic Data Collection

Ameren-IL, working with the Ameren-UE substation-engineering group, is developing a method for electronically inputting and obtaining substation inspection and maintenance data. Ameren-IL reported that it would be using a handheld, menu-driven, data collection device, directly connected to Ameren-IL's EMPRV maintenance management program via wireless phone services between the handheld and a server. This device will also be able to locate and identify switchgear equipment via global positioning system (GPS). It will be able to identify equipment inside control buildings, where GPS would not function, using a bar code reader, via wireless phone connection to the EMPRV program.

The handheld device will provide real-time, or near real-time, access to the EMPRV program on an Ameren-IL server by substation inspectors and maintenance personnel. The handheld devices will allow inspectors and maintenance personnel access to:

- Substation equipment inspection routes
- Inspection tasks and reports
- Job Creations
- Maintenance job tasks
- Equipment inspection and maintenance history
- Bulletins
- Parts
- Nameplate data

Liberty found that direct field access to the maintenance management program using the handheld devices should provide for consistent substation inspection and maintenance practices and will improve work management efficiencies by removing much of the paperwork currently required.

However, Ameren postponed funding for this project for 2009. Ameren is planning to add a staff member on July 1, 2009, who will spend half time on this project. This person will make the necessary modifications to EMPRV in preparation for the project, prior to the purchase of hardware.

Liberty will continue the verification of progress on the new electronic data collection method.

In August 2011,[551] Ameren-IL indicated that it recently began to roll out its handheld computers to substation inspectors. The handhelds allow substation inspectors and maintenance personnel to identify personnel-specific jobs due and past-due in their specific work areas. They provide a catalog of substation equipment identifications and technical details.
In addition, they provide:

- substation, job, and equipment-specific safety and work instructions,
- an electronic means to record and report substation inspection and job completion data,
- and, a means to request follow up job orders.

The handheld computers use Mobile Frame® software that wirelessly interfaces with Ameren-IL's EMPRV® substation maintenance-management software, which stores job orders and completions, and inspection and job data. The maintenance engineer managing the handhelds has designed into each substation inspection menu the specific equipment within each substation with specific inspection details. Inspectors have been provided with the ability to modify the way the handheld menu physically routes the inspector around each substation, the ability to add equipment data not already entered, and the ability to report comments and follow up job orders to supervisors and maintenance engineers. Ameren IT engineers working with the maintenance engineer provided security measures to prevent electronic intrusion into Ameren-IL's databases.

Ameren-IL reported that all substation inspectors would be using the handheld computers by the end of 2011. Line-personnel substation inspectors will be using the handhelds by the end of 2012. Eventually, all substation inspectors and maintenance personnel will be using the handhelds to manage their jobs. Funding restrictions delayed the initial roll out of handhelds to substation inspectors by more than a year and funding limitations might further slow the complete roll out to all substation personnel. Ameren-IL indicated that it is investigating using Cascade® software to interface EMPRV with equipment testing and other data programs that cannot interface directly with EMPRV. However, this software is expensive and its use will depend on funding availability.

Liberty found that Ameren-IL initial implementation of its handheld computers, although delayed, is consistent with its commitment. However, the timely full implementation of the substation handheld computer program is critical for accurate and cost effective use of the EMPRV maintenance management software for substation inspection, maintenance, and repair work as described in Recommendations VI-3, VI-8, and VI-13.

Liberty will revisit this recommendation in 2012.

In August 2012, Liberty confirmed that in all substation areas Ameren-IL implemented the use of handheld computers by substation electrician inspectors to replace the use of paper inspection forms and corrective maintenance repair forms.[552] Nearly all substation inspectors who are

[551] Interview #449, August 19, 2011.
[552] Interview #478, August 6, 2012; Interview #481, August 7, 2012; Interview #483, August 8, 9, and 10, 2012; Interview #484, August 13, 2012; Interview #485, August 15, 17, and 20; Interview #486, August 21, 2012; and Interview #487, August 22 and 23, 2012; and response to Data Request #1640.

substation electricians (called one-man truck crews) were using the devices by early in August. Linemen substation inspectors (who conduct some of the monthly inspections) are still using paper inspection forms, but Ameren-IL will soon train them to use the devices. Substation electricians inspect all substations at least two times each year (seasonal inspections) and monthly if they also conduct the monthly or weekly inspections. The handheld computers retrieve and input equipment and inspection data located in Ameren-IL's EMPRV substation inspection and maintenance software, via wireless phone connection. Ameren-IL indicated that about 80 handheld computers are in service. The cost of the program was less than $1,000,000.

Before Ameren-IL implemented the devices company-wide, it compiled substation-specific equipment data and inspection checklists within EMPRV and conducted trial usage by selected inspectors to identify and correct weaknesses in the software, hardware, and wireless connection systems. Liberty interviewed and observed several inspectors while inspecting substations in each of the three substation areas. They indicated that the use of the device was convenient and improved their inspection and repair job order process. They are able to select from EMPRV substations to inspect, to download inspection checklists, to review past inspection data, to correct equipment data, to prepare and to upload corrective repair job orders with comments into EMPRV for supervisor approval, and to upload directly into EMPRV completed inspection data. When they observe critical issues, they immediately call or text supervisors. Their only complaint was that one of the wireless services used by Ameren-IL did not provide service in some areas where it should. Ameren-IL is in the process of correcting this problem by changing the service provider and hardware, where necessary.

When a substation electrician inspector finds a defect, he can repair the defect while on site without preparing a job order (quick repairs), or enter a job order into the handheld and complete the repair (longer repairs), or enter the job order, with comments, for later repair by a maintenance crew. The supervisors enter the criticality of the repair into EMPRV, and assign completion dates based on the repair time limits assigned by the Substation Maintenance Strategy.

Substation-maintenance crew leaders also use the handheld computers. When preparing for a maintenance job at a substation, the crew leaders not only download the primary job, but also open other corrective maintenance jobs assigned to that substation. This feature makes efficient bundling of work convenient and effective. Using the handheld computer, crew leaders directly close jobs in EMPRV. Previously, supervisors had to do this manually.

Substation supervisors reported that, since the implementation of the handheld computers with the EMPRV system, there has been an elimination of paperwork and delays in entering and closing corrective maintenance jobs. Using EMPRV, superintendents and maintenance engineers enter job orders and monitor open, closed, and past-due substation preventive maintenance and corrective maintenance jobs. After review of EMPRV data, Liberty found that there has been timely completion of preventive and corrective maintenance jobs in 2012. Ameren-IL indicated that it has been able to timely complete its work because of the recent increase in the number of substation electricians.

Liberty accompanied inspectors at 29 substations. Liberty found that the substation electrician inspectors trained well in using the handheld computers and were using them as intended. Liberty found that all inspections conducted were thorough, whether conducted by linemen or substation electricians, and that the conditions of the substations and the equipment in the substations were very good; Liberty observed only a few minor issues. Ameren-IL is appropriately inspecting its substations and repairing defects when found.

Liberty found that Ameren-IL met its commitment by effectively implementing the use of handheld computers as remote terminals for EMPRV software for providing checklists for substation inspections, for tracking inspection data, for automatically opening and closing job orders for improved job accuracy and timeliness, and for reducing supervision costs.

The verification of this part of Recommendation VI-5 is closed

Recommendation

VI-6
Improve transmission line inspection practices.

Background

Liberty concluded that Ameren-IL should require Ameren Services
(1) To use helicopters to inspect its transmission lines. Ameren Services should develop a plan for Ameren-IL's approval that considers at least annual inspections using a helicopter for inspecting its more aged transmission lines, and for lines that have exhibited more defects than on other lines.

(2) To conduct periodic maintenance of its transmission-line switches and develop a plan for Ameren-IL approval that provides for transmission-line switch maintenance consistent with good utility practices and manufacturers' recommendations.

(3) To conduct periodic and ad hoc thermographic inspections of Ameren-IL transmission line connections and switch contacts during peak, or near peak load and temperature conditions.

Ameren-IL's Implementation Plan

(A) By October 8, 2009, for Ameren-IL's approval, Ameren Services will develop a plan to use helicopters to conduct inspections on Ameren-IL's transmission lines. Ameren will survey at least three other utilities for current use of helicopters for inspecting transmission lines, and it will consider using helicopters for inspecting aged lines and those lines with a history of more defects than other lines.

(B) By October 8, 2009, Ameren Services will develop a plan based on surveys of other utilities and for Ameren-IL's approval for conducting periodic transmission-line switch inspection and maintenance.

(C) Ameren Services will develop a plan by October 8, 2009 to perform thermographic inspections on Ameren-IL's transmission line connections and line switch contacts during peak, or near peak load and temperatures.

Verification Discussion and Conclusions

Part A - Transmission Helicopter Inspection Program[553]

For the last 20 years or so, Ameren has been using an inspector, flying a fixed-wing aircraft, to conduct semi-annual aerial inspections of accessible[554] Ameren-IL transmission lines. Ameren found that these inspections are effective in identifying encroachments and broken parts. Because of low cost and proven effectiveness, Ameren plans to continue using the fixed-wing aircraft for its semi-annual aerial inspections of Ameren-IL lines, at least until the flying inspector becomes unavailable.

[553] Interview #316, November 16, 2009, and response to Data Request #1306.
[554] Flying altitude is restricted in some urban, industrial, and air space control areas. Foot patrols are conducted in these areas.

Ameren uses helicopters flying at normal speeds for conducting special ad hoc inspections, such as identifying the causes of transmission line lockouts, and for conducting annual transmission-system vegetation inspections. The trained vegetation observers identify transmission line defects and report defects to Ameren transmission operations. The helicopters hover during these inspections when needed to investigate defects.

In March and April 2009, Ameren conducted a survey of 25 utilities questioning their use of helicopters for inspecting transmission lines, and in particular for slow-speed-and-hover inspections. Of the 24 utilities using helicopters for transmission line inspections, 15 conduct normal-speed inspections and 9 conduct slow-speed-and-hover inspections, on cycles from 3 years to 12 years. One utility's inspection cycles varied, depending on the type of structure.

Ameren's consideration is whether to use, and how often to use, helicopters for routine slow-speed-and-hover inspections for identifying small defects possibly missed by regular semi-annual and annual vegetation aerial inspections. Ameren recognizes that it cannot easily identify conductor strand and shield wire damage with the fixed-wing inspector or by helicopter vegetation observers flying at normal speed (or from ground observations). Ameren reported that in addition to the current fixed-wing and vegetation inspections, it is considering implementing a slow-speed (a few mph) helicopter inspection program in which the helicopter hovers on each side of transmission structures. In addition, if the fixed-wing aircraft inspection service becomes unavailable, it will consider using helicopters for the semi-annual normal-speed inspections.

Because of logistical problems in retaining a qualified observer, Ameren has not yet conducted any slow-speed-and-hover inspections to verify the effectiveness of such inspections. However, after it conducts some flights, it will evaluate the results and present a going-forward plan to Ameren-IL. Ameren also recognizes that its shield wire inspection program (Recommendation VI-48) requires implementing a helicopter slow-speed-and-hover inspection program.

In November 2009, Liberty found that Ameren conducted a utility survey, but because of its difficulty in retaining a qualified observer, it was not able to make final its plan to use helicopters for routine slow-speed-and-hover inspections of Ameren-IL's transmission lines. Liberty reserves comment on this verification until Ameren provides its formal plan to Ameren-IL. Liberty will continue this verification work later.

In February 2011, Liberty accompanied the Ameren transmission line inspector on a slow fly over of several Ameren-IL transmission line segments.[555] It conducts regular, semi-annual aerial transmission line inspections from a fixed wing aircraft. However, starting in 2010, Ameren-IL used a helicopter for conducting ad hoc inspections and specific Copperweld® shield wire inspections. The Ameren inspector reported that he conducted three inspection trips in 2010 and four inspection trips so far in 2011. The helicopter pilot used by Ameren, and previously by the legacy companies, has been flying transmission-line inspections since 2000.

[555]Interview #422, February 17, 2011.

The Liberty inspection lasted for about three hours and covered about 80 miles of line and structures on several lines. Although the helicopter slowed and sometimes returned to examine defect items, it could not hover because of the helicopter load. The pilot reported that he can hover when there are only two people in the helicopter. Items observed included:

- 2 broken ground wires at pole tops
- Several broken shield wire strands
- 1 damper out of position
- 2 broken cross arms
- 1 X-support loose (bolt pulled out)
- Several split pole tops
- Contaminated insulators
- One pole of H-structure washed out by creek bank
- Several houses are encroaching under a transmission line in Rosewood Heights, Illinois.

The inspector completed inspection forms for each item identified. He indicated that he would verbally report one of the broken cross arms as needing immediate repair. He normally submits the written reports within a week.

Liberty found that using the helicopter for inspections allows slow speed and close up inspections of the transmission lines. The inspector was very knowledgeable of transmission construction and materials and was able to identify defects with expertise. The pilot was knowledgeable of circuit numbers and transmission line components, and assisted with the inspection.

Liberty suggests that Ameren transmission consider:

- Using a high quality digital camera capable of taking zoom photographs of defects quickly and easily. These photos could be provided to Ameren transmission maintenance engineers for review. Photographs might prevent the need for follow-up ground inspections to reevaluation by transmission maintenance engineers.
- Determine if a recording system could be connected to the aircrafts intercom system so that the inspector can verbally report locations and defects in flight rather than trying to complete written forms, which he could do post flight.

In February 2011, Liberty found that Ameren is conducting "ad hoc" and Copperweld® shield wire inspections per its commitment. However, Liberty will revisit Recommendation VI-6A later.

In February 2012, Liberty learned that Ameren was continuing to conduct its pilot program for the best use of helicopters for transmission line inspections.[556] Although transmission line defects might be more easily observed from a slow flying helicopter than from an fixed-wing airplane, using a helicopter for transmission line inspections is much more expensive (at least $825 per hour) compared to an airplane ($130 per hour). Ameren is currently using helicopters

[556] Interview #466, February 17, 2012, and response to Data Request #1628.

for closely inspecting lines with specific problems, such as suspected shield wire damage, and to closely inspect lines that will be highly loaded because of planned maintenance outage of a parallel line. Under a separate program, Ameren uses LIDAR-equipped helicopters to gather data for Ameren's TAMS transmission maintenance program.

Ameren has not made any final decisions on using helicopters inspections, to supplement fixed-wing aircraft inspections, for periodic inspections of Ameren-IL's transmission system. In addition, it does not have plans to use helicopters for conducting thermographic inspections of Ameren-IL's transmission system, because those lines are not heavily loaded.

In November 2012, Ameren reported that in 2013 it would no longer have the opportunity to use fixed-wing aircraft for aerial inspections. It decided to use helicopters exclusively, beginning in 2013, for conducting its routine semi-annual aerial inspections, ad hoc aerial inspections, and forestry aerial inspections of the 4,600 miles of Ameren-IL transmission lines.[557]

Liberty found that Ameren is complying with its commitment for developing a plan to use helicopters for inspecting Ameren-IL's transmission lines. Liberty considers the verification for this part of this recommendation closed.

Part B - Transmission Switch Preventive Maintenance[558]

In March and April 2009, Ameren surveyed 25 utilities, and several others at a technical conference, regarding each utility's transmission-switch maintenance practices. Only one utility reported that it had a routine transmission-switch maintenance program. The remaining utilities serviced switches only when inspections and operational problems indicated the need for maintenance. Manufacturers' literature did not indicate recommended maintenance.

All transmission line switches on the Ameren-IL system are gang-operated (manually operated from a handle at the switch), except for one new remote-operated SCADA controlled, motor-operated switch. Ameren is not aware of any unusual systemic mechanical problems with Ameren-IL gang-operated switches. Generally, if a gang-operated switch fails, mechanical linkage adjustment problems might cause a switch to become inoperative in the open position. When this occurs, Ameren repairs or adjusts the switch. Ameren is also aware that it is possible that poor switch contact penetration could cause excessive heat which could cause a line fault.

Ameren reports that it has not experienced transmission switch problems in sufficient numbers to justify a routine maintenance program. Only one utility of those surveyed reported having a routine transmission-switch maintenance program. Other reasons for not conducting routine switch maintenance include:

- Obtaining necessary line outage is difficult. MISO requirements and potential cost implications to Ameren-IL customers limit the availability of transmission line outages necessary to conduct periodic switch maintenance.

[557] Interview #491, November 9, 2012, and response to Data Request #1651.
[558] Interview #317, November 16, 2009, and response to Data Request #1307.

- Reportedly, many years ago, transmission substation switches were routinely exercised, but the procedure was discontinued in the 1980s because exercising switch mechanisms to conduct maintenance caused excess wear and repairs.

Ameren believes that it is prudent to conduct routinely thermographic inspections of switch contacts. Overheated contacts could cause line faults. Transmission switch contacts will be included in the transmission line thermographic inspection program, as discussed under Part C below.

Ameren is also concerned about the reliability of Ameren-IL's one new (and only) motor-operated SCADA controlled transmission line switch. Because it is remotely operated and serves a large customer, Ameren reported that it would develop an inspection and thermographic inspection procedure specific for this switch.

In November 2009, Liberty found that Ameren-IL met its commitment. Ameren's conclusion not to conduct routine maintenance on Ameren-IL's transmission switches is appropriate based on Ameren experience and its utility survey. However, Ameren should conduct routine thermographic inspections of switch contacts, as discussed below. Liberty considers this verification closed, but will verify the inclusion of transmission switch contacts in the transmission thermographic inspection program under Part C.

Part C - Transmission System Thermographic Inspections[559]

In March and April 2009, Ameren surveyed 25 utilities regarding each utility's transmission thermographic inspection practices. Thirteen utilities reported that they conduct full-line thermographic inspections on their transmission systems, with careful assessments of switch contacts.

To evaluate methods and to develop a plan, Ameren reported that during the summer of 2009 it intended to conduct experimental thermographic inspections on Ameren-IL's transmission system at times when temperatures were high and when system contingency conditions caused peak load flows. However, these conditions did not occur in 2009, and it conducted only one thermographic inspection project, on an old line containing many splices that was to carry potentially heavy loads. The inspection uncovered no problems.

Ameren indicated that it based its decision to defer its experimental thermographic inspections until there were peak loads on Liberty's recommendation to conduct the inspections at or near peak temperature and load conditions. In the interview, Liberty and Ameren agreed that conducting thermography during peak load conditions reveals the greatest information, when splices and contacts are at greatest thermal stress. However, thermography can still be very effective when conducted under normal summer load conditions.

In November 2009, Liberty found that Ameren did not develop a formal plan for Ameren-IL because it did not reach peak loads in the summer of 2009. It did complete its utility survey. Ameren plans to conduct experimental thermographic inspections later under less than peak load

[559] Interview #318, November 16, 2009, and response to Data Request #1308.

conditions, at least on transmission line switch contacts, and it will provide a plan after it completes this evaluation. Liberty reserves comment until the formal plan is developed. Liberty will continue this verification in November 2012.

In November 2012, Ameren reported that it is planning to conduct thermographic inspections of Ameren-IL transmission switches from the ground, using the contractor that currently inspects Ameren-IL substations.[560] It will conduct these annual inspections during summer months when loading and ambient temperatures are elevated.

Liberty found that conducting annual thermographic inspections of transmission switches from the ground is an acceptable and effective alternative to conducting the inspections from a helicopter. Ameren-IL has complied with its commitment. Liberty considers the verification of this part of the recommendation closed.

[560]Interview #492, November 9, 2012, and response to Data Request #1652.

Recommendation

VI-7

Improve substation inspector training.

Background

Liberty found that Ameren-IL's substation inspection practices had weaknesses, and recommended that Ameren-IL improve substation inspector training. Substation inspector training should include substation equipment theory, operation, expected abnormal conditions, equipment failure modes, and in actions required for critical abnormal conditions, such as bushing oil leaks. Training should include the identification of National Electrical Safety Code compliance issues.

Ameren-IL's Implementation Plan

Ameren-IL accepted the recommendation, noting that it intends to implement an electronic inspection data-gathering system. One purpose of the electronic data-gathering system is to eliminate inconsistencies in inspection practices between different areas and/or personnel within Ameren-IL. In addition to containing a database of specific equipment at each substation, the handhelds used to perform the inspections will be pre-set with data fields geared toward capturing many of the various conditions noted by Liberty.

Ameren-IL said it would enhance substation inspector training on substation equipment theory and operation, expected normal and abnormal conditions, equipment failure modes, and NESC compliance. Where labor contracts allow inspectors to perform required corrective actions for critical abnormal conditions, it will develop specific training materials. It will also define process and handoffs for work documentation.

Verification Discussion and Conclusions

Ameren-IL provided its "Substation Inspection Training Manual," revision 6, dated March 26, 2009.[561] Ameren-IL reported that it would use this manual in training its linemen conducting substation inspections. In May 2009,[562] Ameren-IL reported that although it had not yet used this formal substation-inspection training document, it had been providing components of it as part of the annual switching training program for journeyman linemen, which included about one-half of Ameren-IL's linemen each year for the past two years. The program did not include substation electricians, who received substation inspection training via the apprentice program. Ameren-IL does not have a standalone substation inspector training or refresher program for its linemen and substation electricians who conduct periodic substation inspections. Ameren-IL reported that it might integrate this substation inspector-training program in its annual journeyman lineman refresher-training program.

Liberty found that Ameren-IL made a good effort to comply with Recommendation VI-7. However, Ameren-IL has not fully complied with its Implementation Plan. The manual provided was completed before the implementation date, but the manual has not yet been used to provide

[561] Response to Data Request #1076.
[562] Interview #236, May 7, 2009.

training to either the lineman or substation electrician substation. It was Liberty's intention in its recommendation that substation inspection training would include both linemen and substation electricians who inspect substation, as a stand-alone program.

Additionally, the manual is deficient in discussions about equipment failure modes, discussions about critical conditions, such as low bushing oil levels, and discussions about required corrective actions; and it did not clearly identify NESC substation requirements. Liberty provided suggestions to Ameren-IL at the May 7, 2009, interview on items to include in the manual. Liberty also suggests that Ameren-IL use defect data and defect photographs indicated in the Liberty reports of past and on-going Liberty substation inspector audits and substation inspections.

In May 2009, Liberty indicated that it would review Ameren-IL's substation inspector training manual again to monitor progress in improving its contents, and to discuss updates on substation inspector training.

In November 2010, Ameren-IL provided a copy of its revised Substation Inspection Training Manual dated September 29, 2010.[563] This manual included discussions about low bushing oil levels, oil leaks, NESC required substation grounding, a photograph of a failed bushing, and a table of failure modes. Ameren-IL accepted a few additional minor additions that Liberty recommended to the revised training manual.

Over the past 2 years, Ameren-IL used the previous version of the Substation Inspector Training manual in its training of linemen who conduct substation inspections. It will use the newly revised training document for refresher training of substation personnel who conduct substation inspections for their upcoming refresher training and for linemen later. The refresher program (for substation personnel) begins in November 2010. Liberty found that the training document was comprehensive and appropriate, and included the topics Liberty previously recommended. Ameren-IL agreed that it should treat the manual as a "living document," where engineers and technicians can suggest additional topics or a more thorough treatment of particular topics.

Liberty found that the latest revision of Ameren-IL's substation inspector training manual is now very comprehensive and appropriate. Ameren-IL used the original manual for training linemen substation inspectors in 2008 and 2009, and, beginning in November 2010, will use the revised manual for training substation personnel who inspect substations. Liberty considers this recommendation verified and closed.

[563] Interview #403, November 4, 2010, response to Data Request # 1443.

Recommendation

VI-8
Develop a new priority system for substation repairs

Background

Liberty found that substation repairs were not adequately prioritized, and recommended that Ameren-IL develop a new priority system for substation repairs. (1) Ameren-IL should assign substation repair items priorities and associated completion dates. (2) The priority range should go from immediate to one year with appropriate points in between to classify the urgency of the repair. (3) Even minor repair items should have an expected completion date, which should be no longer than one year. (4) Work management tools should be capable of reporting on repairs completed on time and reporting repairs that are past due or backlogged. (5) Management should receive regular repair reports on the status of repair completions. (6) Ameren-IL should develop meaningful performance measures for the timely completion of substation repairs. (7) Organizations responsible for repairs should be accountable for completing those tasks on time.

Ameren-IL's Implementation Plan

Ameren-IL reported that by October 8, 2009, its Substation Maintenance Strategy Team would develop a priority system for all corrective maintenance repair jobs and for all condition-based maintenance jobs.

Verification Discussion and Conclusions[564]

Ameren-IL indicated that it identified failure modes with underlying causes and catalysts. It established a not-to-exceed timeframe based on criticality of asset type and historical rate of progress to failure. Ameren-IL provided a spreadsheet indicating equipment type, failure causes, and maximum time to complete repairs for each type of corrective maintenance. The corrective maintenance items are given due dates based on the type of equipment and problem, and not by priority codes. The repair completion date limits ranged from one day to one year. The Substation Maintenance Strategy Team substantially completed the evaluation work in March 2009 and completed it by September 23, 2009. Ameren-IL will add the new corrective maintenance timelines to the EMPROV maintenance work tracking system when it implements the new handheld data recording device program. Once implemented, it will attach the new timelines to new corrective maintenance orders. Reports will be generated showing overdue items and the amount of time on item is past due.

Ameren-IL confirmed the information provided in the data request response. Additionally, Ameren-IL indicated that it would give these corrective maintenance items actual due dates based on evaluations by the inspector and others, limited by the maximum time indicated by the spreadsheet. It will track and report corrective maintenance task completions in the same fashion as preventive maintenance task completions. It will not implement the new corrective maintenance timelines until it can implement the new handheld data recording device program.

[564] Interview #337, January 26, 2010, and response to Data Request #1344.

Liberty found that Ameren-IL's corrective repair time limits were consistent with good utility practice, except for a few items that it is reconsidering.

Ameren-IL met its commitment to develop time limits for substation corrective maintenance tasks. However, it will not implement this program until it begins using the handheld data recording device program. Therefore, Liberty will continue this verification until after implementation of the handheld data recording device program (Recommendation VI-24).

Please refer to Recommendation VI-5, Part C. In August 2011,[565] Ameren-IL indicated that it recently began to roll out its handheld computers to substation inspectors. The handhelds allow substation inspectors and maintenance personnel to identify personnel-specific jobs due and past due in their specific work areas. Liberty will revisit this recommendation in 2012 after the use of handheld computers has been in place for substation maintenance personnel.

In August 2012, Liberty found that Ameren-IL had implemented its handheld computer program for substation inspectors.[566] Please refer to Recommendations VI-3C and VI-5C above. Liberty had previously found that Ameren-IL had prepared a document indicating time limits for repairing equipment defects. Liberty agreed with the timelines, except for the 1-year maximum time allowed for replacing leaking bushings. Although rare, a leaking bushing could result in catastrophic consequences and Liberty suggested that Ameren-IL clarify its time requirements for replacing leaking bushings. Ameren-IL revised its time limit requirements for bushing problems as follows:

- Maintenance Engineering will evaluate each corrective maintenance job created to address a bushing problem within two working days.
- Jobs will be categorized as:
    - Emergency – bushing will be removed from service as soon as load can be transferred.
    - Critical – bushing will be repaired or replaced within one calendar month – pending parts availability
    - Routine – bushing will be repaired or replaced within 12 calendar months
- All timelines are subject to outages.

Ameren-IL indicated that it has over 10,000 spare bushings available to replace defective bushings.

Liberty found Ameren-IL's use of these time-limit categories for bushing problems as appropriate.

Ameren-IL has integrated corrective maintenance time limits into EMPRV, which automatically applies time limits into repair jobs after inspectors submit them via the handheld computers, and supervisors approve the jobs.

[565] Interview #449, August 19, 2011.
[566] Interview #479, August 6, 2012, and responses to Data Requests #1642 and #1649.

Ameren-IL has met its commitment to develop appropriate time limits for corrective maintenance jobs and has integrated the time limits into its EMPRV substation maintenance management program. The verification of this recommendation is complete.

Recommendation

VI-9

Implement a complete distribution and sub-transmission circuit-patrol inspection program.

Background

Liberty found that Ameren-CILCO and Ameren-IP had reasonable circuit-patrol inspection programs. Ameren-CIPS did not. None of the companies kept records adequate to show whether they complied with their programs and completed repairs resulting from inspections. However, in 2007, Ameren-IL implemented a sub-transmission and distribution-line patrol inspection policy that included a 4-year patrol inspection cycle for distribution lines and a 2-year foot-patrol inspection cycle for sub-transmission lines. Based on its review of the program documents, Liberty found that the new program is complete and consistent with good utility practices. Ameren-IL needs to effectively implement this program and maintain accurate and complete records of inspections, inspection results, and the resolution of defects identified by the inspections.

Ameren-IL's Implementation Plan

Ameren- IL implemented a statewide formal circuit inspection program for all distribution and subs transmission circuits. Each year, the inspection includes one quarter of Ameren-IL's circuits. The inspections generate work requests for pole attachments requiring repair or replacement.

Verification Discussion and Conclusions

Ameren-IL's operations support group conducts circuit patrol inspections on Ameren-IL's distribution and sub-transmission circuits on 4-year cycles.[567] In 2008, Ameren-IL planned and its contractor inspected 583 circuits, including:

- 171 distribution and 99 sub-transmission circuits, including 71,402 poles for CIPS. Labor agreement restrictions limited the magnitude of CIPS Division 2 circuit inspections for 2008
- 47 distribution circuits, including 20,732 poles for CILCO
- 204 distribution and 62 sub-transmission circuits, including 146,795 poles for IP.

In 2009, Ameren-IL plans to inspect 547 circuits, including:

- 229 distribution and 79 sub-transmission circuits for CIPS
- 28 distribution and 2 sub-transmission circuits for CILCO
- 121 distribution and 88 sub-transmission circuits for IP

Contractor personnel trained and dedicated for the circuit-patrol inspection work conducted most of the inspections. However, to prevent redundancy, the sounding and boring inspectors used for the 12-year ground-line pole inspection program inspected some of the circuits. These inspectors received the same training and used the same electronic data-gathering device as used by the circuit patrol inspectors. Ameren-IL personnel conduct one-day inspection verifications twice

[567] Interview #203, February 5, 2009, and response to Data Request #1011.

each month. Each day of verification includes re-examination of 75 to 100 poles, or about one-half of a circuit.

The inspectors enter inspection data on a database program linked with Ameren's electronic circuit maps installed in hardened laptop computers. They record pole location coordinates on the maps via GPS modules attached to the computers. The inspectors upload the maps and data daily onto storage devices and provide them to contractor supervisors. The supervisors upload the maps and data to the Ameren-IL operations support group via wireless phone service. Supervisors call in critical deficiencies identified immediately. They provide maps with circuit defect data and pole locations to the division's supervising engineers. The divisions evaluate the inspection results and produce the necessary work orders.

Liberty concluded that Ameren-IL's 2008 circuit-patrol inspection work, and its plans for the 2009 circuit inspection work, were consistent with Liberty's recommendation and with Ameren-IL's response to the recommendation. Liberty also found that Ameren-IL's circuit inspection practices now appear to be consistent system-wide, using an effective state-of-the-art data gathering process and producing timely, accurate, and user-friendly inspection results for division engineers. Liberty will accompany circuit-patrol inspection personnel in the future to evaluate the effectiveness of the inspection methods. Liberty will also review inspection-work completion data in about one year.

Circuit Patrol Inspection Program Field Audit[568]

In May 2010, Liberty observed three of the Ameren-IL contractor's sound-and-bore inspectors, while they were conducting circuit patrol inspections under the Ground-Line Inspection Program.[569] The inspectors were conducting circuit patrol inspections and sound-and-bore inspections on one- and two-phase circuits. In addition to their sound and bore inspection work, the inspectors conducted thermographic inspections of switch contacts and connections, photographed each pole, applied tags, inspected for and entered NESC violations and other defects (and reliability program information) into laptop computers, and recorded GPS locations. The inspectors had 2-8 years experience and had received at least one week of training. The circuit inspection work conducted by the sound-and-bore inspectors was thorough and appropriate. Defects found included guy wire issues and broken ground wires. Although loose, cut, broken, or stolen pole ground wires might be hazardous to the public, Ameren-IL could not

[568] Interview #365, May 13, 2010, and response to Data Request #1387.

[569] Ameren-IL has three types of inspectors. "Circuit Patrol Inspectors" applies tags, photograph poles, record GPS locations, enter NESC items and equipment defects and missing animal guards data into laptop computers, and they conduct thermographic inspections of switch contacts and circuit connections on 1-, 2-, and 3-phase circuits under the 5-year (was 4-year) Circuit Patrol Program. "Excavate Crews" conduct ground-line inspections (sound, bore, and treat) only on 3-phase circuits under the 12-year Ground-Line Inspection Program. Excavate Crews do not conduct formal visual circuit patrol inspections. "Sound-and-Bore Inspectors" conduct sound and bore pole inspections (no excavating around poles or treating poles) on 1- and 2-phase circuits. However, they also conduct circuit inspections (identical to that done by Circuit Patrol Inspectors) on all 1-, 2-, and 3-phase circuits under the 12-year Ground-Line Inspection Program. Sound-and-Bore inspectors work in the same areas with the Excavate crews so that they can perform the circuit patrol inspections on the 3-phase circuits, just prior or just following the Excavate Crews.

permit the inspectors to repair pole ground wires because of contractual language with the IBEW.

Inspectors transmitted pole and inspection data gathered on their computers to the contractor's engineering group for processing, who then supplied the processed data to Ameren-IL's division engineering groups and electronic work management systems via electronic drawings and spreadsheets. The system automatically enters NESC and repair items into Ameren-IL's work management system.

2009 Circuit Patrol Inspection Program Results[570]

Ameren-IL obtained 156,708 data items from its 2009 circuit patrol inspection program. These items included defects needing repair, NESC violations, and information (such as non-animal protected transformers) for in inclusion in various reliability programs.

Change in Circuit Patrol Inspection Program Cycle[571]

As of the beginning of 2010, Ameren-IL changed its first 4-year distribution circuit patrol inspection cycle to a 5-year cycle because it lacked sufficient resources to correct all NESC items identified (more than originally estimated) within the originally specified period, as indicated in correspondence to the ICC Staff, dated July 10. 2009. In addition, based on the results of the completed first cycle of sub-transmission circuit patrol inspections, Ameren-IL determined that the 2-year cycle for its sub-transmission system circuit patrol inspection program was excessively intensive. Ameren-IL extended its sub-transmission ground-line inspection program to a 5-year cycle for 2010.

Circuit Patrol Inspection Program Completions Performance[572]

Ameren-IL's system is made up of 2,496 distribution circuits and 473 sub-transmission circuits (including both single-line and double-line circuits). In May 2010, Liberty reviewed Ameren-IL data to determine whether Ameren-IL was conducting circuit patrol inspections consistent with the program's 25 percent per year rate for distribution circuits and its 50 percent per year rate for sub-transmission circuits. For 2010, the inspection rates for distribution and sub-transmission circuits both should be about 20 percent, according to the new 5-year cycle.

Liberty found that Ameren-IL completed its distribution circuit patrol inspections at nearly 25 percent per year for 2008 and 2009, consistent with its original 4-year cycle. For 2010, it plans to complete about 20 percent, consistent with the new 5-year cycle. Liberty found that Ameren-IL completed its sub-transmission circuit patrol inspections at nearly 50 percent per year for 2008 and 2009, consistent with its original 2-year cycle. For 2010, Ameren-IL plans to complete over 20 percent of its sub-transmission circuits, consistent with its new 5-year cycle. However, Ameren-IL had not included any Ameren-CILCO sub-transmission circuits in 2008 or 2009. Ameren-IL explained that Ameren-CILCO sub-transmission circuits were not included in the circuit patrol program because they all had been inspected in 2005 and 2006, prior to the

[570] Response to Data Request #1385.
[571] Interviews #367 and #375, May 4, 2010, and response to Data Request #1417.
[572] Interviews #367 and #375, May 4, 2010, and responses to Data Requests #1403, #1404, #1418, and #1420.

implementation of the current circuit patrol inspection program. Ameren-IL reported that Ameren-CILCO sub-transmission circuits would be included in the program for 2011.

In May 2010, Liberty found that Ameren-IL is conducting its circuit patrol inspection program, in content and timeliness, consistent with its program, and that the program is producing appropriate NESC and other defect data for inclusion in Ameren-IL's work management system and reliability programs. However, when Ameren-IL has completed correcting its NESC violations, it should determine if it has resources to return to 4-year cycles for both its distribution and sub-transmission circuits. In addition, it should consider whether it would be feasible to allow contractor inspectors to repair broken pole ground wires.

Liberty will interview Ameren-IL divisions later to determine whether they appropriately address the defective items and engineering data gathered by the circuit-patrol inspection program. Liberty will also revisit Ameren-IL's circuit patrol program later.

In August 2011,[573] Ameren-IL reported that it readjusted its circuit patrol inspection cycles for both distribution and sub-transmission to 4 years, or 25 percent per year. In 2010, it inspected about 21 percent of its distribution circuits and about 17 percent of its sub-transmission circuits (reduced because of funding limitations). These completion numbers are acceptable because in 2010, Ameren-IL was on a 5-year distribution cycle and it had inspected all sub-transmission circuits within the previous 2 years (except some CILCO sub-transmission circuits). In 2011, Ameren-IL plans to inspect about 27 percent of its distribution circuits and about 67 percent of its sub-transmission circuits (CILCO circuits included). Through May 6, 2011, Ameren-IL completed about 40 percent of its scheduled circuit patrol inspections for 2011. Ameren-IL indicated that it would complete its planned 2011 circuit patrol inspections by the end of the year. Ameren-IL reported that it plans to continue the 4-year cycle for circuit patrols and the 12-year cycle for groundline inspections for its distribution and sub-transmission circuits. Liberty found that Ameren-IL's on-going distribution and sub-transmission circuit-patrol program is consistent with its commitment.

Liberty found that Ameren-IL implemented, and it is conducting, its statewide formal 4-year circuit inspection program cycle for all distribution and sub-transmission circuits consistent with its commitment and Liberty's intent. Liberty considers this verification closed.

In May 2012, Liberty interviews and found that all divisions received overhead line-repair work data and maps indicating the locations needing additional lightning and animal protection.[574]

[573] Interview #442, August 19, 2011, and response to Data Request #1573.
[574] Interviews # 471 through #476, May 14-18, 2012.

Recommendation

VI-10

Implement a periodic and thorough ground-line inspection of distribution and sub-transmission wood poles.

Background

In the Ameren-IP and Ameren-CILCO areas, ground-line pole inspections were thorough. Ameren-CIPS only sounded poles. Sub-transmission pole inspections occurred on about a 12-year cycle. Overall, however, only about 2 percent of the poles received inspections. Ameren-IL needs to inspect poles to determine whether they meet National Electrical Safety Code strength requirements.

Liberty recommended that Ameren-IL ensure that its poles receive periodic and thorough inspections according to a defined program. Ameren-IL should also ensure that the inspection of distribution poles includes those on lines that tap or branch off main distribution circuits. Ameren-IL should maintain inspection records and records showing completion of replacements, reinforcements, and treatments of poles as called for by the inspection results. Organizations conducting or managing the inspections should be accountable to Ameren-IL for completing them on schedule.

Ameren-IL's Implementation Plan

Ameren-IL implemented a statewide, formal ground-line inspection program for all distribution and sub-transmission poles. Each year, the program includes 1/12 of the poles. The inspections generate work requests for poles requiring replacement. Poles that require supplemental ground-line support without replacement are coordinated through Ameren Services for reinforcement.

Verification Discussion and Conclusions

Ameren-IL's Operations Support group, which replaced the old Ameren Resource Management group, conducts ground-line inspections on Ameren-IL's distribution and sub-transmission circuits on 12-year cycles.[575] For 2008, the program included 111,480 distribution poles on 180 circuits and 5,366 sub-transmission poles on 46 circuits. During those 2008 inspections, Ameren-IL found:

- P1 reject: 976 distribution poles and 98 sub-transmission poles requiring replacement within 90 days
- P2 reject: 993 distribution poles and 52 sub-transmission poles requiring replacement in one year
- 671 restorable distribution poles and 93 restorable sub-transmission poles requiring reinforcement within 90 days
- 945 restorable distribution poles and 68 restorable sub-transmission poles requiring reinforcement within one year

[575] Interview #204, January 27, 2009, and response to Data Request #1012.

Ameren-IL reported that it reinforced 586 distribution poles and 140 sub-transmission poles, many of which were the result of the 2007 inspections.

Ameren-IL managed all ground-line inspection work; a contractor conducted all inspections. An Ameren-IL supervisor is responsible for the ground-line pole inspection program and personally conducts quality control reviews of the contractor's work. The contractor provides 12-15 inspectors for the sounding, boring, and inspections, and five 3- or 4-man crews to conduct excavations and chemical treatments. They inspect, sound, and bore the poles on all circuits. They excavate and treat poles on 3-phase circuits. The inspectors provide reports and maps to the divisions indicating needed pole replacements, maintenance, and repairs.

The ground-line pole inspection also replaces the 4-year patrol inspection on the circuits inspected. Inspectors provide data obtained from the visual inspection to the circuit patrol manager in the Operations Support Group.

Ameren-IL is meeting its implementation plan and appears to be meeting the intent of Liberty's recommendation. Liberty's verification work is not complete. Liberty will:

- Continue to monitor Ameren-IL's pole inspection progress
- Monitor the work of the pole inspection crews
- Review Ameren-IL's progress in completing the maintenance identified as necessary by the pole inspection program.

Ameren-IL's Ground-Line Inspection Program

- Ameren-IL inspects poles 15 years old or more every 12 years.
- On three-phase circuits, ground-line excavate crews remove soil around poles to 18 inches below the ground line, scrape deteriorated material from the pole below the ground line, examine the poles, sound the poles for voids with a hammer from below the ground line to about 8 feet above the ground line, bore holes down at the ground line and at other several places depending on the type of wood and where voids are suspected. They measure pole shell thickness using a special tool inserted into the bored holes (pole strength is determined from shell thickness). They plug the holes, apply a chemical preservative wrap around the pole base below the ground line, and refill the excavations. Ameren-IL had been inserting chemical rods and activator into the holes before plugging. However, it discontinued this treatment as a cost reduction measure following the recent Illinois rate case decision.
- Inspectors sound and bore poles on one- and two-phase circuits as described above. They do not excavate or apply chemical treatments to these poles.

Ground-Line Inspection Program Field Audit[576]

In May 2010, Liberty observed the activities of two ground-line inspection program "excavate crews" while they were conducting sound, bore, excavate, and treat pole inspections (on three-phase circuits) and three ground-line inspection program "sound and bore" inspectors while they were conducting sound, bore, and pole/circuit inspections on one- and two-phase circuits. The

[576] Interviews #365 and #366, May 13 and 14, 2010, and response to Data Request #1388.

sound-and-bore inspectors also conducted visual and thermographic circuit inspections on the three-phase circuits, as well as the one- and two-phase circuits. The excavate crews do not conduct formal visual circuit patrol inspections. The sound-and-bore inspectors and the excavate crews generally work in the same area so that the sound-and-bore inspectors can conduct visual circuit patrol inspections either just before or just after excavate crews conduct their work.

Liberty found that the excavate crews:

- sounded the poles with a hammer to about 8 feet above the ground line (to identify voids)
- removed soil to about 18 inches below the ground line
- scraped and removed deteriorated pole shell material from below the ground line
- bored a hole below the ground line and bored several others above the ground line
- inserted a measuring tool into the bore holes to determine shell thickness
- plugged the holes
- applied a chemical preservative wrap around the base of the pole below the ground line.

The crew reported that Ameren-IL instructed them to stop inserting chemical preservative rods into the bore holes, as of that week. Ameren-IL indicated that it had to reduce costs and had determined that it was the least effective procedure to discontinue.

The excavate crews photographed priority 1, priority 2, and restorable poles to reduce the need for engineers to conduct field visits. Sound and bore inspectors and excavate crews immediately and directly reported emergency reject poles to Ameren-IL. Liberty witnessed the immediate reporting of the two emergency reject poles identified. Foremen made the reject and restorable evaluations, which laptop computer software verified. The contractor submits pole evaluation reports to Ameren-IL in about 2 weeks.

The sound-and-bore inspectors photographed each pole, applied tags, inspected and entered NESC violations and other defects into a laptop computer, conducted thermographic inspections of switch contacts and connections, and recorded GPS locations. The inspectors sounded the poles with a hammer at the ground line and up to about 8 feet above the ground line. They do not excavate below the pole ground line nor do they apply chemical preservative treatments. They bored downward at the ground line and elsewhere into the pole wherever the soundings indicated a possible void. Where there were voids, they measured shell thickness via the bored holes using a special gauge. They entered pole and shell thickness data into a laptop computer to determine if the pole was acceptable, rejected, or if the pole required restoration (installing steel support clamps).

Pole Condition Classifications[577]

- "Emergency"– poles deemed as an immediate risk to the public, these poles need to be reported immediately to an Ameren representative by phoning the appropriate Ameren representative to report.

[577] Response to Data Request #1388.

- "Priority 1"– poles with an imminent risk of failure, but do not pose an immediate risk to the public, and are not restorable.

- "Priority 2"– poles that do not meet minimum strength requirements, do not pose an immediate risk to the public, and are not restorable.

- "Priority Restorable and Restorable" - poles that do not meet the minimum strength requirements, do not pose an immediate risk to the public, but have enough good wood to repair per Ameren-IL reinforcing specifications.

2009 Ground-Line Inspection Program Results

See VI-21 for discussion of reject and restorable pole percentages.

The Ground-Line Inspection Program Cycle

Ameren-IL should be conducting its distribution and transmission ground-line inspection program on 12-year cycles (8.3 percent per year) to comply with its Ground-Line Inspection Program.

Ground-Line Inspection Program Completions Performance[578]

In May 2010, Liberty found that Ameren-IL's average rate of distribution circuit ground-line inspections from 2007 through 2009 was 8.6 percent, which was consistent with the program's 8.3 percent rate. Ameren-IL's average for sub-transmission circuit ground-line inspections was 5.5 percent. Ameren-IL explained that this is consistent with the program because it included only circuits not inspected during the previous 12 years. It had conducted ground-line inspections on many sub-transmission circuits within the previous 12 years. Although Ameren-IL did not have records for distribution ground-line inspections that it might have performed before the program, it did have good records for contractor-conducted ground-line inspection records for Ameren-IP and Ameren-CIPS sub-transmission circuits. In addition, Ameren conducted ground-line inspections on Ameren-CILCO sub-transmission circuits in 2005 and 2006, prior to this program. The sub-transmission ground-line inspection rate should increase to 8.3 percent when Ameren-IL completes the first inspection cycle in about 10 years.

For 2010, Ameren-IL's schedule calls for completion of 7.0 percent of its distribution circuits. Ameren-IL is currently reassessing its first cycle schedule for conducting future sub-transmission ground-line inspections. It is striving to assure that circuits that have never been inspected have priority over circuits that have been inspected (even if more than 12 years ago).

In May 2010, Liberty found that Ameren-IL was conducting its ground-line circuit inspection program from 2007 through 2009, in content and timeliness, consistent with its program. However, Ameren-IL has discontinued inserting chemical preservative rods and activator into borings as a cost saving measure. Ameren-IL should consider, at least, applying the treatment rods into poles in wet locations and where it cannot excavate and treat poles with the chemical preservative wrap.

[578] Interview # 367 and #375, May 4, 2010, and responses to Data Requests #1395, #1403, #1404, #1406, and #1419.

During 2010 and 2011, Ameren-IL conducted sub-transmission ground-line inspections at a reduced rate of about 3 percent per year because by 2011 it had inspected all 530 sub-transmission circuits during the previous 12 years.[579] During the same period, Ameren-IL conducted distribution ground-line inspections of its 2,641 circuits at a rate of about 8 percent per year. From 2012 onward, Ameren-IL plans to maintain its ground-line inspection rates of 8 percent or more to maintain the 12-year inspection cycles.

Ameren-IL indicated that its pole reject rate is about 1.5 percent, and its pole reinforcement rate is 1.5 to 2 percent, which are essentially unchanged over the last few years.

Liberty found that Ameren-IL complied with its commitment to implement ground-line inspections on 12-year cycles and closes this recommendation.

[579]Interview #458, November 10, 2011, and response to Data Request #1606.

Recommendation

VI-11

Conduct periodic inspections of distribution system regulators, line reclosers, capacitor banks, and switches, and sub-transmission system switches.

Background

Liberty found that distribution line device-inspection programs were not consistent among the companies. Liberty recommended that Ameren-IL conduct periodic inspections of distribution system regulators, line reclosers, capacitor banks, and switches, and sub-transmission switches. (1) Ameren-IL should have a consistent and complete device inspection program. (2) The inspections should be consistent with manufacturers' recommendations and good utility practices. (3) As with other inspection programs, Ameren-IL should maintain adequate records and have tools necessary to determine easily the status of inspection completions.

Ameren-IL's Implementation Plan

Ameren-IL reported that it is conducting periodic inspections of distribution system regulators, line reclosers, sectionalizers, and capacitor banks. However, it will enhance the current Line Device Inspection Program by including 3-phase group-operated switches. Ameren-IL reported that by October 8, 2009, it would develop a prioritization of critical switches, including appropriate inspection intervals.

Verification Discussion and Conclusions[580]

Ameren-IL implemented a vehicle, foot patrol, and slow-fly inspection program for all 12,000-volt, 34,500-volt, and 69,000-volt gang-operated air switches. Ameren-IL's Procedure E03.08 "Distribution Line Air Breaker switch Inspection Procedure and Form," dated August 25, 2009 describes the switch inspection program, including reportable conditions. The switch inspection program commenced at the beginning January 2010.

Ameren-IL's 2008 and 2009 Device Inspection Program included inspecting capacitor banks annually, and reclosers, regulators, and sectionalizers at the rate of twice each year for all Ameren-IL companies. The program continues for 2010, but includes annual inspection of all gang-operated distribution and sub-transmission switches.

All companies schedule and track device inspections consistently using the Ameren-IL CDIS maintenance management system. Ameren-IL tracks division past-due inspections and repairs and includes device inspection and repair performance in with its monthly division reliability action plan performance reports.

In 2008, Ameren-IL completed 11,042 device inspections of 11,247 inspections scheduled. It identified 373 needed repairs, and it completed 358 repairs. For 2009, Ameren-IL completed 9,252 distribution line-device inspections of the 9,350 inspections scheduled. It identified 422 needed repairs, and it completed 341 repairs. The new annual switch inspection program for 2010 includes 1,946 group-operated air switches.

[580] Interview #338, February 2, 2010, and response to Data Request #1345.

Liberty concluded that Ameren-IL is inspecting it line devices consistently among the companies. It included group-operated air switches in its device inspection program. Ameren-IL's actions were consistent with its commitments. Liberty will continue the verification until Ameren-IL completes switch inspections.

In November 2010, Ameren-IL provided data on its 2010 switch-inspection program. Ameren-IL reported that it reviewed the frequency of its device inspections to determine the effectiveness of the inspection cycles.[581] Ameren-IL determined that capacitor, recloser, and voltage-regulator inspection cycles were effective. However, it determined that its dedicated switch inspection program implemented at the beginning of 2010 was not cost effective, and it will not continue the dedicated switch inspection program in 2011.

Ameren-IL completed inspections of all 1,948 switches in 2010, at a cost of about $416,519, under the dedicated inspection program. It identified only 35 switches needing repairs (less than 2 percent). Furthermore, it periodically inspects switches thermographically by the ground-line pole inspection contractor, making the switch inspection program redundant to the ground-line patrol program.

In November 2010, Liberty found Ameren-IL had inspected all switches at least once in 2010, and identified less than 2 percent as needing repairs. Liberty agrees that Ameren-IL should discontinue the dedicated switch inspection program because the program is not cost effective, because defect rate is low, and because it will continue to inspect switches as part of the periodic visual inspection program. Liberty considers this recommendation verified and closed.

In May 2012 follow-up verification work, Liberty conducted an overview interview at each division.[582] Liberty found that each division was consistently using its CDIS device-inspection scheduling tool and that each division was timely completing device inspections and follow-up repairs.

[581] Response to Data Request #1472.
[582] Interviews #471 through #476, May 14-18, 2012.

Recommendation

VI-12
Improve the Underground Residential Distribution cable program.

Background

Underground residential distribution (URD) is usually made up of many cable segments connected into a loop feed at each end from separate sources. When a cable segment fails in a loop, it is common practice for a troubleman to open switches to clear the faulted cable from the loop to restore service without a lengthy service interruption. However, if another cable segment fails before the cable segment is repaired or replaced, restoration time for some customers might be lengthy because a cable will need to be repaired or replaced before service is restored. Therefore, it is important to minimize the time in which the redundancy afforded by the cable loop is lost by completing timely repairs or replacement of failed cable segments before another cable segment fails. Liberty knows that one large utility requires repairing cable segments within 10 days.

Liberty recommended that Ameren-IL track the numbers of URD cable loops left open subsequent to URD cable failures, and track the time required to close those loops by repairing or replacing the faulted cable segments within reasonable time. Liberty also recommended that Ameren-IL management should have the tools available to track not only the number of open URD cable loops, but also the time required to close each loop.

Ameren-IL's Implementation Plan

In its response to the recommendation, Ameren-IL agreed with the Liberty recommendation and indicated that although its URD cable repair program includes methods for tracking cable replacement costs and cable replacements, that there are areas of improvement for better tracking costs and for further evaluating timely repairs and better recording open cable loops. By April 30, 2009, it will have the URD program group, the reliability group, and the information technology group together to look for improved ways to track replacement costs. The intention would be to include this information on a monthly scorecard shared with the divisions.

Verification Discussion and Conclusions

On September 17, 2009, Ameren-IL implemented Procedure E03.16 – Underground Cable Fault Tracking. The purpose of this procedure is to provide a consistent method to track cable repairs so that operations and management have the ability to ensure that URD cable loops are repaired in timely manner to maintain reliable URD systems. The procedure includes a Cable Fault Tracking Process flow diagram that indicated that an "Outstanding Cable Fault Report" produced by the DOJM work scheduling process is provided to the monthly reliability action plan review process. However, this procedure does not require a specific time for repairing or replacing faulted cable segments.[583]

The procedure requires that when a URD loop is opened because of a cable segment failure to restore customer service, that the proper cause code must be entered into OAS and that a DOJM

[583] Response to Data Request # 1309.

order to repair the faulted cable segment must be created and scheduled. When the faulted cable segment is repaired or replaced, division operations close the DOJM order with the correct completion date. Reliability engineering provides management with summary reports on the numbers of URD cable-segment-repair work orders open at the end of the reporting month and the number closed during the past 90 days.[584]

Ameren-IL reported that, starting in 2010, it is including the number of URD cable segments repaired and the number not yet repaired in the Reliability Action Plan Report. Division managers, the operations manager, and the vice president review and discuss this report at the monthly vice president meetings. Ameren-IL showed Liberty a report from the DOJM system indicating the cable segment repairs completed and those not completed. Ameren-IL reported that on September 24, 2009, that during the previous 90 days, 279 cable segments had faulted and it had repaired 261. There were 18 segments open more than 30 days. By October 1, 2009, it had not repaired only one of those cable segments.[585]

In November 2009, Liberty found that although Ameren-IL is complying with the recommendation, it could improve two parts of the procedure. (1) Management should make it a division key goal to complete repairs of open cable segments (closing loops) within a specific period. Liberty suggests starting with 30 days, and possibly later reduce that to 15 days or less before a cable segment repair is past due. (2) The monthly reliability action plan report should make it clear as to the number cable segment repair work orders that were left open (open loops) for more 30 days (or some lesser time period), and not just the number of work orders open at the end of the reporting month. It can obtain this information from the DOJM.

In November 2010, Ameren-IL provided its Electric Operating Procedure EO3.16-Underground Cable Fault Tracking.[586] The Vice President-Regional Operations signed this procedure by February 12, 2010. Ameren-IL also provided a work-process decision-flow diagram. The purpose of the procedure is to develop a consistent method to track repairs of faulted cable segments. It requires that Ameren-IL close URD loops (i.e., complete cable repairs) within 30 days unless extenuating circumstances occur, such as easement issues, weather conditions, and accessibility. The procedure indicates data entry, tracking method, and responsibility. The tracking of repairs will allow operations and management the ability to ensure the timely repair of underground cable loops, with a targeted goal of 30 days or less, for maintaining reliable underground cable systems.

The Reliability Engineering group provides monthly progress updates to the Division Electric Superintendents and to the Illinois Operations Manager. Ameren-IL's October 14, 2010, UG Fault Tracking attachment included spreadsheets indicating the number of overdue loop closings by division, and included details about every loop-closing job. The jobs were color-coded to indicate open loop-closing jobs less than 30 days old, those about 30 days old, and those exceeding 30 days old. The spreadsheet included a remarks column for describing difficulties in completing the work order.

[584] Response to Data Request #1309.
[585] Interview #319, November 3, 2009.
[586] Interview #404, November 1, 2010, and response to Data Request #1449.

Ameren-IL discusses underground cable faults and open loops at the monthly Division Manager meetings as part of the Reliability Action Plan Performance Report. The January to September 2010 Reliability Action Plan Performance Report indicated for "UG Primary Cable Repairs less than 30 days," Ameren-IL had completed 780 URD repairs out of 839 scheduled (93 percent).

Ameren-IL explained that 19 out of the outstanding 59 loop-closing jobs were greater than 30 days old because resource limitations were an issue with cable replacements due to timing of the release of some contractors. Other reasons for repair/replacement delays included coordination of outage scheduling with a customer, right-of-way acquisition, a unique material issue, and changes in elevation leading to the need for replacement rather than repair.

In November 2010, Liberty found that Ameren-IL continues to use an appropriate URD open-loop tracking method, and it is closing most of its open URD loops within 30 days. However, it did not close a small percentage of jobs within 30 days and, in Liberty's opinion, explanations for the delays were not clear on the tracking documents. Liberty will revisit the topic in a later verification quarter to monitor improvements in documentation and loop-closing performance.

In February 2012, Ameren-IL reported that during 2011 it closed 97.2 percent of its 1,118 primary loops (underground residential cable faults) within 30 days and 98.3 percent within 40 days.[587] The causes of any loop closing delays were customer reasons, weather (snow, ice), a shortage of construction resources (delayed due to emergency storm response), cables being replaced rather than repaired, and waiting on material. Ameren-IL's URD cable repair and replacement tracking documentation method now provides clear and timely reports to management regarding the time required to close loops and the specific reasons for repairs delayed beyond 30 days.

Liberty found that Ameren-IL's URD loop-closing performance is reasonable, and that the tracking method is effective. Ameren-IL met its commitment to this recommendation. Liberty considers this verification closed.

In May 2012 follow-up interviews, Liberty found that all divisions were tracking all open URD loops and consistently closing the loops within 30 days, and sometimes within 14 days.[588] URD loop closing performance is one of the activities tracked on the monthly reliability report provided to Ameren-IL's management. When it does not close a loop within 30 days, the tracking tool clearly indicates the reasons for the delay.

[587] Response to Data Request #1629.
[588] Interviews # 471 through #476, May 14-18, 2012.

Recommendation

VI-13
Improve the substation maintenance program.

Background

The Ameren-IL companies had reasonable substation maintenance and testing programs but they did not complete all maintenance activities in a timely fashion.

Ameren-IL reported that it integrated components of various programs in a new system-wide substation maintenance program implemented in 2007. Ameren-IL should complete all maintenance program work consistent with its new substation-maintenance program schedules and triggers. It should take measures to ensure that it has adequately trained and instructed its personnel to identify accurately and to correct critical deficiencies that require immediate corrective action, such as leaking high-voltage bushings. It should correct all Priority 3 minor deficiencies, such as rusted paint and small oil leaks, within finite timeframes. Uncorrected Priority 3 defects that might appear to be cosmetic issues can cause operational problems later and could contribute to a general lack of concern by Ameren-IL personnel regarding the upkeep of equipment in good condition. It should take measures to track the completion of all repairs and all maintenance activities to verify that it completed the activities within the new program timeframes.

In its comments on the draft report, Ameren-IL accepted this recommendation in principle but only wanted to monitor Priority 3 deficiencies and correct them if problems worsen. Liberty disagrees with this approach. An important part of this recommendation was to require the correction of minor deficiencies within a defined timeframe.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation. It will carry out the maintenance strategy, establishing timeframes for Priority 3 repairs (Recommendation VI-8), the painting program (Recommendation VI-23), and staffing levels (Recommendation VI-19).

Verification Discussion and Conclusions

In November 2010, Liberty reviewed Ameren-IL's latest version of its Substation Maintenance Strategy, reviewed Ameren-IL high-voltage circuit breaker and transformer major maintenance and testing reports (from all three substation areas), and monitored an Ameren-IL crew and a contractor crew conducting tests on a high voltage circuit breaker and a high voltage transformer.[589]

Ameren-IL's latest revision of its Substation Maintenance Strategy (dated April 12, 2010), included time-based minor maintenance activities and major maintenance activities that include both time-based and condition-based (depending on numbers of operations or on testing results)

[589] Interviews #405, November 4, 2010, #406, November 2, 2010, #408, November 2, 2010, and responses to Data Requests #1451 and #1452.

activities. The strategy allows Ameren-IL to carryover 10 percent of the maintenance work into the beginning of the subsequent year.

Liberty found the substation-maintenance program document to be comprehensive, complete, and consistent with good utility practice, except Ameren-IL did not include in this document its commitment (VI-14) to conduct semi-annual DGA (Dissolved Gas Analysis) testing on its 345,000-volt transformers and 138,000-volt transformers with LTCs. Ameren-IL completed the revised substation maintenance document prior to the July 9, 2010, commitment date.

Liberty also found that the high-voltage circuit breaker and transformer maintenance and testing reports were consistent with its substation maintenance strategy and with good utility practices. Moreover, Ameren-IL and its contractor testing crews were knowledgeable and were conducting testing and maintenance work conducted on the high-voltage circuit breaker and the high-voltage transformer consistent with Ameren-IL's substation maintenance strategy and with good utility practice.

Liberty will revisit the Ameren-IL's maintenance strategy document later to verify that the semi-annual DGA testing procedure is included and will revisit Ameren-IL's substation maintenance and testing practices on other substation equipment.

In August 2011,[590] Ameren-IL indicated that it recently began to roll out its handheld computers to substation inspectors (refer to Recommendation VI-5. The handhelds allow substation inspectors and maintenance personnel to identify personnel-specific jobs due and past due in their specific work areas. Liberty will revisit Recommendation VI-13 in 2012, after the use of handheld computers has been in place for substation maintenance personnel.

In August 2012, Ameren-IL provided its most recent Substation Maintenance Strategy. Ameren-IL made minor changes only to 3-phase recloser testing and to the interval for conducting overhauls.[591] Liberty still finds that Ameren-IL's substation maintenance strategy is appropriate.

Ameren-IL has implemented the use of handheld computers for substation inspections and maintenance crew leaders, and integrated the use with the EMPRV substation maintenance software. Please refer to the verification of Recommendation VI-5 for details. Management has direct access to EMPRV and can monitor open and past-due maintenance work jobs.

Ameren-IL has complied with its commitment. The verification of this recommendation is complete.

[590] Interview #449, August 19, 2011.
[591] Response to Data Request #1643.

Recommendation

VI-14

Shorten the intervals for gas-in-oil testing for large transformers

Background

Liberty found that Ameren-IL's substation maintenance programs were reasonable, except for the 1-year intervals for gas-in-oil testing (dissolved gas testing or DGA testing) of its large transformers (345000-volt transformers and 138000-volt and above transformers with load tap changers - LTCs). Unless there is a continuous gas-in-oil monitor on a large transformer, Ameren-IL should test for gas-in-oil at least quarterly to have a better chance of detecting many of the deteriorating conditions that lead to catastrophic transformer failure.

Ameren-IL's Implementation Plan

Ameren-IL disagreed with the recommendation to perform DGA on all "large" transformers on a quarterly basis. However, Ameren shortened the interval for DGA to six months on all transformers rated 345000-volts and LTC transformers rated 138000-volts. It suggested that quarterly inspections were not reasonable.

Verification Discussion and Conclusions

In May 2009,[592] Liberty found that Ameren-IL agreed to begin conducting DGA testing on all of its 138000-volt and above transformers, except for a few without LTCs (load tap changers). DGA testing of all other transformers will be done on an annual cycle. Ameren-IL is conducting DGA sampling with semi-annual transformer inspections and minor maintenance procedures. Ameren-IL's EMPRV[593] maintenance management report indicates that Ameren-IL scheduled about 417 transformers for DGA tests for the spring of 2009. It had not yet input the fall schedule to the EMPRV system.

Ameren's lab in St. Louis conducts DGA analyses. An electronic database automatically evaluates the results based on industry formulas and the electronic system automatically sends e-mails to the appropriate substation engineer for follow-up. An Ameren-IL substation engineer monitors sampling compliance and assists substation engineers determine appropriate follow-up work.

Hydrogen gas monitors are devices that measure, in real time, hydrogen gas generation, and to some extent other combustible gas generation, in transformers. Although not as accurate as DGA testing, they provide a means to identify the development of incipient faults within transformers as they occur. The monitors send alarms via the SCADA system to system operators. Ameren installed gas monitors on some of its generating station transformers over the years, and is ordering some new transformers fitted with gas monitors. Ameren-IL reported that it is currently evaluating retrofitting some of its older 500-600 MVA[594] transformers with gas monitors, pending the evaluation of various types of gas-monitoring equipment.

[592] Interview #237, May 6, 2009, and response to Data Request #1077.
[593] Ameren-IL uses the EMPROV electronic maintenance-management computer program to plan and track its substation maintenance and repair work. EMPRV is "EDS Maintenance Process Reengineering Vision."
[594] MVA is 1 million volt-amperes.

In May 2009, Liberty found that Ameren-IL's plan to conduct DGA testing on its 138000-volt (with LTCs) transformers, and on all higher voltage transformers, on 6-month cycles is reasonable and complies with its response to Recommendation VI-14. Liberty found that Ameren-IL's application of transformer gas monitors on new large transformers is appropriate.

In the spring of 2010, Liberty will review Ameren-IL's compliance to its DGA program and will review the results of its 2009 DGA testing program. Liberty's verification of Ameren-IL's response to Recommendation VI-14 remains open.

In August 2010,[595] Ameren-IL provided its 2009 and to July 2010 EMPRV dissolved gas analysis (DGA) job printout. This document indicated that Ameren-IL sampled oil for DGA testing 2-times per year for its 138,000/69,000-volt and 138,000/34,500-volt (with LTCs) transformers, and for all higher voltage transformers. It performed about 1,187 DGA tests during this period under the periodic DGA testing program. Ameren-IL reported that if it detects abnormal gas levels by the periodic testing, as occurred for one transformer, it may conduct follow-up, monthly testing. Ameren-IL also conducts additional DGA tests to investigate gassing transformers of any voltage. It implemented a special DGA program to target its 69,000/12,000-volt rectangular-wound transformers. About 10 percent of Ameren-IL's approximately 100 rectangular-wound transformers exhibited high hydrogen gas levels. Internal inspection of one transformer indicated that the windings have deformed for some reason, possibly from exposure to high close-in fault currents. Investigations are in progress to determine the cause of the distortion and hydrogen generation, how to prevent further distortion, to determine transformer failure risk, and to determine which locations have the highest priority for transformer replacement or modification, if necessary.

Ameren-IL's substation maintenance engineers are using a state-of-the-art portable gas analyzer to supplement DGA testing. Ameren-IL has not yet installed permanent SCADA-monitored dissolved gas monitors on any of its large (500 MVA and above) transformers. Ameren-IL feels that DGA monitor maintenance requirements are troublesome and the expense may not be worth the benefit.

Liberty found that Ameren-IL met its commitment to conduct semi-annual DGA testing on its 345,000-volt transformers and 138,000-volt transformers with LTCs. It is using special DGA testing to monitor suspicious transformers of any voltage. Dissolved gas analysis testing is useful in identifying incipient defects in transformers that the utility could repair before unexpected failure. Its use could prevent unplanned disruptions to customer service or transmission system stability and might reduce repair costs. Liberty suggests that Ameren-IL continue to consider installing permanent real-time, SCADA-monitored DGA monitors, at least on its several ageing 400 to 600 MVA transformers. The semi-annual testing could miss some incipient transformer defects that could lead to failure.

[595] Interview #382, August 9, 2010, and Response to Data Request #1427.

In August 2011,[596] Liberty learned that Ameren-IL continued to conduct Dissolved Gas Analysis (DGA) testing on it large transformers on a twice-per-year basis. From July 2010 to July 2011, it sampled oil and conducted DGA tests on its 195 345,000-volt, 230,000-volt, and 138,000-volt transformers with LTCs (load tap changers). Since the start of this program, Ameren-IL identified at least one deteriorating large transformer and removed it from service before it failed. Ameren-IL considers DGA testing as an important part of its substation maintenance strategy and plans to continue the program.

Ameren-IL also uses DGA testing to monitor the condition of its rectangular-wound 69,000/12,000-volt distribution transformers and to verify the condition of any substation transformer exposed to close-in, secondary-side faults. As the result, in part, of DGA testing, Ameren-IL has replaced about six of the rectangular-wound transformers, reducing customer outages caused by the failure of these distribution transformers while in service. Ameren-IL also uses DGA to evaluate the condition of its 138,000-volt load tap changers and to trigger maintenance activities before the tap changers fail. Liberty agrees that Ameren-IL's condition-based LTC maintenance is generally more cost effective than time-based maintenance.

Liberty found that Ameren-IL's on-going Dissolved Gas Analysis program is consistent with it commitment of conducting twice-per-year DGA testing on its 345000 and 230000-volt transformers and on its 138000-volt transformers with load tap changers. Liberty considers this verification complete.

[596] Interview #443, August 19, 2011, and response to Data Request #1574.

Recommendation

VI-15

Complete all relay testing work consistent with the 2006 program.

Background

Ameren-IL implemented a system-wide relay testing program in 2006 consistent with good utility practices. However, Ameren-IL did not fully comply with its relay testing schedules because of some workforce issues. Ameren-IL should take measures to provide adequate workforces for testing its relays consistent with program schedules.

Ameren-IL's Implementation Plan

Ameren-IL indicated that all scheduled maintenance that was unfinished at the end of 2006 was in February 2007. It completed all maintenance scheduled for 2007 in 2007, except for a few relays, most in hard to access customer substations. The 2008 maintenance is on track for completion. Ameren-IL changed its completion date to July 8, 2010.[597]

Verification Discussion and Conclusions

Ameren-IL conducts routine relay tests on either a 3- or 6-year basis depending on the type of relay.[598] Ameren-IL reported that overall during 2008, it completed 100 percent of its scheduled routine transmission and bulk power relay maintenance testing and 96 percent of its routine distribution relay testing work. This met the Ameren-IL relay testing program policy of a completing a minimum of 95 percent of its scheduled distribution relay testing during a year.

Ameren-IL-CIPS caused the distribution relay testing shortfall in 2008 because it completed only 40 percent of its scheduled routine distribution relay tests. In addition, Ameren-IL-CIPS Metro East completed only 61 percent of its routine distribution relay tests. Ameren-IL explained that in 2008, an Ameren-Missouri group tested the Ameren-IL-CIPS Metro East relays, but an Ameren-IL group will test these relays in 2009. A shortage of skilled relay testers in Ameren-CIPS resulted in it low relay testing completion rate in some of its areas. Ameren-IL said that it will complete routine testing on those relays scheduled for 2008, but not completed in 2008, during the first quarter of 2009.

Routine relay testing verifies that the protective relays operate as intended, but it does not verify that the trip potential actually causes circuit breakers to trip. Ameren-IL reported that its philosophy is to conduct periodic checking that relays trip lockout relays, because actually tripping circuit breakers might cause nuisance outages. It did not typically trip circuit breakers from lockout relays. Although in 2008, Ameren-IL conducted some operational checks on relay circuits with lockout relays to prove that the protective relays trip the lockout relays,[599] and one of the Ameren-IL companies also conducted some tripping of circuit breakers from relays (trip checks), the completion rates were not included in the routine relay testing completion rates. Highly skilled technicians should conduct lockout relay or trip checks because of the potential

[597] Completion date modified on May 13, 2009.
[598] Interview #205, February 3, 2009, and response to Data Request #1013.
[599] Lockout relays are used to send trip potential when more than one circuit breaker is tripped from a protective relay.

for erroneous breaker trips. Ameren-IL reported that it did not do lockout checks in CIPS areas where the relay technicians were not sufficiently skilled.

Ameren-IL reported that it realizes that it needs to have consistent approach to checking its relay trip circuits. It will have to make some changes to comply with the NERC requirement that utilities must periodically verify that their transmission circuit breakers actually will trip from each relay, via lockout relays.

Liberty found that the routine relay test completions were consistent with its program. However, it needs to take actions, such as providing more highly skilled relay technicians in the CIPS areas, to improve on its routine relay test completion rates in those areas. Liberty will continue to monitor Ameren-IL's routine relay testing completion rates to verify that it completed its 2008 scheduled testing during the first quarter of 2009, and that it improved on completing routine relay testing in the CIPS areas where the shortfalls occurred in 2008.

Liberty also found that Ameren-IL should implement a consistent, system-wide policy and procedure to assure that circuit breakers will trip from relays. Liberty will further examine this issue later in the verification phase of the project.

Liberty covers this verification under its review of Recommendation VI-3C. In February 2012, Liberty found that Ameren-IL's relay testing and transmission load and trip testing work have been consistent with its 2006 program.[600] However, because of an insufficient work force, its distribution load testing and trip checking have not been consistent with its program. Recent rate changes for Ameren-IL should provide for funding so that Ameren-IL can eventually provide sufficient numbers of trained relay technicians needed to complete the distribution trip checking work. Ameren-IL essentially complied with its commitment to complete its relay testing in compliance with its 2006 program (distribution trip checking was affected by funding and NERC transmission maintenance requirements). Liberty considers this verification as closed.

[600] Interview #467, February 17, 2012, and response to Data Request #1627.

Recommendation

VI-16

Continue current reliability-improvement programs and implement additional programs.

Background

Liberty recommended that Ameren-IL continue its tap-fuse program, with reduced criteria for implementation, when it completes the current program in 2008, implement additional programs, and improve tracking of all reliability-related programs, including lightning and animal protection work.

(1) The Ameren-IL tap-fuse program should continue past 2008 because un-fused taps contribute to poor reliability by causing main circuit outages for tap line faults. Typically, tap fusing is more cost effective than other reliability improvement programs.

(2) Ameren-IL should continue its "normalized" (excluding major storms) worst performing circuits program implemented in 2007. This program supplemented the ICC-mandated program and used valuable non-storm related outage cause data as a basis for improving conditions that affect reliability on certain circuits.

(3) Ameren-IL should continue the programs, both ongoing and those implemented in 2007, as tracked in the Reliability Action Plan Performance Report.

(4) Ameren-IL should conduct analytical system-wide studies specifically for identifying how it could reduce lightning-caused outages by actions in addition to current lightning protection practices. Ameren-IP conducted such a study in 2004.

(5) Ameren-IL should also determine whether there is value in conducting an animal-protection study that could result in supplementing current animal protection practices.

(6) Ameren-IL should conduct a systematic system-wide distribution system protective device coordination program, similar to the program conducted by Ameren-IP prior to its merger with Ameren.

Ameren-IL's Implementation Plan

Ameren-IL indicated that it would continue the tap-fuse program in IL past 2008, with reduced criteria for implementation.

Ameren-IL will continue the program to review circuits with a "normalized" (excluding major weather events) SAIFI > 2.0 in an effort to make reliability improvements on these circuits. This is an extension of the program that was implemented in 2007.

Ameren-IL will continue the reliability programs, both the 2008 programs and those implemented in 2007, as tracked in the Reliability Action Plan Performance Report.

Ameren-IL will develop a plan to conduct an analytical study to identify how it could potentially reduce lightning caused outages, in addition to current lightning protection practices.

Ameren-IL will develop a plan to determine if there is value in conducting an animal protection study that could result in supplementing our current animal protection practices.

With regard to the protection-device coordination study, Ameren-IL indicated that this program would be part of the Reliability Action plan. Over a 5-year period, the divisions and the substation department will coordinate to ensure that this is completed.

Verification Discussion and Conclusions

(1) Tap Fuse Program

Ameren-IL's tap fuse program began in 2003 with CIPS, then CILCO and IP in 2003 and 2005.[601] Installing fusing on unprotected mainline tap circuits reduces mainline circuit outages for faults occurring on tap lines. The purpose of this program is to prioritize the installation of fusing on circuit tap lines based on the greatest return in reliability improvement per dollar. Ameren-IL distribution operations department's reliability engineering group in Decatur is now responsible for conducting the evaluations for prioritizing circuits for tap fuses. Reliability engineering provides lists of circuits to the division-engineering supervisors for further field evaluation and work order preparations. Distribution operating managers and vice presidents monitor the divisions' application of the tap fuse program via the reliability action-plan performance reports and the monthly VP level staff meetings.

The 2006–2008 program included all three companies. Under this program, Ameren evaluated and prioritized complete circuits based on adding the value of fusing to all un-fused taps on a circuit with a "service available cost factor" (SACF) value of less than $25 per kVA-hr of avoided customer outages. Approximately 1,000 tap circuit locations in 2007 met this criterion. Ameren-IL cannot fuse all identified locations because of physical limitations on some tap poles. CILCO tap fuse work was limited because of budget constraints.

In 2009, Ameren-IL reduced the criterion to $30 per kVA-hr and began evaluating individual taps, rather than entire circuits. The numbers of tap circuit locations identified for fusing in 2009 are 243 for CIPS, 215 for IP, and 343 for CILCO. Ameren-IL reported that it would determine at the end of 2009 whether continuing to fund this program is justified.

Liberty found that Ameren-IL's 2009 tap fusing program is consistent with Liberty's recommendation and with Ameren's response to the recommendation. By the end of 2009, Ameren-IL more than likely will have received all cost-effective reliability improvement that it can obtain from this program. Liberty will verify Ameren-IL's application of the 2009 tap fuse program, particularly by CILCO, in about one year, and Liberty will determine whether continuation of the program at the end of 2009 is justified.

[601] Interview #206, February 5, 2009, and response to Data Request #1014.

In May 2010, Liberty found that Ameren-IL had continued its tap fusing program in 2009 and 2010, using the criterion of costing no more than $30 per kVA-hr saved.[602] During 2009, Ameren-IL targeted 269 taps for fuse installations and completed work on 203 taps. In 2010, for 2010 and 2011 work, Ameren-IL is reviewing 254 tap locations. Ameren-IL does not ultimately fuse all taps that meet the criterion because it determines later that some are already fused or it cannot fuse some economically because of pole or circuit configuration issues. Ameren-IL reported that although this program has been very effective for improving reliability, it is not certain if tap fusing will continue as a separate program past 2011, because fewer taps now meet the criterion. However, tap fusing will continue to be an element of the on-going 5-year distribution-protection coordination program and the normalized WPC program. Ameren-IL's tap fuse program continues to be consistent with its commitment and Liberty considers this verification closed.

In May 2012, Liberty conducted follow-up interviews at each division.[603] They reported that no circuits met the program criteria. However, the divisions sometimes install tap fuses as part of other reliability improvement programs.

(2) Normalized WPC Program

Ameren-IL continued its normalized worst performing circuit program in 2009.[604] Ameren-IL distribution-operations department's reliability-engineering group in Decatur is responsible for identifying the worst performing circuits (WPC) with SAIFI values over 2.0, after the effects of major storms were removed (normalized). Previously, Ameren Services did this work. Prior to 2009, Ameren Services based the worst normalized SAIFI circuits on the previous three years outage data. In 2009, the Ameren-IL began identifying the circuits with normalized SAIFI values greater than 2.0, based on outage data from 2008 and the most recent connected customer counts. It has identified 40 circuits with a normalized SAIFI greater than 2.0, and budgeted reliability improvement work on 20 worst "action" circuits. One of these circuits was also an ICC worst performing circuit and one circuit received improvements at the end of 2008. The remaining 20 circuits are on "watch" status for additional review in 2010. The reliability-engineering group provided the list of the 20 selected action circuits to the division-engineering supervisors for field inspection and review. The reliability-engineering group also uses the results of the lightning prevention and animal protection programs to evaluate the work needed to improve the reliability on the worst normalized WPC circuits selected for reliability improvement actions.

The reliability-engineering group met with division supervising engineers in January 2009 to discuss the best ways to improve worst performing circuit reliability. The reliability group requested that each division engineer assemble division reliability teams to discuss distribution, substation, and transmission problems on a monthly basis. Distribution operating managers and vice presidents monitor the status of normalized WPC work via the reliability action-plan performance reports and the monthly VP level staff meetings.

[602] Interview #369, May 5, 2010, and response to Data Request #1389.
[603] Interviews # 471 through #476, May 14-18, 2012.
[604] Interview #207, January 5, 2009, and response to Data Request #1015.

Liberty found that Ameren-IL's 2009 normalized WPC program is consistent with Liberty's recommendation and with Ameren-IL's response to the recommendation. Liberty will verify Ameren-IL's application of the 2009 normalized WPC program in early 2010.

In May 2010, Ameren-IL reported that in 2009 it modified its criterion for identifying circuits for inclusion in its normalized WPC program.[605] It now bases normalized worst performing circuit selections on a criterion of having a SAIFI number of at least two times actual statewide SAIFI, rather than a SAIFI of 2.0 or more. Ameren-IL identified 20 circuits requiring reliability improvement actions in 2009, based on this new criterion, and it placed another 40 circuits on watch status for review in 2010. Ameren-IL completed the engineering for the 20 action circuits in 2009, and all reliability fieldwork on these circuits was due for completion by mid-year 2010. In 2010, Ameren-IL identified 20 more action status circuits and placed 5 additional circuits on watch status for review in 2011. Normalized WPC corrective actions included:

- Animal guarding
- Replacing transformers
- Building circuit tie connections
- Replacing poles and arresters
- Replacing conductors
- Correcting clearance issues
- Installing tap fuses
- Installing air spoilers
- Replacing underground cable
- Correcting automatic throw-over (ATO) schemes
- Trimming trees
- Installing SCADA

In May 2010, Liberty found that Ameren-IL's Normalized WPC program continues to be consistent with its commitment and that Ameren-IL plans to continue its normalized WPC program. Liberty will review the status of this program in about one year.

In August 2011,[606] Liberty learned that Ameren-IL continued to use a "two times average SAIFI" criterion to identify circuits that qualify for its Normalized Worst Performing Circuit (WPC) analysis and improvement work, such as pole equipment repair, protection coordination, and lightning and animal protection. Ameren-IL's overall average SAIFI is currently at about 1.25. Ameren-IL indicated that it completed nearly all of the planned corrective work in 2010 on the 20 Action Status circuits identified in the 2010 WPC program, and will complete all remaining work in 2011. It removed the five 2010 Watch Status circuits from consideration for engineering evaluation after SAIFI performance on these circuits improved to less than the SAIFI criterion. Ameren-IL indicated that the SAIFI improvements were due to the improvements and repairs conducted under the regular circuit-patrol inspection program.

[605] Interview #370, May 5, 2010, and response to Data Request #1390.
[606] Interview #444, August 18, 2011, and response to Data Request #1575.

In 2011, no circuits qualified for either Action or Watch Status, based on the current SAIFI criterion. Ameren-IL reported that the WPC program is effective for identifying and improving poorly performing circuits not identified by the other reliability programs. Ameren-IL plans to continue the WPC program, even if regulation requires Ameren-IL to conduct other reliability programs.

Liberty found that Ameren-IL's on-going "Normalized Worst Performing Circuit" program, although now using a slightly modified selection criterion, is consistent with its commitment and Liberty's intent. Liberty considers this verification work closed

In May 2012, each division confirmed that although the Normalized WPC program is still in effect, no circuits met the criteria for 2012.[607]

(3) Reliability Action-Plan Performance Report

Liberty examined Ameren-IL's modified reliability action-plan performance report form.[608] Ameren-IL was not able to provide the reliability action-plan performance report for end of 2008 because it would not finalize all data until the end of February. Generally, these monthly reports are ready for distribution by the 15th of the subsequent month. However, the divisions, vegetation management, and substation groups required additional time to produce year-end results.

Ameren-IL provided examples of its 2009 reliability action plan report. The report tracks, on a monthly basis and separately, the engineering and field reliability and repair work for which Divisions, Illinois Technical Services, and Illinois Operations Support are responsible. Ameren-IL provides the estimated customer interruption values to each reliability program. Several new reliability programs have been included in the monthly report for 2009, such as:

- Protective Device Coordination Program
- Animal Protection Program
- Lightning-Caused Outage Reduction Program

In January 2010, Liberty found that Ameren-IL's 2009 reliability action-plan performance report format is sufficiently inclusive and it continues to be a valuable tool for tracking reliability work progress. However, Liberty cannot verify the completeness of Ameren-IL's reliability work for 2008 until it provides the year-end report. Liberty will review this report when it becomes available.

Ameren-IL subsequently provided the 2008 year-end reliability action-plan report.[609] The report indicates that the system-wide reliability work, except for system automation, was at least 90 percent complete at the end of the year.

[607] Interviews # 471 through #476, May 14-18, 2012.
[608] Interview #208, February 5, 2009, and response to Data Request #1016.
[609] Response to Data Request #1059.

In February 2010,[610] Liberty found that the Ameren-IL had made minor changes to the reliability action-plan performance report format for 2009 and 2010. It added the Protective Device Coordination Program for 2009. For 2010, Ameren-IL added (or separated from more general task groups) the following reliability-related task groups:

- Protective Device Coordination Program
- Animal Outage Reduction Program
- Normalized Worst Performing Circuit Program
- NESC work completed < 90 days
- Underground loops repaired < 30 days
- Line Air-Break Switch Inspection Program
- Distribution relay testing
- Pole restoration by C-Truss

Ameren-IL added these groups to track completions for better accountability.

For 2009, three of the divisions completed 98 percent or more of planned reliability-related work. One division completed 95 percent, one completed 90 percent, and one completed 88 percent. Ameren-IL continues to use and to improve its monthly reliability action-plan performance reports for executive management review. Liberty will review the 2010 end-of-year reliability action-plan reliability reports again in about one year.

In August 2011, Ameren-IL was continuing the use of division and the overall reliability action-plan performance reports, as indicated by reports produced for year-end 2010 and for each month of 2011 through June.[611] The monthly reports to management contained all reliability related programs and other tracking as reported in 2009. Ameren-IL indicated that it would continue to use the reliability action plans.

Liberty found that Ameren-IL's monthly reliability program reporting is consistent with its commitment and Liberty's intent. Liberty considers this verification work closed.

In May 2012, Liberty conducted an overview interview at each division.[612] Liberty found that each division was using the Reliability Action Plan Performance Reports for its monthly division meetings and the quarterly performance status meetings with the Ameren-IL vice president. The divisions also use Project Execution Reports to investigate details about overdue work, and semi-weekly "Must Do" reports to assure that they timely complete WPR, NESC, and Priority Pole jobs.

[610] Interview #340, February 1, 2010, and responses to Data Requests #1348 and #1369.
[611] Response to Data Request #1576.
[612] Interviews # 471 through #476, May 14 through May 18, 2012.

(4) Lightning Study

In 2009, Ameren-IL began the implementation of its lightning-caused customer interruption reduction program.[613] It reported that this program is similar to the lightning-caused outage reduction program conducted by IP before merging with Ameren. Elements of the program include the:

- Identification of circuits with the greatest number of lightning-caused customer interruptions using data from the Outage Analysis System (OAS) and the Vaisala Fault Analysis and Lightning Location System (FALLS)
- Preparation of specific work plans for identified circuits by the reliability group and the divisions. Improvements include adding lightning arresters and improving grounding
- Prioritization of the work with other reliability work, based on a cost versa reliability improvement criterion
- Review of reliability improvements after lightning-caused corrective work

Ameren-IL reported that OAS data indicated that only about 1 percent of customer interruptions are lightning-caused, but it recognizes the inaccuracies in this number because lightning is not a specific cause code in the OAS system and many momentary interruptions are not counted. Currently, Ameren-IL suspects lightning for outage causes when the other or unknown cause codes and thunderstorms are indicated by OAS data, along with correlation of lightning activity using FALLS data. Ameren-IL is working on improving the identification of lightning as a cause by changing the OAS system and providing additional training for trouble men.

Ameren-IL distribution-operations department's reliability engineering group in Decatur is responsible for conducting the evaluations for prioritizing circuits for lightning-caused outage improvements. Reliability engineering has provided the 2009 list of circuits for lightning improvements to the division-engineering supervisors for field evaluation and work order preparations.

In February 2009, Liberty found that Ameren-IL's 2009 lightning-caused outage reduction program is consistent with Liberty's recommendation and with Ameren-IL's response to the recommendation.

Later in 2009, resulting from its implementation of the Lightning-Caused Outage Reduction Program, Ameren-IL identified 16 distribution feeders as candidates for inspection and analysis with respect to lightning protection. It scheduled the resulting work to repair or to upgrade deficiencies for completion by the end of 2010. It completed work on three projects, has work in progress on three projects, and has engineering completed on six projects. It has not completed the engineering on the three remaining projects. Although there is at least one lightning protection project in each of the six divisions, 9 of the 16 projects are in Divisions VI. The divisions have also identified nine additional lightning protection improvement projects outside the Lightning-Caused Outage Reduction Program. Three of these projects are complete.[614]

[613] Interview #209, February 5, 2009, and response to Data Request #1017.
[614] Response to Data Request #1113.

In November 2009, Liberty found that Ameren-IL met its commitment to plan a method to improve its animal protection system wide. Liberty's verification work under Recommendation VI-26 showed that Ameren-IL uses data from its Outage Analysis System (OAS) and its Vaisala Fault Analysis and Lightning Location System (FALLS) to focus on identifying additional candidates for lightning protection improvements. Ameren-IL indicated that it would continue the Lightning-Caused Outage Reduction Program past 2009 to identify areas where additional lightning protections would be of greatest reliability value. It will schedule projects identified in 2010 for completion by the end of 2011. Ameren-IL indicated that it would later evaluate the positive effects of the Lightning-Caused Outage Reduction Program on the feeders included in the program. Ameren-IL also reported that it has been inspecting its distribution feeders for missing and broken ground wires (arresters must be grounded to function). In 2008, Ameren-IL replaced or repaired 4,145 distribution ground wires. Up to the end of August 2009, it replaced or repaired 2,872 additional ground wires.[615]

Ameren-IL's response to this part of Recommendation (VI-16) is identical to its response to Recommendation No.VI-26. Liberty closes this part of its verification work, but will follow-up on Ameren-IL's progress with its Lightning-Caused Outage Reduction program with the verification of Recommendation VI-26.

In May 2012, the divisions reported that the reliability group identifies and confirms circuits with larger lightning-caused outages and the circuit patrol inspection contractor provides maps indicating were additional lightning arresters are needed on those circuits.[616] The divisions are installing arresters where these studies indicate the need. Liberty found Ameren-IL's lightning protection practices to be effective and consistent with good utility practices.

(5) Animal Protection Study[617]

In 2009, Ameren-IL began implementing a program specifically addressing animal protection.[618] The purpose of the program is to reduce animal-caused customer interruptions. Elements of the program include the:

- Identification of the 30 worst performing circuits, caused by animal contact, out the 470 circuits inspected in 2008 by the circuit patrol inspection contractor
- Determination of the need and cost for additional animal-protective devices based on the inspection contractor's reports. Needs and costs for each circuit are based on the
    - number of non-animal guarded transformers
    - total number of transformers
    - number of connected customers and connected kVA
    - total customer, and customer minute, interruptions during previous year
    - estimated cost of animal guarding non-protected transformers

[615] Interview #321, November 3, 2009, and telephone follow-up interview on November 4, 2009.
[616] Interviews # 471 through #476, May 14 through May 18, 2012.
[617] This part covers only distribution circuits. See Recommendation No.VI-25 for substation animal protection improvements.
[618] Interview #210, February 5, 2009, and response to Data Request #1018.

- Identification of which of the 30 circuits met Ameren-IL's cost and reliability improvement criterion. For 2009, 15 circuits met the criterion. One of these had already been included in the ICC WPC program and two in the normalized WPC program
- Review by division engineering to verify that adding animal protection is justified

In February 2009, Liberty found that Ameren-IL's 2009 animal protection program is consistent with Liberty's recommendation and with Ameren-IL's response to the recommendation. Liberty will verify Ameren-IL's application of the 2009 animal protection program in early 2010. This recommendation is identical to part B of Recommendation No.VI-25, which closed in November 2009.

In May 2010, Liberty found that Ameren-IL included 15 circuits in its animal protection program in 2009.[619] It selected these circuits from among those circuits experiencing excessive animal-caused outages over the previous three years, that had animal guard needs based on data gathered from the circuit-patrol inspection program, and that met the cost-benefit criterion of costing no more than $25 per kVA-hr saved. Under this program, Ameren-IL installed 534 animal guards on 10 circuits in 2009, and plans to install animal guards on the remaining 5 circuits during 2010. Ameren-IL reported that it is identifying more circuits in 2010 to include in the program for 2011, and that it plans to continue the animal protection program in the future using the same criterion, as more animal guard data becomes available from the on-going circuit-patrol inspection program. Ameren-IL reported that its animal protection initiatives included in this and other reliability programs have resulted in nearly a 30 percent reduction in animal-caused customer interruptions between 2006 and 2009. Liberty will continue the verification in one year.

In May 2011,[620] Ameren-IL confirmed that the animal guard program work (installing guards on pole-mounted transformer bushings) is verified, funded, and performed by the divisions. The Ameren-IL reliability group identifies feeders with the highest numbers animal-caused customer interruptions. The division engineering groups use line inspection records to identify the locations of unguarded transformers. For each of the feeders identified by the Ameren-IL reliability group, the divisions determine where transformer animal protector installations will cost-effectively (cost weighted against outages) improve animal performance, based on outage data, on the numbers of customers affected, and on the locations where animal might be present.

Ameren-IL is currently in the third year of this program. It identified and approved 15 circuits for animal protection work in 2009, 25 in 2010, and 12 for 2011.

Animal guards installed under this program (these do not include guards installed with new construction and repair work):

2009 – 534 guards installed
2010 – 1481 guards installed
2011 – 419 guards installed so far, out of 973 planned
2012 – 253 guards planned

[619] Interview #371, May 5, 2010, and response to Data Request #1391.
[620] Interview #432, May 9, 2011, and responses to Data Requests #1500 and #1524.

In 2010, Ameren-IL completed animal protection work for 16 of the 25 circuits due in 2011. It discontinued this accelerated work after the outcome of a 2010 rate case.

For 2010, Ameren-IL found that on the 10 feeders on which in completed animal protection program work in 2009, the animal-caused outages were reduced by about 86 percent. The divisions also install animal guards as part of their distribution new construction and line repair work. Ameren-IL reported that it will continue the animal protection program, and it would continue monitoring animal performance on the feeders included in the program.

In 2010, Ameren-IL implemented its new Avian Protection Program. Although related to the animal protection program, this program is compliance-based (reducing electrocutions of protected raptors), rather than reliability-based (reducing animal-caused outages). The US Fisheries and Wildlife Service (USFWS), and the US Attorney General, required Ameren-IL to implement this program. Ameren-IL indicated that raptor-caused outages had not been a problem, and that money spent on the program would not improve reliability. However, Ameren-IL is modifying 1,400 poles, located within eagle habitat, over 3 years using its new avian-friendly pole design standards (60 inch spacing between phases). It must use the new design standards for all new line construction. Ameren-IL reported that the USFWS wants Ameren-IL to rebuild even existing poles located outside eagle habitat to the new standards, when it performs any amount of repair work on a pole. Ameren-IL contested this request.

However, under threat fines and jail terms by the US Attorney General, Ameren-IL must spend on the avian protection program, which does not cost-effectively improve reliability. This program will cost Ameren-IL $1,500,000 during the 2010 through 2012 time period (to upgrade the 1400 poles within eagle habitats), and about $250,000 each year for the extra materials needed for the new avian-friendly designs for new construction.

In May 2011, Liberty found that Ameren-IL was progressing with its distribution animal protection program per its commitment and the program is successfully improving reliability. However, the avian protection program requires funding that it might otherwise use for improving reliability.

This recommendation remains open. Liberty will revisit this recommendation in 2012.

In August 2011,[621] Ameren-IL reported that its division engineering groups received circuit maps for 12 circuits identified in the 2011 animal protection plan. Through June 2011, Ameren-IL installed 623 animal guards of the 2144 planned for 2011 and it is on track to complete its 2011 animal protection work. Liberty found that Ameren-IL's on-going animal protection program is consistent with its commitment and Liberty's intent. Liberty considers this verification work closed.

In May 2012, the divisions reported that the reliability group identifies and confirms circuits with larger animal-caused outages and the circuit patrol inspection contractor provides maps

[621] Response to Data Request #1577.

indicating were additional animal protection is needed on those circuits.[622] The divisions are installing animal guards where these studies indicate the need. Ameren-IL is installing animal discs at substation terminals where the substation group is installing animal fences. The divisions are also modifying pole structures where required to comply with the federally mandated avian program. Liberty found Ameren-IL's animal protection practices to be effective and consistent with good utility practices.

(6) System Protective Device Coordination

In January 2009, Liberty learned that Ameren-IL initiated a program to verify protective device (relays, fuses, reclosers, and reclosing relays) coordination on all of its distribution circuits and taps, and in the substations that feed the circuits.[623] Ameren-IL will determine the coordination (relays and fuses, and reclosing times) of each circuit specifically to the needs of the circuit. Ameren-IL does not apply general protective devices settings to its circuits.

Ameren-IL will study one-fourth of all circuits (the same circuits selected for the circuit inspections) each year. It will budget corrective actions based on resulting recommendations for implementation the following year. Based on this program, Ameren-IL will complete the protective device coordination studies all 2,648 distribution circuits by the end of 2012, and complete corrective actions by the end of 2013.

Ameren-IL tracks its distribution coordination program and resulting completions on an Action Plan, part of its monthly Reliability Action Plan available on SharePoint, and its monthly face-to-face management review process. The System Protection Manager is accountable for completing coordination studies and issuing orders to make changes as needed in each substation. The Division Supervising Engineers are accountable for completing coordination studies and issuing orders to make changes as needed on each circuit within each division. The system protection group supplies a project notification and any new feeder settings found by its review to the divisions for comment. After the division completes its studies and comments, the protection group issues a final project notification for the following year. It also determines an estimated reliability improvement for each project. Ameren-IL reported that it might prioritize the budgeting of work for making changes for improving coordination, but that Ameren-IL had no requirement for a minimum reliability improvement versus cost amount.

The system protection group reviews the substation needs first and provides any feeder circuit breaker relay setting changes to the divisions for them to coordinate circuit fusing. If the division finds a problem coordinating the circuit fusing to the feeder relays, the two groups will get together to determine final relay settings and fuse selections.

The System Protection group provided a standard circuit coordination procedure, training, and a manual (PS50 discussed in response to Recommendation V-31) for the distribution engineers in all divisions. Currently, some divisions use the DEW coordination program, and others use the PPU program. Because the DEW software is more user friendly, all divisions will be using the

[622] Interviews # 471 through #476, May 14-18, 2012.
[623] Interview #211, January 28, 2009, and response to Data Request #1019.

DEW software by the end of 2009. System Protection uses a program called ASPEN for substation coordination.

As of January 2009, System Protection had commenced its substation protective device coordination studies. The division circuit-coordination studies had not yet commenced.

Liberty expressed concern for possible coordination study inaccuracies caused by actual line fuse sizes and ratings not complying with the values indicated on the system maps, which are the values input to the coordination studies. Installing incorrect sized fuses (without indicating on the system maps) could occur during storm restorations. Ameren-IL commented that division engineers include the possibility of improper fuse sizing in their daily outage reviews and make corrections when they learn about conflicting fuse sizes. However, it was not clear to Liberty that Ameren-IL has a universal procedure for verifying correct fuse size.

Ameren-IL is meeting its implementation plan and appears to be meeting the intent of Liberty's recommendation. Liberty's verification work is not complete. Liberty will:

- Continue to monitor Ameren-IL's progress in completing the circuit coordination studies and follow-up work
- Investigate how Ameren-IL verifies actual circuit fuse sizes.

In May 2010, Liberty found that Ameren-IL was on track for reviewing and implementing distribution protective device coordination at the rate of 25 percent of the circuits per year.[624] Because the fieldwork trails the engineering work by one year, this is a 5-year program. The work requires coordination and cooperation among several Ameren-IL groups—the system protection group, the substation field groups, the divisions' engineering groups, and the divisions' field groups. The system protection group provides upstream coordination data for the divisions and recommendations for field changes to the substation groups. The division engineering groups review circuit protection for coordination with substation transformer protection and provide instructions to division field groups to make the changes.

System Protection Engineering Work

The system protection group reviews include coordinating as practical, the sub-transmission system protection with the distribution substation transformer protection by selecting fuses or circuit switchers with relays such that will coordinate (reducing customer interruptions for downstream faults) both with upstream protection and with substation reclosers, while allowing appropriate transformer overload capacity.

Because the division engineering groups need to know the status of any changes at the distribution substation level, in 2009 to kick start the program, the system protection group made a concerted effort to complete coordination reviews for the distribution substations for more than 25 percent of the distribution circuits. It completed 157 percent of its scheduled work in 2009, including transformer high-side protection reviews for 1,002 circuits. Out of those, 537 locations

[624] Interview #372, May 11, 2010, and response to Data Request #1392 and #1422.

required substation fieldwork. As of the end of April 2010, system protection had completed 18 percent of its 2010 work.

Most of the substation changes resulting from the system protection reviews involved replacing transformer high-side fuses. However, because fuses on 20,000kVA transformers generally cannot properly coordinate with reclosers while allowing appropriate overload capacity, system protection recommended changing fuses with circuit switchers/relays at 40 locations. However, circuit switcher installations reportedly might cost about $200,000 each. Therefore, capital, engineering, and labor availability governs the number of circuit switcher projects that can completed in a given year. Of the 40 circuit-switcher installations recommended, only 2 are planned for 2010. Ameren-IL selected non-standard fuses for two other transformers recommended for circuit switcher installations.

Substation Field Work

The substation maintenance group is responsible for carrying out substation changes recommended by system engineering. For locations where a high side fuse change is recommended, Ameren-IL considers the work complete either when it changes out the fuses or when it places the recommended fuses in the substation fuse cabinet by the substation group (to be changed out during the next scheduled or unscheduled transformer outage). In many cases, scheduling outages to change out only the fuses could affect reliability and might not be cost effective. Substation supervisors are aware of the need to change out transformer fuses with those temporarily placed in fuse cabinets because system protection entered work orders in the substation EMPRV maintenance-management system. Supervisors bundle fuse change outs with other transformer work. Substation fieldwork began in 2010. The substation group had completed 7 percent of its fieldwork as of the end of April 2010.

Division Engineering Work

System protection must provide completed substation coordination before the division engineering groups can begin their reviews. Sometimes the two groups must work together to resolve coordination problems. The division engineering groups then have the upstream data required to coordinate the circuits fed by transformers. In 2009, the division engineering groups completed about 100 percent of their required review work. They viewed 642 circuits and identified that division fieldwork was required on 249 circuits. As of the end of April 2010, the division engineering groups had completed 17 percent of their 2010 work.

Division Field Work

The division engineering groups' task is to coordinate the downstream fuses such that appropriate fuses blow, or reclosers operate, for sustained faults before substation reclosers lock out unnecessarily. Many of Ameren-IL reclosers have no, or limited, settings, causing coordination of the reclosers with the transformer fuses and downstream fuses to be poor. The vast majority of the changes resulting from the division reviews involve the changing of tap fuse size or installing or resetting line reclosers. Division supervising engineers indicate that the 2010 fieldwork should be complete on time. As of the end of April 2010, the divisions had completed 59 percent of their 2010 fieldwork resulting from the 2009 engineering work.

In May 2010, Liberty found that Ameren-IL is on track to complete the 5-year coordination program.

In May 2011,[625]Ameren-IL reported that the system protection supervising engineer, the Ameren-IL vice president, and substation and division managers and supervisors, periodically monitor each organization's progress in completing their part of system protective coordination work, via the monthly staff meeting and the monthly reliability action plan reports.

The T&D engineering group (system protection engineering) is responsible for protective device coordination down to the high side of the distribution substation transformers. The substation/relay maintenance group is responsible for carrying out any changes in the substations, as directed by the system protection engineers. The division engineering groups are responsible for protective device coordination from the low side of the distribution substation transformers to the circuit ends. The division construction groups are responsible for making the circuit protection changes, as directed by the division engineers.

The division engineering groups coordinate the circuits planned for review each year with the system protection and substation/relay maintenance groups, and typically have the results of the upstream reviews before proceeding with their portion of the circuit review.

In 2010, the system protection group completed 37 percent of the circuit reviews planned. However, because of the concerted effort to complete substantially more than the minimum required circuit reviews in 2009, the percentage of planned reviews complete by the end of 2010 stands at 96 percent. Although it did not review as many circuits in 2010 as in 2009, the system-protection review process is essentially on schedule. However, the large number of circuit reviews performed by the system protection group in 2009 resulted in a larger than expected number of recommended changes for the substation and division groups in 2010. Most of the changes resulting from the reviews involved replacing distribution substation transformer high side fuses, distribution feeder breakers, or reclosers. However, several of the recommendations include the addition of circuit switchers, which require substantial funding by the substation group.

In 2010, the substation/relay maintenance group completed the required work for 75 circuits, or 15 percent of the total changes identified by system protection engineering on 2009. The larger than expected amount of coordination-related work, which came from system protection's 2009 work, along with budget reductions early in 2010, caused substation engineering to defer much of its coordination work. Ameren-IL reported that it cut back hiring and contractor use following the result of a 2010 rate case. Reportedly, Ameren-IL needs about 30 substation/relay electricians.
In 2010, the division engineering groups, overall, completed 90 percent of the scheduled reviews. The vast majority of the changes resulting from the reviews involved the changing of tap fuse sizes, or the addition or realignment of line reclosers. However, Division II completed only 13 percent of its reviews because of manpower and budgeting limitations in that division.

[625] Interview #433, May 9, 2011, and response to Data Request #1501.

The division construction groups, overall, completed 89 percent of the planned coordination changes in the field in 2010. Liberty found that some of the divisions did not complete all scheduled system coordination fieldwork. However, some of this work was delayed by the deferred scheduling of some substation work. The substation and division fieldwork must usually be completed at about the same time. In one case, a division completed only 10.5 percent of its 2010 fieldwork. Ameren-IL said that this was primarily due to Division III budget and manpower limitations. As with substations, division manpower and contractor hiring was stopped following the outcome of a 2010 rate case.

Liberty found that some of the divisions did not complete all scheduled system coordination fieldwork. However, some of the division fieldwork was delayed by the deferred scheduling of some substation fieldwork. Ameren-IL said that the deferred work was primarily due to budget and manpower limitations. As with substations, division manpower and contractor hiring was stopped following the outcome of a 2010 rate case.

In May 2011, Liberty found that budget and manpower limitations caused at least one division and the substation/relay maintenance group to fall behind in completing their system protection coordination field work in 2010. It appears that, because of funding limitations, the some system-protection coordination work will be deferred, and the system protection coordination program might not be completed by the end of 2013.

In August 2011,[626] Liberty learned that Ameren-IL's System Protection group was on track to complete its substation coordination reviews scheduled for completion by the end of 2012. As of August 1, 2011, Ameren-IL completed 69 percent (1603 out of 2388 total circuits) of the planned reviews. From the 1603 circuit reviews, it has or will make changes on 876 circuits by Substation Maintenance group. Currently, Substation Maintenance made changes on 143 circuits. Ameren-IL indicated that Substation Maintenance funding and work force restrictions would likely cause the completion of required changes in the substations to extend past 2013.

Liberty found that Ameren-IL met its commitment and Liberty's intent for this part of the Recommendation VI-16. However, as indicated in a February 16, 2010, letter to Liberty, Ameren-IL said that it might not be able to fund the complete implementation of certain recommendations, including VI-30,which is the same as this recommendation (VI-30, Part 6), until and if the ICC approves a special funding request. The reason for the funding request on this recommendation involves additional capital and labor costs required for substation equipment modifications and additions required to implement the changes resulting from the coordination reviews.[627] Despite the matter of an open funding request, Liberty considers this recommendation verified and closed.

Liberty considers the verification work for all six parts of Recommendation VI-16 closed.

[626] Interview #454, August 18, 2011, response to Data Request #1581.
[627] Response to Data Request #1600.

In May 2012, Liberty conducted interviews and found that all divisions were working with system protection and substations to better coordinate circuit protection.[628] Liberty found that Ameren-IL was timely completing the division coordination engineering and fieldwork.

[628] Interviews # 471 through #476, May 14-18, 2012.

Recommendation

VI-17
Increase the distribution system workforce

Background

Liberty recommended and Ameren-IL agreed that Ameren-IL should conduct a comprehensive study to determine the required number of in-house linemen, or have firm commitments for contractor linemen. The companies' distribution system workload will increase because Ameren-IL has intensified its line inspections, including identifying variances from the National Electrical Safety Code, and because of ICC commitment work. Ameren-IL held a number of open linemen positions until the settlement of its labor agreement, which occurred in December 2007. Once the results of this comprehensive study are complete and Ameren receives the recommendations from an on-going staffing study (HB825), Ameren-IL should act promptly to implement short- and long-term staffing changes for this recommendation. Ameren-IL should estimate the necessary staffing levels based on known additional work (e.g., correcting National Electrical Safety Code deficiencies) and on an estimate of additional work that will result from new or more rigorous inspections. Improved tracking of defects to resolution and not permitting a buildup of backlogged maintenance items will be the key measures for deciding what staffing adjustments from the initial estimates Ameren-IL will need to make. In its comments on the draft report, Ameren-IL suggested the comprehensive study, which Liberty included in the final recommendation.

Ameren-IL's Implementation Plan

Ameren-IL expected to receive the results of the staffing study required by Illinois House Bill 825 for all three companies by the end of 2008. Ameren-IL will take the results of those studies, and develop a short- and long-term staffing plan, by October 8, 2009, for both Ameren-IL and contract resources to meet the projected distribution system workload.

Verification Discussion and Conclusions[629]

Ameren-IL hired 100 linemen and apprentices since 2006 to maintain a level of distribution craft worker staffing of about 628. Ameren-IL indicated that it has been able to cover the increased NESC violation-related work load by unloading some less-skilled work from linemen to others, because of the reduction in new business construction work, and by better defining what in-house crews should be doing versa contractor crews. The 2008 Jacob's Audit Report (staffing study required by House Bill 825) did not contain recommendations for increasing distribution craft worker staffing or changing in-house to contractor personnel ratios. However, Ameren-IL does conduct annual short-term and long-term reviews of critical open positions and it makes recommendations for filling those openings such as to assure that staffing is sufficient complete NESC repairs. In the past, staffing planning was lead by the Ameren's Human Relations (HR) group. However, for 2010, Ameren-IL has begun to implement a formal Workforce Strategy Team, directly led by the Illinois Operations Manager rather than the Ameren HR group for looking at upcoming retirements and workloads and for developing workforce-planning strategies.

[629] Interview #373, May 11, 2010, and responses to Data Requests #1393, #1409, #1423, and #1424.

Short-Term Distribution Workforce Planning

By June 2009, Ameren-IL had conducted a formal short-term critical assessment with position listings indicating immediate needs for linemen and apprentices. Working with division managers, Illinois Operations identified that Ameren-IL had an immediate critical need for 12 linemen or apprentices. Ameren's HR Talent Acquisition Group tested and interviewed applicants and Ameren-IL hired 14 new apprentices. Training started on November 2, 2009. Ameren-IL also determined that it would need 16 additional linemen or apprentices by the spring of 2010. However, Ameren-IL did not anticipate the revenue shortfall resulting of the recently issued rate case order. Due to the shortfall, Ameren-IL decided to suspend filling these positions as it anticipates significant financial constraints in coming months.

Long-Term Distribution Workforce Planning

Ameren-IL conducted a high-level, companywide long-term workforce plan in April 2009. It based this plan on evaluations on the business environment, state of the workforce, current corporate actions supporting workforce planning efforts, workforce projections, and modeling. The plan included the following highlights.

- Current projections suggest that the Ameren-IL will face a significant number of retirements in the coming 15 years. Assuming steady headcount, Ameren-IL can expect to replace roughly 60 percent of its current workforce in 11 years. The majority of these are retirements will come from skilled craft jobs.
- Because Ameren-IL co-workers tend to have a long tenure with the organization, retirees take significant amounts of knowledge and experience with them. If this knowledge is not effectively shared or captured, it is likely that Ameren-IL could be less efficient and effective.
- If sustained, the current economic environment could affect the standard retirement forecasts. While some co-workers may be well prepared to retire as planned, others will likely continue to work until the market recovers. This could result in larger numbers of coworkers retiring in a more condensed timeframe.
- To replace upcoming retirees, Ameren-IL will be required to compete with other utilities and like industries for a limited talent pool. Some research concludes that skilled craft coworkers and experienced engineers may be particularly difficult to replace due to their availability in the broader labor market.
- As experienced leaders leave the organization due to retirement or other factors, it may become increasingly difficult to replace them with leaders prepared for the next level of responsibility. Ameren-IL must position itself to develop talent internally for leadership positions and/or recruit outside talent.
- Some may perceive the need to prepare for upcoming retirements and a more volatile workforce as an issue to address in the future. However, early preparatory actions will limit the challenges that Ameren-IL will experience when these workforce projections become a reality.

Ameren-IL also projected distribution and substation workforces needed to conduct the recommendation actions indicated in the Liberty Report. For example, to accomplish the actions in Chapter VI – Maintenance, Inspections, and System Conditions, Ameren-IL projects the need to add 44 craft workers to its distribution and substation workforces by 2013.

In May 2010, Liberty found that Ameren-IL's actions were consistent with its commitment. It conducted long-term and short-term planning for its distribution workforce before October 8, 2009. Ameren-IL maintained its level of distribution craft workers between 2006 and 2010 by hiring about 100 linemen and apprentices. It made more linemen and apprentices available for the NESC work by unloading some work to less skilled workers. However, the rate case decision may prevent Ameren-IL from hiring the additional craft workers to replace retiring craft workers and to conduct non-NESC repairs identified by the circuit-patrol inspection program. Liberty considers this verification closed.

In May 2012, Liberty conducted interviews at each division.[630] Liberty found that each division was maintaining it staffing level of linemen and engineers and preparing to increase levels when it implements the new Modernization Action Plan program. Ameren-IL diverted a few engineers in some divisions to the new Illinois design group in Decatur.

[630] Interviews # 471 through #476, May 14-18, 2012.

Recommendation

VI-18

Increase the number of substation engineers

Background

Ameren-IL had five substation maintenance engineers in the field, or about one for every 300 substations. Liberty suggested that this ratio of engineers to substations is insufficient to provide adequate quality control of substation inspection, repair, and maintenance activities. One engineer for every 100 to 150 substations is a more reasonable ratio, depending on the mix of smaller and larger substations in an area. In its comments on the draft report, Ameren-IL proposed only a staffing study. Liberty disagreed with this approach saying that the need for substation maintenance engineers was apparent.

Ameren-IL Implementation Plan

Ameren-IL reported that it carries out a variety of staffing studies to determine the correct level of staffing for substation personnel. These include demographic studies related to replacing personnel due to retirement and maintenance strategy staffing studies. The implementation of these plans needs to balance the benefit with cost. Ameren-Il said that by October 2010, it would develop a staffing model that will fit in with the model developed for substation maintenance engineers.

Verification Discussion and Conclusions[631]

In its audit report, Liberty stated that a reasonable number of substations per maintenance engineer are about 100-150. With 1,500 substations in Illinois, this establishes a range of 10-15. Assuming that lower number of 10 is reasonable, this leaves a shortfall of six substation maintenance engineers with the existing staffing level of four. Ameren-IL has an open position for one additional substation maintenance engineer for 2011, and it is planning to hire three more substation maintenance engineers in the future, pending available funding. Ameren-IL indicates these positions on its organization charts as proposed positions.

In February 2011, Liberty found that Ameren-IL had made plans to hire additional substation maintenance engineers. However, funding restrictions are limiting Ameren-IL's ability to hire additional substation maintenance engineers. Ameren-IL indicated that fully staffing its substation maintenance engineering staff would depend on the outcome of the upcoming rate case. Liberty will revisit Recommendation VI-18 later.

In August 2012, Ameren-IL reported that in 2012 it increased the number of substation maintenance engineers from four to seven, and that it is planning to hire two more engineers, one for general support and one for handheld computer support.[632] It will be adding one more before the end of 2012.

[631] Interview #420, February 16, 2011, and response to Data Request #1482
[632] Interview #480, August 6, 2012, and response to Data Request #1644.

There are now three substation engineers south of I-70 (previously there was only one). These engineers will provide more assistance for managing substation equipment problems in all areas, even if the assigned engineer is busy or away. Ameren-IL provides the new engineers with formal and informal in-house and outside training. Addition of new substation engineers will improve equipment failure--related investigations and improve quality of maintenance work.

Liberty found that Ameren-IL complied with its commitment. This recommendation is verified and closed.

Recommendation

VI-19
Increase substation electrician staffing

Background

Liberty indicated that Ameren-IL may need to increase its substation electrician staffing levels because of more intense substation inspections, more repair work, and possibly more substation reliability work. Ameren-IL should conduct a study that determines substation-staffing requirements for its estimated future substation workloads. As proposed in its comments of the draft report, Ameren-IL could include this study as part of the comprehensive staffing study mentioned in Recommendation VI-17. In its response, Ameren-IL reported that it carries out a variety of staffing studies to determine the correct level of staffing for substation personnel. These include demographic studies related to replacing personnel due to retirement and maintenance strategy staffing studies. The implementation of these plans needs to balance the benefit with cost.

Ameren-IL's Implementation Plan

Ameren-IL indicated that it updated the demographic plan. It is reviewing the maintenance-strategy staffing plan to determine the implementation plan that makes the most business sense. The implementation plan will be complete by October 9, 2009.

Verification Discussion and Conclusions[633]

Short-Term Substation Workforce Plan

In June 2009, Ameren-IL's substation/relay group was included in a written short-term workforce plan indicating the number of new substation/relay engineers, electricians, apprentices, and supervisors needed for 2010. The group also conducts analyses in the third quarter of each year for critical craft workforce needs for the following year. Its 2009 analysis was based on anticipated construction and maintenance workload, including considerations for the availability of substation contractor resources. Hiring in 2010 was critical because it hired no substation/relay personnel in 2009. This analysis indicated that Ameren-IL should hire at least 17 additional in-house substation/relay personnel in 2010. Those additional resources were budgeted and approved for hire by April 1, 2010, pending the successful results from Ameren-IL's 2009 rate case. In March 2010, Ameren-IL hired a contractor (three crews) to perform breaker maintenance. However, because of the results of the Illinois rate case, Ameren-IL did not hire the additional personnel and as of May 28, 2010, plans to release the contractor.

Long-Term Substation Workforce Plan

Ameren-IL substation/relay group was included in a long-term workforce plan. Completed in June 2009, the plan indicated the need for 4 maintenance engineers, 24 electricians, and 3 field relay engineers by 2013.

In May 2010, Liberty found that Ameren-IL's actions were consistent with its commitment. It conducted long-term and short-term planning for its substation/relay workforce before October 8, 2009. Ameren-IL did not hire any new substation/relay personnel in 2009, but it planned to hire

[633] Interview #374, May 11, 2010, and responses to Data Requests #1394, #1425, and #1426.

17 in 2010. It also used a substation maintenance contractor beginning in March 2010. However, subsequent to the Illinois rate case decision, Ameren-IL postponed new hiring and released its contractor to control costs.

Liberty considers the verification of this recommendation closed.

Recommendation

VI-20
Increase number of relay maintenance engineers

Background

Liberty found that Ameren-IL had only two relay field engineers to provide technical guidance for 28 relay technicians. Liberty recommended that Ameren-IL conduct a comprehensive study to determine the required number of graduate electrical engineers needed to provide the appropriate level of technical guidance and to adequately assist the technicians. In addition, field relay engineering is good "training ground" in a utility electrical engineer's career path that produces engineers that are more knowledgeable when they later advance into management positions in other operating groups. One engineer for every five relay-technicians may be a more reasonable ratio. Ameren-IL should complete the implementation of the short-and long-term staffing study results as quickly as possible.

Ameren-IL Implementation Plan

Ameren-IL reported that it carries out a variety of staffing studies to determine the correct level of staffing for substation personnel. These include demographic studies related to replacing personnel due to retirement and maintenance strategy staffing studies. The implementation of these plans needs to balance the benefit with cost. Ameren-Il said that by October 2010, it would develop a staffing model that will fit in with the model developed for substation maintenance engineers.

Verification Discussion and Conclusions[634]

Liberty recommended a staffing level of one relay field engineer for every five technicians. There were 29 technician positions, which would indicate that it needed six relay maintenance engineers. There are currently four relay maintenance engineers on staff, with effectively one engineer dedicated to transmission work. Ameren-IL is advertising and will be interviewing for another field relay engineer for 2011 for NERC compliance. Ameren-IL is planning to add three relay maintenance engineers in early 2012, to bring the total number of relay maintenance engineers to seven in 2012, pending funding availability. Ameren-IL indicates these positions on its organization charts as proposed positions.

In February 2011, Liberty found that Ameren-IL had made plans to hire additional relay maintenance engineers. However, funding restrictions are limiting Ameren-IL's ability to hire additional relay maintenance engineers, except as required for NERC compliance work. Ameren-IL indicated that fully staffing its relay maintenance engineering staff would depend on the outcome of the upcoming rate case. Liberty will revisit Recommendation VI-20 later.

In August 2012, Ameren-IL reported that in 2011, it increased the number of relay maintenance engineers from four to six, and in 2012, it increased that number to ten (plus a supervising engineer).[635] This number exceeds the number of Liberty recommended engineers by four

[634] Interview #420, February 16, 2011, and response to Data Request #1483.
[635] Interview #480, August 6, 2012, and response to Data Request #1644.

because of additional workload necessary to meet NERC relay trip checking requirements. Ameren-IL has an additional opening for one Events Analysis Engineer. The new engineers include an experienced relay design engineer and newly graduated engineers. Ameren-IL provides both formal and informal in-house and outside training. The addition of new relay engineers will improve relay-related investigations and satisfy NERC requirements. Ameren-IL has also has 33 relay technicians, who install and maintain relays, and plans to increase that number by six.

Liberty found that Ameren-IL complied with its commitment and considers this recommendation verified and closed.

Recommendation

VI-21

Monitor closely the quality of and results from inspections of distribution and sub-transmission wood pole inspections

Background

Liberty found that the Ameren-IL companies had not regularly and thoroughly inspected their distribution and sub-transmission system poles, making it difficult to determine the condition of these poles. However, the results of the inspections that the companies did perform and the results from Ameren-IL's new inspection program indicate acceptable pole conditions. Liberty recommended that Ameren-IL ensure that its new 12-year cycle pole inspection inspections are thorough and should closely monitor the results. If the results show a significantly higher pole rejection rate than the 2007 results, Ameren-IL should inspect more aggressively, i.e., reduce the inspection cycle and concentrate on poles that are more likely not to have the required strength. Ameren-IL should have already implemented this recommendation.

Ameren-IL's Implementation Plan

The Resource Management group currently performs this work as a part of the 12-year cyclic program implemented in 2007. Ameren-IL will summarize the 2008 results of this program and compare them to the 2007 results in a report completed by April 1, 2009.

Verification Discussion and Conclusions[636]

In May 2010, Liberty reviewed and compared the 2007 through 2009 results of Ameren-IL's ground-line inspection program to determine if the 12-year cycle is appropriate. Ameren-IL conducts ground-line inspections on an annual rate of about 1/12 of its distribution circuits. It started distribution ground-line inspections from scratch because it did not formal pre-2007 records for distribution circuits. However, Ameren-IL has been conducting ground-line inspections on sub-transmission circuits at an annual rate of less than 1/12 because it did have formal records of past ground-line inspections for some sub-transmission circuits. It had inspected many circuits within 12 years, and had completed inspections of Ameren-CILCO sub-transmission circuits in 2005 and 2006. Ameren-IL initially concentrated on inspecting sub-transmission circuits that had no ground-line inspection history and on those not inspected in 12 years. Therefore, the inspections conducted up to 2010 generally included many of the least maintained sub-transmission circuits. Ameren-IL indicated that it was confident that the 12-year cycle is optimum, and it is not considering any change to either shorten or lengthen the cycle.

Distribution Pole Reject Rates (Priority 1 and 2, Priority Restorable and Restorable)

2007	2.26%
2008	3.22%
2009	3.67%

Sub-Transmission Pole Reject Rates (Priority 1 and 2, Priority Restorable and Restorable)

2007	2.58%

[636] Interviews #367 and 375, May 4, 2010, and response to Data Request #1395.

2008 5.8%
2009 3.07%

In each Ameren-IL company, Priority 1 reject pole rates and Priority 2 reject pole rates were less than 1.5 percent each year, except in 2008, when Ameren-IP had a sub-transmission Priority 1 reject pole rate of about 2.5 percent. Ameren-IL explained that overall sub-transmission reject rate (5.8 percent) and the elevated Ameren-IP Priority 1 pole reject rate (2.5 percent) in 2008 were abnormalities caused by excessively conservative evaluations by the ground-line inspectors. During its quality control inspections (and probably from division reports), Ameren-IL found that voids or deterioration in many of the rejected sub-transmission poles were insignificant and did not qualify for rejection status. The inspectors were re-educated.

In May 2010, Liberty found that total rate of reject and restorable poles identified in 2009 (3.4 percent) was not substantially out of line with the 2007 rate (2.4 percent), and were in-line with other utilities. The slightly higher 2008 rate (4.5 percent) is considered inaccurate because of an identified inspection procedure problem.

The pole rejection rates do not indicate the need for Ameren-IL to shorten its 12-year ground-line inspection cycle. Liberty considers this verification as complete and closed.

Recommendation

VI-22
Examine failed poles

Background

Liberty recommended that Ameren-IL implement a program to inspect broken poles. Poles can break for several different reasons. For example, they might have been rotten and weak, they may have broken because they were leaning and high winds caused excessive forces, or a vehicle may have hit an otherwise strong pole. Determining that a pole broke because of deterioration may provide a trigger for distribution engineers to order pole inspections for other poles in the same area or of poles of the same age and type. Liberty recognized that in a large storm environment, examining poles should not take priority over restoration efforts, and that it is not necessary to examine every failed pole. Nevertheless, pole failure information can help Ameren-IL prioritize maintenance and inspection efforts.

Ameren-IL's Implementation Plan

In its response, Ameren-IL reported that it would develop a process to inspect broken poles by January 8, 2009.

Verification Discussion and Conclusions[637]

Ameren-IL provided documentation showing that it implemented a Broken Pole Inspection Policy, dated January 8, 2009.[638] The purpose of this policy was to determine the causes of wooden pole failures and if proactive corrective actions were necessary to prevent similar failures across the company. The program does not apply to poles broken during storms classified as Level 2 and above.

According to the policy, when Ameren-IL discovers a broken pole, the responding troubleman, crew foreman, or other party fills out a broken pole inspection form. Photographs should be taken whenever possible. They return the completed forms to the appropriate division-supervising engineer to conduct reviews for determining whether follow-up actions are necessary, and whether the evidence warrants additional inspections of surrounding poles.

In August 2009, Ameren-IL provided examples of completed broken pole inspection forms, dated from February 2009 through June 2009.[639] Several of the reports indicated deteriorated poles prior to the break. However, Ameren-IL did not take photographs.

Ameren-IL reported that it has generated about 200 broken pole reports, and that operations managers reviewed the completed forms, which they then sent to division-supervising engineers for follow-up reviews and actions. Ameren-IL was not providing the forms to the ground-line pole-inspection program supervisor for review. It was unclear if and how the division-supervising engineers were using the broken pole inspection forms to identify weaknesses in the

[637] Interview #278, August 6, 2009.
[638] Response to Data Request #1020.
[639] Response to Data Request #1237.

ground-line pole inspection program and whether they initiated any other investigative or corrective actions. Liberty could not verify whether the broken pole inspection program was effective. Ameren-IL indicated that it was not effective. However, the division-supervising engineers were not included in the interview.

The intentions of the recommendation were that:

- at least samples of poles broken during severe storms should be examined for condition
- the quality of the ground-line inspection program could be checked (*i.e.*, if any recently inspected poles broke because of condition)
- some very deteriorated nearby or similar poles should be inspected outside of the regular ground-line inspection program
- at least some broken poles should be photographed for evaluation and lasting evidence.

Liberty found that Ameren-IL had complied with its response by implementing a broken pole inspection policy and program by January 8, 2009. However, it was unclear whether the program is effective in identifying issues with the ground-line pole inspection program and in supplementing the ground-line inspection program by examining similar or nearby poles not recently inspected.

Because some poles will not receive a ground-line inspection for 10 years (Ameren-IL fully implemented the 12-year program in 2007), identifying "hot spots" of bad poles by the broken pole inspection program should be worthwhile in reducing poles broken during storms. In addition, division-supervising engineers should involve the ground-line inspection group if it determines that a broken pole found had been had been recently inspected under the ground-line inspection program.

Liberty will conduct interviews with pole inspection supervisory personnel to determine whether Ameren-IL is using this program effectively, or if the program is not reasonable. Liberty's will continue its verification of Recommendation VI-22.

In 2010, Ameren-IL received reports on 517 poles through the Broken Pole Inspection Form.[640] Liberty reviewed samples of completed forms. Ameren-IL indicated that supervisors review the broken pole forms generated by troublemen and submit them to the division supervising-engineers, who file them by circuit. After several poles have broken on a circuit, it inspects surrounding poles. Finally, the forms go to the construction supervisor responsible for the ground-line inspection program to determine if Ameren-IL should change the circuit's inspection schedule date.

The division supervising-engineers and the construction supervisor reported that they found no indications of general pole deficiencies within pole groups, nor any need to change any line's ground-line inspection schedule. Therefore, Ameren-IL considers the program as ineffective and is considering discontinuing the program. Liberty found that Ameren-IL complied with its commitment and Recommendation VI-22 is closed.

[640]Interview #421, February 16, 2011, and response to Data Request #1482.

Recommendation

VI-23
Correct substation paint deficiencies.

Background

Liberty recommended that Ameren-IL repaint major substation equipment that have aged and faded paint coatings. Liberty observed faded paint and rust developing on very large transmission transformers. Appropriate paint coatings are necessary on transformers for optimal heat transfer as well as for preventing rust-through. In addition, there were distribution substation transformers with rust along the top of their radiators and faded paint on some 138,000-volt oil circuit breakers. Ameren-IL should develop a plan for major substation equipment painting. A reasonable plan would include the correction of known deficiencies within five years.

Ameren-IL should also include identifying and correcting minor equipment paint issues in its regular substation maintenance program. Liberty observed some small but severe rust conditions on some cabinets, radiators, and other equipment. Ameren-IL could easily correct these by removing the rust and applying coats of paint on-site, often without equipment outages. Neglecting small rust spots can result rust-through. Rust-through can result in moisture contamination of or oil leakage from equipment components.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation but said that it does not believe it is the best use of funds. However, it said that it would identify locations with major paint issues and develop a plan to carry out a painting program to address these.

Verification Discussion and Conclusions

In August 2011,[641] Ameren-IL reported that it spent about $200,000 on substation painting projects over the last two years, as part of other substation projects where mobile transformers were set. Most of funds were spent painting transformers and oil circuit breakers. It conducted equipment painting at Canton South, North Seminary, South Edwardsville, and Granville substations, and on two of the mobile substations. Depending on the outcome of the upcoming rate case, Ameren-IL is planning to spend $1,000,000 for substation equipment painting over the next two years.

In a February 16, 2010, letter to Liberty, Ameren-IL said that it might not be able to fund the complete implementation of certain recommendations, including this one, until and if the ICC approves a special funding request. The reason for the funding request on this recommendation involves the need for increased O&M funding for substation painting. However, Liberty concluded that Ameren-IL's initial substation equipment painting practices and its plan to continue funding for additional painting is consistent with its commitment and Liberty's intent. Therefore, despite the matter of an open funding request, Liberty considers this recommendation verified and closed.

[641] Interview #448, August 19, 2011, and response to Data Request #1582.

Recommendation

VI-24
Improve processes for correcting substation deficiencies.

Background

Liberty recommended that Ameren-IL formalize procedures and improve tracking of the repair of substation-equipment oil leaks, low oil levels, zero transformer nitrogen pressure, and other time-sensitive issues.

Oil leaks can have a negative affect on the environment and equipment operation. No nitrogen pressure on transformers could mean that wet air might enter the transformer. Ameren-IL should investigate and correct these types of substation condition issues without undue delay. To accomplish of this, Ameren-IL should:
(1) Implement universal and formal inspector, supervisor, and repair crew procedures, with time limits, for correcting and cleaning up oil leaks, zero nitrogen pressures, and adding oil to equipment. The procedures should include when and how to notify the Ameren environmental organization of oil leaks.
(2) Implement changes to its substation job management system such that it can record and track at least the aforementioned tasks by specific codes or key words from the date of identification to the date of completion.
(3) Assign the responsibility for monitoring pending tasks and the amount of time the tasks were open, and for providing periodic task performance reports to Ameren-IL management for review.
(4) Consider supplementing the substation inspection program with periodic "find and fix" inspections conducted by two-person substation maintenance crews. Direct these crews to conduct detailed substation inspections and to repair, or to initiate the repair of, emergent and standing minor repairs such as oil leaks and oil clean up, zero transformer nitrogen pressures, spot painting, and yard cleanup.

Ameren-IL's Implementation Plan

Ameren-IL said that it agreed with this recommendation. The implementation of the electronic handheld recorders will greatly enhance the process for managing and correcting substation deficiencies. In conjunction with the rollout of the recorders, it would give universal and formal procedures to inspectors, maintenance crews, and supervisors for identifying and correcting problems. It will modify the maintenance management system to produce automated exception/variance reports to alert maintenance engineers of new problems and track the completion of existing ones. The Substation Maintenance Strategy team will establish specific procedures and timeframes for correcting deficiencies.

Verification Discussion and Conclusions

Liberty covers its review of Recommendation VI-24 under Recommendations VI-3, VI-8, and VI-13. Ameren-IL's discussion on its commitment to implement handheld recorders is under Recommendation VI-5. Liberty found in August 2011[642] that Ameren-IL had recently began to roll out its handheld recorders to substation inspectors. The handhelds allow substation

[642] Interview #449, August 19, 2011.

inspectors and maintenance personnel to identify personnel-specific jobs due and past due in their specific work areas.

Liberty closes this verification because Recommendation VI-5, Part C specifically covers Ameren-IL's implementation. Liberty will continue the verification of progress in the handheld recorder program under that recommendation.

Recommendation

VI-25

Improve animal protection on distribution circuits and at distribution substations.

Background

Liberty recommended that Ameren-IL should improve animal protection on distribution circuits and at distribution substations. Outage Analysis System (OAS) data showed that animals caused many of Ameren-IL's substation outages. Some of the outages were on equipment operating above 15,000-volts. Ameren-IL should evaluate the costs of, and the expected reliability improvements gains from, accelerating the adding animal protection compared to other reliability improvement efforts and it should propose an improved animal protection program. Ameren-IL should prepare a written report on the evaluation and the program.

Ameren-IL's Implementation Plan

By April 8, 2009, Ameren-IL will review the effectiveness of the various animal mitigation techniques already in use at Ameren-IL substations and will recommend additional installations, where necessary. It will revise the Animal Mitigation Guide and install additional devices based on the results of the review.

Verification Discussion and Conclusions

Part A – Substations

Ameren-IL provided a report indicating that animals caused 42 percent (of 216) of Ameren-IL substation outages from 2005 through 2008. The report indicated that birds caused 43 substation outages, cats caused 6 outages, raccoons caused 53 outages, snakes caused 4 outages, and squirrels caused 110 outages. Animal-caused substation outages caused an average of 326,552 customer interruptions (CIs) per year during the 2005 through 2008 period. Curiously, in 2008, three snake-caused outages resulted in 31,112 CIs. (Ameren-IL reported that at least one of the snakes shorted across two 34kV buses). The number of animal-caused substation outages ranged from 51 to 58 and the number of animal-caused substation CIs ranged from about 59,000 to 95,000. Over the 4 years covered under the study, there was no obvious trend indicating improvement in reducing animal-caused substation outages.[643]

Beginning in March 2009, Ameren formed its Substation Animal Mitigation Subcommittee or team (a part of its Substation Maintenance Strategy Committee) to review Ameren's current use of animal mitigation protective devices and techniques, and to look into new devices and strategies to help alleviate this ongoing problem. The team meets once every one or two months. The team (includes Ameren-IL and Ameren-MO personnel) reviewed Ameren's use of insulated tape and split-tubes on exposed leads, wildlife discs, bushing guards and covers, snake chemicals, critter guards and spinners, and electric fences. It also is researching the increased use of "hardware cloth" [644] laid at fence bottoms and "Lehman" covers attached to equipment legs to

[643] Response to Data Request #1310.

[644] Hardware cloth is wire fence material, placed along the bottom of the cyclone fence about a foot or less high, where the wires are much closer together (smaller openings) than the cyclone fence material.

prevent snakes from entering substations and climbing structures, new type of fences, and other new devices. It reported that each device can be effective, especially when using them in combinations to provide maximum protection. The committee used a ranking system to determine the most optimal use of the devices for each animal. Ameren-IL developed a strategy with three levels of substation animal protection, depending on the animal-caused outage experience and exposure to various animal types. Ameren estimated improvement in the reduction of customer interruptions for each level of protection.[645]

The "Preliminary Level" (to reduce outages by squirrels by 25 percent and by raccoons by 75 percent) includes installing spinners on overhead lines coming into the substation (prevents squirrels from entering that way) and rocking around the fence to prevent gaps under the fences.

The "Primary Level" (to reduce outages by squirrels, raccoons, snakes, and cats by 90 percent and by birds by 75 percent) includes preliminary level protection plus covering all busing and arresters, installing split tube insulation over equipment leads, and wildlife discs on insulators. Inspectors must remove bird nests during each inspection.

The "Elevated Level" (to reduce outages by all animals by close to 100 percent) includes installing electric animal fences along with improvements indicated in the preliminary and primary levels of protection.

Ameren-IL reported that it has between 50 and 60 animal-caused substation outages each year. It indicated that it spends $4,000,000 to $5,000,000 each year for emergent substation work including an estimated $1,500,000 for adding animal protection in substations. It routinely installs animal protectors on voltage regulator and recloser bushing when it maintains (about 6-year cycles) or repairs them. Substation maintenance engineers (4 for Ameren-IL) are responsible for assuring that Ameren-IL orders and installs animal protection when it plans maintenance or repair projects for equipment and buses. Ameren-IL reported that it installed electric animal fences in over 50 substations between 2006 and 2008 and in more than 80 substations in 2009. Ameren-IL reported that it has not experienced any animal-caused outages in 2009 at substations protected with electric animal fences. It will probably install animal fences in 50 to 100 substations in 2010. The Substation Maintenance Strategy Committee is about to issue the Substation Animal Protection Guide it completed in October 2009. Liberty noted that the programs do not include protecting 12kV transformer bushings or any 34kV bushings.[646]

In November 2009, Liberty found that Ameren-IL complied with its response by forming its Animal Mitigation Subcommittee in March 2009, conducting an evaluation of animal protection devices, and by revising its Substation Maintenance Strategy Committee's Animal Protection Guide (although it has not distributed the Guide). It had reviewed the effectiveness of various animal mitigation techniques and the costs of installing various animal protection devices in its substations. Liberty observed, during its substation inspections, that Ameren-IL has been installing animal protection devices in its substations, including electric animal fences. Some distribution substations were protected well, some were partially protected, and a few had no

[645] Interview #320, November 5, 2009, and response to Data Request #1310.
[646] Interview #320, November 5, 2009.

animal protection. Based on the 50-60 animal-caused substation outages that occur each year, Ameren-IL should continue installing these devices, based on its Animal Protection Guide.

In May 2011,[647] Ameren-IL reported that it experienced 48 animal-caused substation outages in 2008, 51 in 2009, and 55 in 2010. The number of animal-caused customer interruptions (CIs) increased from about 50,000 in 2009 to about 75,000 in 2010. It indicated that the number of CIs increased in 2010, primarily because of one outage that included several sub-transmission buses at one bulk power substation. Ameren-IL reported that only one outage occurred in the 110 substations protected with electric animal fencing, indicating the effectiveness of the electric animal fencing.

Ameren substation personnel continue to meet quarterly to discuss animal-caused outages and animal mitigation activities. For example, Ameren experienced failures of the chargers used to electrify the fences and it took actions with the manufacturer to mitigate these problems. In addition, Ameren-IL is considering installing tight-weave fencing called "Vanquish Animal Deterrent Fencing."

As of May 2011, Ameren-IL had installed electric animal fencing in 110 of about 1,000 larger substations (about 1,750 total outdoor substations). It installed 30 electric animal fences in 2010, and plans to install fencing in another 30 in 2011. Eventually, it will probably install animal fencing in about 200 substations exposed to animal intrusions. Ameren-IL has spent about $4,000,000 so far on substation electric animal fencing and insulator animal protector installations. It determines which substations are candidates for electric animal fence installations based on outage data, the high possibility of animal intrusions, and where an outage can cause a large number of customer interruptions. It usually installs insulator-mounted protectors when it conducts work during maintenance or construction outages in substations.

In May 2011, Liberty found that Ameren-IL is continuing to install animal protection, including electric animal fencing, in its substation each year. Based on outage data for substations with animal fencing, the electric animal fences are effective in preventing most outages caused by squirrels and raccoons. However, the overall trend of animal-caused substation customer interruptions has not yet decreased, indicating that more substations need animal protectors and electric animal fences. Ameren-IL should continue to fund this program.

In February 2012, Liberty learned that Ameren-IL continues to install substation animal protection and believes that animal fences are effective in preventing animal intrusion-caused outages.[648] Ameren-IL installed animal fences in 39 substations in 2011, it will continue to install animal fences in its substations, and it has been evaluating emerging technologies such as fence fabric designed to stop animal penetrations and more effective insulator guards. Recent rate changes should assure that funding will be available for this reliability-related work. Liberty found that Ameren-IL has complied with its commitment. Liberty considers this verification closed.

[647] Interview #431, May 9, 2011, and response to Data Request #1499.
[648] Interview #468, February 17, 2012, and response to Data Request #1630.

Part B – Distribution Circuits

Ameren-IL's response to this recommendation is identical to its response to Recommendation VI-16 part E. Liberty will perform its verification work under that recommendation.

Recommendation

VI-26

Improve lightning protection on distribution circuits and at distribution substations.

Background

Liberty recommended that Ameren-IL develop a lightning protection program that will result in bringing all distribution circuits into compliance with Ameren-IL's current standards. The program should address improving lightning protection at distribution substations. The program should also address lightning protection at distribution line switches, particularly line-tie switches. Retrofitting circuits built to older standards is not a requirement. Therefore, Ameren-IL should evaluate the costs of, and expected reliability improvement gains from, the addition of more lightning protection against other reliability improvement efforts and propose an improved lightning protection program. Ameren-IL should prepare a written report on this evaluation and on program improvements within one year of the date of Liberty's final report. It is reasonable to expect that the program will call for completion of improved lightning protection within five years of the date of Liberty's final report.

Ameren-IL's Implementation Plan

In its response to this recommendation, Ameren-IL indicated that it would form a group made up of field and standards engineers to study, evaluate, and document the whole issue of lightning protection. It indicated that some corrective work and system enhancements are ongoing. It will complete the study in one year and spread out the implementation of the recommendation over the following four years in conjunction with other work requests resulting from ongoing circuit inspections.

In its responses to this recommendation and Recommendation V-34, Ameren-IL indicated that by June 30, 2009, it will identify lightning-caused distribution substation outages occurring over the past 5 years and will develop a plan to analyze lightning protection design of all Ameren-IL distribution substations built prior to 2003. By October 31, 2011, it will have completed lightning protection design analysis for all older substations and will have developed recommendations and cost estimates for improving lightning protection at those substations that do not meet current Ameren standards.

Verification Discussion and Conclusions

Part A – Distribution Circuits

From a previous interview and data request for Recommendation No.VI-16D, Liberty confirmed that in 2009, Ameren-IL began the implementation of its lightning-caused customer interruption reduction program.[649] It reported that this program is similar to the lightning-caused outage reduction program conducted by Illinois Power before merging with Ameren. Elements of the program include the:

- Identification of circuits with the greatest number of lightning-caused customer interruptions using data from the Outage Analysis System (OAS) and the Vaisala Fault Analysis and Lightning Location System (FALLS)

[649] Interview #209, February 5, 2009, and response to Data Request #1017.

- Preparation of specific work plans for identified circuits by the reliability group and the divisions. Improvements include adding lightning arresters and improving grounding
- Prioritization of the work with other reliability work, based on a cost versa reliability improvement criterion
- Review of reliability improvements after lightning-caused corrective work

Later in 2009, as a result of implementing the Lightning-Caused Outage Reduction Program, Ameren-IL identified 16 distribution feeders as candidates for inspection and analysis with respect to lightning protection. It scheduled the resulting work to repair or to upgrade deficiencies for completion by the end of 2010. Work on three projects has been completed, work is in progress on three projects, and engineering has been completed on six projects. It has not completed the engineering on the three remaining projects. Although there is at least one lightning protection project in each of the six divisions, 9 of the 16 projects are in Divisions VI. The divisions have also identified nine additional lightning protection improvement projects outside the Lightning-Caused Outage Reduction Program. Three of these projects are completed.[650]

Ameren-IL verified that it uses data from its Outage Analysis System (OAS) and its Vaisala Fault Analysis and Lightning Location System (FALLS), and beginning in April 2009, from its additional information obtained by adding lightning cause codes to the OAS to focus on identifying additional candidates for lightning protection improvements. Ameren-IL indicated that it would continue the Lightning-Caused Outage Reduction Program past 2009 to identify areas where additional lightning protections would be of greatest reliability value. It will schedule projects identified in 2010 for completion by the end of 2011. Ameren-IL indicated that it would later evaluate the positive affects of the Lightning-Caused Outage reduction Program on reducing lightning-caused outages on the feeders included in the program. Ameren-IL also reported that it has been inspecting its distribution feeders for missing and broken ground wires (arresters must be grounded to function). In 2008, Ameren-IL replaced or repaired 4,145 distribution ground wires. Up to the end of August 2009, it replaced or repaired 2,872 additional ground wires.[651]

In November 2009, Liberty found that Ameren-IL is complying with the recommendations by adding lightning cause codes to its OAS system in April 2009, using its FALLS system to verify the accuracy of the cause codes, and by conducting distribution feeder lighting protection improvements under its new Lightning-Caused Outage Reduction Program, and by division projects not included in this program. Liberty will revisit Ameren-IL's progress in improving lighting protection on its distribution feeders in about one year.

In August 2011,[652] Ameren-IL reported that in 2009 it identified 16 feeders as candidates for inspection and analysis for lightning protection improvements. It completed various lightning protection improvements on 14 of the circuits in 2009 and 2010. No actions were necessary on the other two feeders. In 2010, Ameren-IL identified nine feeders as candidates for inspection

[650] Response to Data Request #1113.
[651] Interview #321, November 3, 2009, and telephone follow-up interview on November 4, 2009.
[652] Response to Data Request #1578.

and analysis. It completed improvements on seven of the circuits in 2010. No actions were necessary on the other two feeders. In 2011, Ameren-IL identified nine feeders as candidates for inspection and analysis. It completed or will complete improvements on five feeders by the end of 2011. It had not completed the reviews for four feeders.

Ameren-IL reported that the Lightning-caused Outage Reduction Program would continue beyond 2011 using the OAS lightning cause code data, Vaisala Fault Analysis, and the FALLS data to identify areas where additional lightning protection would be of greatest value and benefit with respect to reliability. It will schedule projects identified in 2012 for completion by the end of 2013. Ameren-IL expects to continue this program to improve lightning performance for years to come.

As indicated in a February 16, 2010, letter to Liberty, Ameren-IL said that it might not be able to fund the complete implementation of certain recommendations, including VI-26, until and if the ICC approves a special funding request. The reason for the funding request on this recommendation involves additional O&M costs required to install lightning protection where identified by the analyses.[653] However, Liberty found that Ameren-IL met its commitment and Liberty's intent for this recommendation. Therefore, despite the matter of an open funding request, Liberty considers this part of the recommendation verified and closed.

In May 2012, Liberty conducted interviews at each division.[654] The divisions reported that the reliability group identifies and confirms circuits with larger lightning-caused outages and the circuit patrol inspection contractor provides maps indicating were additional lightning arresters are needed on those circuits. The divisions are installing arresters were these studies indicate the need. Liberty found Ameren-IL's lightning protection practices to be effective and consistent with good utility practices.

Part B – Distribution Substations

Ameren-IL reported[655] that its review of substation lightning protection in underway. It completed the project scope and schedule, as well as the assessment criteria and outage data for the last 5 years. It is analyzing the data and comparing them to the utility industry. Ameren-IL also reported that it would review lightning protection (arresters, masts, and shield wires) in all distribution substations (about 1,000) before the end of 2011. It is developing an Ameren-IL Lightning Protection Guide, based on IEEE 998, Direct Stroke Lightning Protection. Ameren-IL indicated that this guide would be finished by the end of 2009. Ameren-IL indicated that it has improved lightning protection in a few substations recently by upgrading or moving 12kV lightning arresters closer to transformer bushings. Liberty noted that the 12kV sections of some substations it had recently inspected appeared adequately protected with lightning masts or shield wires while some were not protected.[656]

[653] Response to Data Request #1600.
[654] Interviews # 471 through #476, May 14-18, 2012.
[655] Interview #321, November 3, 2009, and response to Data Request #1311.
[656] Interview #321, November 3, 2009, and Response to Data Request #1311.

In November 2009, Liberty found that Ameren-IL met its commitment. Ameren-IL is progressing on its development of a Lightning Protection Guide, which is to be finished by the end of 2009, and it is conducting some substation lighting protection improvements. It plans to continue review of all Ameren-IL substations for need of lightning protection improvements until completed by October 3, 2011. The verification of this part is closed. However, Liberty will continue its verification of Ameren-IL's substation lightning protection improvements under Recommendation No.V-34.

Recommendation

VI-27
Improve the physical condition of distribution-circuit tap lines

Background

Liberty found that Ameren-IL had not included all tap lines in the legacy companies' routine patrol inspection program. Liberty recommended that Ameren-IL improve the physical condition of distribution-circuit tap lines. (1) Ameren-IL should include all circuits tapped onto main lines in its routine distribution patrol inspections and (2) make certain that inspectors identify condition issues, such as broken ground wires, rotted poles, floating conductors, and broken aerial cable spacers. (3) Ameren-IL should ensure that it tracks to completion the correction of identified issues.

Ameren-IL's Implementation Plan

Ameren-IL reported that it implemented this recommendation before April 8, 2009.

Verification Discussion and Conclusions[657]

Ameren-IL provided a copy of policy "Electric Sub-transmission and Distribution Circuit Inspections," effective January 1, 2007. This policy stated that it will inspect all sub-transmission and distribution circuits for defects, foreign company attachments, and clearances for NESC compliance on 4-year cycles. The policy also described inspection content, addressing defects, and record keeping. Ameren-IL also provided spreadsheets listing all Ameren-IL circuits inspected since 2007, and a tabulation of abnormal conditions and actions for inspection reporting purposes. Actions are listed as information only, repair, replace, replace in 90 days, and emergency. The documents indicate that Ameren-IL tracks tap-line abnormal conditions to completion using DOJM,[658] and the information is contained in the CDIS[659] system. Ameren-IL can check the status of ground-line inspection completions by taking DOJM snap shots. The documents indicated that Ameren-IL has no past-due inspections. Local divisions track repairs generated by the inspections in work tracking meetings and reports.

Except for work-rule constraints in a couple of the divisions, standardized line patrol inspections using the line inspection contractor began at the beginning of 2007. All divisions were included at the beginning of 2008. The inspection contractor walks each circuit, including all 1, 2, and 3-phase tap lines, records GPS data and abnormal conditions using a "toughbook" laptop, and applies an inspection tag and pole number on every pole. The contractor calls in any emergency or tree clearance problems to the Illinois Operations Services group to pass on. The Op Services group conducts quality assurance inspections to verify that accuracy of the inspections conducted by the contractor. The Op Services group tracks circuit inspections but not repair completions. Under the current program, Ameren-IL will have inspected all sub-transmission and distribution poles, including all tap line poles, by the end of 2011. Some poles will be in the second cycle

[657] Interview #339, January 27, 2010, and response to Data Request #1346.
[658] DJOM is Ameren-IL's Distribution Operational Job Management system.
[659] CDIS is Ameren-IL's Circuit and Device Inspection system.

during 2011. Ameren-IL reported that it plans to continue the current patrol inspections in the future.

Liberty found that Ameren-IL is including all tap lines in its line patrol inspections and is tracking the inspections and inspection completions. It does not have any inspection program work past due. Liberty will continue verify repair tracking and completions under the verification of Recommendation VI-9.

Ameren-IL met its commitments related to this recommendation. Liberty considers the recommendation verified and closed. Nevertheless, in May 2012, Liberty conducted follow-up interviews at each division.[660] The divisions reported that the 4-year circuit patrol contractors were continuing to notify the divisions directly when it finds the need for emergency or high priority repairs. Ameren-IL schedules minor line repair jobs in DOJM and the divisions work them. The monthly Reliability Action Plan performance reports track the overall performance of completing the minor line repairs. The divisions reported that while the goal is to work these minor repairs within the year reported, it delayed some minor repair work generated from 4-year circuit patrol inspections in the past due to the bad outcome of the prior rate case. Ameren-IL has been working on these minor repairs and, companywide, plans to hire contractors to help complete all minor repair work reported in 2008 and 2009 by the end of 2012. It plans to catch up on all repair work after it implements Modernization Action Plan. Liberty plans to check on the status of the minor line repair work in December 2012.

[660] Interviews # 471 through #476, May 14-18, 2012.

Recommendation

VI-28

Correct National Electrical Safety Code issues.

Background

Liberty found instances of non-compliance to the National Electrical Safety Code in Ameren-IL's electric delivery system. Ameren-IL developed a program for correcting NESC compliance issues and submitted it to the Staff of the Illinois Commerce Commission. Ameren-IL should continue the implementation of this committed program. In addition, Ameren-IL should determine where less than four grounds per mile of distribution line exist and make changes as required by NESC code.

Ameren-IL's Implementation Plan

Ameren-IL said that it will continue with its program and commitments to the ICC and is currently noting locations without grounds and will comply with the more recent code revision requirement of having four grounds per mile.

Verification Discussion and Conclusions

Ameren-IL's modified its circuit patrol inspection database to include pole grounds.[661] Ameren-IL instructed circuit patrol inspectors to indicate on their electronic data gathering devices whether each pole inspected has a ground wire. Ameren-IL will add grounding wire data to the maps and inspection data provided to division supervising engineers.

Liberty found that Ameren-IL's change in its circuit inspection method is consistent with Liberty's recommendation and its response to the recommendation. However, Liberty will evaluate the how division engineers apply the grounding data to the NESC work.

In May 2012, Ameren-IL reported to that it has completed its commitment of assuring that it meets the NESC four grounds per mile requirement.[662] The circuit patrol inspection contractor and the design group verified the locations of grounds. Ameren-IL schedules jobs to install or repair grounds in DJOM. Liberty considers the verification of this recommendation complete.

[661] Interview #213, February 5, 2009, and response to Data Request #1021.
[662] Interview #475, May 14, 2012.

Recommendation

VI-29

Improve information systems for evaluating system conditions.

Background

Liberty concluded that Ameren-IL should take steps that could lead to improved information and analyses of system conditions and equipment problems. These included:

- Add cause codes for lightning. Consider codes for obvious direct lightning strikes and suspected, but unverified strikes.
- Use "equipment malfunction" cause code when equipment did not operate as intended, or broke without external cause. To evaluate properly damage causes and to identify conveniently systemic equipment problems, Ameren-IL should not use the equipment malfunction code when a fallen tree breaks a line or pole, or lightning damages equipment.
- Use tree-related cause codes in such a way to allow conveniently evaluation by the vegetation management and reliability groups for preventable and non-preventable tree contact.
- Train troublemen and dispatchers to apply cause codes with as much accuracy as possible.
- Study the organization of information entered into the Outage Analysis System (OAS). Determine whether there are ways to structure the input, and use typical outage scenarios to gain more consistency in data entry.
- Develop methods to use OAS to capture information on particular equipment issues. Survey other utilities and information system vendors for possible replacement for functions now performed by OAS and related to causes of outages.

Ameren-IL's Implementation Plan

A. Lightning cause codes will added to the OAS and mapped to the appropriate ICC cause code for the annual report. Ameren-IL will complete this by April 30, 2009.

B. Ameren-IL will train troublemen and dispatchers to apply cause codes with as much accuracy as possible. Ameren-IL will complete this by October 8, 2009.

C. Ameren-IL will improve the way it reports information into the OAS system. Ameren-IL is currently studying the possible use of the DMS system (see IV-16) which is due April 8, 2009. Ameren-IL is also developing a friendly front end for OAS Mobil Data users that will change and structure the OAS information for easier entry as well as require more information. This project is pending the completion of the DMS study.

D. Ameren-IL will develop methods to use OAS to capture information on particular equipment issues by October 8, 2009.

E. Ameren-IL will survey other utilities and information system vendors for possible replacement of functions now performed by the OAS system related to causes of outages. A DMS study, as referenced in response to recommendation IV-16, is currently underway that will evaluate outage systems. Implementation depends on the results of the DM study.

Verification Discussion and Conclusions

Ameren-IL appears to be addressing the issues in this recommendation V-29, except for tree-related cause codes.

(Part A – Add Lightning Cause Codes to OAS)[663]

According to e-mail to key Illinois operation resources, dated March 16, 2009, Ameren-IL added lightning cause codes to its OAS system. It indicated that field Code "LI" indicates suspected lightning, and code "LV" indicates that the reliability group verified LI following review of confirming weather data. An Energy Delivery Systems Update for OAS users, dated April 17, 2009, indicated that Ameren-IL implemented the LI and LV cause codes for use by OAS users.

Ameren-IL reported that through July 23, 2009, about 40 outages were cause coded as confirmed "LV" lightning causes, out of about 1600 suspected lightning-caused outages coded with "LI." Liberty could not determine why Ameren-IL confirmed only 40 outages to be lightning caused (LV).

Liberty found that Ameren-IL implemented its plan by April 30, 2009. However, it was not clear how the effective the division engineering groups were in investigating the "LI" cause codes, and how the reliability group will be using the LI and LV data. Liberty will continue its verification of VI-29A by interviews with the division supervising-engineers and the reliability group.

(Part B – Lightning Cause Training)[664]

In February 2010, Liberty conducted interviews, including an interview with personnel from one division, to determine Ameren-IL's compliance with its commitment to provide cause-code training to dispatchers and troublemen by October 8, 2009.

Dispatcher Training

Dispatchers are responsible for assigning the cause codes, with troubleman help, for sub-transmission outages, substation outages, and total feeder outages. The distribution dispatch group reviews cause-codes following outages and after the conclusion of major storms, Ameren-IL reliability engineers use the FALLS lightning activity program to verify lightning cause codes.

In May 2009, Ameren-IL's reliability engineering group produced a graphic presentation entitled "Electric Reliability" for the Ameren-IL dispatchers. Reliability engineers used the presentation as the basis for providing training to all Ameren-IL dispatchers at the three Ameren-IL Distribution Dispatch Conferences, held on October 20 and 28, and November 4, 2009. This training concentrated on the proper application of Tree Cause Codes, Lightning Cause Codes, Customer Equipment Cause Codes, Operator Error Cause Codes, the use of multiple cause codes, and the application of cause codes under abnormal switching conditions.

[663] Interview #280, August 10, 2009, and response to Data Request #1239.
[664] Interviews #341 and #344, February 1 and 9, 2010, and response to Data Request #1349.

Troubleman Training

Troublemen are responsible for applying cause codes for outages affecting less than total feeders. Troubleman supervisors verify the accuracy of troubleman-applied cause codes, as part of planning the repair activities. For Division V, six dedicated troublemen are available or on-call 24 hours each weekday. Ameren-IL schedules regular construction linemen during weekends to respond to outages. The linemen receive annual and on-the-job trouble response training.

On September 29, 2009, Ameren-IL prepared a cause-code "job aid" document. The purpose of the job aid was to inform supervisors and troublemen about recent cause code changes. The job aid included instructions on verifying animal, tree, and weather (except lightning) cause-codes, and instructions to not report an outage as "equipment malfunction" caused, if equipment damage was caused by trees or ice. Attached to the job aid was a revised list of cause codes. Ameren-IL provided the job aid to troubleman supervisors in February 2010 and will use it for lineman refresher training in the future.

Division engineers review feeder outages resulting in more than 100 customer interruptions (CIs), they identify appropriate reliability corrective actions, and, as an additional quality control procedure, they verify the accuracy of troubleman cause-code reports.

In February 2010, Liberty found that Ameren-IL complied with its commitment to provide better training to dispatchers and troublemen, and that the dispatch training appeared to be good. However, Liberty found Ameren-IL could improve troubleman training. Troubleman cause-code training appears to be somewhat informal and troubleman knowledge depends primarily on supervisor guidance and annual linemen refresher training. Liberty suggests that Ameren-IL conduct periodic cause-code specific training, under reliability engineering guidance, for division supervisors, troublemen, and linemen, possibly using the graphic presentation used for dispatchers.

Liberty will continue the verification of cause-code training until after the new windows-based DMS (distribution management system) has replaced the OAS system. The new DMS will be more intuitive for users and will allow Ameren-IL to gather and sort additional outage data.

(Part C – Improve Ways Information is Entered into the OAS Mobile Data System)[665]

Ameren-IL halted further OAS Mobile Data System development, pending the implementation of the new distribution management system (DMS). Liberty will review this part of the recommendation after DMS implementation.

(Part D – Capturing Equipment Data with OAS)[666]

Since early 2008, Ameren-IL has been using the "overhead malfunction" cause code, with a description of either Hendrix cable, or spacer cable, for identifying Hendrix cable-related outages. During a 19-month period, Ameren-IL identified 76 Hendrix cable-caused outages

[665] Response to Data Request #1350.
[666] Interview #342, February 1, 2010, and response to Data Request #1351.

resulting in 13,963 customer interruptions. Ameren-IL reported the results of a study of Hendrix cable-caused outages to supervising engineers at a meeting on September 2, 2009. Ameren-IL also developed an OAS use method for identifying and improving the timeliness of repairing and closing URD loops, as a response to Recommendation VI-12.

Ameren-IL demonstrated the OAS Mobile Data Recorder screens during Liberty's Division V Maryville interview.[667] Liberty found that with the current mainframe-based OAS system, reporting equipment-specific "equipment malfunctions" require descriptors and the process is inconvenient and not practical for identifying specific equipment issues, other than Hendrix cable issues. Liberty suggests that when Ameren-IL implements the new Windows-based DMS (distribution management system), it includes a list of specific equipment malfunctions that can be directly entered into the system without descriptors. This would simplify reporting, identifying, and analyzing systemic equipment problems, such as cutout failures, CSP transformer failures, and other equipment problems that division engineers, reliability engineers, and standards engineers might need to track.

Ameren-IL is not pursuing any improvements in the OAS to provide additional equipment specific issues. Ameren-IL indicated that it would review the need to add additional specific equipment malfunction cause-codes when it implements the new Distribution Management System (DMS).

In February 2010, Liberty found that Ameren-IL's actions were consistent with its commitment. However, Liberty will continue its verification work after implementation of the new DMS.

(Part E – Survey for an Improved Outage Analysis System)[668]

Ameren reviewed DMS programs from six vendors during the course of the DMS study, including eleven DMS (Digital Management System) vendor presentations or visits provided to, or by, Ameren's DMS Study Team in 2008 and 2009. At the completion of the study, Ameren released requests for proposals to the vendors on October 23, 2009.

Ameren selected three vendors for final consideration. Ameren indicated that it would select the new DMS vendor by April 2010. Goals for the new DMS include automation for new smart grid programs and intelligent processing of SCADA and outage data together during storm restoration activities to help operators optimize restoration activities and improve restoration times.

Liberty found that Ameren-IL had surveyed a sufficient number of DMS vendors.

Ameren-IL met its commitments related to this part of the recommendation. Liberty considers this part of the recommendation verified and closed.

In May 2012, Liberty conducted interviews at each division.[669] They reported that Ameren-IL has not implemented the DMS system. Liberty found that Ameren-IL trained troublemen on an

[667] Interview # 344, February 9, 2010, Maryville Division V.
[668] Interview #343, January 26, 2010, and response to Data Request #1352.

ongoing basis about properly applying cause codes into the existing OAS system, particularly lightning, overhead equipment malfunctions, and animal cause codes, so that it could use this information to develop lists of circuits needing protection and repairs.

In November 2012, Ameren-IL reported that it would fully implement its Distribution Management System (DMS) for dispatchers by the end of 2013.[670] The DMS will allow dispatchers to observe and control system conditions using one control monitor, without having to compare separate OAS and SCADA screens and old-fashioned wall maps, and to identify more quickly fault locations and system conditions. Dispatchers will be able to see which feeder section is affected by an outage and the position of circuit breakers and switches on an electronic map, and can control equipment with SCADA control, all through the DMS. The DMS should reduce Ameren-IL's CAIDI indices by speeding up response times and by isolating more quickly the affected feeder sections during normal and major storm conditions. In 2014, DMS will also provide data to mobile devices in one-man trucks and some crew trucks. This will allow troublemen to observe maps indicating fault locations.

As of November 2012, Ameren-IL had integrated SCADA, and was well along in integrating its maps, into the new DMS system. It was training its trainers as preparation for fully implementing the DMS by the end of 2013, when the system fully integrates OAS and reporting tools.

Liberty found that implementation of DMS should greatly improve the accuracy of fault locating and improve response times, especially for major storm response when multiple faults occur. Although funding concerns slowed the implementation of the DMS system, Ameren-IL is on track to implement this important state-of-the-art system by the end of 2013 to dispatchers and to troublemen in 2014. Liberty considers the verification of this recommendation closed.

[669] Interviews # 471 through #476, May 14-18, 2012.
[670] Interview #493, November 8, 2012..

Recommendation

VI-30

Improve the analysis and reporting of incidents and equipment failures

Background

Liberty concluded that Ameren-IL should improve the analysis and reporting of incidents and equipment failures. Ameren-IL should take better advantage of learning from incidents and equipment problems across its entire Illinois territory. Having one system instead of three for reporting such matters would help in this regard. A common format and content for reporting problems could help distribution engineers and others avoid recurrence of problems that took place in other parts of the Ameren-IL system. Ameren-IL should take the best features and practices from the existing systems to develop the new, comprehensive, and consistent program. It should also establish means for making the information available to those who could benefit from it. As an example, Ameren-IL did not evaluate the cause of all substation transformer failures. Age and electrical conditions (excessive loading) apparently were not significant factors in the failures that could have been improper application, design or construction deficiencies, manufacturing deficiencies, under-maintenance, or inadequate lightning protection and grounding of the lines or the substations. Ameren-IL could benefit from a better understanding of what caused these transformer failures. In its comments on the draft report, Ameren-IL accepted this recommendation. Ameren-IL interpreted this item as two recommendations. However, Liberty used substation transformer failures as an example of the need for improved analysis of equipment failures.

Ameren-IL indicated that it usually analyzes failures of major substation equipment like transformers and circuit breakers, but does not document the results of these inspections consistently.

Ameren-IL's Implementation Plan

Ameren-IL said that by October 8, 2009, it would adopt a strict policy in the Substation Maintenance Engineering group to produce failure analysis reports for major equipment problems. The new Supervising Engineer of Illinois Substation Maintenance will prepare the guidelines and will define the events that require documentation.

The current failure analysis/trouble report template should be revised to include all follow-up action items for the substation that experienced the failure as well as any other locations that could experience a similar failure.

Verification Discussion and Conclusions

In August 2010,[671]Ameren-IL a copy of the "Template for Apparent Cause Investigation" used prior to October 8, 2009, and a copy of the new "Ameren Illinois Substation and Relay Maintenance Corrective Action Program," dated October 8, 2009. All three Ameren-IL companies use this program. The new program is an expansion of the old in that it includes definitions and threshold information and is intended to supplement Ameren-IL's new Root

[671] Interview #384, August 9, 2010, and response to Data Request #1429.

Cause Policy by using less detailed analysis for less severe substation and relay events that do not qualify for the Root Cause Plan. The new substation/relay program includes:

- Identifying the cause of events
- Collecting and organizing data
- Tracking and trending events for recurrence
- Improving substation and sub-transmission system protection

The manager and supervising engineer for substation and relay maintenance are responsible for qualifying events for investigation, assigning maintenance engineers to conduct the investigations, reviewing investigation results, and managing corrective actions.

The program defines system (abnormal) events and two thresholds for investigations:

- Apparent (or direct) cause investigations for substation or primary relay equipment failures that cause customer outages.
- Common (or underlying) cause investigations for substation equipment failure that results in an outage of more than 10,000 customers, or the failure of both primary and secondary relay protection. Depending on the consequences of the system event, it might initiate the Ameren-IL Root Cause Plan according to the thresholds in that plan.

The program includes a template for conducting an investigation, fact investigation and gathering, analysis of various issues, conclusions, and actions to prevent recurrence.

Ameren-IL reported that it has conducted "Substation Corrective Action Program" investigations for about six transformer events and six relay events. Liberty pointed out that the program does not clearly indicate the need to be specific about defining "system events." In addition, one event might require more than one problem statement. Liberty suggested that the substation/relay maintenance supervisor provide completed reports to the Ameren RCA expert for review and constructive criticism.

The Ameren Distribution Standards Group representative also attended the interview. The Ameren distribution representative was unfamiliar with the Ameren-IL RCA process. The standards group does not use the substation investigation format, but uses an informal process for investigating distribution equipment problems and identifying corrective actions. It has an unsatisfactory equipment performance report. By using its method, the Distribution Standards group has issued a new policy for switching all fused cutouts, because some have broken and caused a safety hazard.

In August 2010, Liberty found that Ameren-IL complied with its commitment to standardize its substation and relay investigation procedure by October 8, 2009. The procedure adds a few elements to the older procedure. It includes "apparent cause" (direct cause) investigations for minor substation/relay events, and "common cause" (root cause) investigations for major events that do not qualify for the full Ameren-IL RCA procedure. Liberty will review substation/relay investigation reports later before commenting on the effectiveness of reports resulting from use of the procedure.

However, based on review of the procedure and the interview, Liberty suggests that Ameren-IL might improve the substation/relay procedure by having Ameren-IL's RCA expert review it and the reports resulting from the procedure. For example, the substation/relay procedure does not emphasize how to appropriately identify the "System Event," (the undesired outcome), how the report should be outlined, or indicate a procedure to track corrective actions to completion. In addition, the procedure does not provide examples for maintenance engineers to follow. Ameren-IL should consider RCA training for all maintenance engineers.

In August 2011,[672] Ameren-IL reported that it experienced an event that met Ameren's Root Cause (RCA) Policy criteria. Ameren-IL commissioned a team to conduct a formal detailed RCA of the entire June 1, 2011, West Mt. Vernon Substation outage event. Please refer to Recommendation VI-31 for the discussion of this event and the RCA conducted following that event. Liberty covers the implementation of this recommendation under Recommendation VI-31 and therefore considers this verification closed

[672] Interview #451, August 18, 2011, and response to Data Request #1584.

Recommendation

VI-31

Institute an effective root cause analysis (RCA) program

Background

Liberty concluded that Ameren-IL did not perform valid root cause analyses of important incidents and accidents.

Ameren-IL makes engineering assessments of equipment failures and problems, and analyzes accidents involving personnel injuries. For most of the typical problems that occur on transmission and distribution systems, Ameren-IL's evaluations are adequate and typical of most electric utilities. However, some significant or unusual incidents warrant a more in-depth investigation. A root cause analysis will determine one of the underlying events, conditions, or factors that created or allowed a defined, undesired outcome. The actual root cause should be specific, something over which management has control, and something for which the analysts can generate effective recommendations.

Liberty recommended a program that should define the type of incidents for which Ameren-IL will perform a root cause analysis and the level of management that can call for a root cause analysis. The program should call for a multi-disciplinary team of personnel to perform the assessment and should make provisions for the team to have time dedicated to the analysis. Procedures should describe the objectives and methods for the team, define the common terms the team should use, and provide a common structure for the reports.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation. However, the implementation plan only mentioned an increase in staffing level of Substation Maintenance Engineering group, all new engineers to attend Apollo RCA class, and Substation Maintenance Engineering to work with PDAC group to establish guidelines for determining which events qualify for RCA.

Verification Discussion and Conclusions

In May 2009, [673]Ameren-IL reported that the seven maintenance engineers in the substation group attended a one-day RCA seminar on the Apollo method for root cause analysis. This is the method used by the Callaway nuclear power generating group.

Ameren-IL currently conducts root cause analyses on major substation-equipment failure incidents. Ameren-IL generally assigns the investigations for the analyses to the engineer responsible for the equipment that failed. Ameren-IL is expanding the program to the sub-transmission system and all major incidents other than safety related incidents. Later in 2009, the Dispatch Operations (DDO) will record them and route through the substation maintenance-engineering supervisor for distribution to others for RCA assignment. Ameren's transmission-relay event review team in St. Louis conducts evaluations of all transmission relay operations.

[673] Interview #238, May 7, 2009.

Ameren-IL provided Liberty with a copy of its "Root Cause Improvement Program," and the "Template for Root Cause Investigation."[674]

Root Cause Improvement Program

Substation maintenance engineers conduct this program. Its primary focus is substation, relay, and sub-transmission system (and some transmission system) events defined as significant by the DDO and confirmed by the substation engineering supervisor. Input to the RCAs is sought and used from the design-engineering group, the DDO group, and the reliability and maintenance leadership. Ameren-IL will document all sub-transmission events down to the last distribution recloser in the DDO database, which is currently under development. The events will be assigned a priority based on the number of customers affected, the dollar value of the failed equipment, and multiple events of similar equipment. Substation maintenance engineering and others, if needed, will conduct the RCA, which will include testing, factory teardown, vendor assistance, design review, maintenance history, and industry experience. Expected RCA solutions to prevent recurrences include review of similar installations, designs, and equipment, and could result in changes in equipment or design standards, maintenance practices and training, substation refurbishment plans, operating philosophy.

Template for Root Cause Analysis

This is a guideline for collecting data related to the event, the investigation process, the analysis, conclusion, and achievable actions to prevent recurrence. The analysis included failure modes, operation, maintenance, design, and equipment failure issues. However, the template did not indicate how to determine conclusions using root cause methods.

At the May 7, 2009 interview, Liberty reviewed several past Ameren-IL substation event RCAs. Liberty found that these RCAs appeared to be limited to investigations (determining direct causes and contributing factors), with no evaluations of underlying or root cause and no recommendations for solutions to root causes to prevent recurrence of similar incidents. For a case reviewed where a transformer faulted when a downstream bus fault occurred, the conclusion was that the downstream fault was the cause. In fact, the downstream fault was a contributing factor because the transformer fuse should have protected the transformer. The direct cause was the use of an improperly sized fuse. The root cause was likely a management decision not to replace the fuse with the proper fuse when Ameren-IL knew about the improperly sized fuse. However, the report did not discuss this cause and there was no evaluation on whether Ameren-IL should replace similar fuses at other locations.

Liberty found that Ameren-IL complied with its implementation plan and it has improved and expanded its RCA program. However, it does not include distribution system events. In addition, it does not include standard RCA methods or definitions for identifying direct causes, contributing factors, and root causes that would make the process more efficient for identifying and correcting underlying causes.

[674] Response to Data Request #1078.

Liberty will continue to review Ameren-IL root-cause analysis reports and provide feedback to Ameren-IL. Liberty's verification of Ameren-IL's response to Recommendation VI-31 remains open.

In August 2010,[675] Ameren-IL indicated that it issued its "Policy for Performing Root Cause Analysis Investigations," early in 2010. This policy outlines Root Cause Analysis (RCA) purpose, definitions, and responsibilities. Serious injury, non-weather outages involving customer interruptions of 10,000 or more, or damage of $250,000 or more trigger Ameren-IL's formal RCA investigations. In addition, it might conduct a RCA for any adverse trend or event that suggests a significant underlying weakness.

Ameren-IL prepared a one-day course graphical presentation for training employees in conducting RCA. The presentation included RCA policy, type of events that trigger an RCA investigation, and steps in conducting an RCA investigation up to identifying and tracking the best corrective actions. The training material also used numerous examples of RCA investigations for students to work out. Ameren-IL reported that so far in 2010 it provided training to 30 Ameren-IL management employees who might conduct future RCA investigations. As of July 2010, no adverse events occurred that would trigger an RCA investigation. Therefore, no examples of completed RCA investigations were available for Liberty review.

Ameren-IL's RCA policy and training complies with its commitment and is consistent with good utility practice. However, Liberty withholds comment on the effectiveness of RCA reports until an event occurs that triggers a major RCA investigation. Liberty suggests that Ameren-IL provide RCA training to Ameren transmission and distribution management and engineering personnel whom may be involved with Ameren-IL T&D events.

Liberty also suggests that Ameren-IL not restrict the concept of using RCA to only major events. Less-formal investigations, using RCA elements, by one or two management personnel could be useful for providing the best solutions to common issues that have less impact to Ameren-IL. The substation/relay maintenance group uses an event investigation procedure that contains some RCA elements for events that do not trigger a formal RCA. Ameren-IL should consider developing an additional, but less formal, RCA policy and procedure for investigating minor events for any type of problem.

In August 2011,[676] Ameren-IL reported that it experienced an event that met Ameren's Root Cause (RCA) Policy criteria. Ameren-IL commissioned a team to conduct a formal detailed RCA of the entire June 1, 2011, West Mt. Vernon Substation outage event. Ameren-IL presented the event details, the casual facts, and the preliminary root cause determinations, but the final RCA report was not available at the time of Liberty's review.

The purpose of the RCA was to prevent recurrence of similar outage events. Ameren-IL created an RCA policy and team for this event, and made certain that team members received RCA training before proceeding. The team consisted of 10 employees from planning, operations,

[675] Interview #385, and responses to Data Requests # 1370 and #1430.
[676] Interview #451, August 18, 2011, and response to Data Request #1584.

relaying, T&D design, and other related areas working about 40 hours each reviewing failures, gathering data, reviewing maintenance and operational history, and making conclusions.

The RCA team determined that the Problem Statement for this event was the 4-hour outage of about 18,000 customers over a 30-mile wide area. The purpose of the RCA was to identify and to correct all contributing causes and the root cause of the event to prevent recurrence of similar events. Ameren-IL placed this RCA procedure, working documents, and results on the company's Sharepoint® site to allow employees to observe the work done on this RCA, and to use it as an example for future RCA projects.

Ameren-IL provided and explained the various RCA documents and drawings, which graphically demonstrated the event locations and the timeline of the events. The causal factors included:

- 138000-volt bushing failure – Initial fault that should have cleared without customer interruptions.
- Relay wiring error – Caused in the tripping of more breakers than necessary.
- SCADA communication and operator display issues – Slowed restoration.
- Auto-sectionalizing issue – Slowed restoration.
- Loss of station service – Slowed restoration.
- Switch contact failure – Equipment damage only. It did not cause customer interruptions.
- Burning open of line jumper conductor – This event was identified as the root cause because it caused the customer interruptions. Also, a similar jumper had burned open before at another location and these jumpers should have been repaired after that event.

An important part of the RCA was to identify why these events occurred, identify other locations where similar conditions exist, and take reasonable corrective actions to reduce recurrence of all causal factors and the root cause.

- Bushing failure – Find similar bushings and improve methods for identifying overheating in this bushing type.
- Wiring error – Require complete trip checking of relay circuits when only part of circuit is modified.
- Communication and display issues – Determine measures to improve SCADA communications and to making displays more flexibility in moving from one system display screen to another (the outage area was larger than could be observed on one screen).
- Bus-transfer switch contact failure – No effect. The bus transfer switches were not necessary and will be eliminated.
- Line jumper failure –Improper materials used in the jumper connector. Find and replace similar jumper connectors at all locations using correct materials.
- Improve auto-sectionalizing schemes.
- Fix station service problem.

Ameren-IL assigned personnel with duties to verify that all corrective actions are timely completed.

Ameren-IL reported that it would use this RCA as an example for future RCAs, and as a case study for mock emergency training for dispatchers and operators.

Liberty found that this example of the use of Ameren-IL's root-cause analysis (RCA) policy was professional, effective, and consistent with good utility practices. However, the verification work for this recommendation remains open until the formal RCA report is complete and reviewed by Liberty.

In November 2011, Liberty found that Ameren-IL conducted a thorough and proper RCA investigation, causal analyses, and corrective action identifications for this very complicated example of a major outage event.[677] In this case, Ameren-IL determined that the failure of a copper-to-aluminum connector in a transmission line jumper failed while under high loading conditions was the most underlying or root cause of the widespread outage. However, the RCA report did not discuss whether Ameren should have identified and corrected the bad connector before the event occurred. If Ameren had information to believe that the copper-to-aluminum connector was a probable failure risk, then the underlying root cause would have been either a procedure failure or a management decision not to replace the jumper before the outage event.

Ameren-IL reported that it had analyzed the history of transmission line jumper failures and whether periodic thermography inspections, if conducted, would have identified the bad connector under normal load conditions. Ameren-IL reported that it did not include these analyses in its written report because it had determined that there was no history of copper-to-aluminum jumper connection failures, and that under normal loading conditions, thermography inspections would not have likely identified the connector as a problem. In response to Liberty's suggestion, Ameren-IL included these conclusions in the final RCA report to assure readers of the RCA that there was no procedural-related or management decision-related underlying root cause that allowed the jumper connector to fail.

Ameren-IL has complied with its commitment to implement a formal Root Cause Analysis Procedure. However, Liberty will keep this recommendation open to review any additional root-cause analysis reports that may become available during the next year. Liberty plans to complete its review of this recommendation in November 2012.

In November 2012, Ameren-IL reported that no significant system-related events, at a level to trigger a system event root-cause analysis (RCA) process, had occurred since November 2011.[678] However, one significant personal injury accident, which had not triggered the formal RCA process, had occurred and it initiated an Ameren accident investigation that used the elements of the RCA process. As a result of this accident investigation, Ameren recognized the value of the RCA and developed a formal root-cause process, for Ameren system-wide, dedicated to investigating injuries and near-miss accidents, and for preventing recurrence of similar accidents. Pending only final management approval, Ameren expects to implement soon this injury/accident RCA process and its training.

[677]Interview #459, November 10, 2011, and response to Data Request #1607.
[678]Interview #494, response to Data Request #1653.

Liberty found that Ameren-IL complied with this recommendation and considers the verification of this recommendation closed.

Recommendation

VI-32

Develop allowed transmission vegetation heights from the ground.

Background

Liberty concluded that Ameren-IL's transmission conductor-to-vegetation clearance requirements are not functional for the vegetation management contractor. Ameren defines clearances between vegetation and the conductors of transmission lines. Transmission vegetation-management contractors do not have the capability to determine operating conditions of the transmission line on which they are working. Therefore, vegetation-management clearance requirements based on the operating condition of the line are not functional to the contractor and may lead to errors in permitted vegetation heights that could in turn result in an outage

Operating conditions of a transmission line can be different for each line depending when it was constructed, and can vary on the same line during the day during normal operating conditions. Furthermore, the line could sag to its minimum allowed NESC conductor clearance limit during system contingency events. Liberty recommended that Ameren-IL develop allowed vegetation heights measured from the ground and take into consideration all sag variables.

Ameren-IL's Implementation Plan

Ameren-IL objected to this recommendation. It said that the North American Electric Reliability Corporation (NERC) vegetation management standard FAC-003-1 specifies that clearances should be between the conductor and vegetation. Ameren-IL agreed to evaluate clearance language as written and possibly modify language for clarity. Ameren-IL also agreed to emphasize the concept of line movement in the training program that it will implement as part Recommendation VI-43. Ameren will include illustrations to enhance training. The NERC FAC-003-1 is currently under going a revision. Ameren expected a draft of the new version in February of 2009. Ameren-IL proposed modifications to program language might be required after it reviews updated vegetation standards.

Verification Discussion and Conclusions[679]

Ameren's transmission-vegetation program document specifies clearances that field personnel can understand and implement, and that adequately address line movement. Transmission engineering provided input for the document to ensure that the program covered worst-case conditions. The primary elements of the clearance specifications in the wire zone are:

- The contractor should remove plant species that normally reach a mature height of 10 feet or greater. Exceptions are permissible for locations that have a minimum line-to-vegetation clearance of greater than 20 feet.
- If line sag causes conductors to come within 30 feet of the ground, then contractors should maintain vegetation for a mature height on less than 10 feet.
- If line sag causes a line-to-ground clearance of greater than 30 feet, then contractors should maintain vegetation to provide at least 20 feet of clearance to the line.

[679] Interview 267, August 18, 2009, and response to Data Request #1288.

NERC issued a draft of its FAC-003-1 standard in early 2009; Ameren expects a second draft in August 2009. It is not clear whether Ameren will need to modify its program after NERC makes its standard final.

Training materials covered, among other subjects, were line sag and required clearances. Ameren conducted training prior to its commitment data for this recommendation.

Ameren-IL took the actions specified in its implementation plan. Liberty considers this recommendation verified and closed.

Recommendation

VI-33
Include all taps in the mid-cycle patrol and trimming program.

Background

Liberty found that when Ameren-IL adds fuses to a distribution tap line, it removes the line from the vegetation mid-cycle patrol. This could allow vegetation-caused outages to occur that otherwise it would have prevented. Liberty recommended that Ameren-IL change its mid-cycle patrol requirements to include all taps.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation. Ameren-IL said it could achieve benefits to reliability by clearing dead or danger trees prior to next scheduled trim cycle. There will be limited reduction in outages caused by re-growth into single-phase vertical construction. The Ameren-IL system experiences fewer outages from growth contact on single-phase construction since achieving and maintaining 4-year trim cycle.

Verification Discussion and Conclusions

Ameren-IL provided a description of its expanded mid-cycle patrol, inspection, and trim program.[680] The program indicates that Ameren-IL's emphasis will be on dead trees, hazard trees, vine conditions, and excessive re-growth that are a threat to the safe and reliable operation of the Ameren-IL distribution system prior to the next scheduled maintenance trim. It covers the patrol, trimming, and the required administrative items such as processing trim orders. Ameren-IL also provided evidence of mid-cycle patrol training conducted in January 2009.

Ameren-IL said that it deferred an expansion of the program in 2009 pending the provision of additional funding to support costs associated with the additional resources required to perform patrols and subsequent trim/remove work.[681]

In a February 2010 interview, Ameren-IL explained that it spends about $1.2 million annually for the trim work identified by the existing mid-cycle patrols.[682] To expand the program would require an additional $2.4 million plus about $150,000 for additional personnel to perform the patrols. If these estimates are accurate, there is a substantial amount of vegetation work identified by the mid-cycle patrols and this work should produce reliability improvements. Liberty will keep this recommendation open to review after Ameren-IL resolves the financial hurdles for implementation.

In August 2012, Ameren-IL indicated that its 2012 budget includes the funds required for the expanded mid-cycle patrol and trim work.[683] Starting in the second quarter of 2012, Ameren-IL

[680] Response to Data Request #1365.
[681] Response to Data Request #1365.
[682] Interview #350, February 4, 2010.
[683] Interview #482, August 7, 2012.

is inspecting and trimming where necessary all primary distribution lines, including single-phase tap lines on a mid-cycle (2-year) basis.

Recommendation

VI-34

Add Section 218.B of the NESC to all voltage levels of the vegetation management standards that allow overhang.

Background

Liberty found that Ameren's vegetation management standards did not incorporate NESC Section 218.B requirements for infrastructure crossings. The NESC requires specific trimming requirements at line crossings, railroad crossings, and limited-access highway crossings. These requirements are stricter than most of Ameren-IL's vegetation management standards and are not included in the standards. Ameren-IL's standards allow some vegetation overhang of conductors at the lower voltage levels. Section 218.B of the NESC does not allow vegetation overhang at infrastructure crossings and one span on each side of crossings. Liberty recommended that Ameren-IL include this requirement in its vegetation management standards.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation and said it would integrate language from NESC 218 part B into Ameren-IL's vegetation program.

Verification Discussion and Conclusions[684]

Ameren-IL revised a page of its program document that includes the NESC requirement. Ameren-IL issued the revision on December 15, 2008; the commitment date was January 8, 2009. Ameren-IL included the revised section in training sessions for contractor and Ameren-IL personnel.

Ameren-IL met its commitments. Liberty considers this recommendation verified and closed.

[684] Interview #268, August 12, 2009, and response to Data Request #1282.

Recommendation

VI-35
Strengthen tree-climbing requirement to vegetation management standards.

Background

Liberty concluded that Ameren-IL's vegetation management standards needed a stronger climbing safety standard. Vegetation management standards and pruning standards allow some vegetation to remain within the trim zone and in proximity to the conductors. The vegetation that remains is generally main stem and wood that is in excess of 4 inches in diameter. If people could climb these trees, good utility practice requires extra safety measures. Ameren-IL's vegetation management standards do not address this issue completely. Liberty recommended that Ameren-IL strengthen the provision in its vegetation management standards that addresses the ability of the public to climb trees with vegetation within the trim zone.

Ameren-IL's Implementation Plan

Ameren-IL accepted the recommendation and indicated that it would review current program language and modify language to address trees that have limbs left with in the trim zone.

Verification Discussion and Conclusions

Ameren-IL's vegetation management program contained public safety language that addressed items such as tree houses, swings, and climbing steps. It noted that where it is evident that children are using a tree for climbing, vegetation personnel should examine the tree for its proximity to energized lines and be either trimmed or removed to prevent contact with those lines.

Ameren-IL strengthened the language to direct that it should attempt to remove all vegetation in the trim zone where the public might ascend a tree with potential contact with electric conductors. The program recognizes that vegetation clearance in the trim zone for tree climbing safety is not always possible due to things such as easement restrictions and property owner refusal. In the latter case, Ameren-IL will contact the property owner or proper authority and discuss vegetation removal required to provide safety for the public. If Ameren-IL cannot reach an agreement on required vegetation removal, it will send certified letter to property owner or the public entity involved describing the safety concerns and the work required that the owner denied. The revised language directs that if personnel observe a tree house, swing, climbing steps, or similar item within a tree that if used will bring a person into contact with an energized line, they should promptly notify the property owner to remove the item using trained personnel. If the tree crew obtains permission from the owner, the tree crew should remove the item. Ameren-IL provided training on the revised language in January 2009.[685]

Liberty found that Ameren-IL met the commitments of its implementation plan. Liberty considers this recommendation verified and closed.

[685] Response to Data Request #1283, Interview #269, August 12, 2009.

Recommendation

VI-36

Evaluate for merit several possible refinements to the vegetation management program to improve efficiency, understanding, or processes.

Background

Liberty recommended that Ameren-IL evaluate the items listed below for potential refinements to its vegetation management program. Ameren-IL should document its evaluation and any implementation plans for each item.

- Evaluate the viability of an enhanced trimming specification for use in urban areas where No. 6 or No. 8 copper wire is in use and vegetation is problematic.
- Evaluate the use of the current GPS system in identifying and tracking trimming restrictions and refusals, mid-cycle problem trees, and take down trees.
- Prioritize mid-cycle problem trees for take down and danger trees by species, growth rate, tree condition, and tree location on the circuit.
- Provide a requirement that once tree shelves and side clearances have been established, those trees are to be maintained to those locations even if pruning standards would allow some vegetation to remain.
- Include pruning diagrams as examples of what finished vegetation work should look like in relation to the various line configurations and voltages and supply them to contractors along with associated training.
- Provide trimming contractors with more training and information so that they can identify and report non-vegetation corrective maintenance items beyond obvious deficiencies.

Ameren-IL's Implementation Plan

Ameren-IL indicated that it agreed with five of the six refinements mentioned in this recommendation. The refinement under the fourth bullet requires that once a level of clearance is established then trimming should be to that same level even if vegetation could remain. To include this as a requirement could place Ameren-IL's program in conflict with ANSI A300 trim standard. There are sound arboricultural reasons not to make pruning cuts at the same location on every cycle. The Ameren-IL vegetation program has communicated to contractors that Ameren-IL would like to eliminate tree shelves as long as doing so does not jeopardize the health of the tree and structural integrity. Ameren-IL has instructed contractors to prioritize shelf removals based on tree species-growth rate, location on the circuit, and voltage.

Verification Discussion and Conclusions

Ameren-IL provided and Liberty reviewed several documents related to this recommendation.[686] These included:

- A series of drawings depicting clearance requirements by voltage classification. Ameren-IL indicated that contractor personnel reviewed these drawings during training sessions in January 2009 and that it distributed them to all crews.

[686] Response to Data Request #1366.

- The Ameren Overhead Damage Training Guide for tree trimming contractors, which it reprinted in March 2009 to reflect minor changes in the damage report and information about using the meter number to identify the location of any damage. The guide contained many good photographs of various equipment deficiencies and damages that the contractors should look for.
- Training attendance reports.
- Forestry Overhead Damage Report.
- Ameren Refusal Form.
- Removal Prioritization Matrix and decisions trees.
- An evaluation of the current prescriptive trim program to determine whether there is merit for enhanced trimming at specific places in the system.
- An evaluation of the use of the current GPS system in identifying and tracking trimming restrictions and refusals, mid-cycle problem trees, and take down trees.

Ameren concluded that use of GPS units would not add value to the current mapping systems. Furthermore, Ameren-IL implemented a new vegetation management database (Powel Maintenance Manager) in April 2009. It has mapping attributes and Ameren-IL found that it might prove to have useful capabilities.[687]

Ameren-IL described a "multiple device interruption program" that can identify locations by circuit device that had three or more tree-related outages. This results in a special tree patrol for the circuit downstream of the device.[688] Ameren-IL also described a "high SAIFI" review in which any circuit with a SAIFI contribution of 0.23 of more results in a special vegetation review. Ameren-IL provided sample reports and spreadsheets used to evaluate circuit outage statistics and prioritize vegetation patrol and field work.[689]

In a February 16, 2010, letter to Liberty, Ameren-IL said that it might not be able to fund the complete implementation of certain recommendations, including this one, until and if the ICC approves a special funding request. The reason for the funding request on this recommendation was the purchase of the Powel software. Nevertheless, Ameren-IL evaluated the use of the current GPS system in identifying and tracking trimming restrictions and refusals, mid-cycle problem trees, and take down trees. Ameren-IL met its commitments and Liberty considers this recommendation verified and closed.

[687] Response to Data Request #1366, and Interview #351, February 4, 2010.
[688] Interview #351, February 4, 2010.
[689] Response to Data Request #1366.

Recommendation

VI-37

Increase vegetation management staffing to permit inspecting 100 percent of contractor work.

Background

Liberty found that Ameren-IL's distribution vegetation-management workforce was not adequate to conduct a reasonable amount of inspections of contractor work. Liberty's inspections revealed that some contractor work was unsatisfactory. Ameren-IL is required under its program to inspect a minimum of 1 percent of the contractor work but typically inspects more. Good utility practice requires that Ameren-IL evaluate and track the various contractors and crews to prevent workmanship issues from causing unnecessary customer outages.

Liberty recommended that Ameren-IL add personnel to allow for complete inspection of all contractor distribution work and management oversight of both contractors and Ameren-IL inspectors. To accomplish this, Liberty recommended that Ameren-IL add one person to each division in the distribution area and one person attached to the vegetation management superintendent in Illinois.

Ameren-IL's Implementation Plan

Ameren-IL agreed that it should evaluate a modification to the current vegetation-management audit process. Ameren-IL will perform joint inspections, with a third-party contractor, on 100 percent of all completed maintenance cycle distribution trimming. Ameren-IL proposed doing 100 percent inspections for one year from the time of full implementation of the revised audit process and completion of staffing increases. Initially, Ameren-IL indicated that it would submit a revised audit process by February 15, 2009, and a staffing plan by March 15, 2009. It expected the completion of added staff by July 1, 2010. In May 2009, Ameren-IL indicated that due to economic conditions it would delay the additional staffing until October 1, 2011.

The Ameren-IL vegetation management superintendent and Ameren vegetation management supervisors will participate in this process. The Ameren-IL vegetation management superintendent will conduct periodic inspections of work audited by trained Ameren-IL personnel including Ameren-IL vegetation supervisors and third-party contractor personnel. It will then conduct an evaluation of the revised audit process after one year. It will use information from the evaluation to determine the best course of action for Ameren-IL vegetation-management program audit process. Ameren-IL will continue several other quality assurance programs that are currently in place including drive-by inspections of work sites and contractor-performance management program.

Verification Discussion and Conclusions

Because of the delay in implementing this recommendation, Liberty asked Ameren-IL to describe interim measures that it was taking to better inspect contractor work.[690] Ameren-IL provided the following information.[691]

[690] Interview #276, August 12, 2009.
[691] Response to Data Request #1287.

During the fourth quarter 2008, Ameren-IL developed an audit process map and "Completed Circuit Audit Form." On January 13, 2009, Ameren-IL introduced the process map and form to Ameren vegetation management supervisors. It directed them to provide training to contractor supervision and begin performing joint inspections, on at least one feeder equaling at minimum 10 percent of the miles of maintenance cycle distribution trimming completed for the first quarter 2009. Ameren-IL met that first quarter goal. In an effort to ensure that it audited all general foremen's work, the directive for the second quarter was to audit at minimum 10 percent of the miles of maintenance cycle distribution trimming completed by each general foreman. Ameren-IL reported that it also met that goal.

Ameren-IL is auditing more of the contractors' work than had been done in the past. Liberty will continue to monitor Ameren-IL's progress in implementing this recommendation.

In August 2012, Ameren-IL reported that it hired four additional supervisors and contracted with a company to accomplish the 100 percent inspection, which started in the second quarter of 2012.[692] Ameren-IL met its implementation plan (although later than originally planned due to financial considerations) and Liberty considers its verification work on this recommendation complete.

[692] Interview #482, August 7, 2012.

Recommendation

VI-38

Determine and correct the cause for the increase in transmission vegetation rework in 2007.

Background

Liberty found that there was a sharp increase in transmission vegetation rework for reliability-based items in 2007. The number of contractor and Ameren-IL rework for reliability-based items on the transmission system for the first nine months of 2007 was four times the number of the rework items for the previous three years combined.

If the increase in transmission vegetation rework identified by the audit process is indicative of the 2007 work performed by the contractors, something fundamentally changed from the prior years. Liberty recommended that Ameren-IL determine the cause for the increase in transmission vegetation rework and take the appropriate corrective actions to prevent unnecessary transmission line operations.

Ameren-IL's Implementation Plan

Ameren-IL accepted the recommendation and said that transmission vegetation-management personnel will evaluate the reason for increased re-work in 2007. Ameren-IL transmission vegetation-management personnel will conduct an annual training session with contractors to review Ameren-IL transmission vegetation-management program specifications.

Verification Discussion and Conclusions[693]

Ameren evaluated the increase in 2007 rework and found:

- Ameren completed the separation of transmission and distribution vegetation-management duties in February 2007. This resulted in increased staffing and an increased focus on compliance to standards.
- Ameren updated its clearance definitions in May 2007 to comply with NERC standard FAC-003-01.
- Ameren increased the number of its transmission vegetation-management supervisors for Illinois in 2006 and completed the full responsibility change in January 2007. It added the position of superintendent transmission management in May 2007.

Ameren conducted annual training at the beginning of 2009 in accordance with its commitment.

Liberty discussed Ameren's evaluation, and reviewed version 4 (February 1, 2009) of the transmission vegetation-management program document and the most recent transmission training manual. Liberty concluded that Ameren met its commitments and the intent of Liberty's recommendation. Liberty considers this recommendation verified and closed.

[693] Interview #270, August 18, 2009, and response to Data Request #1289.

Recommendation

VI-39

Inspect 100 percent of distribution system vegetation-management contractor's work.

Background

Ameren-IL finds rework on the contractor submitted work that it audits. This rework is in addition to the rework performed by the contractor prior to submitting its work for audit. If representative of all work performed, the inspections suggest that a significant number of vegetation issues remain on the system. Only inspecting work submitted by the contractor does not represent good auditing practice. Liberty recommended that Ameren-IL inspect 100 percent of the distribution vegetation-management contractors' work with Ameren-IL trained personnel.

Ameren-IL's Implementation Plan

Ameren-IL said that it would begin to increase inspection percentages of completed work by March 1, 2009. Training of third-party inspectors will require approximately four weeks. Ameren-IL's goal is to begin 100 percent inspections upon full implementation of the revised audit process and completion of staffing increases.

Verification Discussion and Conclusions[694]

Ameren-IL developed a process for increased inspection of contractors' completed vegetation work in early 2009. It involves a one-page audit form that goes back and forth with the contractor when there is required re-work. After re-work completion, Ameren-IL again inspects the work. The process includes a means of tracking the audited vegetation work.

During the first quarter of 2009, Ameren-IL inspected 10 percent of the completed work. From the second quarter up to the present, Ameren-IL inspected 10 percent of each general foreman's work. The contractors report competed work by feeder and Ameren-IL attempts to inspect the work within two weeks of completion. Unlike the prior practice, Ameren-IL selects the area that it audits.

Ameren-IL's goal remains to inspect 100 percent of completed vegetation work. It indicated that attainment of this goal is dependent on the results of a rate case rider that could permit it to hire the additional personnel or contractors required for a 100 percent inspection.

Ameren-IL has met its commitments to date on this recommendation. Liberty will keep this recommendation open and review Ameren-IL's plans and progress after it has assessed the staffing situation. (See related Recommendation VI-37.)

In August 2012, Ameren-IL reported that it hired four additional supervisors and a contractor to accomplish the 100 percent inspection, which started in the second quarter of 2012.[695] Ameren-IL met its implementation plan (although later than originally planned due to financial considerations) and Liberty considers its verification work on this recommendation complete.

[694] Interview #352, February 2, 2010.
[695] Interview #482, August 7, 2012.

Recommendation

VI-40

Continue to pursue standard easement widths for distribution and sub-transmission voltage levels for facilities in and out of the roadway.

Background

Ameren-IL drafted standard easement widths. It is not clear if the proposed widths are applicable to facilities that are in the roadway. The proposed easement widths do not always align with the new vegetation side-clearance requirements put into effect in May 2007. Liberty recommended that Ameren-IL continue to pursue standard easement widths for distribution and sub-transmission facilities that are consistent with Ameren-IL's vegetation side-clearance requirements and applicable facilities located on or off the roadway.

Ameren-IL's Implementation Plan

Ameren Real Estate and Illinois Energy Delivery will develop a procedure that includes standardization of easement widths for these facilities in and out of the roadway. Ameren's due date for completion of this plan was April 8, 2009.

Verification Discussion and Conclusions

On March 23, 2009, Ameren-IL distributed a revised real estate acquisition procedure that went into effect on April 1, 2009. The procedure standardizes easement widths in and out of the roadway. It includes easement widths that are consistent with Ameren-IL's new side-clearance requirements.[696]

Overhead Electric	Standard Easement Width in Feet
4kV - 12.5kV	20
34.5kV – Urban	30
34.5kV – Rural	40
69kV	50

The procedure recognizes that there are many factors affecting the preferred width of a proposed easement. The procedure characterizes those listed above as general guidelines. Ameren-IL indicated that it might revise the procedure to add additional flexibility for cases in which the easement does not affect vegetation management. Nevertheless, Ameren-IL took the actions specified in its implementation plan. Liberty considers this recommendation verified and closed.

[696] Interview #271, August 11, 2009, and response to Data Request #1280.

Recommendation

VI-41

Acquire required trimming easements for distribution and sub-transmission facilities on a forward going basis.

Background

Ameren-IL has not had a big problem with attaining permission to perform required trimming. Ameren-IL also increased its 6- to 8-foot side trimming requirements to 10 feet in May 2007, which may increase customer refusals in the future. For new lines and on a going forward basis, Liberty recommended that Ameren-IL secure adequate easements when possible that allow for trimming in accordance with its vegetation management standards for facilities where the easement would extend entirely or partially off the roadway.

Ameren-IL's Implementation Plan

Ameren-IL said that it would acquire easements for distribution and sub-transmission facilities that include language necessary to meet Ameren-IL's vegetation management guidelines. Ameren-IL's due date for completion of this plan was April 8, 2009.

Verification Discussion and Conclusions

Liberty reviewed Ameren-IL's new standardized procedure, as discussed above under recommendation V-40. It would require securing adequate easements when possible that allow for trimming in accordance with its vegetation management standards for facilities where the easement would extend entirely or partially off the roadway.[697] Ameren-IL also shared easement documents that it uses. These documents provide for the insertion of the easement consistent with the procedure.

In its third quarterly report, Liberty concluded that Ameren-IL took the actions specified in its implementation plan. Liberty considered this recommendation verified and closed. However, in a February 16, 2010, letter to Liberty, Ameren-IL said that it might not be able to fund the complete implementation of certain recommendations, including this one, until and if the ICC approves a special funding request. The reason for the funding request on this recommendation was staffing of real estate agents to acquire easements. Therefore, Liberty will re-open this recommendation so that it can clarify whether Ameren-IL actually met its implementation plan.

In August 2012, Ameren-IL reported that it hired two additional real estate agents to assist in acquiring trim easements.[698] Liberty's work on the verification of this recommendation is complete.

[697] Interviews #271 and #272, August 11, 2009, and response to Data Request #1280.
[698] Interview #482, August 7, 2012.

Recommendation

VI-42
Improve customer trim refusal practices.

Background

Liberty recommended that Ameren-IL take the following measures related to customer trim refusals:

1. Increase customer awareness of importance of tree trimming at Ameren-CIPS. In addition to its normal identification and customer relations program, Ameren-IL should increase efforts to alleviate customer concerns with tree trimming at Ameren-CIPS.

2. Revisit distribution customer refusals prior to the next trim cycle at all Ameren-IL companies. Ameren-IL (and not the contractor) should revisit distribution-trimming refusals prior to the next trim cycle to gain a better understanding of customers' concerns and at least to perform trimming in the public way.

3. Determine cause(s) for the increase in transmission trimming refusals at Ameren-CIPS and take appropriate actions.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation. It said that the customer refusal rate at Ameren-CIPS has shown an improving trend. The number of refusals on Ameren-CIPS distribution circuits trimmed in 2002 decreased for the 2006 trim cycle. Ameren-IL companies have always trimmed trees that are in the public right-of-way including trees involved with customer refusals. Ameren-IL will continue interaction with community public-works departments, tree advisory boards, municipal arborists, and Illinois arborists association. Interaction will include presentations and attendance at workshops related to tree care and safety. Ameren-IL will continue to distribute Ameren right tree right place planting brochures annually. A revised mid-cycle trim program will provide additional interactions with refusal customers. Ameren-IL will draft a public service message on why it trims.

Verification Discussion and Conclusions

Ameren-IL provided several documents related to the implementation of this recommendation, including:[699]

- Ameren-CIPS listing of print orders for tree trimming notices.
- Ameren-IP listing of print orders for tree trimming notices.
- Ameren-CILCO listing of print orders for tree trimming notices.
- A summary of 2009 corporate communication initiatives regarding tree trimming, such as:
  - Newspaper trimming notices at a cost of over $7,200
  - A bill newsletter on "right tree in the right place"
  - Arbor Day bill insert

[699] Response to Data Request #1367.

  - An educational brochure on "Line Clearance For Safe and Reliable Electric Service"
- Description of an Outage Analysis System (OAS) order for each customer who refused trimming.
- A listing of Ameren-IL's Arbor Day and tree replacement contributions by city.

Ameren indicated that it has implemented the OAS enhancement that generates the list of customers to send a tree trimming notification and creates a trim refusal list (service orders) for the forestry service center to talk with the customer.[700] Ameren-IL said that, overall, it has a relatively small number of customer refusals or situations in which it cannot make satisfactory arrangements with the customer regarding necessary vegetation work

With regard to the increase in transmission trimming refusals at Ameren-CIPS, Ameren-IL indicated that the separation of transmission and distribution vegetation management resulted in an increased focus on this and similar situations. Ameren-IL believes that a change in the vegetation management standard resulted in increased trimming distances beyond that experienced by customers in the past. Ameren-IL indicated that during 2008 there were only three refusals on Ameren-CIPS right-of-ways.[701]

Ameren-IL met its commitments. However, in a February 16, 2010, letter to Liberty, Ameren-IL said that it might not be able to fund the complete implementation of certain recommendations, including this one, until and if the ICC approves a special funding request. The reason for the funding request on this recommendation was the continuation of customer awareness practices. In February 2012, Ameren-IL said that it put into its budget the continued funding of the programs related to customer education and the handling of trim refusals and problems.[702] Therefore, Liberty's verification work on this recommendation is complete.

[700] Interview #353, February 2, 2010.
[701] Response to Data Request #1367.
[702] Interview #470, February 6, 2012.

Recommendation

VI-43

Reinforce Ameren-IL vegetation standards with transmission vegetation contractors.

Background

Contractors remove vegetation from the rights-of-way with a variety of methods to meet Ameren-IL standards. One of those standards is that vegetation above transmission structure guy wires is to be removed to prevent line damage should the vegetation fall. Liberty noted many instances where contractors did not follow this removal practice. Liberty also noted right-of-way side clearances to flare inward at the end of a wooded stretch. This vegetation can quickly grow to interfere with lines that are in Ameren-IL's narrow rights-of-ways in a short period. Liberty recommended that Ameren-IL demonstrate that it has reinforced correction of these issues with its transmission vegetation contractors.

Ameren-IL's Implementation Plan

Ameren-IL Transmission Vegetation Supervisors will schedule a refresher training session for transmission line clearance utility crews. The training will emphasize mature woody plant growth height located within the wire zones and border zones of the right of way, vegetation to conductor clearance, clearance requirements for guy wires, and locations where helicopter trimming leaves a flare of growth along the right of way side wall. Ameren-IL will complete a refresher training session annually to reinforce Transmission Vegetation Management program standards.

Verification Discussion and Conclusions

Ameren-IL provided evidence of training conducted in both January 2009 and January 2010.[703] Liberty reviewed the purposes and content of the training with Ameren-IL.[704]

Liberty concluded that Ameren-IL met its commitments on this recommendation, and considers it verified and closed.

[703] Responses to Data Requests #1290 and #1355.
[704] Interview #354, January 20, 2010.

Recommendation

VI-44

Remove and prevent right-of-way obstacles from occurring.

Background

Liberty's inspections noted many instances of yard trees and customer encroachments that could interfere with reliable operation of transmission facilities. Vegetation management personnel are responsible for identifying and correcting these conditions where possible. Ameren-IL should identify, record, track, and correct all such conditions and easement violations. This should be an ongoing process to capture new conditions. Ameren-IL personnel should conduct this process because they are better equipped to make business decisions and decisions that affect system reliability.

Ameren-IL's Implementation Plan

Ameren-IL said there are three basic steps to implement this recommendation. First, Ameren-IL must inspect the rights-of-way to ascertain whether any such encroachments exist. Second, it must address any encroachments. Finally, a database containing information on the rights-of-way and any permitted uses must be in place for future inspections to aid in detecting encroachments.

Ameren will develop a program of regular inspection of transmission rights-of-way that, among other things, will catalog all obstacles. After obstacle identification, Ameren will review it for compliance with the NESC and the terms of Ameren's property rights. In addition to capturing any new obstacles, subsequent inspections of the transmission rights-of-way will monitor all known and cataloged uses for changes beyond those agreed to. Additionally, Ameren will develop a written policy that will be distributed to all internal Ameren groups that may have occasion to create an obstacle (such as an overhead distribution line) on the transmission right-of-way. The policy will require design review by the transmission engineers for NESC compliance. Any incursions into the right-of-way require approval, and formal notice sent to the requestor before the start of any construction. When Ameren finds encroachments, it will take appropriate action to correct any violations. The inspector will forward to transmission engineering any suspected encroachments. Transmission engineering will review the details of the suspect encroachment to verify whether it is in fact in the right-of-way, and if so, whether there is compliance with NESC, and to verify whether it would create an obstacle to Ameren's use. If the use does not jeopardize Ameren's enjoyment of its property rights or any safety requirements and it is in a category of approved uses by Ameren, Ameren will create a formal permission document that both the encroacher and Ameren will execute. The permission document will outline the rules for the encroachment. Ameren will then add this information to the database.

Verification Discussion and Conclusions

Ameren-IL indicated that financial constraints have delayed some aspects of its implementation.[705] More specifically, it has not implemented the database for tracking encroachments and permitted uses in its rights-of-way. Liberty reviewed with Ameren-IL its new

[705] Interview #355, January 20, 2010.

procedure on the removal and prevention of encroachments,[706] its planning document on strictly disallowed and possible permitted uses in rights-of-way,[707] and the attributes of the database that Ameren will employ in the future.[708]

In January 2010, Liberty concluded that Ameren-IL has taken reasonable steps to implement this recommendation, short of those steps that require extra personnel or investment in software.

In February 2011, while accompanying the Ameren aerial (by helicopter) transmission line inspector, Liberty observed locations where several houses and garages appeared to encroach on the right-of-way under the Ameren-IL Wood River to Stallings 138 kV line in the Rosewood Hills addition in East Alton, Illinois.[709] In March and May 2011,[710] Liberty inquired as to whether these encroachments were consistent with NESC[711] clearance guidelines, and how Ameren is identifying permitted encroachments on the Ameren-IL transmission system. In addition, in May 2011, Liberty inspected some of the encroachment locations from the ground.

Ameren reported that, in addition to its aerial and ground line transmission line inspection programs, it is implementing a new transmission asset management system (TAMS) program, originally for improving encroachment management consistent with this recommendation, but most recently in response to a new NERC transmission line clearance Alert. NERC[712] requires all transmission companies to survey their entire transmission systems to identify line clearance problems that might occur under worst loading and weather conditions. TAMS is a computer-based program that will eventually be made up of layers and will include, at least, permitted encroachments, line clearances, vegetation, real estate, topography, structural detail, and inspection data. Ameren has hired a LIDAR[713] contractor. During the next 3 years, it will use this LIDAR contractor to fly the Ameren-IL transmission lines (roughly 1/3 of the system per year) and to record encroachments, clearances, structural configurations, and topography. Ameren indicated that its first phase of LIDAR would include the measurement of clearances for the 138 kV line which crosses Rosewood Hills.

At the same time, Ameren will populate the program with data, including permitted encroachments, real estate, and inspection data. Ameren expects to have the TAMS program fully populated by 2014. It will use this program for facilities asset management functions, including inspecting for hardware defects, encroachments, vegetation management, structure details, and GPS-based tower locations. This is similar to the distribution AM/FM program (automated mapping facilities management).

In March 2011, Ameren reported that it verified that houses are located under the Ameren-IL Wood River to Stallings 138 kV line in the Rosewood Hills addition in East Alton, Illinois.

[706] Response to Data Request #1356.
[707] Response to Data Request #1357.
[708] Response to Data Request #1359.
[709] Interview #423, February 18, 2011, for Recommendation #VI-6A.
[710] Interview #425, March 25, 2011, and Interview #428, May 10, 2011.
[711] NESC is the National Electrical Safety Code.
[712] NERC Alert #R-2010-10-01. NERC is the North American Electric Reliability Corporation.
[713] LIDAR is Light Detection and Ranging.

However, based on ground observation, Ameren indicated that the houses appear to comply with NESC clearance limitations. The NESC determines clearances, but it does not prevent encroachments as long as the utility maintains proper clearances. In May 2011, Ameren reported that its real estate group is currently determining Ameren-IL's and landowners' rights for using the area under the transmission line, and whether Illinois Power (the legacy company) had permitted the placement of these houses and garages (which appeared to have been constructed in the 1970s) in its right-of-way. Liberty will request the results of this investigation later.

In May 2011, Liberty conducted a drive-by inspection of the Ameren-IL Wood River to Stallings 138 kV line in the Rosewood Hills addition in East Alton, Illinois. It appeared to Liberty that either there was no dedicated right-of-way for this line in this location, or there were many encroachments in the right-of-way for the several blocks that this line passes through the Rosewood Hills addition. Liberty inspected only part of the route through the addition and observed that several house and garages were under the transmission line. Ameren reported that it would determine its actions, if any, concerning these apparent encroachments, by the end of 2011. It had not yet determined whether these were permitted encroachments.

In May 2011, Liberty concluded that Ameren's new TAMS program should be a good tool for improving the ways it monitors and maintains Ameren-IL's transmission system. However, Ameren should resolve the issue of the apparent encroachment of houses on Ameren-IL right-of-way.

This recommendation remains open. Liberty will revisit progress of the TAMS program and of Ameren's determinations and actions regarding the houses under the line in Rosewood Hills in early 2012.

In February 2012, Liberty found that Ameren was committed to taking specific actions to mitigate the encroachment of houses under the 138kV line in the Rosewood Heights[714] area.[715] Ameren reported that it has gathered LIDAR data for the 138kV line crossing over the houses in Rosewood Heights area, and engineering for mitigating the encroachment issues is now 90 percent complete. The new design attempts to remove the poles from the rear yard areas and site those poles in alternative locations at intersections of the right-of-way and streets, or paved surfaces. As part of those relocations, Ameren will add additional height as necessary to assure the maintenance of proper clearances. Construction should commence with final pole placement and material delivery.

In November 2012, Ameren reported that it had completed about two-thirds of LIDAR graphical representations of the 4,600 miles of Ameren-IL's transmission lines, structures, vegetation, and topography.[716] NERC required these LIDAR representations, and well as loading and sag studies to determine clearances to ground and vegetation during periods of peak loading and temperatures. Ameren also reported that it is currently populating its TAMS program with data and it will be ready for implementation in 2013, when the LIDAR work is complete.

[714] The affected area was Rosewood Heights and not Rosewood Hills, as indicated previously.
[715] Interview #466, February 17, 2012, and response to Data Request #1631.
[716] Interview #496, November 9, 2012, and response to Data Request #1655.

Transmission line inspectors will use TAMS data to identify changes in encroachments and line and hardware defects and will provide an electronic method for reporting encroachments and defects.

Ameren completed the engineering and land purchases required for resolving the encroachment and clearance problems at Rosewood Heights. Ameren is planning to complete the work in 2013.

Liberty found that Ameren's TAMS system will improve on the effectiveness of the inspections on Ameren-IL's transmission lines, and will prevent any assumptions about whether right-of-way encroachments are approved or not. The changes Ameren plans to make to the line in Rosewood Heights in 2013 appear to solve the encroachment problem. Liberty found that Ameren is complying with its commitments and considers the verification of this recommendation closed.

Recommendation

VI-45
Trim back-lot facilities to vegetation management horizontal specifications.

Background

Liberty found that back-lot facilities had insufficient horizontal trimming that did not meet Ameren-IL's specifications. The nature of back-lot construction generates considerable customer issues with regard to trimming because the vegetation often forms property boundaries providing customer privacy. However, not maintaining horizontal specifications increases customer outages. Outages on these facilities are sometimes longer due to inaccessibility to lines and equipment.

Ameren-IL's Implementation Plan

Ameren-IL accepted this recommendation. Ameren-IL said that its program specifications do not distinguish between back-lot private property and roadside locations. Ameren-IL bases clearance requirements on voltage and tree species. Ameren-IL will reinforce this message with all contractors.

Verification Discussion and Conclusions

Ameren-IL reinforced trimming requirements and checked to determine that back-lot locations received proper attention and trimming.[717] Ameren-IL conducted meetings on November 17, 19, and 25 in all divisions and with representatives of all vegetation contractors.[718] The meetings included discussions of clearance requirements using diagrams and reminders about fast growing tree species. Ameren-IL vegetation management also conducted special inspections of back-lot trim areas. Ameren-IL's quality control inspection covered back-lot areas.[719] Liberty concluded that Ameren-IL met its commitments related to this recommendation, which Liberty considers verified and closed.

[717] Interview #274, August 12, 2009.
[718] Response to Data Request #1284.
[719] Response to Data Request #1190.

Recommendation

VI-46

Re-evaluate the removal of mid-cycle trees requiring trimming.

Background

Ameren-IL vegetation supervisors and contractors are responsible for identifying mid-cycle problem trees and evaluating the possible need of removing these trees. Ameren-IL should re-evaluate its current guidelines taking into consideration the current economic considerations and the value of prevention of customer outages. Ameren-IL personnel and the contractor should work in a collaborative effort to make the tree removal evaluations. Ameren-IL should reinforce with contractors that they would make removal evaluations based on sound business reasons as well as potential for improvement to the reliability of the system.

Ameren-IL's Implementation Plan

Ameren-IL said that in the course of doing mid-cycle and cyclical maintenance trimming, Ameren-IL and trimming contractors work in a collaborative manner to evaluate and prioritize removals. Ameren-IL vegetation personnel instruct contractors to prioritize removals based on the location of the tree with respect to the conductor, voltage present, construction type, tree species, and tree condition. A higher priority is placed on trees located near sub-transmission and three-phase lines that typically provide service to a greater number of customers. This prioritization is included in the guideline on removals. In addition, Ameren-IL vegetation personnel take into consideration the tree species and the likelihood that the tree would be a threat to safety and reliability of the distribution system. In addition to the prioritization and evaluation, Ameren-IL must obtain permission from the tree owner before it can remove the tree. Ameren-IL will re-evaluate the economics associated with current removal program. Ameren-IL vegetation personnel do have some information on tree-caused outage by species. The majority of the tree caused outages are the results of trees breaking and contacting conductors, not from re-growth making contact with conductors prior to the next trimming activity. Ameren-IL will factor this data into the evaluation. Overall, Ameren-IL has to balance the economics associated the number of removals that can be done in a given year with other vegetation management work that is scheduled.

Verification Discussion and Conclusions

Ameren-IL conducted a study of the effects and economics of tree removal during both cyclical and mid-cycle vegetation work.[720] Ameren-IL documented the evaluation guidelines, prioritization matrix, and decision tree diagram.[721] Considerations include voltage, line construction type (e.g., three-phase, single phase), location, species, circuit reliability, and critical customers. The flow charts should help make the trim/remove determination easier for field personnel. Ameren-IL also documented the training it gave regarding the removal decision process. The documentation appeared to be a significant improvement in Ameren-IL's process.

[720] Interview #275, August 12, 2009.
[721] Response to Data Request #1285.

In its third quarterly report, Liberty found that Ameren-IL met its commitments related to this recommendation, which Liberty considered verified and closed. However, in a February 16, 2010, letter to Liberty, Ameren-IL said that it might not be able to fund the complete implementation of certain recommendations, including this one, until and if the ICC approves a special funding request. The reason for the funding request on this recommendation was the costs involved in additional tree removals. Therefore, Liberty re-opens this recommendation to learn whether Ameren-IL actually implements the practices it put in place.

In August 2012, Ameren-IL indicated that it included in its 2012 budget the funds necessary for mid-cycle tree removal.[722] Liberty's verification work on this recommendation is complete.

[722] Interview #482, August 7, 2012.

Recommendation

VI-47
Enforce contractor record keeping requirements.

Background

During its distribution inspections, Liberty found evidence that some contractor supervision may not be keeping master copies of circuit maps updated in a timely manner. A contractor cannot keep track of completed work, deferred work because of traffic control or the need for high reach equipment, or rework without these documents. Skipped areas of trimming can result in unnecessary customer outages. Liberty recommended that Ameren-IL take steps to ensure that contractors keep required daily work records

Ameren-IL's Implementation Plan

Ameren-IL vegetation management will send a letter re-enforcing Ameren-IL current practice on contractor record keeping requirements to all contractor management personnel and Ameren-IL vegetation supervisors. Ameren-IL vegetation supervisors conduct weekly meetings with all contractor general foremen and will document that they have updated copies of master circuit maps. Documentation will be included in the comments section of trimming crew monthly drive by audit form. The Ameren-IL vegetation management superintendent will do random checks of contractor general foreman to review copies of master circuit maps on projects that are in progress.

Verification Discussion and Conclusions

Liberty reviewed the actions Ameren-IL took related to this recommendation.[723] Ameren-IL notified all of its vegetation contractors about the requirement to keep master copies of circuit maps for current trimming with them in the field.[724] The letter noted that general foremen will be required to sign off on a verification form after each weekly meeting with Ameren-IL vegetation supervisors, and that Ameren-IL would be making other random visits to check on record keeping. An internal document forwarded the new verification form to Ameren-IL vegetation personnel. Liberty also reviewed a sample of the verification sign-off by Ameren-IL and contractor personnel.

Ameren-IL met its commitments related to this recommendation. Liberty considers the recommendation verified and closed.

[723] Interview #276, August 12, 2009.
[724] Response to Data Request #1286.

Recommendation

VI-48

Develop a program to identify and repair or replace lightning-damaged shield wire.

Background

Ameren determined that lightning-caused burn spots on strands of the old copper-clad shield wires on some of Ameren-IL transmission lines cause the shield wires to corrode and to break during storms. Liberty concluded that Ameren-IL should require Ameren to implement a program to identify and repair, or replace, lightning-damaged copper-clad shield wire on the Ameren-IL transmission system.

Ameren-IL's Implementation Plan

Ameren-IL indicated that it would implement and refine its program to detect burn spots on the shield wires by October 8, 2009. It will review past records and operating log entries for circuits that have experienced lightning damage, and it will continue to do so. Where it has not yet completed repairs, it will create a schedule to initiate repair work. It will identify burn damage by helicopter inspections and probabilistic-based isokeraunic evaluation (i.e., likelihood that lightning caused damage because of known lighting activity).

Verification Discussion and Conclusions[725]

Ameren reported that it previously identified that two Ameren-IL transmission circuits, the Latham-Mason City circuit and the Benton-West Frankfort circuit, had lightning-damaged shield wires. Ameren reported that it plans to replace these shield wires by the end of 2011.

Going forward, the helicopter inspection program, when implemented, will focus on identifying additional circuits that need shield wire repair. When they locate burn damage, Ameren will use its lightning location and intensity program to determine if it can make a predictive assessment to initiate out-of-cycle inspections. To date, it has only minor repairs to damaged shield wire.

Ameren indicated that shield wire burn spots and open strands are difficult to observe from the ground and by normal-speed aerial inspections. Therefore, identifying shield wire burns will not progress until it implements the slow-speed-and-hover helicopter inspection program.

In November 2009, Liberty found that Ameren's program to identify and to schedule repairs for lightning-caused shield-wire burn spots on Ameren-IL's transmission system was not complete because the program depended on the implementation of a slow-speed-and-hover helicopter inspection program. Once it implements that program, and Ameren has identified shield wire burn spots, it will begin evaluating lightning data to verify that these burns were lightning caused. From there, it will determine whether it should implement ad hoc helicopter inspections of shield wires in areas identified with heavy lightning activity. Liberty reserves comment until Ameren implements inspections to determine program effectiveness.

[725] Interview #322, November 16, 2009, and response to Data Request #1312.

In November 2012, Ameren reported that it had been using a fixed-wing aircraft, and sometimes a helicopter, to inspect shield wires, and found over the last two years no broken shield wires or no shield wires exhibiting lightning-caused burn damage of such extent to require repair.[726] Ameren indicated that lightning activity intensity during the last couple of years in this part of Illinois has been low. However, Ameren will continue to inspect Ameren-IL's transmission shield wires as part of the periodic and ad hoc helicopter inspections.

Liberty found that lightning-damaged shield wires appear to be a non-issue at this time. However, Ameren will continue inspecting Ameren-IL shield wires when it commences with its semi-annual, system-wide helicopter inspection program in 2013. Ameren is complying with its commitments and Liberty considers the verification of this recommendation closed.

[726]Interview #495, November 9, 2012, and response to Data Request #1654.

Recommendation

VI-49
Intensify substation circuit breaker maintenance.

Background

Liberty concluded that inadequate maintenance of substation circuit breakers contributed to the negative effects of the 2006 storms. Liberty recommended that Ameren-IL ensure that its substation circuit-breaker maintenance practices meet scope and cycle-lengths in its written programs. Those programs cover all transmission, sub-transmission, and distribution circuit breakers. Although the maintenance varies depending on breaker type, typical 2- and 4-year maintenance includes inspecting, lubricating, testing, and operating the breakers from relays.

Ameren-IL's Implementation Plan

Ameren-IL said that it would follow the breaker maintenance identified in the Maintenance Strategy Program. It will carry out breaker maintenance as generated by the maintenance system and achieve a 90 percent completion rate. Ameren-IL accepted this recommendation and committed to taking actions as outlined for Recommendation VI-3C.

Verification Discussion and Conclusions

Please refer to Recommendation VI-3, Part C for Liberty's verification work prior to August 2011.

In August 2011,[727] Liberty learned that Ameren-IL's documents indicate that it completed about 90 percent of its 2010 scheduled circuit breaker preventive maintenance This is consistent with its substation maintenance strategy. Ameren-IL reported that it is on-track to complete at least 90 percent of its 2011 scheduled circuit breaker maintenance work. Ameren-IL also reported that it would have all 2010 backlogged circuit breaker mechanism overhaul jobs completed in 2011. It added 65 new, specialized mechanism overhaul projects for 2011. There are six backlogged specialized mechanism overhauls outstanding from 2010.

As indicated in a February 16, 2010, letter to Liberty, Ameren-IL said that it might not be able to fund the complete implementation of certain recommendations, including VI-49, until and if the ICC approves a special funding request. The reason for the funding request on this recommendation involves additional O&M and labor costs as required to complete circuit breaker work according to Ameren-IL's maintenance strategy.[728] However, Liberty concluded that Ameren-IL's on-going circuit breaker maintenance practices meet its commitment and Liberty's intent for this recommendation. Therefore, despite the matter of an open funding request, Liberty considers this recommendation verified and closed.

[727] Interview #450, August 19, 2011, and response to Data Request #1583.
[728] Response to Data Request #1600.