Summary of Recommendations

1. Recommendation: ***Schedule a presentation with the Commission to discuss the KEMA report and the Company's anticipated actions in response to the recommendations in the report.***

2. Recommendation: ***Review and evaluate the findings, conclusions and recommendations of the other December 2007 Storm Investigation reports. Determine if practices implemented by other utilities may be beneficial to utility operations during outage restoration.***

3. Recommendation: ***Participate in a Commission sponsored storm restoration workshop to discuss this report and concurrent reports for other utilities. Incorporate an agenda item for the workshop to include a consistent methodology for future utility storm reporting.***

4. Recommendation: ***Review customer comments in any EFIS filing pertaining to the Company***

5. Recommendation: ***Develop and utilize a Company community outreach function to participate with city and county agencies in an active role in assisting citizens that have special needs during an outage.***

6. Recommendation: ***Review the Company's Communications Plan with respect to major outage restoration and develop a process to aid in delivering a consistent effective message to the public.***

7. Recommendation: ***Revise vegetation management procedures to incorporate the Commission's Electrical Corporation Vegetation Management Standards and Reporting Requirements, 4 CSR 240-23.030, which will become effective on June 30, 2008.***

8. Recommendation: ***Revise operation standards to incorporate the Commission's Electrical Corporation Infrastructure Standards, 4 CSR 240-23.020, which will become effective on June 30, 2008.***

Missouri Public Service Commission

POST OFFICE BOX 360
JEFFERSON CITY MISSOURI 65102
573-751-3234
573-751-1847 (Fax Number)
http://www.psc.mo.gov

January 8, 2008

Mr. Zdellar
Union Electric Company
Mail Code 202
1901 Chouteau Avenue
St. Louis, MO 63103

Dear Mr. Zdellar:

The Commission recently opened cases and issued orders directing Staff to investigate the effectiveness of utilities' storm preparation and power restoration efforts for the December 2007 Ice Storms and report its findings and recommendations to the Commission (Case Numbers EO-2008-0215, EO-2008-0218, EO-2008-0219, and EO-2008-0220 for The Empire District Electric Company, Union Electric Company d/b/a AmerenUE, Kansas City Power & Light Company, and Aquila, Inc., respectively). The orders direct Staff to file an initial report regarding the results of its investigation no later than April 3, 2008. Staff anticipates filing an initial report by the date specified followed by additional reports as necessary at a later date. Staff will also consider scheduling a roundtable discussion (or similar forum) to review the results of these reports and analysis on a state-wide basis.

Since all investor-owned utilities in Missouri were affected, Staff is requesting the following information from each of the individual utilities by the dates listed.

A. Description of the event, including statistics related to number of customer outages, duration of outages, infrastructure affected, call center performance data that includes metrics considered by the utility to be most critical during the outage, use of internal and third parties to provide personnel and facilities, and any other relevant information. *Submit to Staff by January 25, 2008.*

B. Description of remedial actions taken by the utility to recover from the event, including resources utilized (manpower, material, financial expenditures, etc.), outage tracking, crew dispatching, restoration prioritization, customer communications, public official communications, special circumstances encountered, and any other relevant information. *Submit to Staff by February 15, 2008.*

C. Description of actions taken (since the December 2007 storms) and planned actions to be taken by the utility to prevent or mitigate the effects of future events such as the December 2007 ice storms, including policy/procedure modifications, communications enhancements, vegetation management, reliability monitoring, infrastructure modifications, and any other relevant information. This item should include a review of any previous corrective actions (due to similar events) taken prior to December 2007 and an analysis of the success of those actions relative to this event. *Submit to Staff by February 29, 2008.*

D. A complete copy of all procedures, policies, guidelines, plans, or other documents that existed prior to December 1, 2007, that were utilized during the December 2007 ice storm events, specifically relating to Items A and B above. If the Company had a consolidated document such as a "Storm Restoration Plan", please provide it. _Submit to Staff by January 18, 2008._

E. A complete copy of any revisions made since the storm, to any of the documents listed in item D. _Submit to Staff by January 18, 2008._

F. A copy of all reports and other documentation provided to Company management regarding the Company's operations immediately prior to and during the storm restoration activities. _Submit to Staff by January 25, 2008._

G. Copies of all documentation defining the Company's methodology and data collection process to generate statistics (e.g. customer outages, costs, etc.) related to the impact of the storm on the Company's operations and financial conditions. _Submit to Staff by February 15, 2008._

Staff has designated storm investigation coordinators for each of the utilities. Please feel free to contact the appropriate person with any questions or comments.

Staff Lead	Lena Mantle	573-751-7520	lena.mantle@psc.mo.gov
Empire	Dan Beck	573-751-7522	dan.beck@psc.mo.gov
AmerenUE	Debbie Bernsen	573-751-7440	debbie.bernsen@psc.mo.gov
KCPL	Mike Taylor	573-526-5880	michael.taylor@psc.mo.gov
Aquila	Lisa Kremer	573-751-7441	lisa.kremer@psc.mo.gov

An outline of the proposed topics and activities that Staff is proposing to be utilized is attached for your information. Please let us know if you have any suggestions for additional topics or activities.

If you have any questions regarding this information, or can't meet the timelines listed, please provide a written explanation why the timeline can't be met and when the information will be available for Staff review. You may contact Lena Mantle at 573-751- 7520 or me at 573-751-7435.

Sincerely,
Wess Henderson

Wess Henderson
Executive Director

Attachment

cc: Blane Baker
Bob Berlin
Nathan Williams
James Swearengen
Renee Parsons
William Riggins
Thomas Byrne
Natelle Dietrich
Bob Schallenberg
Lena Mantle
Dan Beck
Lisa Kremer
Debbie Bernsen
Mike Taylor
Warren Wood

Responses to the 14 Issues included in the Concurring Opinion of Commissioner Robert M. Clayton

1) Analysis of the age, sitting, durability and quality of the utility's infrastructure, including the placement of distribution lines in light of the ice storm outages of 2007.

Response: AmerenUE has performed this analysis in the past and is committed to the continuation of this type of analysis. A program is in place to methodically inspect the distribution system and perform any needed repairs, in advance of the inspection requirements of the Commission's Infrastructure Inspection regulations. Data collected from this program is used to improve overall system integrity.

2) A comprehensive compliance review of Commission Orders stemming from prior storms and outages applicable to the utility.

Response: Please reference the document titled Recommendations Specific to Outage Planning July 2006, previously submitted.

3) An analysis of all assistance requested or offered and whether the utility accepted or denied the offers of assistance by other entities.

Response: AmerenUE did not receive any offers of assistance that were denied.

MUTUAL ASSISTANCE: At 14:00 on 12/9/07, AmerenUE received commitments for contractor and utility resources from Duke, E-ON US, Indianapolis Power and Light, and Vectran Energy. Most Midwest Utilities were holding their internal resources due to weather forecasts. Utilities were willing to release their contractor resources which AmerenUE accepted. On 12/10/07, AmerenUE received commitment from Xcel Energy to send utility resources. All offers of assistance from Mutual Assistance companies were accepted.

LINE CONTRACTOR RESOURCES: Ameren requested and received assistance from the following companies:

Asplundh Construction Corp, BBC Electrical Services, Capital Electric, Chain Electric, PAR Electric, Miller Construction, L. E. Myers, Pike Electric, Henkels and McCoy, Serco, Service Electric Co, JF Electric, Highlines Electric, Davis Elliot, N. G. Gilbert, IPL, Eon US, Xcel, Shaw Energy Delivery Services, Wright Tree Service, Shade Tree Service, Nelson Tree Service Co.

4) An analysis of the Call Center Operations during the storm and any observations about customer service issues.

Response: Please reference the document titled Call Center Storm Stats December 2007, previously submitted.

5) An analysis of the utility's current tree trimming schedule and input on whether there is the need to amend the current program or consider alternative programs suggested through other Commission cases.

Response: The Commission's new vegetation rules set the standards for appropriate trimming schedule. AmerenUE is adhering to those rules in advance of its effective date.

6) An evaluation of the communication, cooperation and assistance between the affected utilities, citizens and city, county and state officials.

Response: Please reference the document titled Communications with Customers and City County State, previously submitted.

7) If any of the utility's service area lost electrical service for a prolonged amount of time, provide an analysis of what caused the prolonged outage.

Response: There were no issues of this kind experienced by AmerenUE during the December 2007 storm.

8) An assessment of the coordination of the efforts to ensure that critical operations facilities such as hospitals, residential care facilities, police and fire department buildings had temporary electric needs satisfied until service from the grid could be restored.

Response: Please reference the document titled Critical Needs Customers, previously submitted.

9) An assessment of the interdependence among all PSC certificated utilities as well as with utilities not certificated by the PSC in the affected area.

Response: AmerenUE is a member of the Midwest Mutual Assistance Group along with other Commission certificated electric utilities in Missouri. Through this association, AmerenUE has access to the resources of those utilities and is able to provide resources to those utilities when the need arises and is requested. AmerenUE also has a relationship with the Association of Missouri Electric Coops and has received assistance from Coops in the past. AmerenUE does not have the data to perform further analysis.

10) An analysis that includes a comparison of utility performance with other utilities that had significant outages during the same time period.

Response: AmerenUE does not have the specific data available to compare AmerenUE's performance to other utilities in the State of Missouri that had significant outages during the same time period. Additionally, because of the difference between the various utilities in Missouri, AmerenUE does not believe such a comparison would be appropriate.

11) If damage was caused by vegetation, a detailed overview of the type and extent of damage caused by various scenarios including whether the vegetation was located in the easement or right of way, whether the vegetation fell from outside the right of way, whether the vegetation was diseased or particularly weak, whether the vegetation fell vertically from above the electrical conductors and whether the vegetation had been appropriately addressed prior to the storm in accordance with the utility's vegetation management plan. Further, what percentage of the damage would have been prevented by the utility strictly adhering to its vegetation plan? What percentage of the damage would have been prevented by the utility if strictly adhering to the vegetation management plan proposal attached to this Opinion?

Response: As Staff recognized and stated in the Case No. EO-2007-0037, in its November 17, 2006, Staff report, "One common misconception is that vegetation management programs are structured to significantly reduce the extent of damage to the electric utility's transmission and distribution infrastructure during major storms. While this is true for right-of-way (ROW) corridor vegetation clearance programs along transmission lines, this is generally not true for sub-transmission and distribution lines. Transmission lines serve many thousands of customers and are accordingly "hardened" against damage from all forms of severe weather other than tornadoes, extraordinarily powerful hurricanes and abnormally severe ice storms".

12) If the damage was caused by infrastructure failure aside from vegetation contact, identify more detailed reasons how and why the infrastructure failed, i.e., age, design, etc., and what can be done to strengthen the infrastructure.

Response: There were no infrastructure failures noted on the AmerenUE electric system during the December 2007 storm.

13) An analysis of the economic impact on customers who experienced a disruption of power during the ice storms.

Response: AmerenUE does not have the specific data available to assess or forecast the economic impact on customers who experience power outages during major storm events. AmerenUE is sensitive to financial hardships to businesses and individuals that storms and the associated power disruptions cause.

14) Any and all recommendations to improve utility response to weather related and day to day electric outages in the future.

Response: AmerenUE conducted a Post Storm Critique. The results and recommendations of that meeting are contained in the Response to Item C of the original answer. AmerenUE will continue to look for ways to improve our response to both storm and non storm electric outages.

FINAL

AmerenUE
Storm Adequacy Review

AmerenUE
St. Louis, Missouri

KEMA Project AMSV.0001

Attachment C

Executive Summary

In July and December of 2006 AmerenUE's Missouri service territory experienced severe weather inflicting the most extensive damage to the electric sub-transmission and distribution infrastructure in the company's history. Severe July winds, from windstorms two days apart originating at right angles to each other, created the largest restoration effort ever performed by AmerenUE. In December AmerenUE's customers were assaulted with an extreme ice storm, again leading to protracted restoration efforts. These storms caused widespread damage to trees and power lines resulting in power outages confined to an area comprised of six districts encompassing the greater St Louis area. Over 650,000 and 270,000 AmerenUE electric customers lost power during the July and December events respectively.

In response to these storms, AmerenUE quickly ramped up from its normal field complement of 800 AmerenUE line personnel and contractors to 3800 and 4400 electric line crews, tree crews, and electric service crews for July and December respectively, in addition to numerous corporate personnel, to support the restoration efforts. The rapid response by AmerenUE's management to secure additional resources from contractor companies and other utilities was a significant factor in the company's ability to fully restore the system in ten and eight days respectively, especially considering there was no advance warning for the July storm and little warning for the December storm.

The magnitude of the supporting logistics, generally invisible to the average customer, was the equivalent of bringing the population of a small town into the area and providing all necessary logistical services; food service, lodging, parking, vehicle support and security, and personal needs to accommodate the population. In addition, the operational logistics for field work such as materials, equipment and supervision are extensive and far exceed requirements in normal operating periods. These restorations were a massive effort by any standard. In overall review of the effort put forth by AmerenUE, KEMA concluded that:

> ***AmerenUE, its employees, and contractors performed very well restoring power after these record-breaking 2006 storms. AmerenUE's restoration plan, while not designed to address the magnitude of the storm damage and the overwhelming volume of restoration activities, did provide a sufficiently robust framework for an effectively executed restoration response. AmerenUE is found to be a company dedicated to continuous improvement and management demonstrated by its dedication and commitment to this principle by adopting a series of initiatives in the areas of system design, maintenance, and emergency restoration planning and execution.***

This review focused on three areas; sub-transmission and distribution (T&D), design and maintenance (including an infrastructure review based on a forensic study of the system resilience as response to the storms) and the emergency restoration plan's implementation during these severe storms. In summary, KEMA found the following:

- While AmerenUE's non-storm reliability indices have been relatively constant in recent years, its overall daily reliability has been trending slightly downward during the same period due to a marked increase in severe weather activity,

- AmerenUE's design standards are consistent with good engineering standards for the typical wind and weather conditions found in the mid-west,

- While AmerenUE's average age of the T&D pole inventory in the six districts affected by the 2006 major storms is approximately 35 years, it is within the norms for the industry in the mid-west,

- AmerenUE's pole inspection and vegetation management practices were consistent with industry practices. Programs, primarily due to a 2003 budget cut, were sporadic prior to these catastrophic events and have been significantly upgraded since 2004,

  - Much of the 2006 storm damage would not have been prevented by these programs,

  - Since the 2006 major storms, AmerenUE has introduced an extensive overall inspection program encompassing a solid interlaced scheme of vegetation management (including addressing out of easement tree removal), sub-transmission and distribution circuit inspections and pole inspections,

- AmerenUE's emergency restoration plan and elements of information processes were designed for the more moderate storms typically experienced, therefore, AmerenUE was limited in their ability to scale up the technology solutions to storms of this size, and

- AmerenUE's reaction to the storms was immediate and appropriate given the management tools present at the time.

It is also KEMA's opinion that AmerenUE could have managed the process of providing restoration time information to its customers in a better fashion. The magnitude of these storms and AmerenUE's lack of experience with these large storms resulted in customers not receiving timely, actionable and valuable information.

Based on KEMA's specific conclusions, coupled with knowledge of leading industry practices in the area of system design, maintenance and outage management, KEMA has identified the following 37 opportunities for AmerenUE to improve overall T&D system resilience to storms and the storm restoration efforts to both minimize the level of damage and shorten the overall restoration time. The recommendations have been grouped into the following three categories:

- Continue with AmerenUE identified improvements,
- Modify existing processes and systems to better address severe storms, and
- Develop new processes and systems to support Levels III and IV restoration efforts.

Continue with AmerenUE's already identified improvements. AmerenUE has already established a need for these 12 improvements and has incorporated them into current budgets. The numbers in parentheses (4.4.1) represents the recommendation number and section in the report.

- Continue emphasis on the vegetation management program to achieve the committed schedule by the 4th quarter of 2008 and to implement the program enhancements. Address the out of easement tree removal issues and review total budget periodically with the anticipation of the growing tree canopy. (3.4.1)

  AmerenUE response to 3.4.1 **– AmerenUE is committed to achieving the desired cycle lengths (four-year "urban" and six-year "rural") by the end of 2008 according to previous arrangements made with the Public Service Commission, and AmerenUE is currently on target to satisfy this goal. Additional vegetation program enhancements have been and will continue to be implemented on an even broader scale as cycle lengths are obtained. Current budgets for vegetation management associated with Project Power On are roughly double what they've been in recent years, and these figures are reviewed each year in the interest of improving service reliability in the most cost-effective manner.**

- Continue the revised pole inspection at the targeted inspection rate. The pole inspection planning, record keeping, analysis and auditing functions should be improved. (3.4.2)

  AmerenUE response to 3.4.2 **– AmerenUE plans to continue inspections of the entire Missouri wood pole plant at the targeted rate of once every twelve years. Inspection planning and record keeping are currently done within the newly developed Circuit and Device Inspection System (CDIS) database. The database is linked to the pole plant record in the AM/FM system, thus providing the recommended functionality. Planned enhancements for 2008 include standard**

reporting functions as well as enhanced access to the data for analysis purposes. With regard to the auditing recommendation, CDIS now tracks completion of the pole replacement work through DOJM, AmerenUE's work management system. Results are monitored by AmerenUE management on a monthly basis.

- Complete and distribute the automated pole loading calculation tool currently in development in the standards department. (4.4.1)

  <u>AmerenUE response to 4.4.1</u> **– The automated pole loading calculation program has been in development in the Standards Department for approximately two years and is scheduled to be released for AmerenUE internal use by the Missouri divisions and distribution planning departments in early 2008.**

- Continue the evaluation of the enhanced vegetation management program and apply the same approach to pole inspection and distribution line equipment programs. (5.4.2)

  <u>AmerenUE response to 5.4.2</u> **– Both the vegetation management program as well as pole inspection and distribution line equipment programs will be evaluated on an annual basis for cost effectiveness. A Users' Group has also been established for purposes of evaluating the effectiveness of the pole and line equipment inspection programs, consisting of field construction and engineering personnel, as well as other subject matter experts. The group meets monthly to review program status and evaluate potential program modifications and improvements, in order to provide the necessary information in the most efficient manner. Among the enhancements introduced thus far are the automation of inspection data delivery and construction job creation by both AmerenUE and its inspection contractor.**

- Continue with AmerenUE's plan to deploy additional weather recording sites and develop improved forecasting of potential damage capability. (8.4.1)

  <u>AmerenUE response to 8.4.1</u> **– AmerenUE is currently working with St Louis University to install 50 weather stations around Missouri. These weather stations will be strategically placed to enable AmerenUE to track, and therefore more accurately forecast, impending weather events as they approach the St Louis metropolitan area. A number of the weather stations will be installed in and around the metropolitan area to assist AmerenUE with initial damage assessments after a storm has hit. All 50 weather stations should be installed by early Spring 2008 and St Louis University should have the system up and receiving data by the end of April 2008.**

- Continue with AmerenUE's practice for notifying, mobilizing, and managing foreign and mutual aid resources. (8.4.2)

  AmerenUE response to 8.4.2 – It is AmerenUE's full intent to continue with the practice of notifying, mobilizing and managing foreign and mutual aid resources when the need arises. AmerenUE further intends to continuously monitor, evaluate, and revise its methods of doing so.

- Expand the use of AmerenUE's leading practice of using Public Safety Advisors and Cut-and-Clear crews, permitting Field Checkers to focus on damage assessment while simultaneously ensuring the public is safeguarded from electric hazards. (9.4.2)

  AmerenUE response to 9.4.2 – The use of Public Safety Advisors and Cut-and-Clear Crews has become critical during storm restoration efforts to ensure public safety. AmerenUE will continue to evaluate the expansion of these two roles.

- Expand the number and use of Mobile Command Centers during Level III and IV events. (10.4.4)

  AmerenUE response to 10.4.4 – AmerenUE is currently performing a needs assessment to determine the optimum number of Mobile Command Centers required during Level III and Level IV events. One unit is currently in service and a second is on the drawing board.

- Continue nurturing the strong working relationship AmerenUE already has with the Missouri Department of Transportation, the State Emergency Operations Center and local emergency operations centers. (10.4.5)

  AmerenUE response to 10.4.5 – AmerenUE will continue to build and expand upon the relationships it currently enjoys with the Missouri Department of Transportation, the State Emergency Management Agency, and other local EOCs.

- Continue with the practice of issuing information cards to foreign and mutual aid crews, as part of the overall orientation package, to streamline the interface with the Distribution Dispatch Office for clearance taking and ensure that the process is formalized in the Electric Emergency Restoration Plan (EERP). (10.4.6)

  AmerenUE response to 10.4.6 – AmerenUE will continue the practice of issuing information cards to foreign and mutual aid crews as part of its overall orientation package. In addition, AmerenUE will continue to review the orientation package

and presentation (at least on an annual basis) for subject content and process updates.

- Continue with the 24-hour coverage practice for vegetation restoration activities, where 20% of the tree crews work through the night on an as-needed basis. (10.4.8)

  AmerenUE response to 10.4.8 **– AmerenUE will continue to provide the appropriate shift coverage with Vegetation Management personnel based upon the unique requirements of each restoration effort.**

- Complete the review of the loss of customer call situations. (12.4.1)

  AmerenUE response to 12.4.1 **– This recommendation has a number of constituent parts. Per the more detailed discussion in the text, Ameren's IT function and the business lines will work together to determine all the in-bound communication stakeholders and their needs. The anticipated call volumes will be estimated based on the ultimate criteria for the various storm levels. Ameren already has design information from AT&T and Stericycle (the in-bound high volume outage call vendor) on their respective call volume capabilities. However, the test scenario discussed in the recommendation may be more difficult than anticipated and unattainable. This is due to AT&T having 27 different local Central Office switches in the St. Louis area. Realistically, Ameren would have to make the phone calls in each of the local regions covered by these switches, and access to each of the 27 local Central Office switches may not be possible. A test scenario can be conducted utilizing the AT&T 800 service for AmerenUE by calling the local AT&T number for AmerenUE from a centralized location. Ameren will need to further investigate and fully define these types of scenarios. Once these definitions are in place, Ameren is willing to work with the vendors to complete the testing and evaluate the results.**

AmerenUE's current processes and structures are adequate for Levels I and II restoration efforts, but need to be modified to support the restoration efforts of Levels III and IV. The following 15 modifications will enable existing systems, processes and structures to better support the more severe events.

- Make use of detailed pole loading analyses done for foreign attachment applications by cataloging the loading data by circuit, location or other identifier. The assembled information may then be used as a data sample in future studies of loading, pole condition, failure analysis, etc. (4.4.3)

AmerenUE response to 4.4.3 **– AmerenUE will evaluate the usefulness of utilizing the information from existing pole loading analyses for studies internal to AmerenUE.**

- Develop and maintain current knowledge of technological developments in pole and conductor materials and designs. (4.4.4)

- ***AmerenUE response to 4.4.4*** **– Ameren's Standards Department is charged with keeping abreast of the industry's technological developments in pole and conductor materials and designs and considers this part of its daily mission. This department has studied various composite materials associated with distribution facilities as well alternate design configurations. Among the more recent changes made in Ameren construction standards have been the introduction of cambered poles, fiberglass crossarms for distribution voltages, and armless construction configurations for subtransmission voltages. As other opportunities present themselves that make economic sense to pursue, Ameren Standards will give them due consideration.**

- Redefine the existing storm level classifications to include at least one additional level. (7.4.1)

AmerenUE response to 7.4.1 **– AmerenUE plans to add a Level IV storm definition to its EERP. The initial recommendation is that Level IV would be declared when greater than 200 feeders are locked out or when greater than 200,000 customers are without power, or both. This recommendation is still being evaluated and may be adjusted.**

- Integrate all subordinate emergency plans into the master EERP. (7.4.2)

AmerenUE response to 7.4.2 **– AmerenUE has recently created and filled a new position – Superintendent of Emergency Planning. It will be this person's job to continually monitor and revise the EERP and work with all of the AmerenUE Divisions to ensure the subordinate plans are in line with the master EERP. Integration of all subordinate emergency plans into the master EERP, per this recommendation, will be a part of the process. This project will be started in the first quarter of 2008.**

- Expand Section Six of the EERP to include the development of self-administered work islands during Level III and IV storms. (7.4.4)

AmerenUE response to 7.4.4 **– The expansion of Section Six of the EERP is a priority for AmerenUE. Development of self-administered work islands will be considered as a part of that expansion.**

- Define the process and enhance the communications between AmerenUE's Emergency Operations Center (EOC), Resource Management and the Divisions relating to resource volume and arrival times to assist Divisions in improving efficient crew dispatching. (10.4.2)

  AmerenUE response to 10.4.2 **– Timely communication with regard to resource volume and arrival times is crucial during the initial stages of a storm restoration effort. AmerenUE will define the communication process between the EOC, Resource Management and the Divisions as it relates to incoming resources and their estimated arrival times. AmerenUE will continue to review this process definition (at least on an annual basis) for possible communication enhancements between all parties. AmerenUE's existing plans to upgrade to V3.2 of Resources on Demand, its storm resource tracking software, will also have an impact on this enhancement.**

- Refine the certified functional agent program to secure more employee participation. (10.4.7)

  AmerenUE response to 10.4.7 **– AmerenUE is evaluating the certified functional agent program to determine additional training needs. This includes, but is not limited to, adding more employees to the list and determining annual training requirements to ensure certified employees maintain their degrees of competency.**

- Evaluate the AMI (Advanced Metering Infrastructure) system ability to support large scale restoration events. (11.4.3)

  AmerenUE response to 11.4.3 **– AmerenUE's AMI service provider, Cellnet Technologies, and Ameren's IT Operations Department have both made changes to monitor the outage-related AMI functions on a consistent basis. Cellnet has tuned various parameters in the application. Together, AmerenUE and Cellnet are studying a number of software options given the limitations inherent in the current AMI technology. They expect to have design specifications finalized by the end of 1Q08.**

- Develop a process to deliver AmerenUE's restoration information and estimates directly to customers in a form under AmerenUE's control. (13.4.2)

AmerenUE response to 13.4.2 **– The purchase of radio time and newspaper ad space in the interest of delivering "custom" AmerenUE messages to the public is something that has been done before, albeit on a limited scale. The potential for negative slants to be integrated into the media/press coverage of severe weather events does make the prospect of customizing messages for the public and delivering them directly a more attractive strategy than it's been in the past. AmerenUE will seriously consider using these kinds of controlled information outlets more consistently.**

- Develop a critical facility list and define responsibilities and expected outcomes. (13.4.3)

  AmerenUE response to 13.4.3 **– A critical facility list has been developed and covers all of AmerenUE's operating territory. The initial definition of what constitutes a "critical facility" has been determined and facilities that fall within that definition have had their accounts coded to include them on the list. Effective 12/19/07, customers with "critical" SIC codes appear on various screens within AmerenUE's Outage Analysis System (OAS). Responsibility for maintenance and control of the list is currently being defined.**

- Develop and perform a realistic test for EMPRV. (14.4.1)

  AmerenUE response to 14.4.1 **– Since the 2006 storms, EMPRV's interfaces have been replaced by faster interfaces and workflows to Oracle Purchasing, and AmerenUE's removed the temporary interface to MMIS, the old materials management system. In early 2008, AmerenUE will be moving to a faster server infrastructure, which balances CPU usage during peak times. In addition to monitoring normal performance, AmerenUE plans to hold special post-storm meetings to address process, application, and workflow issues for purposes of achieving continuous improvement in this area.**

- Develop an implementation plan for Resources on Demand (3.0) to support the logistics function and all contractors and mutual aid crews. (15.4.1)

  AmerenUE response to 15.4.1 **– Version 3.2 of Resources on Demand is currently being configured with AmerenUE information and should be ready for implementation at the start of 2008. Training on the upgrade is tentatively scheduled for mid-January of 2008.**

- Develop a restoration communications process that uses the EOC informational dashboard and twice daily conference calls to obtain and provide timely and consistent information to all external communications stakeholders. (13.4.1)

  AmerenUE response to 13.4.1 **– The manner in which AmerenUE deals with the restoration of storm-related outages has fallen under far greater scrutiny in recent years. In light of this, AmerenUE is in agreement that a more standardized method of communication with both internal and external stakeholders during these types of events is necessary. AmerenUE Corporate Communications will work to identify those stakeholders and their respective needs and collaborate with EOC personnel on the development of informational "templates" that can be used to transfer information from the EOC to those stakeholders during severe weather events.**

- Refine and formally adopt a Corporate Communications Strategy. (13.4.4)

  AmerenUE response to 13.4.4 **– Communication with the customer and public engagement in general have become very important for AmerenUE over the last couple of years. And while many new branding and communication initiatives are afoot, there is no centrally documented Corporate Communications Strategy binding these activities together. AmerenUE is currently developing such a strategy.**

- Continue enhancing the outage determination business logic in the Outage Analysis System (OAS) to improve the estimation of Expected Restoration Times and resource requirements during Level III and Level IV restorations. (11.4.1)

  AmerenUE response to 11.4.1 **– This recommendation has a number of constituent parts. In response to the more detailed discussion in the text, the issue of multiple damage points downstream from a protective device is related to the OAS analysis engine and how it "groups" outages, as well as to the use of its partial restoration capability. AmerenUE will have to organize a team of business experts to discuss enhancements to the analysis engine before any changes can be implemented in OAS. Regarding counts of damaged assets, OAS's OA6C screen was designed and implemented to capture the detailed construction needs on a specific order, though it is not often used. An AmerenUE team will have to convene to review this existing screen and determine policy and requirements for its expanded use. Regarding OAS support of a "quick damage assessment process," another team would have to be formed to understand what information (other than what comes in from the OAS call) can be collected and entered in order for an algorithm or process to determine**

a high level damage assessment. In the mean time, an update ERT process was put into place in the last year to improve ERT accuracy and customer communication. Given this, AmerenUE will continue to use the new ERT process and monitor customer and media feedback regarding its effectiveness.

The following 10 enhancements will help ensure that AmerenUE's T&D system is significantly robust to minimize future damage, and that future restoration efforts support the reasonable return of all AmerenUE customers in the shortest time possible.

- Develop, design, and implement an initial damage assessment methodology to be conducted during the first six hours of the event that provides the appropriate determination of the storm classification, estimated required restoration resources, and initial restoration time estimates appropriate for public communication. (9.4.1)

  AmerenUE response to 9.4.1 **– Initial damage assessment is probably one of the most critical aspects of storm restoration. The EERP addresses this issue and lays the groundwork for development, design, and implementation. The next step is, within the framework of the subordinate emergency plans, to establish how the assessment is implemented at the division level. The Superintendent of Emergency Planning will be working with the Missouri divisions to review and revise their storm plans in 2008. This item will part of that review.**

- Adopt a "Restoration Work Island" approach under Level III and IV emergency conditions. (10.4.3)

  AmerenUE response to 10.4.3 **– AmerenUE has used the "Restoration Work Island" approach in the past in isolated instances, with a good degree of success. AmerenUE will continue to research and evaluate this approach as a storm restoration practice under particular emergency conditions.**

- Use the 800 network in front of Customer Service System/IVRU (Integrated Voice Response Unit) to enhance call-taking capacity and information capabilities. (12.4.2)

  AmerenUE response to 12.4.2 **– This recommendation would require that all AmerenUE calls would need to be converted to 800-service. The local numbers would need to be eliminated, which would take several years due to the local numbers needing to be removed from the phone book, internet, and customers' speed dial lists. Ameren will need to investigate if a unique message can be played to each individual customer based upon each customer's Automated Number Identification (ANI). Ultimately, AmerenUE will need further clarification from**

KEMA on this suggested recommendation before any degree of commitment can be made.

- Modify the OAS data structure to capture outage root cause and affected components better, supporting post-storm infrastructure analysis or create a dedicated forensic database. (3.4.3)

  AmerenUE response to 3.4.3 **– AmerenUE is willing to investigate this further in terms of how the necessary data would be captured, who would enter it, and how it would be extracted for analysis. Preliminarily, a team (perhaps including Construction Standards personnel) would need to identify what criteria and associated data should be required for supporting a forensic analysis. Then a determination can be made as to how to best capture the information and where it should be entered. AmerenUE will plan for establishing the criteria and data requirements in 2008 and implementing a solution thereafter.**

- Institute a formal Forensic Analysis process to run concurrently with damage assessment. (7.4.3)

  AmerenUE response to 7.4.3 **– The development of a formal forensic analysis procedure that is integrated into the damage assessment phase of storm restoration activity is currently being evaluated.**

- Develop design standards and guidelines related to NESC construction grades (B or C) and to specific applications in the service territory. (4.4.2)

  AmerenUE response to 4.4.2 **– In early 2007 AmerenUE made a decision to "early adopt" the 2007 version of the National Electric Safety Code (NESC), that is, before the State of Missouri endorsed it as its version of choice. The Ameren Standards Department is currently working to incorporate all provisions of the code into its next revision of the Construction Standards, to be released in early 2008. In the mean time, AmerenUE incorporated the NESC's new "extreme ice loading" criteria into its replacement and build-out strategy for all 34kV and 69kV construction as of March 2007, which exceeds the code's original intent. The Standards Department continues to study expanded applications of B-grade construction in those instances where reliability stands to improve and it makes economic sense.**

- Develop a statistical analysis methodology to ensure that maintenance is optimal for different classes of line equipment. (5.4.1)

AmerenUE response to 5.4.1 **– AmerenUE will analyze the data returning from the circuit and device inspections to determine optimal maintenance policies. AmerenUE expects to complete the first study in 2008 and will refresh the analysis on an annual basis. In addition, AmerenUE will utilize an existing proprietary methodology, developed in conjunction with another consulting firm, to analyze equipment life cycles for optimum replacement policies.**

- Enhance the internal informational dashboard displaying current and historical information during the progression of the storm that includes customer outage and restoration resource levels. (10.4.1)

  AmerenUE response to 10.4.1 **– AmerenUE currently has an informational dashboard that provides information as the storm restoration progresses. Enhancements to the dashboard are being evaluated.**

- Evaluate the benefits and risks of providing temporary repairs to customers' weather head equipment under emergency conditions. (10.4.9)

  AmerenUE response to 10.4.9 **– There are many issues surrounding this recommendation that will have an effect outside the realm of AmerenUE. Further evaluation and study will be required in this area.**

- Integrate the CellNet system into the restoration verification process during Level III and IV events to the extent of the current AMI technology's capabilities. (11.4.2)

  AmerenUE response to 11.4.2 **– AmerenUE and its AMI vendor, Cellnet Technologies, have been investigating the capabilities and limitations inherent in the AMI technology. Together they are defining software specifications that could potentially improve restoration verification functions during larger scale severe weather events.**

It should be noted that many of these activities have already been started by AmerenUE as part of their continuous improvement program. Consistent with the EERP, the company completed a series of post-event debriefings. From these debriefings, a number of actions and recommendations were developed to enhance the company's ability to respond to future events of a similar nature and impact. Many of the resulting action items have been completed at the time of publication, while others are still a work in progress.

This report is an evaluation of the AmerenUE's storm restoration response to the 2006 major storms. The report details a number of conclusions reached by KEMA during the review. These conclusions have been shared with AmerenUE personnel and the ensuing recommendations designed to address the identified opportunities have been developed jointly. The detailed findings, conclusions and recommendations constitute the body of this report.

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1. Introduction

1.1 Background

In an effort to learn from the past to improve the future, the management of the Missouri Operations of Ameren Corporation engaged KEMA Inc. to conduct a study of the adequacy of the company's ability to prepare for and respond to severe weather events. The scope of this engagement included reviews of the company's emergency restoration plans and processes; evaluation of the system damage incurred during 2006 storms and review of company programs in the area of infrastructure design and maintenance. This report details the methodology used by KEMA to collect and analyze information, the findings resulting from that analysis, the conclusions, and recommendations for actions that KEMA believes would generally contribute to improvement in the company's ability to manage severe weather events.

Throughout this report, we refer to the Company, as "AmerenUE" and it should be noted that the review and work reported herewith involved only the Missouri operations of Ameren Corporation or AmerenUE. All findings, conclusions, and recommendations reported apply to only to the Missouri operations of the company.

1.2 Situation

The geographic area in which AmerenUE provides electric service is often subject to severe weather. The weather can take the form of significant ice storms with menacing accumulation, tornadoes, lightning, and severe thunderstorms that can occur with little or no warning on any hot summer day. The impact of severe weather on an electric transmission and distribution system can vary greatly from one occurrence to another. The storm impact is dependent upon many variables, including such things as the specific geographic area affected, age and condition of the electric facilities, vegetation density and condition both inside and outside the utility easement, and electric system operating configuration at the time of the event. In all cases however, AmerenUE, like many other electric utilities around the country, strives to ensure that electric service is maintained during weather events and when interruptions do occur, strives to restore service in the fastest possible time while maintaining safety of the electric system for the public and the workforce.

In 2006, the central US, including Missouri and the AmerenUE territory, experienced many storms that were considered unusual and severe. As illustrated in Exhibit 1-1, recent weather records show that severe weather is becoming more common in all parts of the US and what once was classified as an unusual event is becoming more commonplace. Damage to the utility infrastructure of communities is occurring at higher rates and many utility companies are performing in-depth evaluations of the condition of the electric infrastructure and its ability to withstand severe weather events. Specifically, the companies are asking if the infrastructure performed as expected given the age, condition, and other attributes of the system and considering the severity of the event in question.

This report examines the performance of the AmerenUE infrastructure during the windstorms of July 2006 and the ice storms of November-December 2006. At the request of AmerenUE, KEMA consultants have evaluated the distribution system infrastructure from the perspectives of age, physical condition, and maintenance practices. KEMA has also evaluated the design and construction standards of the company and the vegetation maintenance practices in place currently and over the years preceding these events. Finally, KEMA has evaluated the emergency restoration plans and procedures of AmerenUE and the execution of those plans during recent outage events due to severe weather.

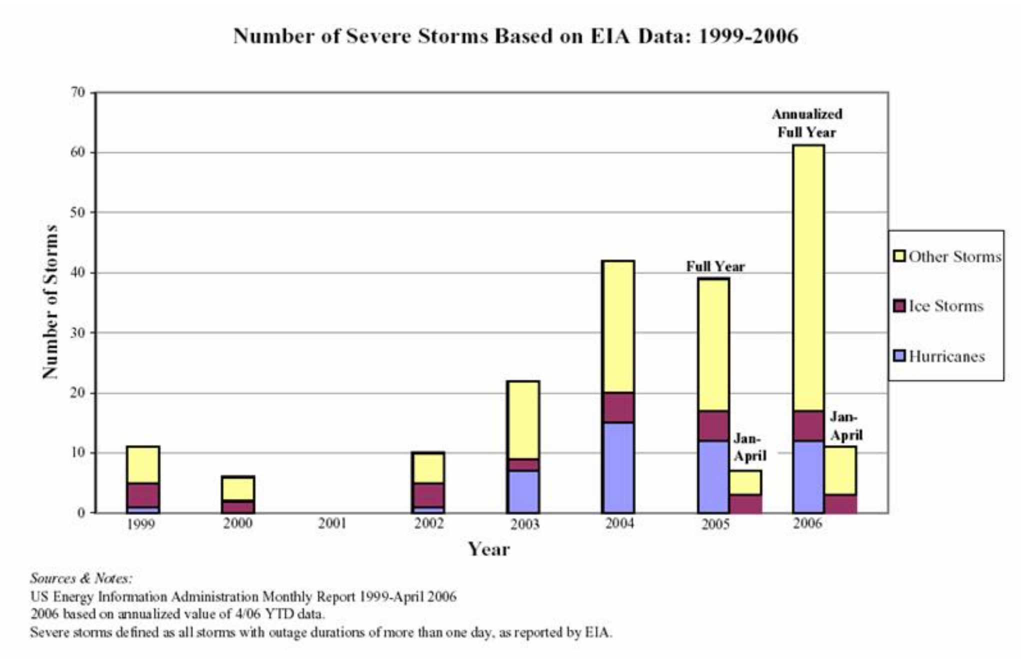

Exhibit 1-1: Severe Weather Trend

The findings of the KEMA investigation indicate that AmerenUE does a credible job in all areas of design, construction, operation, and maintenance of the electric system. AmerenUE's practices in these areas are consistent with industry standards and what is considered good utility practice. However, KEMA also found that the vegetation management program and pole inspection programs prior to the 2006 storms were insufficient due to budget cuts in 2003. AmerenUE was still in the process of ramping up the pole inspection and vegetation management programs at the moment both programs were tested by severe weather events. Apart from the budgeting issue, there are opportunities for improvement and KEMA has identified the areas that we believe can be improved for future outage prevention and restoration. Overall, the AmerenUE system design, construction, operation, and maintenance indicate that the infrastructure is sound and is of the quality one would expect of a leading electric utility. The improvements are primarily focused on a review and continuous improvement process (record keeping, analysis, business case development and feedback), aiming at maintaining the current system integrity and performance levels.

Given this general assessment, why did AmerenUE customers experience extended electric service outages during storms such as the events of 2006? In summary, the weather experienced in the 2006 storms examined by KEMA was of severity and localized intensity that the utility infrastructure was not designed to withstand, nor would be expected to withstand, using industry accepted design and construction methods. Furthermore, the expectation of an electric utility to build a system that would withstand such weather is questionable when considering the potential impact on rates and public concern over aesthetics of utility facilities in their community.

In order to ensure that an electric system has adequate storm resilience, a utility must undertake an extensive analysis to quantify both the probability of certain weather conditions and the probability of the infrastructure to withstand those conditions over an expected facility life in excess of thirty years. Add to this the changes in community development, community regulations on utility construction, growth of vegetation and impact of private landowners and public official's management of vegetation, and the variables to consider in building a storm-hardened system become quite numerous. System hardening is not simply about putting in stronger poles or placing facilities underground. It is about, as always in regulated utility environments, doing the best possible job with the resources available while maintaining a reasonable cost structure against good service reliability to meet the needs of consumers. An infrastructure can be built that will withstand severe weather, but the cost is prohibitive to customers and regulators.

When a significant storm occurs leaving hundreds of thousands of customers without service, there is an expectation by the customers, the Commission and the local and state governments that AmerenUE will work to restore service quickly. This is a reasonable expectation; however, the time required to achieve the restoration of all customers could take days if not weeks depending on the severity of the damage. AmerenUE, like other utilities, has a formal plan to manage the restoration efforts, which has been proven to work well in smaller storm events. However, the 2006 storms were not normal, leaving over 650,000 customers in July and 270,000 customers in December without service for an extended period. AmerenUE had never experienced storms of these magnitudes and had to adapt its proven plan to the demands created by these events.

Realizing the magnitude, AmerenUE quickly began the process of obtaining additional resources from both contractors and mutual aid utility partners. AmerenUE mobilized its own forces to begin the damage assessment, first response, and tree removal to permit the process of determining the extent of the damage as well as clearing the easements to allow line crews to begin the re-construction of the sub-transmission and distribution systems. This initial activity brought together numerous resources to orchestrate all the preliminary activities to receive the additional resources and get them actively restoring the systems.

In parallel, the Emergency Operations Center (EOC) began assembling the information to be given to senior management, government officials and the customers. The core plan served AmerenUE well as it provided the basic blueprint for conducting these activities.

AmerenUE had implemented a number of leading edge practices that smoothed the transition from normal to complex emergency operations.

2. Project Approach and Methodology

KEMA approaches projects of this type with techniques and tools that support both the quantitative and qualitative analyses that are required for a full understanding of the operations and organizations under study. Because much of the project involves analysis of data from various systems and reports, a number of data modeling and analysis techniques are employed. The following outline presents that approach used by KEMA in the AmerenUE study:

- Data collection
  - Request detailed information
  - Data interpretation and integration
- Interviews
  - Talk with key players in the areas of focus
  - Review and confirm the data collected
  - Seek information on issues identified in discussion
- Analysis/synthesis
  - All information reviewed, analyzed, integrated, etc.
  - Identification of areas for further study
  - Preliminary findings and conclusions
- Follow-on information collection and verification
- Conclusions and recommendations

3. Project Area – Infrastructure Review

3.1 Data and Analysis

The infrastructure review is a forensic analysis of AmerenUE's distribution system focused on the product of two main events, the July 2006 severe thunderstorm and the December 2006 ice storm. The July storm event is actually composed of two separate storm systems, the first occurring on July 19th and the second occurring on July 21st. The storm paths of both systems were different; however, the type of storms, both characterized by unusually high wind speeds and tornados that occasionally accompany severe thunderstorms, were very similar and therefore considered as one event. The July storms are therefore analyzed collectively. The second event, the December storm event occurred on November 30th and continued through December 1st.

Storms are complex systems and therefore inherently complex in defining severity. Several standardized methodologies have been used to classify storms. Two widely accepted methods employed here are 1) the general definition of a severe thunderstorm [1] and 2) the Saffir-Simpson Hurricane Scale.

3.1.1 Definition of the July Storm Event

A severe thunderstorm produces hail at least three-quarters of an inch in diameter, has wind speeds of 58 miles per hour or higher, or produces a tornado. About one in ten thunderstorms are classified as severe. Some of the most severe thunderstorms occur when a single thunderstorm affects one location for an extended time. Warm humid conditions are highly favorable for the development of thunderstorm systems.

All of these factors were applied in the July storm event that was preceded by extreme heat, reached recorded wind speeds of 92 miles per hour in several locations and produced several tornados. These wind speeds are comparative to the upper bound of a Category One Hurricane (wind speeds of 74-95 miles per hour) according to the Saffir-Simpson Hurricane Scale. It is typical for the forces created by a Category One wind to cause damage to vegetation and unanchored structures.

[1] http://www.fema.gov/hazard/thunderstorm

3.1.2 Definition of the December Storm Event

The December storm event is characterized by sleet, freezing rain and gusts of wind. Frozen rain and sleet will accumulate to create a larger surface area, effectively increasing the force winds impose on affected structures. The sheer weight of ice accumulations also plays a significant role in testing the structural integrity.

Downed vegetation and structures as was frequent in both storm events (i.e., poles, streetlights) will negatively impact the outage response time as normal transportation is obstructed thus hindering restoration efforts.

These storm events will be evaluated in more detail in the sections preceding the forensic analyses of each event as their severity is crucial to determining what the normal expectations of anticipated damage are, and to provide key insights into explaining root causes of damage.

3.1.3 Analysis Methodology

3.1.3.1 Data collected

The forensic analysis performed was primarily analytical (statistical) in nature and therefore data intensive and dependent. The following is a summary of data received:

- Outage Assessment System (OAS) Database – Provides outage records for storm and non-storm outage events. (2001-2007).
- Pole Audit Database – Provides important pole attributes (i.e. install date, type, height, size and more) along with a location and pole tag for reference. Also provides subjective information about vegetation density relative to a pole.
- Pole Inspected and Treatment Database – Provides pole inspection and rejection rates and a pole tag for reference. There is data containing 1999-2003 records and 2003-2007 records with different attributes, and different practices that apply.
- Vegetation Management – Vegetation related spending along with circuit lengths, customer counts and years since last trim on a per feeder basis.

- Customer Counts – Total approximated customer counts on a per circuit basis.

- Distribution Operation Job Management system (DOJM) Summaries – Work management system that provides materials supplied per district.

- AmerenUE Territory Maps – The maps support tying asset and storm information to the geography as defined by AmerenUE's service territory.

- Historical Storm Data – Historical storm information plays a significant role in the analysis as primary root cause, exposing potentially latent deficiencies such as pole overloading, sporadic vegetation management, pole deterioration, etc. The data consists of wind speeds at locations, storm paths and eyewitness expert accounts.

3.1.3.2 Interviews

In addition to the electronic and hardcopy data received, interviews captured useful information for interpreting the data and provided instrumental insight into the underlying procedures and practices.

3.1.3.3 Data Analysis

The data received served several important functions and was assessed and filtered accordingly. Three lines of data gathering and analysis can be distinguished and provide the following information:

1. Provide a baseline, which is the state of the system prior to the storms impact. This is determined by what the system is comprised of (pole attributes and general circuit attributes – this can be defined as the exposure to the storm and exposure to vegetation), system conditions (e.g. pole inspection results, vegetation densities, etc.) and methodologies and practices (e.g. pole inspection and vegetation management programs) held by the company leading up to the events. This provides insight into why the system is in the current condition and may form the basis for recommendations for improvement and / or show what practices are noteworthy and have

helped in mitigating damages that the system has sustained during the storm events.

2. Determine the severity of the storms that attacked AmerenUE's sub-transmission and distribution systems.

3. Ascertain the level of damages sustained due to the storm events and how this damage has impacted customers. The number of sustained (extended) outages per circuit primarily defined severity of damages. Also, the number of locked out feeders, poles issued and conductor issued have been used as indicators.

The extent of damage sustained determined which districts to investigate. These districts are Berkeley, Dorsett, Geraldine, Jefferson, Mackenzie and St. Charles (St. Charles did not play as significant a role in outage events during the December storm event and is therefore omitted from the findings for that event). The combined area covered by these districts held the majority of the outages in both the July and December storm events. KEMA compared the baseline with the damages sustained in order to determine vulnerabilities, system strengths and what role AmerenUE practices may have played. Storm analysis results were also compared with each other where practical. These comparisons were made primarily by descriptive statistics (numerical correlations) and visual interpretation of geographical mapping of key indicators.

After a partial analysis, the results were then reviewed in a comprehensive fashion to generate and underwrite partial findings. Some analysis results may trigger a certain line of additional analysis and collection of newly required data. Conclusions based on these findings are drawn and used to generate recommendations aimed at mitigating future risks. Such recommendations may span from decreasing the impact of equipment failure during comparable storm conditions, hardening the system or to improving relevant practices.

3.2 AmerenUE and Comparative Data

3.2.1 Baseline information

The Outage Analysis System (OAS) tracks AmerenUE's system performance. The data captured OAS provides insight into the daily system reliability metrics and outage causes and components involved. Whereas the number of customers affected and outage duration is collected in an automated fashion, the quality of the failure data depends on the capability of the trouble crews or Field checkers to assess the failed component and cause of failure. As the work ticket for restoration can only be closed out upon entry of such data the quantity of data is not in jeopardy. However, the cause assessment is often a judgment call and the option to enter "UNKNOWN CAUSE" may skew realistic figures, especially during storm conditions. Exhibit 3-1 below provides a summary of this data for the six districts under investigation, useful to interpret recent trends.

Sum of CustomerInterruptions		Yr							
CauseCode	Description	2002	2003	2004	2005	2006	2007	Grand Total	% of Total
AA	AMR MRT AMEREN *	346	337	304	393	813	77	2,270	0.030%
AD	AMEREN DIG IN *	173	1	809	60	634	14	1,691	0.022%
AN	ANIMAL	12,841	30,759	26,906	33,684	33,560	8,228	145,978	1.907%
CE	CUSTOMERS EQUIP	2,268	3,434	1,990	2,155	1,963	680	12,490	0.163%
FI	FIRE, NON AMEREN*	1,184	1,584	263	790	1,116	233	5,170	0.068%
LS	LOSS OF SUPPLY *	174	128	50	43	98	40	533	0.007%
LT	TRANSMISSION *	167	2,464	57	513	6,959	1	10,161	0.133%
OA	#N/A	6		5				11	0.000%
OE	OTHER/EXPLAIN *	18,167	32,937	62,857	45,103	94,353	10,596	264,013	3.448%
OL	OVERLOADED	17,144	25,409	2,214	19,600	6,663	2,366	73,396	0.959%
OM	OH MALFUNCTION	217,265	280,377	307,412	308,210	647,731	99,682	1,860,677	24.302%
OP	OPER. ERROR	22,455	23,154	43,283	20,130	22,175	625	131,822	1.722%
PA	PREARRANGED	109,217	96,749	73,221	75,722	96,280	54,586	505,775	6.606%
PE	PUBLIC EXCAVATION *	4,178	2,666	2,179	2,637	5,481	386	17,527	0.229%
PU	PUBLIC NO VEHICLE *	9,437	12,445	14,158	9,090	15,380	5,286	65,796	0.859%
PV	PUBLIC VEHICLE *	36,969	61,691	35,522	56,488	39,392	28,774	258,836	3.381%
SM	SUB MALFUNCTION	52,092	70,385	64,796	60,867	67,605	6,592	322,337	4.210%
TB	TREE BROKE	107,492	182,715	273,780	236,708	593,574	171,153	1,565,422	20.446%
TC	TREE CONTACT	140,432	125,708	174,132	159,653	458,748	83,909	1,142,582	14.923%
TT	TREE TRIMMERS	548	1,449	865	863	9,293	1,945	14,963	0.195%
UM	UG MALFUNCTION	62,234	72,886	61,851	54,552	44,830	24,427	320,780	4.190%
UN	UNKNOWN CAUSE	67,955	112,085	162,787	142,299	386,191	62,903	934,220	12.202%
Grand Total		882,744	1,139,363	1,309,441	1,229,560	2,532,839	562,503	7,656,450	100.000%

Note: The asterisk indicates that the cause code can be used for both electric and gas.

Exhibit 3-1: Annual number of sustained customer interruptions by cause code (for the six districts under investigation, including storms)

Note: The asterisk indicates that the cause code can be used for both electric and gas.

- Exhibit 3-1Exhibit 3-1 2007 data only includes data through June.

The data in this Exhibit 3-1 is the result before processing the raw OAS data with a proprietary algorithm. This algorithm cleans up unlikely records like lightning as a root cause with a clear weather indication. [2] From this Exhibit it can be seen that Overhead Failures are the largest contributors to the total annual customer interruptions. The contribution of this cause trends up over the years 2002-2006. Furthermore, it can be seen that Trees, with a total contribution by Tree Broke and Tree Contact exceeding the contribution of Overhead Failure, trends up over these years as well. The increase of Tree Contact may possibly indicate insufficient budget and/or inadequate practices; however, the substantial contribution of broken trees indicates primarily the impact of wind. As such, these trends, increasing impact of Overhead Failure and both tree related causes to reliability, can be assigned to the increasing occurrence of storms (Exhibit 1-1). This has been confirmed by omitting the records pertaining to the known storm dates as major events. The trend in the total number of tree-related outages in the six districts under investigation is provided in Exhibit 3-2.

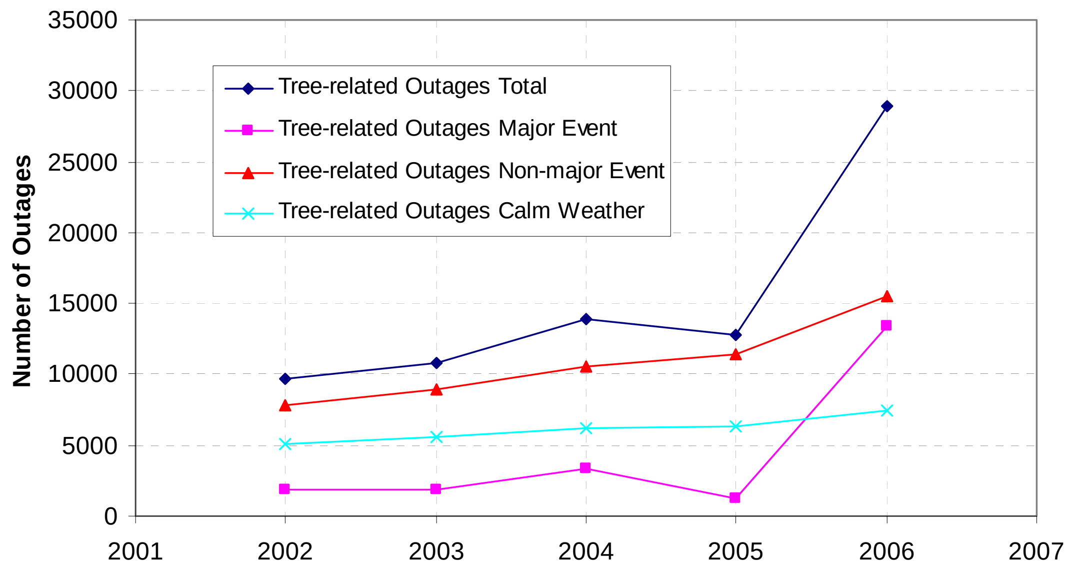

Exhibit 3-2: Total number of tree-related outages 2002-2006 for the six districts under investigation

- Note that while tree-related SAIFI is one of the vegetation management performance indices, the number of outages better represents the system performance under storm conditions for forensic analysis. Both indices can trend differently under the same conditions. This is supported by the fact that

[2] Due to the nature of some of the algorithms, the processed data has higher accuracy at the expense of lower granularity (e.g. no delineation between Tree Contact versus Tree Broke).

tree related SAIFI, with major events removed, is trending downward in recent years. Specifically, KEMA noted the following:

– 0.35 in 2005,

– 0.33 in 2006, and

– 0.23 year to date in 2007.

- Note that the trend of tree-related outages during calm weather conditions is essentially flat.

Analysis of the districts under investigation results in a similar finding that the number of outages trends up over the years with the exception of Jefferson. It should be noted that Mackenzie has feeders that show 100% of the outages attributed to trees. Geraldine and Berkeley have the highest outages due to trees in normal weather conditions.

Storms affect areas to varying degrees or levels of severity. Because maps are often one of the best tools to describe storm severity it is useful to define the system in terms of location as well. Specifically, generated maps as well as various traditional Exhibits are used in this analysis to aid this visual approach. The baseline findings are targeted at those districts where a majority (approximately 86%) of the storm related outages has occurred.

The baseline system inventory shown in Exhibit 3-3 lists the relevant system attributes by district.

	General		Conductor			
District	**Feeders**	**Customers**	**OH (mi)**	**UG (mi)**	**Total (mi)**	**UG (%)**
Berkeley	221	136,419	1,180.15	355.82	1,535.98	23.17%
Dorsett	148	99,677	1,030.33	550.22	1,580.55	34.81%
Geraldine	358	140,347	894.16	215.74	1,109.89	19.44%
Jefferson	103	88,033	2,493.52	565.33	3,058.85	18.48%
Mackenzie	294	192,779	1,257.73	513.47	1,771.20	28.99%
St. Charles	56	58,794	551.32	471.36	1,022.67	46.09%
Total	1,180	716,049	7,407.21	2,671.94	10,079.14	26.51%

Exhibit 3-3: Selected System Characteristics

- Note there was a period of several months between the storm events, the statistics shown in this Exhibit are based on a snapshot of this information after the July storms and may have varied prior to the December storm.

The Pole Audit Database provided pole locations. A pole density map has been created from the geographical pole data and is shown in Exhibit 3-4. Pole density is also useful as a proxy for customer density. Districts of Geraldine, Berkeley and Mackenzie all display high pole densities, as they have relatively more poles per area than other districts investigated. In case the storm intensity is consistent over the areas investigated, it can be expected that those districts would sustain more damage as there is more exposure (more components that can fail and more customers that can be affected).

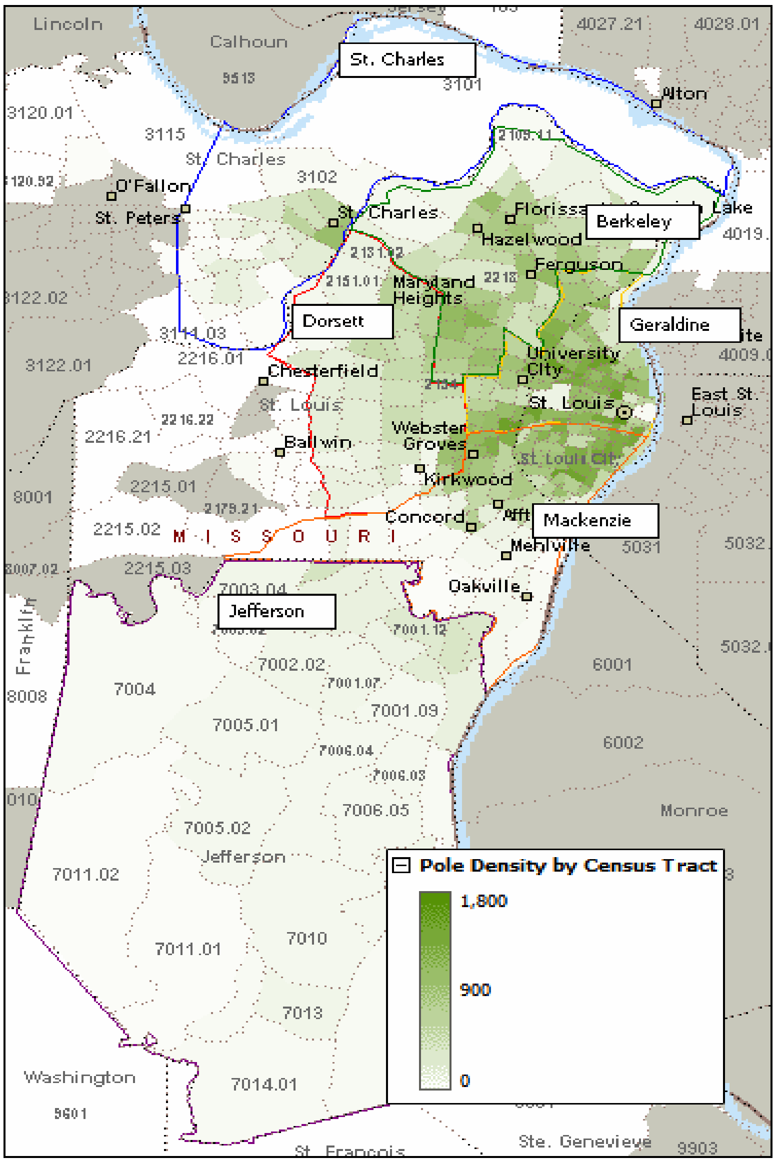

Exhibit 3-4: Pole Density

(Poles/square mile, on a per census area basis)

The system consists of primarily wooden poles made of Southern Pine. In order to ascertain pole strength, a major factor to be determined is pole class; defining the pole diameter (a low pole class is thicker, therefore, generally stronger than a higher pole class). A map showing what locations appear to have stronger or weaker poles by averaging pole class by area, is shown in Exhibit 3-5.

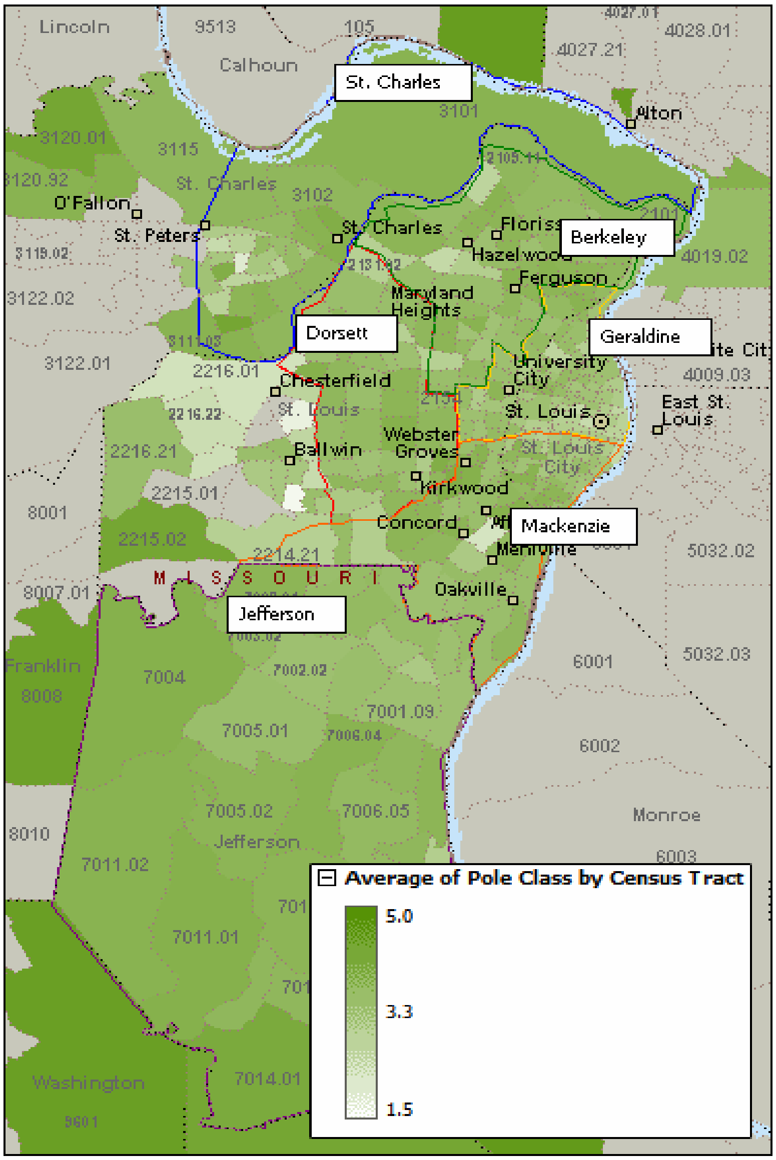

Exhibit 3-5: Pole Class

Exhibit 3-6 provides the average pole class by district. Note, that the distributions of pole classes are moderately consistent from district to district. Jefferson does have relatively more class 4 poles and less class 3 poles. The most common pole in use is a class 4 pole.

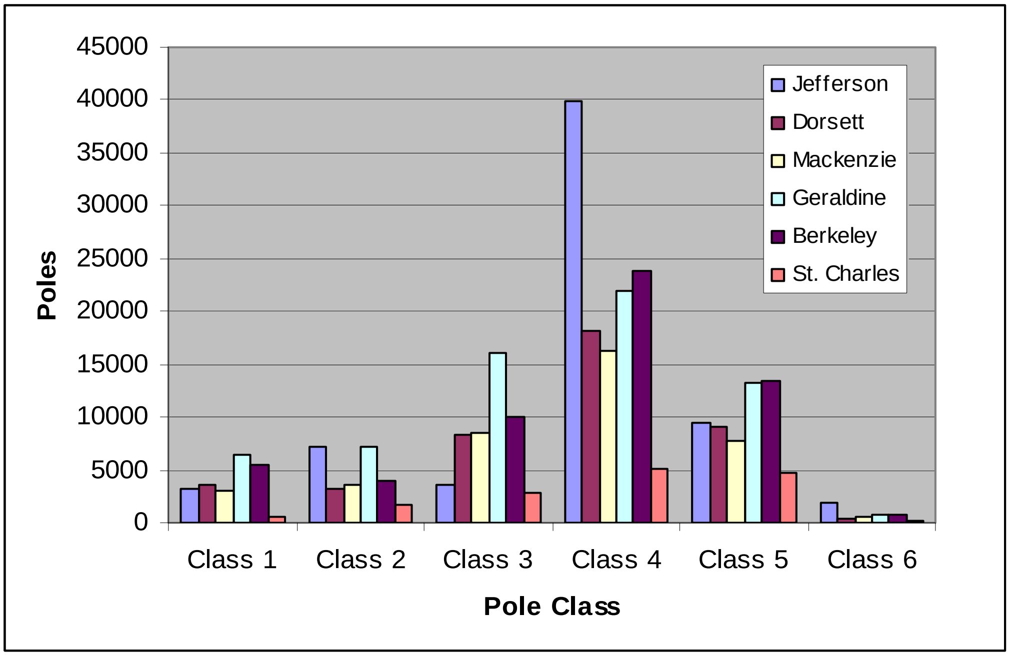

Exhibit 3-6: Pole Class by District

Pole height plays a significant role in the physics of a structural failure. Pole heights are broken down by district in order to determine if there are any apparent vulnerabilities. As shown in Exhibit 3-7, the pole heights vary little by district. The primary range of pole heights used is between 35 and 40 feet tall. The taller poles may have more surface area and therefore may experience higher torque at the potential breaking point (not always ground level) at the same wind speed.