- The approach to determining the initial level of damage,
- The process for conducting a detailed analysis of storm damage to support restoration activities,
- The independent process for forensic analysis of storm related failures,
- The company's approach and channels used to obtain additional crews to support the restoration effort,
- The company's triggers for mobilizing and demobilizing the work force,
- The process for managing and prioritizing critical customers,
- The communications plan for informing the public and government agencies of the extent of the damage and, more importantly, the expected restoration time, and
- The tools required for managing logistics and sourcing additional repair resources to match the level of damage

6.1.3 Organization (Roles and Responsibilities)

Essential to the timely restoration of service is a well-defined emergency restoration organization that defines

- Critical management positions with their attendant qualifications, responsibilities and authorities,
- Clear assignment of responsibility for the strategic and tactical elements of the restoration effort,
- Policies to govern the restoration effort,
- Processes for managing, directing and implementing restoration activities,
- Clearly defined functions which support the processes,
- Prioritization of restoration activities down to the service level categories,
- Required skills for critical positions,
- Required training and its frequency,

- Resource call out lists, and
- Critical checklists used as reminders for each position identified

6.1.4 Plan Execution (including event plan, assessment, tactical plan, dispatch, restoration, verification, communications, and support services).

This section defines how the utility will conduct the restoration efforts, including

- Weather forecasting and the determination of the level of storm for early and continuing customer communications,
- Emergency Operations Center (EOC) mobilization and demobilization,
- Service or operations center mobilization and demobilization,
- Crew and material staging area mobilization to adequately permit managing ten times the normal number of crews,
- Logistics (sleeping accommodations, meals, laundry, vehicle fueling, etc) mobilization,
- Initial "first cut" of damage level for determining initial restoration goals and the number of crews required,
- Detailed damage assessment,
- Work prioritization based on severity of damage,
- Area tactical plan,
- Resource dispatching,
- Management of the physical T&D facilities restoration,
- Progress reporting,
- Customer communications through multiple channels,
- Coordination with governmental agencies at the local, state and federal levels,

- Forensic evaluation of the failed system components,
- Post storm review, and
- Coordination with public agencies

6.1.5 Systems and Services

Underpinning the entire effort from event initiation through post event review is the integration of critical support systems including

- The customer information system used to capture and communicate specific outage data at the customer level,
- Customer contact applications and enablers Integrated Voice Response Unit (IVRU) and web,
- An outage management system (OMS) designed to map individual customer outages to a physical representation of the distribution system This will provide critical information on the size and nature of the event,
- A supervisory control and data acquisition (SCADA) system, providing information on the state of the transmission and distribution (T&D) systems and, in some cases, allowing physical control of critical T&D components,
- A workforce management system (WFM) that facilitates the movement and tracking of materials and personnel,
- A mobile workforce management system (MWF) to provide mobile, automated dispatch and work ticket capability for field forces,
- A resource monitoring tool to manage the additional foreign and contract crews,
- The advanced metering infrastructure (AMI) facilitates meter reading and the determination of whether a customer is receiving power,
- An energy management system (EMS) used for load flows and management of switching orders and clearances, and
- An outage dashboard that updates all parties including executive management on the restoration progress

7. Emergency Restoration – Annual Plan

The ability to respond to any type of emergency begins with capability planning. In the electric utility industry, system damage due to weather or other natural causes is the most common emergency. The ability to respond efficiently and effectively to widespread system outages is a direct result of comprehensive planning and training for such an event.

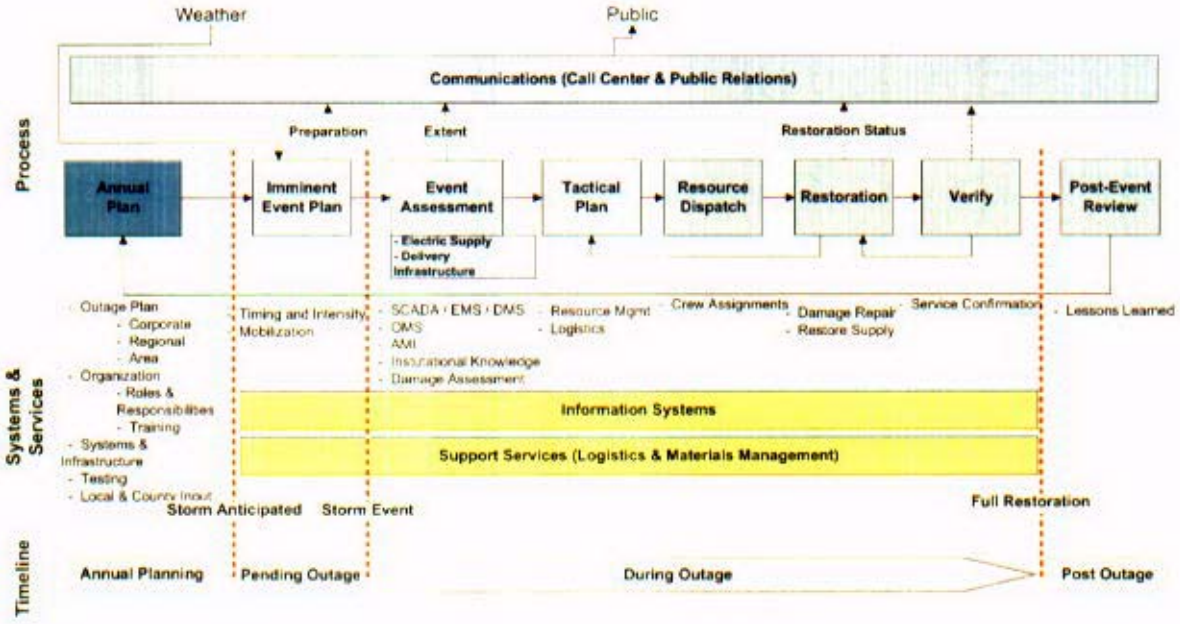


Exhibit 7-1: Outage Management Process – Annual Plan

7.1 Industry Practices

Throughout the electric utility industry, companies routinely review and update emergency response plans on an annual basis. Generally, the responsibility for managing these plans is assigned to a specific person or group located in the T&D operations function. Depending upon the type of emergencies to be handled, annual planning may involve detailed personnel training and drills with emergency simulations. Annual planning by leading utilities includes the review and incorporation of improvements resulting from previous event experience, also from the experience of other companies learned through various industry committees and working groups.

7.2 AmerenUE Practices

Consistent with industry leading practices, AmerenUE modifies and updates the EERP on at least an annual cycle Lessons learned from events during the previous year, as well as potential improvements from other drivers, are incorporated as improvements into the EERP Updates can emanate from either the Asset Management's Engineering Services or Distribution Operations However, the owner of the plan is the Distribution Operations department

The responsibility for maintaining and implementing the plan resides with the Manager of Distribution Operations Unlike some other utilities, who have a separate group to maintain, conduct debriefs and update the restoration plan The Distribution Operations organization maintains the plan and is responsible for ensuring its implementation during major restoration efforts During an actual emergency, the organization will set the restoration strategy and determine the resource requirements All restoration information are reviewed and approved within this group to ensure a consistent public

The EERP works well for Level I and II storms, but the plan did not perform to AmerenUE's expectations during the major storms of July and December of 2006 The following six conclusions were reached with respect to the overall plan

- The AmerenUE EERP provides a consistent approach for responding to any emergency,
- AmerenUE's EERP plan is consistent with industry leading practices, but will benefit from several enhancements designed to address severe storms
- AmerenUE's EERP organization is consistent with leading practices found in the electric utility industry,
- AmerenUE adapted to the unique challenges of the major events very well,
- Training and job aids are critical components of an emergency restoration plan and AmerenUE has incorporated these tools into the EERP for many of the positions, and
- AmerenUE's approach of using the OAS system to guide the repairs is effective for Levels I and II, but becomes questionable in Level III events

7.3 Conclusions

7.3.1 The AmerenUE EERP provides a uniform approach for responding to any T&D emergency.

The intent of the EERP is to define consistent emergency procedures for the company, which should translate to an appearance of consistency and uniformity to the public As written, the plan clearly defines the roles and responsibilities of personnel and leaves specific actions to the individuals The plan implies the following specific guiding principles for all AmerenUE actions

- Return all customers' service as soon as possible (For Levels I and II there is a 72 hour goal),
- Ensure employee and public safety, and
- Maintain environmental stewardship

The primary role of Emergency Operation Center (EOC) is to support and coordinate overall restoration activity in the Divisions The EOC is responsible for ensuring that the Divisions have the resources and materials to affect a uniform restoration of service across the Missouri system The Divisions have their subordinate plans, which are tactical in nature Those interviewed for this review generally felt that the primary division of responsibilities performed well in both the July and December events

7.3.2 AmerenUE's EERP plan is consistent with industry leading practices, but will benefit from several enhancements designed to address severe storms.

AmerenUE's plan benefits from many years of constant refinement However, these refinements were based on Level I and II storms The following seven findings address more severe storms

- The current storm levels should be expanded with clear definitions for the severe storm levels,
- AmerenUE's goal of completing all restoration work within 72 hours is commendable, but this goal will likely be unattainable with wide-spread major damage,

- Critical ancillary elements of the overall EERP are not fully integrated into the master plan,
- Division level plans which make up the tactical component of the overall EERP can be inconsistent in their content or ties to the overall EERP,
- AmerenUE currently does not provide for a forensic failure analysis as part of its plan,
- AmerenUE's plan did not include a means for unburdening the system dispatchers, which in turn created some delays in executing work while crews waited for WPA clearances, and
- AmerenUE's EERP does not include checklists for before, during or after the emergency

7.3.2.1 The current storm levels should be expanded with clear definitions for the severe storm levels.

The leading practice within the industry is to categorize events and tailor the appropriate response for each category Generally, there are at least three levels of emergency conditions defined using any combination of the following descriptors

- Weather and wind types,
- Number of customers without service,
- The amount of time estimated to restore all customers,
- Estimated level of damage,
- Whether the problem is isolated to one area or is it system wide, and
- Need to bring in outside crews to support the restoration

Exhibit 7-2 shows the determinants that several leading utilities use to define the restoration effort The most common determinant is the type of weather, followed closely by the type of winds The other determinants are more sporadically applied

Determinant	Northeastern	Southeastern	Southern	Western	AmerenUE
Type Weather	♦	♦	♦	♦	
Type Winds	♦		♦	♦	
Projected Customers out	♦				
Estimated Restoration time	♦				
Estimated System Damage	♦			♦	
Operating Areas Involved		♦[9]			♦
Type & Location of Crews		♦[10]			♦
LEVELS	5	4	5[11]	3	3

Exhibit 7-2: Determinants Applied to Emergency Definitions and Event Levels[12]

The AmerenUE approach tends to rely on the operating areas involved along with the number of crews These two determinants are considered as "after the fact", in part because AmerenUE does not have the luxury of a long lead-time for approaching weather that many of the coastal utilities have

Exhibit 7-3 shows one company's approach to defining specific categories In each category, management has gone to great lengths to define clearly the weather conditions that apply including the impact to their service territory in the form of customers impacted and project restoration time This level of specificity, allows them to make more informed judgments about what is likely to happen so that appropriate restoration decisions and actions can be planned

[9] For transmission
[10] For transmission
[11] Consistent with the five categories of Hurricanes
[12] KEMA Storm Benchmarking Data Base and Analysis

Storm Category & Resource Requirements	Typical Weather Conditions	Projected Number Customers Affected	Estimated Restoration Time
1 - Upgraded (Regional resources)	• Thunderstorms, rain and moving fronts • Moderate sustained winds • Moderate frequent gusts • Condition is short to mid term • Light to moderate damage to electric	Up to 7,000	8-12 Hours
2 - Serious (Other Company Resources)	• Heavy thunderstorms, rain • Strong sustained winds • Strong frequent gusts • Condition exists for several hours • Heavy damage to electric system • Heavy, wet snow	Up to 15,000	12-24 Hours
3 - Serious (Foreign Resources)	• Severe thunderstorms, Extremely heavy rains • Strong sustained winds • Severe frequent gusts • Condition 12-18 hours or longer • Extensive damage to electric system • Heavy, wet snow	Up to 40,000	1-2 Days
4 – Full Scale	• Nor'easter type storms, heavy rains • Strong sustained winds • Severe frequent gusts • Tropical storms • Condition exists for 6-12 hour	40,000-60,000	2-3 Days
5 – Full Scale Coastal Storm	• Hurricanes Category 1-2 • 25-50% Damage to distribution system • Condition exists for 12 hours	60,000-80,000	≤ 1 week
	• Hurricane Category 3-5 • >50% Damage to distribution system • Condition exists for >12 hours	>100,000	> 1 week

Exhibit 7-3: Leading Practice for Storm Definition[13]

[13] From a Northeast Utility's Storm Plan

Schedule RJM-E1-94

AmerenUE's approach to defining storm levels centers on after the fact determinants, affected areas and to a lesser degree, the resources required AmerenUE has the following three storm levels at present

- "Level I Storm – typically this type of storm damage can be handled by the affected Division's local resources and possibly the partial resources of an adjacent Division "
- "Level II Storm (Major Storm) – This restoration effort will involve the AmerenUE EOC and it is expected that the customers can be restored using AmerenUE employees and contractor employees currently on the AmerenUE property "
- "Level III Storm (Major Storm) – This restoration effort will involve the AmerenUE EOC For damage of this magnitude, it expected that the customers would be restored using AmerenUE employees, on property contractor crews, off property contractor crews and Mutual aid partners if needed This storm may also involve use of the Extensive Damage Recovery method (See Section Six) "[14]

While AmerenUE's definition of areas (Divisions) affected is reasonable, the definitions around resources can be interpreted in several different ways Again, this set of definitions was determined by the nature of the storms and the lack of advance warning afforded the company

Before the events of July and December 2006, Levels II and III were considered major storms In fact, Levels II and III are reasonably small to moderate storms that cause isolated or generally localized damage to the T&D system These storms' restorations are in 72 hours or less The 72 hour restoration goal set by management is reasonable

The level of damage is described by the estimated resources required to complete the restoration within management's goal Level III storms can be described as a catchall for all other storms requiring the use of more resources than are generally on the property

[14] Ameren EERP dated 5-1-06, Page 5

7.3.2.2 AmerenUE's goal of completing all restoration work within 72 hours is commendable, but this goal will likely be unattainable with wide-spread major damage.

KEMA has not come across many utilities that have established restoration goals in advance of a storm event This puts AmerenUE on the leading edge of storm recovery practices This goal has served AmerenUE well in its Level I and II storm recovery events For Level III events, it has proven to be challenging

Since Level III encompasses all other storm conditions, including the type of events that occurred during July 2006, December 2006 and January 2007, having a preset restoration goal is difficult In these unique events, management would be better served having the senior EOC management team set the goal after there is a preliminary assessment of the magnitude of the damage

7.3.2.3 Critical ancillary elements of the overall EERP are present, but not fully integrated into the master plan

A leading practice identified by KEMA is to have all the critical elements of a plan tied together in the master plan This affords management a complete view of the restoration effort required to restore the system, coordinate with other governmental agencies and communications with the public Specifically, these plans contain the following restoration elements

- Organization,
- Position descriptions with qualifications and training requirements,
- Strategy,
- Critical checklists,
- Process maps or descriptions,
- Description of IT system tools,
- Call out rosters,

- Critical Customers,
- Critical local, state and federal contacts,
- Communications plan,
- Mutual aid contacts,
- Contractor rosters,
- Staging areas and layouts,
- Lodging, laundry, crew transport (between staging areas and sleeping accommodations) and food services contacts and arrangements,
- Vehicle support, and
- Portable generator sourcing, etc

An individual generally maintains these plans, or more likely a dedicated group, as is the case in several recent utilities KEMA reviewed KEMA is not implying here that this individual or group is solely responsible for developing the elements, but that they are responsible for assembling the master document and ensuring the necessary updates are completed This ensures that restoration knowledge management is fully documented In some states like New York, the entire plan is filed annually with the State Commission

AmerenUE has all these elements, but they are not assembled into a coherent master plan Generally, all these elements have worked well at AmerenUE with exceptions covered in other areas of the audit review Further, some of these elements, e g the vehicle fueling, discussed later, are not documented

7.3.2.4 Division level plans that make up the tactical component of the overall EERP can be inconsistent in their content or ties to the overall EERP.

Division level plans make up the tactical component of the overall EERP and are therefore the critical link between the field activity

and the EOC Generally, the Division plans are not consistent in their content or ties to the overall EERP Exhibit 7-4 compares the plans provided to KEMA

PLAN COMPONENT	Gateway	Boone Trails	Gravois Valley
Plan purpose	X	X	X
Activation criteria	X	X	X
Define senior mgmt roles	P[15]	X[16]	P
Define subordinate roles		X[17]	
Staffing requirements	X	X[18]	
Damage assessment process defined	X		X
Staging well defined	X	X[19]	X
Material requirements	X	X	X
Logistics parameters	X	X	X
Mgmt callout roster	X	X	X
Field Checker callout roster	X	X	X
Hotel, caterer & restaurant contact information	X	X	X
Fuel source contacts	X		X
Other support contact information	X		X
Critical customer list			
Local government officials/services contacts			
Substation & feeder lists		X[20]	
Substation & feeder priority lists			
Customers with self generation			
Key checklists		X	
List of potential crew squad leaders		X	

Exhibit 7-4: Comparison of Divisional Emergency Response Plans

As seen in Exhibit 7-4, the plans contain the majority of information necessary to call out personnel and acquire needed outside logistics support What was noticeably absent from the plans included

- Critical customer lists and contact information,
- Local government officials and services contacts, although the EOC maintains a contact list,

[15] P in Exhibit 7-4 stands for Partially complete KEMA's opinion
[16] From Ameren's Boone Trails Plan – Uses automated tool for contact information
[17] From Ameren's Boone Trails Plan – Uses automated tool for contact information
[18] From Ameren's Boone Trials Plan – Identifies the process to be applied
[19] From Ameren's Boone Trails Plan – Includes specific contact information and aerial photos
[20] From Ameren's Boone Trails Plan – Includes customer count by feeder and service center responsibility

- Substation and feeder priority lists, although one plan included a list of both with the number of customers, and
- A list of customers with some level of self-generation

Maintaining some of these lists can be quite an undertaking, but doing so will aid management in setting priorities that are more effective

There were several other elements covered by some Divisions and not by others The information contained in these plans is critical local knowledge This knowledge can aid management in better focusing its response to a significant outage with assurance that it has not forgotten any important element

7.3.2.5 AmerenUE currently does not provide for a forensic failure analysis as part of its plan.

A recent addition to emergency restoration plans is the need for a forensic failure analysis process and team This was first developed in the Southeastern utilities to determine the nature of the failures and how best to minimize them in future storm events In Florida, where utilities face hurricanes annually, the State Commission is requiring all regulated utilities to have a process incorporated into their plans

AmerenUE currently does not provide for a forensic failure analysis as part of its plan As a result, KEMA was only able to accomplish a high-level review of the failures that occurred on the system Had a process and team been in place, KEMA could have provided more information leading to an overall comprehensive system hardening strategy

7.3.2.6 AmerenUE's plan did not include a means for unburdening the system dispatchers, which in turn created some delays in executing work, while crews waited for WPA clearances.

When utilities are required to bring in multiples of their normal crew complement there is bound to be some congestion Specifically, this congestion occurs around the system dispatchers, whose responsibility is to issue clearances and switching orders Clearances

are the front line of safety protection for the crews and public All utilities take the clearance process very seriously and provide specialized training to their system dispatchers who are generally the only authorized agents to grant clearances Switching impacts the state of the system, i e , how energy is moved across the system and is an integral part of the restoration process

The leading practice in utilities that regularly experience major outages -- leaving over fifty percent of their customers without service for long periods -- is to divide the management of the restoration into smaller more manageable areas This can be accomplished by assigning feeders or substations to specific individuals who have full control of the state of the substation and feeders assigned In one southern coastal utility, they incorporated a very formal process for assigning the control of a substation and its feeders to a local manager The process has very clear instructions on how to conduct hand-offs in either direction with a formal paper trail That local manager then controls all the restoration and switching activities on his assigned feeders

At the time of the 2006 storms, management had not previously experienced this level of system destruction, but responded very quickly by expanding its work force five-fold This huge increase in the number of crews put a burden on the system dispatchers and tools they use to issue clearances This situation delayed many crews in beginning their work, as they had to wait for clearances to be granted Ameren did activate a new Functional Agent program in an ad hoc fashion during the July storms, albeit on a limited scale

7.3.2.7 AmerenUE's EERP does not include checklists for before, during or after the emergency.

Checklists, whether manual or technology-based, are essential to confirming that an emergency response role has been properly executed Leading practices indicate that emergency restoration plans should include checklists for all jobs to serve as reminders of each position's responsibilities

Emergency response role employees are asked to perform unusual tasks on short notice during periods of potential stress A role-

specific checklist ensures the employee completes all expected tasks, obtains all information needed, and provides proper feedback to customers and other stakeholders [21]

7.3.3 AmerenUE's EERP organization is consistent with leading practices found in the electric utility industry.

The leading practice in the electric utility industry is to have a formal emergency restoration organization defined with the key positions fully identified and their respective roles, responsibilities and authorities defined This organization is designed to go into effect as soon as certain threshold conditions are met At that point, key positions are staffed within a short period and the call out for the critical skills begins

Generally, the Emergency Operations Center (EOC) leads these organizations Some utilities have begun to adopt the Incident Command Structure (ICS), created by the federal government The ICS differs from the EOC in that for any size event there is an Incident Commander while the EOC is generally reserved for the larger or more complex events Both of these approaches are effective

An effective emergency organization will have the following elements clearly defined

- Command structure,
- Critical positions,
- Master personnel roster with backups identified,
- A formal process communicating critical restoration information,
- Mobilization and demobilization triggers,
- A group to develop the restoration strategy,
- A group(s) to manage and direct the physical restoration efforts,
- Personnel assigned to managing
  - Staging resources,

[21] Review of EERP

- Accommodations to rest crews,
- Feeding crews,
- Guiding foreign crews,

- Checklists for each position identified in the plan delineating their responsibilities,
- Personnel and support systems dedicated to providing timely information to the various stakeholders, and
- Liaisons identified to work with government agencies and other first responder organizations

AmerenUE has a well-developed restoration organization There are primarily two levels, the EOC and the Divisions The EOC is the strategic and leadership group for the restoration effort and is co-located with the Electric System Operations at AmerenUE's headquarters

The AmerenUE EOC is the nerve center of the operation where the restoration strategy is set and additional resources are identified and contacted The EOC is responsible, through the communications organization, for crafting the messages given to the stakeholders Specifically, the EOC defines the media message content The one exception is the automatic updating of restoration statistics to AmerenUE's Outage website

Exhibit 7-5 shows the AmerenUE EERP organization The EOC personnel are responsible for interpreting the EERP to adapt to changing conditions during the event The boxes to the right show the key department managers who have a significant role in storm restoration

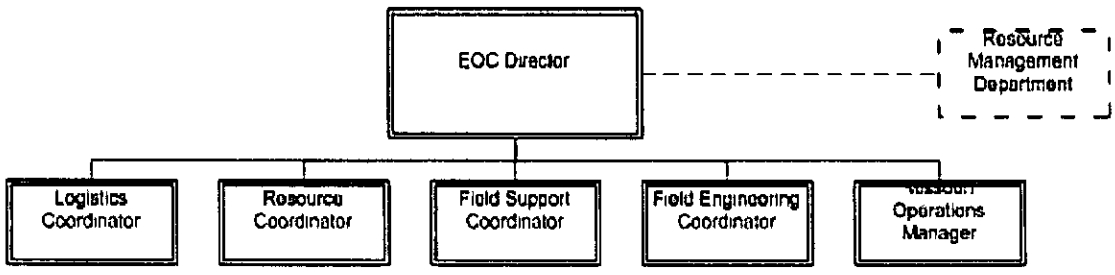


Exhibit 7-5: EERP Emergency Organization

Schedule RJM-E1-102

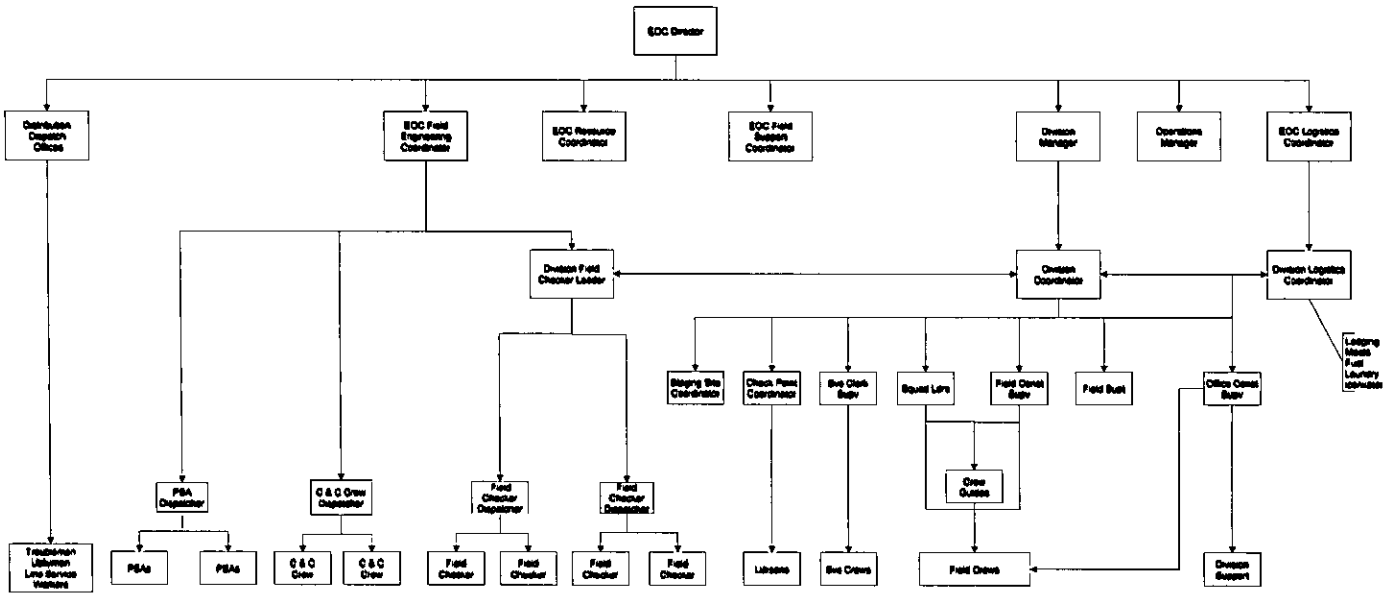


Exhibit 7-6: Depiction of both the EOC and Division Functions

The EERP provides position descriptions, but not the training or prerequisite qualifications requirements for the positions shown in Exhibit 7-5 and Exhibit 7-6 While the qualifications are not delineated in the plan, management has successfully matched the right people with the right roles for the critical EERP positions

7.3.4 AmerenUE adapted to the unique challenges of the major events very well.

Critical to any utility's successful restoration effort is the ability of the personnel and management team to adapt to the situation presented to them

AmerenUE did an excellent job of identifying EERP's shortcomings and overcoming each with a modification to the plan or process Several examples include

- Both storms hit with little notice, but AmerenUE was able to field resources numbering 3800 and 4400 or about five times the normal resources working on AmerenUE's property,

- The increased logistical effort to house this many crews when many of the hotels were already full,
- AmerenUE's well developed relationship with the Missouri Department of Transportation which allowed the movement of unprecedented numbers of foreign and contract crews through neighboring states rapidly, and
- As areas were completed, the resources were quickly moved to support other areas where the progress was slower

7.3.4.1 During the storm, effectiveness of Division management was impacted by the magnitude of the damage in their area of responsibility, but each Division quickly adjusted its respective plan.

In today's electric utilities, KEMA sees fewer Area Operations (Division) Offices staffed by fewer people while covering a larger territory During normal operations, this is a cost effective structure, however, during severe storms it will stretch the best of the operating organizations as system damage is highly dispersed

Some utilities will further divide their operating centers into smaller units to provide more local control over smaller areas This approach ensures that smaller communities are not forgotten during a restoration effort and permits the required focused attention

KEMA did see evidence that the Divisions generally functioned well in their storm roles As stated earlier, one Division Manager opted to invoke Section Six of the EERP Other Division Managers would have preferred to have faster notification of arriving foreign crews to expedite work assignments As the crews came to AmerenUE they were assigned to Divisions, but the Field checkers had not provided enough information to produce the needed work packages as they were still evaluating the damage

7.3.5 Training and job aids are critical components of an emergency restoration plan; AmerenUE has incorporated these tools into the EERP for many of the positions.

The majority of utilities provide training to assigned emergency response personnel This training can take many different forms, including but not limited

to classroom, tabletop, and field exercises A significant number of utilities capture these costs in their annual budgeting and accounting processes

KEMA concurs with this leading practice for training, but also recommends the addition of a formal system of training evaluation To ensure that training is effective, participation is measured and analyzed while the skills to be acquired and/or maintained are tested during and after the emergency response role training

Because emergency response roles may be different from normal assignments, training is important Because emergency response roles are assumed on short notice and with limited time for preparation, checklists, supporting technology, and other tools and aids should be available for employees

AmerenUE does provide training for several functions including the Field Checker and the new post storm Functional Agent The Field Checker is the front line position for identifying and reporting the extent and nature of the damage The Functional Agent is a new position designed to take control of a substation or feeder and manage all the work including the Workman's Protection Assurance (WPA)

7.3.5.1 AmerenUE has a formal Field Checker (Damage Assessor) training program, but should have provided more qualified Field checkers to handle an event of this magnitude.

Well-qualified damage assessors are critical to any storm plan and restoration efforts A qualified and knowledgeable damage assessor can establish a more efficient and effective restoration process These individuals provide critical information regarding the specific nature of primary failure that allows crew dispatchers to send the right type of crews and materials to hasten the repair The practice of using trained damage assessors is considered a leading practice in the utility industry

Training programs are designed to provide the damage assessor with required tools to adequately describe the damage Then appropriate crews and materials can be assigned for repairs At leading utilities, damage assessors are pre-selected based on their knowledge of the system and geography Many utilities budget for the training, which is often mandatory

AmerenUE's damage assessors are known as Field checkers The majority of Field checkers reside in the Division Field Engineering functions and are eminently qualified to perform this vital function The backup for the Division Field Engineers comes from the St Louis Corporate headquarters' engineering function These additional personnel have varying qualifications and levels of proficiencies and therefore require the most training

The training program covers the following topics [22]

- Establishing the scope of a storm (short-lived or multi-day event) during the first six to 12 hours,
- Setting an initial target of 24 hours for a complete assessment,
- Setting work and environmental expectations for the Field checkers,
- Defining proper damage assessment practices and procedures,
- Explaining the damage assessment process,
- Reviewing use and terminology of overhead circuit maps,

[22] Source Review and analysis of Company documents

- Reviewing the potential safety issues (downed live wires) and how to deal with them in the field, and
- Reviewing general types of T&D equipment and structures

There is no formal or informal means for evaluating how well the attendees learned the skills put forth in the class Further, basic skill requirements for the Field checkers do not appear to be formally defined in any document

7.3.5.2 AmerenUE does not measure the effort devoted to emergency response planning and training.

Unless training time and its costs are budgeted, other "measured" priorities will take precedence. Without proper training, restoration efficiency may be adversely impacted and will incur higher costs Training is not budgeted at AmerenUE and instead charged to overhead accounts, which can diminish training

7.3.6 AmerenUE's approach to using the Outage Analysis System (OAS) to guide the repairs, works well for Level I and II storms, but becomes questionable in Level III events.

Many of the leading utilities who regularly face storm events and normal outages have installed Outage Analysis Systems (OAS) OAS supports management in the following ways

- Prioritizes the work according to parameters set by the utility,
- Defines the extent of a particular line/service outage,
- Finds the closest available crew,
- Determines the number of customers impacted, and
- Estimates the restoration time and other functions

The AmerenUE system was developed over ten years ago with periodic fine-tuning over the years AmerenUE has fully integrated SCADA and its CellNet automated meter reading tools into the solution Further, it has tied its outputs to its Outage website that gives its customers a very granular look down to the Zip Code level

OAS has performed well in the Level I and II events, and probably some smaller Level III events However, its application in the type of restoration situations brought about by the storms experienced in July and December 2006 is questionable There are several reasons for this conclusion

- Depending on the nature of the failures and where they occur, relative to the substation and customers, it is possible to get double counts of customers affected,
- Any restoration times calculated by OAS will need to be field updated once the full extent of the damage is known on a particular feeder, and
- The prioritization of work may not be optimal as the crews can be required to incur more windshield time as they move around an area performing the prioritized restoration work instead of finishing a feeder or lateral KEMA did not attempt to quantify this number but did receive comments from Division management

Fortunately, the EERP provides an alternative for this situation (Section Six, Extensive Damage Recovery) in the plan In the event of a significant level of damage, management will switch its restoration strategy to one that dedicates a crew(s) to work a specific feeder from the substation out Many utilities adopt this particular practice when faced with the kind of damage produced in the July and December 2006 storms

Management did not fully apply this alternate strategy across the system during these storms However, it was employed in one of the hardest hit Divisions to more effectively address its restoration

7.4 Recommendations

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

Levels I and II are reasonable Divide the existing Level III into a Levels III and IV The division between Level III and IV should focus on the overall estimated restoration time required For example

- Level III would be for severe storms where less than 200 feeders are locked out and less than 225,000 customers are out with an estimated repair time

less than 8 days Further, the numbers are greater than what is expected for a Level II event

- Level IV would be for severe storms where there are over 200 feeders out and over 225,000 customers out with an estimated repair time of over 10 days

7.4.2 Integrate all subordinate emergency plans into the master EERP.

EERP will include the following plans and components to ensure best practices for major storms are captured for future use For example

- Emergency Communications Plan,
- Support Logistics Plan (Lodging, Feeding and transportation for crews),
- Standardized content and formal inclusion of all divisional emergency response plans to align with the master EERP,
- Define the work process and storm triggers for mobilizing and demobilizing the Functional Agents role,
- Fuel requirement calculations and determination for the number fuel tankers necessary to support the expanded fleet,
- Coordination with the Missouri Department of Transportation (MODOT) to obtain emergency declarations under emergency conditions permitting contract and mutual aid vehicles to cross state borders unimpeded,
- Document all workflows and responsibilities for the major storm restoration processes,
- Identification of receiving staging areas located along major thoroughfares located at AmerenUE's service territory perimeter,
- Checklists for each position identified in the EERP for before, during, and after work activities,
- A fully defined process for conducting an initial damage assessment during the first hours of a Level III and IV event,

- Define and execute training requirements with evaluation criteria for Field checkers and Functional Agents, and
- Definition of the timing and content for scheduled storm drills

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

To ensure that AmerenUE has maintained its T&D systems appropriately, there should be a formal Forensic Analysis process that can be deployed during a major restoration effort The purpose is to evaluate the nature of the failures to determine if AmerenUE could have mitigated the failure through design or maintenance activities Specifically, AmerenUE should

- Develop a formal forensic analysis process that captures system failures during Level III and IV events,
- Develop a methodology to select a statistically valid sample for a specific Level III and IV event,
- Decide whether to conduct forensic analysis with in-house resources or by third parties
  - If in-house, develop a detailed process for analysis and the accompanying data capture tools and training programs, and
  - If contracting for the service
    - Develop a set of criteria to qualify contractors,
    - Select a contractor using AmerenUE's accepted bidding process,
    - Prepare a formal contract with specific performance criteria, and
    - Conduct joint exercises to ensure both AmerenUE and the contractor are prepared

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

Section Six is the only section within the EERP that addresses how the restoration should proceed in the event of a severe Level III restoration It is

critical that this section outline in some level of detail how to identify the most damaged areas and the process for restoring the effected areas in the most orderly fashion

As a result of implementing this recommendation the role of OAS will change In Level III and IV restoration efforts, the initial focus will be on repairing feeders and laterals from the substation in those areas where the damage is extensive The following eight activities must be covered at a minimum

- Define the concept and role of self-administered work islands,
- Determine the level of damage (poles and spans down) using the initial damage assessment,
- Estimate and obtain the required resources by crew type,
- Identify clear triggers for self-administered work islands,
- Determine the need for Functional Agents,
- Develop a formal process for transferring clearance control to a decentralized certified functional agent ensuring clarity in the transfer of accountability,
- Codify the role of Divisions in managing and supervising all in-house, contract, and mutual aid crews working within a division, and
- Reinforce the roles and responsibilities of safety supervisors with respect to self-administered work islands

While KEMA is recommending this be included in the EERP, we understand that it will likely be implemented by the Divisions

8. Emergency Restoration – Imminent Event Plan

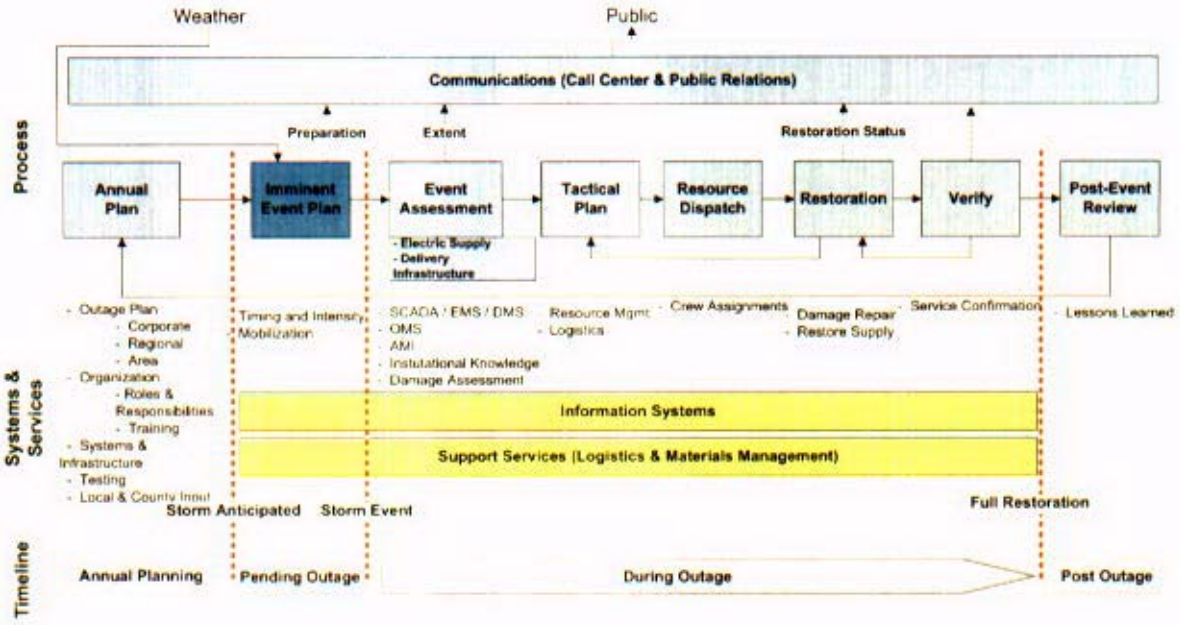


Exhibit 8-1: Outage Management Process – Imminent Event Plan

8.1 Industry Practices

Throughout the electric utility industry, companies have plans in place that detail when and to what extent that company's emergency response plan goes into effect. The first stage of the plan is, most often, the advance planning and mobilization that occur in anticipation of a specific event. The best example of this action is found in companies exposed to tropical storms and hurricanes where significant advanced warning allows for mobilization on an escalating scale. As part of any emergency response plan there must be detailed information on the various stages of planning, mobilization, and the "triggers" for those stages. This early planning and mobilization is tailored to the company and the specific exposure it experiences. Whether the company is in an area of exposure for hurricanes, tornadoes, earthquakes, sub-tropical storms, ice, or wind will determine what the specific plans and triggers should be.

8.2 AmerenUE Practices

Like other utilities, AmerenUE's practice in this area is driven by the amount of advance notice the company has of impending severe weather. AmerenUE, in its 2006 storms,

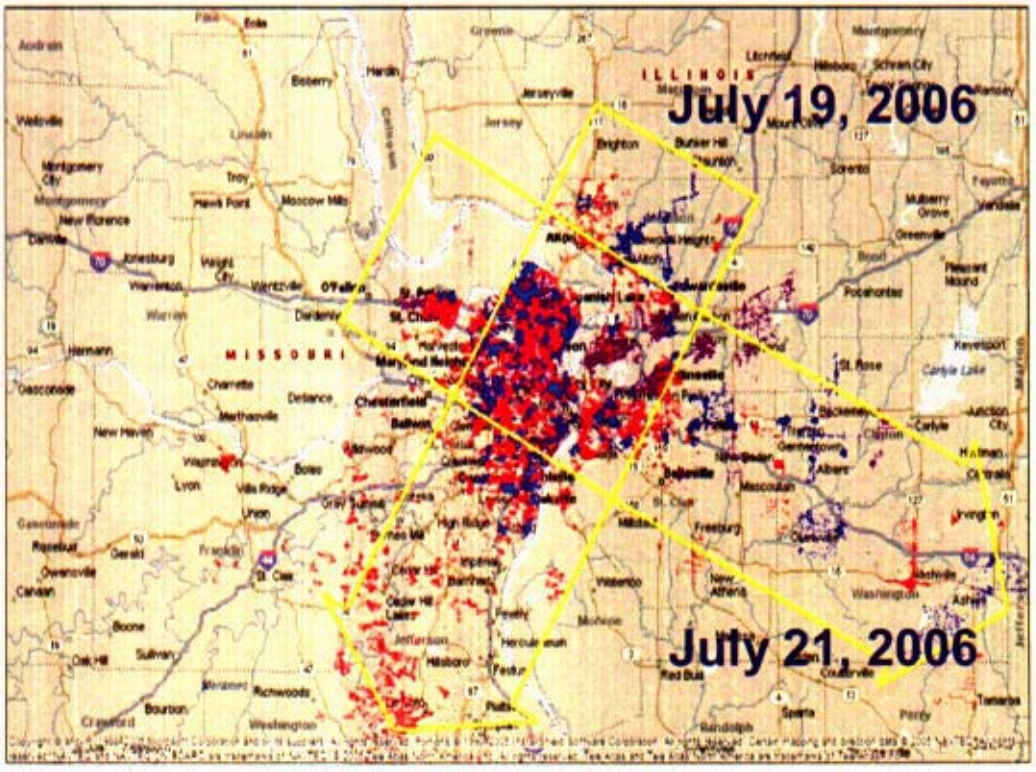
received no advanced warning as the weather service indicated that the July storms would miss AmerenUE's territory. In addition, for the ice storm of 2006, the weather service indicated that the majority of the storm activity would pass to the north of AmerenUE. AmerenUE opens the EOC once an event begins so the amount of specific event planning is minimal. However, within the EERP there are provisions for ongoing readiness for emergency response.

8.3 Conclusions

8.3.1 AmerenUE's severe weather events did not offer the luxury of advance warning to permit pre-mobilization.

This is a crucial point to understand. Unlike many Southeastern or Pacific Northwestern utilities that get several days warning that a storm is on the way, AmerenUE does not. As a result, AmerenUE has to be prepared to initiate its EERP on extremely short notice.

8.3.1.1 The nature of the July Windstorm(s) offered no opportunity for advance warning and consequently AmerenUE was not in a position to pre-mobilize divisional or corporate resources.



Schedule RJM-E1-113

Exhibit 8-2: July Windstorm Paths

The major events in July were both windstorms occurring with no warning and with sudden onset As Exhibit 8-1 indicates, the initial windstorm on July 19, 2006 blew from the northwest with damage focused in and around the St Louis metro area The second wind storm event on July 21, 2006 blew from the northeast also with sudden onset and no warning Some major events can be predicted to a certain degree Examples include a progressing winter storm front or the build up and approach of a hurricane The nature of the two July events with their sudden onset did not offer AmerenUE any warning to the impending event, and consequently, AmerenUE was not able to mobilize for the restoration response in advance [23]

8.3.1.2 **AmerenUE had advance warning of the impending December and January ice storms. Divisions were placed on alert and due to the geographically dispersed weather front, AmerenUE made the prudent decision to stage internal resources within divisional boundaries.**

The nature of the December and January ice storms offered AmerenUE some advance warning of the impending major event AmerenUE alerted divisional and first responder resources to mobilize for the upcoming restoration event Due to the large geographic extent of the weather front, AmerenUE prudently did not re-assign district resources to neighboring divisions until the extent of the damage could be ascertained [24]

8.3.2 AmerenUE follows industry-leading practice of monitoring weather services for impending weather conditions.

It is a well accepted practice within the industry for dispatch offices and emergency operations centers to subscribe to national weather services to receive as much advance notification of an impending weather event as possible The AmerenUE Distribution Dispatch Offices (DDO) adopts this practice and uses a service called Weather Sentry to monitor (National Oceanic Atmospheric Administration, NOAA) weather data for weather forecasts and lightning strikes

[23] Ameren OAS analysis, Press Releases
[24] KEMA Interview MK08, Ameren Press Release

Based on this information the DDO observes the development of pending severe weather and alerts divisions and the EOC management appropriately [25]

8.3.3 AmerenUE is enhancing its storm prediction capability by pursuing an initiative to improve localized weather monitoring during the pre and initial hours of a major event.

AmerenUE has recognized that its storm damage prediction capability is a weakness in its storm restoration process Currently, AmerenUE's information source is from the national weather service that provides an overview assessment of pending weather trends This type of information is not sufficiently granular to predict localized damage impacts AmerenUE is addressing this situation by discussing opportunities with vendors to enhance damage prediction abilities The initial concept is to deploy additional weather-monitoring stations throughout AmerenUE's service territory, providing a finer reporting granularity to better assess actual weather conditions The ambition of this initiative is to enable predictive modeling of the potential system damage in the first hours of a major event [26]

8.3.4 AmerenUE's practice of using a specific group to call in contractors is a leading industry practice.

Leading edge utilities will generally begin lining up additional resources in advance of a pending storm As soon as there is a high probability that a storm will strike, utilities begin the process of acquiring resources AmerenUE, in both of these storms, had little to no warning, but the AmerenUE process for this is well defined and worked extremely well

In order to better manage and control external resources, AmerenUE has elected to accomplish this through its Energy Delivery Technical Service's Resource Management organization The requirements for outside resource assistance are estimated by the EOC Director, the Resource Manager, and other managers The Resource Manager's team then begins the process of lining up resources from various contracting companies Another group calls in mutual aid (other utility companies) crews

The EOC management determines in which affected areas to deploy the crews As crews arrive they are immediately directed to the appropriate Division's

[25] KEMA Interview MK16
[26] KEMA Interview MK19

staging area for safety and operations orientation, followed by their initial assignment

AmerenUE differs in the process at this point by assigning foreign crews to a dispatcher to guide and direct their work activities for the duration of the restoration KEMA believes this to be a valuable industry leading practice These AmerenUE resources are part of the Energy Delivery Technical Service's Resource Management organization and not the Divisions' resources For the most part this process worked very well

8.4 Recommendations

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

AmerenUE is in the process of obtaining additional weather sites for its Missouri territory These additional sites, along with a better weather modeling tool, will help to predict damage and its severity KEMA concurs with AmerenUE on the following four activities

- Identify the number and location of additional weather stations to provide a more granular view of actual weather progression,
- Developing and testing a model that will reasonably predict the potential damage created by a weather event,
- Integrate the prediction model's results to AmerenUE's new storm categories for early triggering of storm classifications and potential restoration resource needs, and
- Provide a means for back casting actual versus predicted weather results for continual model refinements

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

AmerenUE has honed its ability to obtain crews on short notice and provide field management when the foreign crews are deployed KEMA believes that this continuum of obtaining and managing foreign crews is a leading practice and should be continued An improvement is to provide better notification of when

the crews are to be arriving in the Divisions During Level III and IV restoration efforts, the notification issue should pose less of a problem since the crews are assigned to working either a feeder or a set of feeders associated with a specific substation as opposed to working specific Outage tickets

9. Emergency Restoration – Event Assessment

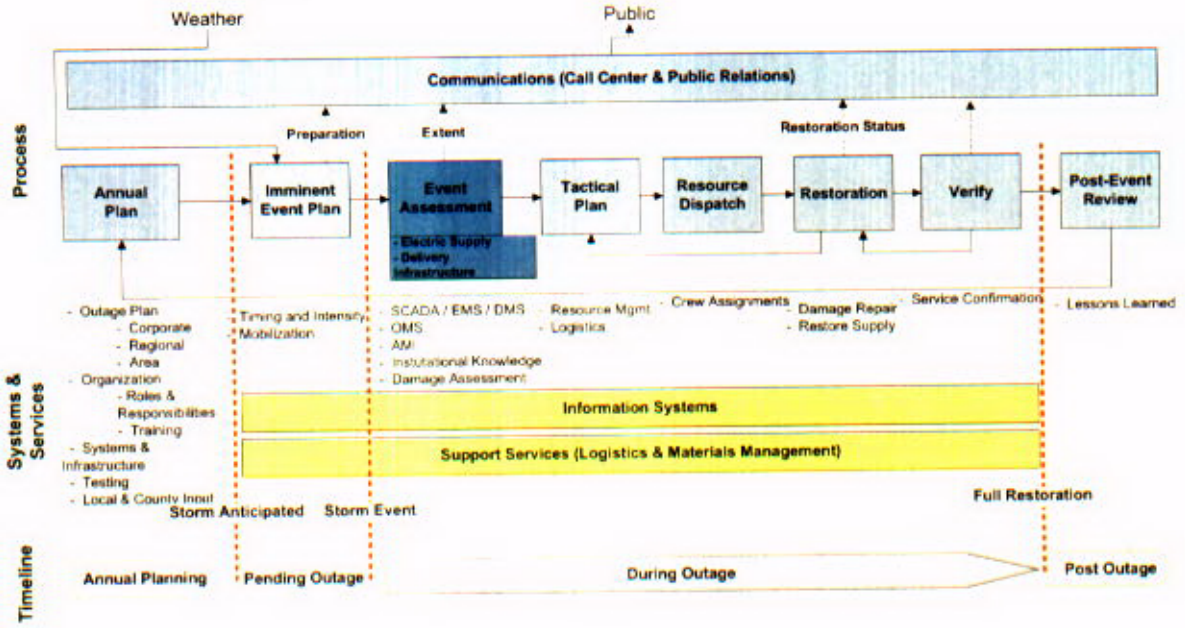


Exhibit 9-1: Outage Management Process – Event Assessment

9.1 Industry Practices

Quickly and accurately assessing damage from a major event varies widely throughout the industry. Those companies on the leading edge of this process are equipped with technology that enables earlier decision making on what areas need the most attention, in terms of on-site assessment and overall extent of damage. In all companies any technology used to facilitate this process is a tool to assist the early focus of the physical assessment. Technology deployed to field assessors permits building of a database containing the number of sites requiring repair, materials and labor estimates, and restoration estimates. In utilities employing outage management systems, the information from this technology will provide EOC management with a more robust and a more clear understanding of the level of damage. Throughout the industry however, this is largely a labor intensive process that requires smooth processes and focused responses in order to provide early information for effective decisions on resource allocation.

9.2 AmerenUE Practices

AmerenUE uses four primary business tools to assess the magnitude of the major event They are

- SCADA and EMS system observations at the Distribution Dispatch Office (DDO),
- OAS which logs all customer calls,
- Field damage assessments, and to a limited degree,
- CellNet's Automated Meter Reading information

AmerenUE's Electric Emergency Restoration Plan (EERP) defines responsibilities for assessing field damage during major events These responsibilities include

- Conducting an initial high level damage assessment, and a
- Detailed field damage assessment

High-level damage assessments are coordinated and dispatched at the divisional level It is at the division's discretion as to when to conduct a high-level damage assessment prior to initiating detailed damage assessments [27] Section 4 2 of the EERP provides a general description of a high-level damage assessment but lacks any real specificity The KEMA team did not find any evidence that a high-level field damage assessment process was routinely conducted in areas that exhibited Level III damage One rural region used helicopter patrols to conduct a quick assessment of the system damage The rural nature of the terrain dictated the use of an aerial assessment This aerial inspection approach is not practical in urban areas or areas where the foliage canopy obscures the visual inspection of the system [28]

AmerenUE conducted detailed damage assessments in all affected regions according to the process outlined in Exhibit 9-2 [29]

[27] Electric Emergency Restoration Plan
[28] KEMA Interview RG, BS
[29] KEMA Interviews MK06, MK17

Field Checking Mobilization & Damage Reporting Process v3

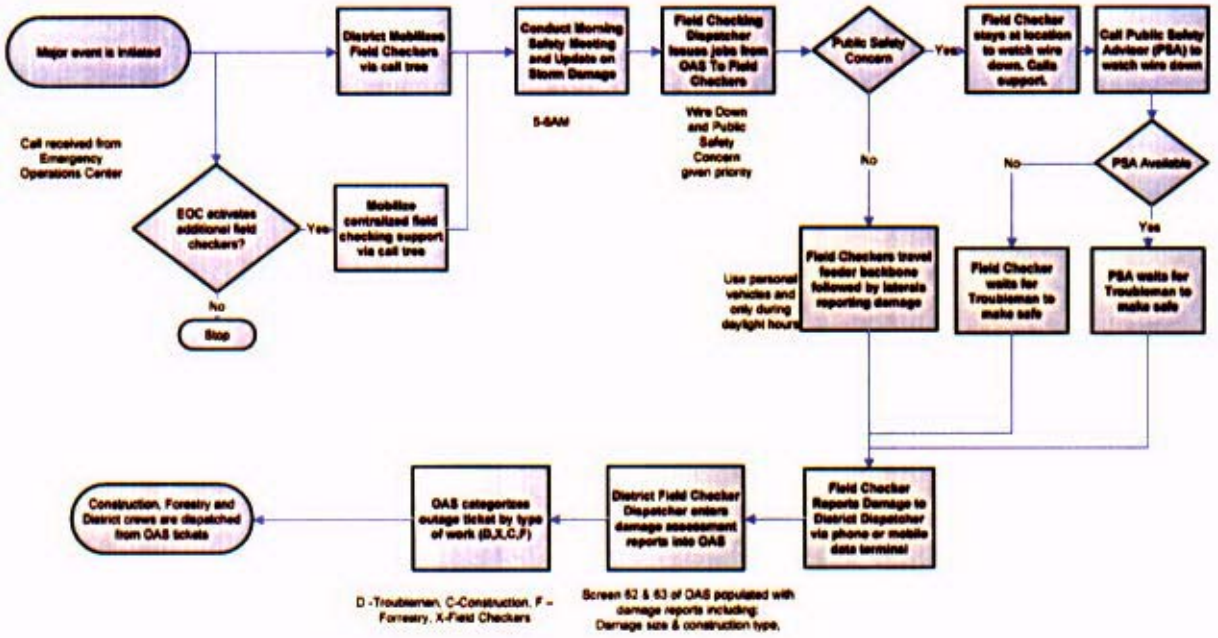


Exhibit 9-2: Field Damage Assessment Mobilization and Reporting

Mobilization of Division and supplemental field checking resources occurs through established call-out trees.

The field checker dispatcher prioritizes the OAS trouble tickets and dispatches field checkers to locations reported in the system. Field checkers use their personal vehicles to inspect system damage and generally conduct damage assessments according to the following priorities:

- Largest customer outage areas,
- Wire down reports, and
- Trouble tickets closest to the substation, followed by inspection of feeder laterals and finally secondaries.

Field checkers report system damage via cell phone to the field checking dispatcher, who in turn, enters the information into the OAS system. The information collected in the field includes:

- A description of the magnitude of damage (single pole down vs multiple span),
- Front/back lot construction,
- Type of construction including pole height, cross-arm design, conductor type, and
- A tree on line

Field checkers place the highest priority on public safety concerns, especially wire down reports At a wire down location, Field checkers prevent the public from entering the hazardous area The Field Checker will request an AmerenUE Public Safety Advisor (PSA), through the PSA Dispatcher, to relieve the Field Checker or until either a troubleman or Cut and Clear crew can confirm the area is de-energized

The field checking process is active during daylight hours Due to safety implications, AmerenUE does not conduct field checking during the night period [30] The July windstorm event started in the early evening, field checking of system damage did not initiate until the following morning

Field checking generally continued for the duration of the major event Once all the major damage on feeder backbones and laterals is identified, field checkers will transition to assessing damage on secondaries and service connections When field checkers assess damage on secondaries and service drops it is a routine practice to hang a door tag informing the customer of AmerenUE's responsibility for electric service restoration and the actions the customer should take to restore cable or phone service, or to repair customer owned electric facilities such as weather heads See Exhibit 9-3 for examples of door tags [31]

[30] KEMA Interviews MK03, MK06, MK17
[31] KEMA Interview MK05

Exhibit 9-3: Door Tag Hangers

9.3 Conclusions

9.3.1 The EOC appropriately uses the SCADA and EMS systems as the primary tool to determine the initial scope and magnitude of the event.

It is common practice in the industry to have a SCADA system installed. The SCADA, abbreviation for Supervisory Control and Data Acquisition, is a system that allows the remote monitoring and control of key electrical equipment at substation locations throughout the system. SCADA systems, initially installed in transmission substation facilities, have been installed in many distribution substations providing indication and control of distribution substation equipment in the past 30 years. SCADA applications at the distribution level generally will only indicate that a feeder is energized or de-energized and generally does not provide any insight as to the state of the feeder outside the substation fence.

DDO through SCADA receives the first indication of the magnitude of a major event. AmerenUE SCADA system is robustly deployed with most distribution substations in the St. Louis metro area providing indication of the system power flows. In rural areas, the SCADA system is less extensive. In these areas, there is limited indication of system power flows and remote switching of feeders. As feeders trip off-line, SCADA registers these events in seconds and displays the

results in OAS In more remote areas where SCADA does not provide an indication of distribution feeder status, AmerenUE relies on customer calls to determine the loss of service During the July, December, and January events, the DDO received the first report of the extent of disruption to the power grid from the SCADA system [32] This initial SCADA information is the primary source of information for the EOC in determining the extent and magnitude of the system disruption at the onset of the event

9.3.2 AmerenUE's technology and processes for event assessments perform well to estimate restoration times for Level I and II events, but do not scale well for Level III events.

A common occurrence found by KEMA is the inability of emergency restoration plans and technology to scale effectively to address severe restoration efforts, unless the utility has had experience with extreme weather, similar to what Southeastern utilities experience with Hurricanes

9.3.2.1 AmerenUE does not perform a formalized high-level statistical damage assessment process to estimate initial storm damage during Level III events. Instead, AmerenUE relies on its institutional knowledge of historical Level I and II events to make an intuitive decision to mobilize contract and mutual aid resources.

Leading industry practice during Level III events is to conduct a high-level assessment during the first six to eight hours after the initiation of the event Leading utilities conduct an initial statistical assessment of the affected areas The assessment process begins by driving the damaged system starting at the Substation (feeder header) and following the feeder along its path This statistical assessment is designed to provide rough counts of downed lines, broken poles, and downed trees to the EOC There is no attempt by damage assessors assigned to this statistical assessment to capture details of any single event, that is done later This statistical assessment is critical information for the EOC to determine resource requirements and is needed to estimate the duration of the restoration effort [33]

KEMA's interviews revealed that during Level III events there is no formal statistical damage assessment process for assessing high level

[32] KEMA Interview MK16
[33] KEMA Interview MK14

system damage, estimating area wide restoration times, and consequently, crew requirements during the first six hours of the restoration effort

AmerenUE does not have a formal model to predict the order-of-magnitude of expected system damage associated with impending weather conditions Additionally, KEMA could not identify a formalized process for early estimation of restoration times Consequently, the EOC relies on its experience gained from historical events and real-time SCADA and EMS information to make an initial estimate of the events magnitude Management has not experienced storms of these magnitudes in the past and as such relied on their experiences of Level I and II events to make the call that more resources would be required than ever before to effectively deal with them It is not until damage assessment reports are received from the field that AmerenUE was able to compile a comprehensive assessment of the extent of system damage and make an educated estimate of restoration times [34] This process took up to a week to complete in some of the hardest hit areas

Without the aid of an initial high-level statistical estimate of system damage, it is difficult for management to accurately quantify resource requirements other than taking the position of "obtaining every possible resource that is available " This can hamper the ability of Corporate Communications to provide the public with early order of magnitude assessment of the storm AmerenUE's senior management had set a blanket target of 72 hours for the restoration of outage events Without the input from a high-level damage assessment process AmerenUE could only ascertain from the number of customers out, the number of devices predicted out by the Outage Analysis System, and the number of feeders locked out by SCADA that the July events would require significantly more restoration time [35] However, AmerenUE did much better projecting the December storm restoration time The implications of this inability are reviewed in Section 13 3 of this report

[34] KEMA Interview MK16, Ameren Electric Emergency Restoration Plan
[35] KEMA Interviews RG01, MK19

The EOC management would like to see the adoption of 24-hour coverage for a high-level statistical field damage assessment during the early hours of a major event to improve AmerenUE's ability to determine the level of the restoration resources that need to be mobilized [36]

9.3.2.2 **AmerenUE's detailed damage assessment process is effective at identifying system damage, which scaled well during the Level III events, but lacked consistency in the specificity needed for restoration crew dispatchers to efficiently deploy crews.**

Damage assessment is critical to any storm restoration program The purpose of damage assessment is to provide management with a clear picture of the level of damage to the T&D assets This information has two primary objectives

- Provide a detailed analysis of what needs to be repaired at each site, and
- Provide a prioritized pipeline of detailed work orders keeping restoration crews engaged from the outset of the major event

Estimation of crew resources implicitly suggests an estimate of restoration time but, during Level III outages, no documentation or confirmation of that restoration estimate is made until crews are on site [37] Additionally, the OAS system logic for estimating restoration is not designed to handle the volume of extensive damage experienced during Level III events

Since 2005, AmerenUE has trained a significant number of additional field checking and public safety advisor resources to supplement the divisional field checking resources [38] Currently there are approximately 200 trained field checkers and public safety advisors The supplemental field checking work force comes from centralized engineering functions, while the public safety advisors are drawn mostly from administrative staff ranks The role of the public safety advisor is to secure wires down sites until crews can make the area safe or effect repairs

[36] KEMA Interview MK19
[37] KEMA Interview MK19
[38] KEMA Interview MK14, Field Checker Training Syllabus & Video

AmerenUE provides daylong training for this supplemental staff in the following areas [39]

- Field Checker training,
- Public Safety Advisor training, and
- OAS refresher training

The syllabus is comprehensive and covers the following topics:

- A review of field checking / Public Safety Advisor roles and responsibilities,
- Overview of the electric system configuration and protective devices,
- Safety issues covering safe field checking practices, minimum approach distances, and other safety topics, and
- A testing component to ensure adequate knowledge transfer

However, a lack of formalized procedures and standardized checklists across the AmerenUE service territory introduced inconsistencies into the reporting of system damage The primary purpose of field damage assessments is to ensure that restoration crews are dispatched efficiently and effectively with appropriate material and equipment complements Restoration crew dispatchers are handicapped by the lack of specificity in damage assessment information entered into the OAS system reducing the efficiency of the restoration effort [40]

Exhibit 9-4 shows an example of AmerenUE's distribution system in Clayton highlighting a back-lot system design prevalent in this area

[39] Syllabus documents for Field Checker Training & Video, Public Safety Advisor Training
[40] KEMA Interview MK08

Exhibit 9-4: Example of Back-lot System Design

A lack of specific information from the field damage assessment could potentially lead to restoration resources arriving on site without the appropriate equipment to be able to access the system and effect repairs.

To assist in streamlining the field checking process, AmerenUE has issued mobile data terminals to supplemental field checkers.[41] These hardened laptops provide field connectivity to AmerenUE's OAS permitting direct field entry of damage assessments into the system. AmerenUE will continue to provide backup using other forms of communication in the event of cell tower outages. KEMA believes this is a distinct advantage and a leading practice as it shortens the time for damage data analysis.

9.3.3 Restoration crews provide direct feedback of an estimated repair time, however, this completion time may not be the same as a restoration time during large-scale events.

When an assigned crew reaches the work site, they perform a quick analysis of what must be repaired and the time needed to complete the repairs. This

[41] KEMA Interview MK01, MK17

information is radioed back to the construction dispatcher in order to refine the OAS estimate of restoration time. However, during Level III events the estimated restoration times provided by the OAS is not as useful in determining a restoration of service time during major events as there may be additional system damage both up and down stream side of the feeder preventing restoration of service.

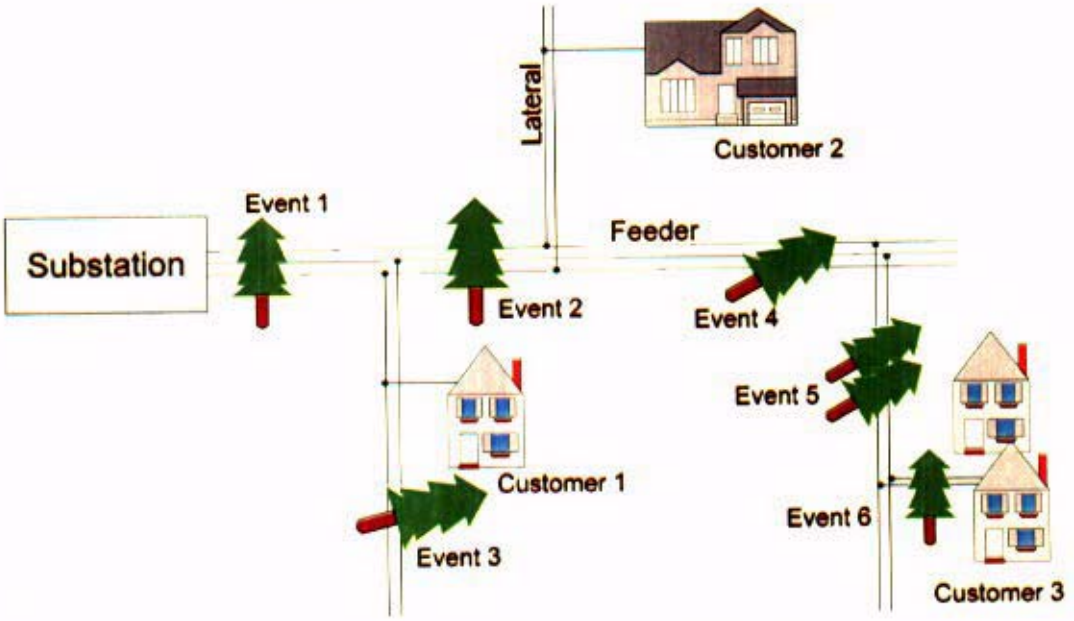


Exhibit 9-5: Outage Event Example

Exhibit 9-5 shows KEMA's reasoning for not equating restoration time with repair time. In this diagram, six emergency events (indicated by tree symbols) are identified on the feeder, its laterals, and services. Customer 1 may be associated with Event 1 in the OAS. When Event 1 is repaired, Customer 1 is returned to service. In this case, restoration time equates to repair given by the crew. Customer 2 may also be associated with Event 1, but because of a second feeder event, the restoration time would be the total time needed to repair for Events 1 and 2. The restoration time for Customer 3 will be the total time needed to repair events 1, 2, 4, 5 and 6. Compounding Customer 3's time is that its repairs cross from the feeder to the lateral and then the service; this means the actual repair time will be far greater than the simple sum previously stated. Repairs are done to Feeder (Event 1, 2 and 4), then the laterals (Event 5) and finally, the secondaries (Event 6).

9.3.4 AmerenUE's adoption of a Public Safety Advisor position is a leading practice.

The PSA is a unique position to AmerenUE and a new leading practice The role of this individual is to safeguard the public once a downed electric power line is identified This frees the Field checkers to continue their damage reporting which drives the creation of work assignments in OAS

In addition to the PSA AmerenUE has assigned Cut and Clear crews to the PSAs and the PSA Dispatcher The Cut and Clear crews are responsible for cutting any downed power wire that could be a hazard This relieves the PSA, police officer or firemen from having to guard a hazardous wire down situation for long periods of time The Cut and Clear crews are outlining troublemen who are assigned to cover this critical safety work Local troublemen are not used for this, as they are performing switching and other high order restoration line work

9.4 Recommendations

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

The leading practice in the industry is to implement an initial damage assessment to gain a reasonable understanding of the level of damage to the system immediately after the storm subsides This assessment needs to be completed quickly so foreign crews (both contractor and utility crews) can be called in as soon as possible KEMA suggests that feeder lockouts be the first indicator of severity and should be used to determine where the initial damage assessment should be conducted

The required tasks include

- Conceptualize the initial damage assessment process,
- Define the available inputs and required information outputs for the initial assessment,

- Define the work processes, roles and responsibilities, information flows, and methodologies to predict
  - Proper classification of the storm event,
  - Macro estimate of resource requirements, and
  - Initial estimates of restoration time
- Back cast the assessment algorithm to ensure reasonable accuracy and continued refinement,
- Develop work aids, tools, etc ,
- Integrate the initial damage assessment into existing processes, and
- Provide training to appropriate personnel

9.4.2 Expand the use of the leading practice of using Public Safety Advisors (PSA) and Cut and Clear crews permitting Field checkers to focus on damage assessment while simultaneously ensuring the public is safeguarded from electric.

KEMA believes that AmerenUE could increase the number of trained PSAs to support the potential safety hazards This would involve identifying new candidates and providing the required training Depending on the extent of damage, AmerenUE may elect to create additional Cut and Clear crews to support the PSAs

10. Emergency Restoration – Execution

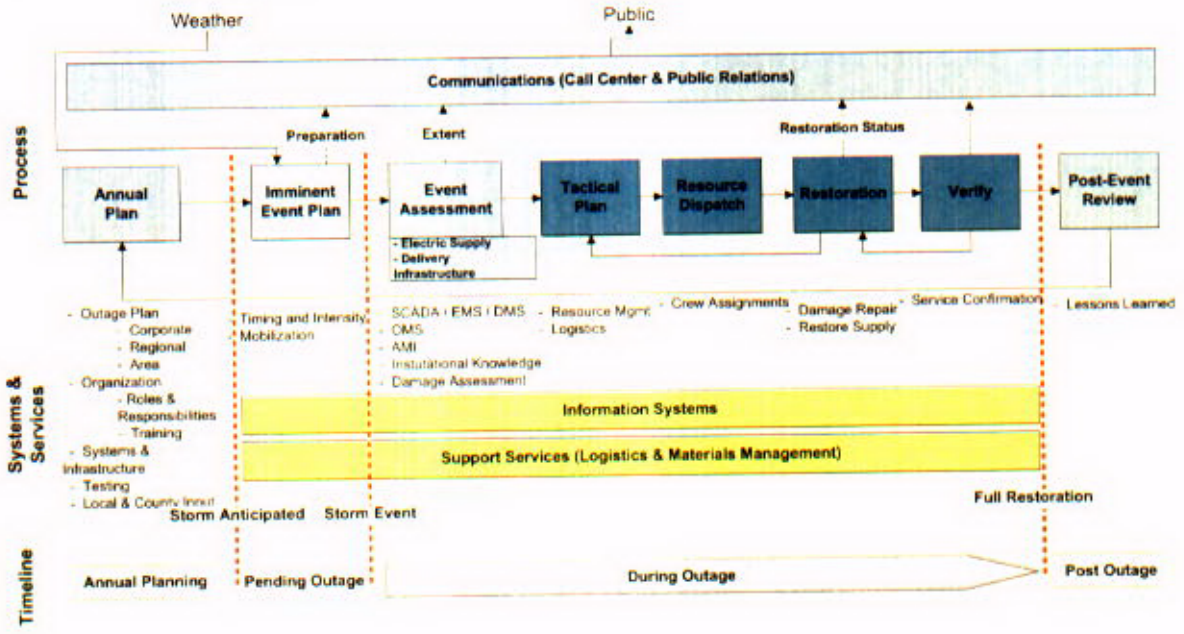


Exhibit 10-1: Outage Management Process - Execution

10.1 Industry Practices

Reliable utility services (electric, gas and water) are essential to maintain our standard of living and provide the infrastructure for our advanced economy. Utility employees recognize their "public service" role and generally exhibit a strong sense of duty, timeliness, compassion, and teamwork, which supports reliability. These attributes form the "utility culture". Consistently, the utility industry has seen increased levels of performance from its employees during the most adverse times and situations, such as outage events.

In addition to strong employee dedication to the "public service" role, effective execution of major event restoration requires the ability to quickly mobilize large numbers of resources, efficiently dispatch resources, and manage material disbursements and provide logistical support for the army of individuals involved in the restoration effort.

Industry leading practices include the ability to quickly re-assign employees from day-to-day responsibilities into a major event mode, have employees well rehearsed in their

storm restoration roles, and efficiently choreograph restoration activities under challenging conditions

10.2 AmerenUE Practices

AmerenUE employees exhibited a strong public service attitude in the execution of storm restoration duties Even though the July windstorm event was the largest major event in the company's history and was followed by December and January Level III ice storms, employees went "above and beyond" in supporting the restoration efforts

AmerenUE quickly accessed and mobilized in-house, contract and mutual aid resources

Even though there were limited storm drills conducted in the last 18 months, AmerenUE efficiently re-assigned day-to-day employee responsibilities to support the storm restoration effort

10.3 Conclusions

10.3.1 AmerenUE employees consistently demonstrated tremendous dedication and regularly went 'above-and-beyond' during the restoration efforts even after working three major events within six months.

The examples of many employees working well above expectations during the restoration are too numerous to catalog within this report In fact, AmerenUE had the support of over 200 employee volunteers with logistics during the restoration effort and over 4,000 employees were either directly or indirectly involved [42] During KEMA's review process, there was never any suggestion that AmerenUE employees lacked dedication to the restoration effort

RESOURCE MANAGEMENT

10.3.2 The EOC's twice-daily conference calls were valued, facilitated a clear understanding of the restoration work, aided the movement of crews, yet did not support concise reporting of outage statistics for the purpose of external communications.

The leading industry practice is to have a central communications exercise multiple times a day to update all internal parties on the restoration effort

[42] KEMA Interview MK12

Further, it allows storm managers to adjust crew numbers in the field to affect a uniform recovery effort

During these exercises it is critical to ensure the right information is being presented

10.3.2.1 The EOC effectively coordinated the macro level deployment of resources fulfilling its strategy of equalizing the restoration effort across the affected divisions.

The leading practice by utilities faced with this level of restoration is to bring the system backbone and laterals back as quickly and uniformly as possible across their system This returns the greatest number of customers to full service quickly while ensuring that no one area is favored over another for restoration

AmerenUE's Emergency Operations Center (EOC) followed this leading practice by coordinating the macro level assignments of resources to the affected divisional areas The EOC's resource deployment strategy operated under the guiding principles of

- Restore the last customers' service at the same time, and
- Minimize the geographic movement of the restoration crews to reduce non-productive travel (Windshield) time

During the restoration effort, the EOC staff was able to effectively support divisional resources special requests for logistical support As just one of numerous examples, the EOC tackled a special request for a divisional request for a boat [43]

The EOC focused exclusively on working the storm restoration effort and was not sidetracked with requests to restore high profile customers [44]

The EOC minimized the impact on restoration productivity by re-assigning restoration resources at the end of the working day [45]

[43] KEMA Interview MK19
[44] KEMA Interview HS13
[45] KEMA Interview MK19

10.3.2.2 The EOC's reporting of restoration magnitude and progress lacked rigor in providing a dashboard of outage statistics and assigned restoration resources limiting the ability to create status reports for internal and external stakeholders.

All interviewees valued the EOC's twice-daily conference calls These calls facilitated the communication and macro level coordination of the current restoration status, supported tactical divisional needs, system wide damage assessment reporting and resource allocation In addition, OAS provides a number of useful screens that provide much of the relevant information

However, feedback to KEMA indicated that the July storms internal restoration message emanating from the EOC lacked consistency especially during the late stages of the restoration effort No minutes or notes of the meetings were taken Inquiries of the EOC from Corporate Communications, and the media as to the expected restoration time, were not readily forthcoming [46] AmerenUE did improve during the December storm restoration

A leading practice observed by KEMA in this area is for the EOC to prepare a short but consistent storm restoration report This enhanced dashboard report would include customer outage statistics and the level of assigned in-house, contract, and mutual aid restoration resources and any known estimated restoration times by geographic area This information is in bold type and is accompanied by a conspicuous date and time stamp for reporting to outside entities Utilities adopting this practice will issue the dashboard approximately twice a day at fixed times and is the de-facto overview information needed for updating internal resources as well as for crafting media and public communication messages

[46] KEMA Interview MK12, MK05

10.3.3 While AmerenUE had no difficulty mobilizing additional resources, its Divisions experienced bottlenecks in dispatching resources to work sites.

Overall the process of managing a five-fold increase in crew resources worked well, yet there were several issues uncovered These are explained in the following sub-sections

10.3.3.1 AmerenUE had no difficulty mobilizing AmerenUE Illinois, contract and mutual aid crews.

Based on the magnitude of major events the EOC quickly determined the severity of the events necessitated mobilizing all available in house, contract and any available mutual aid resources AmerenUE followed industry practice in its resource mobilization priority as shown in Exhibit 10-2

Mobilization Priority	Resource Type
1	In House/Onsite Contractor Crews
2	Off-site Contract Crews
3	Mutual Aid Crews

Exhibit 10-2: Order of Resource Acquisition and Mobilization Priority

During the first windstorm of July 19th, AmerenUE was delayed in mobilizing mutual aid crews, partly due to a lack of a clear picture as to the extent of the damage and mutual aid partners unwilling to release crews until the storm passed their service territory Following the second windstorm of July 21st, AmerenUE immediately mobilized all available resources During the December ice storm, AmerenUE mobilized foreign and mutual aid resources almost at the outset of the event [47]

During the July, December, and January storms, AmerenUE used contract and mutual aid resources to supplement in house restoration resources AmerenUE had no difficulty in contacting and mobilizing mutual aid resources [48] Although, during the December and January ice storms, mutual aid assistance was only released to AmerenUE

[47] KEMA Interview MK09
[48] KEMA Interview MK09

once the weather front had passed without causing damage in the mutual aid utility's territory

The mutual aid crew delays, during the July event, did not materially affect the restoration effort as approximately 600 to 700 contract resources were on site during normal day-to-day operations and were immediately diverted to storm restoration See Exhibit 10-3

Contract Crew Type	Onsite Prior To July Event	Onsite Prior To December Event
Vegetation Crew	390	460
Line Construction Crew	80	125
Directional Boring	30	50
Inspection Programs	37	13
Substation/Transmission Construction	50	50
Total	**587**	**698**

Exhibit 10-3: Approximate Normal Daily Contract Resources[49]

10.3.3.2 A lack of coordination of contract and mutual aid resource arrival times caused divisional level bottlenecks in dispatching resources.

Information flowing from the EOC, contract, and mutual aid managers, lacked specificity as to arrival times of restoration resources at specific divisional locations The deployment of large numbers of crews to a division created management issues for the division One Division Manager suggested that a more orderly staged deployment and enhanced communication from resource management would allow better integration of assigned resources into the restoration work activities Some crews arrived 16 hours later than expected and other crews arrived without the division having prior knowledge This resulted in lost productivity while resources waited for work dispatch assignments [50]

[49] KEMA Interview MK09, MK19
[50] KEMA Interview HS17

The impact on public perception is significant when the public has been without service for days and observes a large number of resources waiting at staging areas or divisional depots for work assignments

10.3.4 The January restoration effort benefited from the use of AmerenUE's new Mobile Command Center (MCC), by providing a local operational command post, but to be truly effective at coordinating regional restoration efforts during future events, AmerenUE will need more than one MCC.

A common theme across the industry during large restoration efforts is the challenge of maintaining operational oversight in the coordination of restoration work and handling the administrative burden associated with issuing work clearances to a large number of field resources Leading practices within the industry has been to establish command centers located at staging areas within affected operating centers that can take on the following needed activities

- Orientation and safety briefings for in-house, foreign and mutual aid resources,
- The issuance of work orders,
- The issuance of job aids, such as system and geographic maps, construction standards, and the like,
- A tactical post situated close to damaged areas, and
- A facility to track the issuance of work clearances within the affected region

Starting in late 2006, AmerenUE researched leading practices in emergency mobile command centers from within and without the utility industry AmerenUE's Mobile Command Center, provides office space, communications, and field interfaces to AmerenUE's Outage Analysis System Exhibit 10-4 shows AmerenUE's single Mobile Command Center situated at AmerenUE's Dorsett facility Its first deployment during the January 2007 ice storm assisted the restoration effort by acting as a field deployed tactical command post, providing

locally distributed system and road maps, distributing AmerenUE's work clearance procedures, and construction standards.[51]

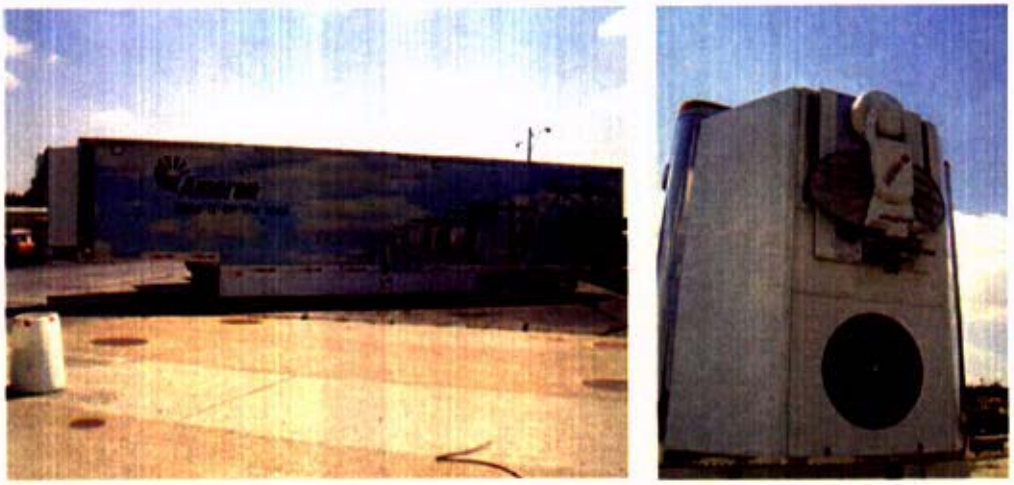


Exhibit 10-4: Mobile Command Center

To be truly effective at alleviating administrative burdens associated with local tactical restoration efforts and issuing Workman's Protection Assurance, AmerenUE will need more than one MCC and a formalized procedure for decentralizing the issuance of work clearances.

RESOURCE DISPATCHING

10.3.5 AmerenUE benefited from the Missouri Governor's delegation of authority to MODOT to initiate emergency plans. This delegation accelerated resource mobilization by allowing easy passage of mutual aid fleets across Missouri state boundaries.

The Missouri governor has delegated the authority to the MODOT to approve requests for emergency declarations under storm conditions. This permits exemptions from driving time limits, mediates International Fuel Tax Agreement (IFTA) and International Registration Plan (IRP) administration, and provides AmerenUE the opportunity to process the multitude of arriving fleet under a single blanket order. This reduction in administrative burden benefited the

[51] KEMA Interview MK01

restoration effort in Missouri, AmerenUE reports that other states without this benefit experienced delays in receiving mutual aid assistance due to fleet stoppages, while awaiting paperwork at state boundaries [52]

10.3.6 The orientation of contract and mutual aid crews during the July storm event omitted critical information needed to secure line clearances from the Distribution Dispatch Office (DDO).

Even though foreign crews received orientations upon arrival on the premises that specifically included safety briefings and procedural reviews of line clearance requests, the orientation missed critical information needed to interface effectively with the Distribution Dispatch Office Specifically, foreign crews at times lacked an assigned crew number, the OAS trouble ticket reference, and the feeder identifier This significantly hampered the issuance of clearances during the first three days of the July restoration event [53]

In response to this process breakdown, the distribution dispatch office is now distributing informational cards to foreign crews at staging areas or from the mobile command center

10.3.7 AmerenUE's practice of providing 'Bird Dog'/Crew Guides and remote dispatching support was instrumental in efficiently managing the unprecedented number of contract and mutual aid crews on-site during the restoration effort.

A leading practice across the industry is to provide foreign crews with a guide to accomplish the following

- Guide foreign crews around the system,
- Support the clearance and switching processes,
- Chase materials, and
- Relieve the foreign crews of some of the administrative burden inherent in storm restoration

[52] KEMA Interview MK04
[53] KEMA Interview MK16

Utilities can take a number of different approaches to this including using retirees, training "Bird Dogs", and breaking up local crews to be integrated into the foreign crews The goal in all of these options is to eliminate any AmerenUE imposed "road blocks" for the foreign crews to ensure maximum productive work time possible

AmerenUE could not effectively dispatch the large volumes of contract and mutual aid resources with the existing divisional dispatch staffing levels AmerenUE re-assigned centralized resources to dispatch foreign crews, and paired 'Crew Guides' from local divisions with foreign crews to assist with local knowledge of the system [54] This practice worked well and enhanced the productivity of both contract and mutual aid crews [55]

10.3.7.1 AmerenUE benefited by engaging retirees to assist in the dispatching of foreign and mutual aid crews but, with the exception of the Resource Management Department and one division, does not actively maintain a list of qualified retirees.

Given the scale of the restoration events, even with the mobilization of in-house remote dispatchers, AmerenUE was still stretched for crew dispatching ability and engaged the assistance of retirees with familiarity of the T&D system, knowledge of AmerenUE's OAS, and experience in dispatching field crews AmerenUE was fortunate in accessing these retirees, as it does not formally maintain lists of retirees with these specific skill sets in all Divisions [56]

10.3.8 During July's event, the backlog of clearance requests delayed crews in their work. In response, AmerenUE decentralized the clearance taking process in an ad-hoc fashion.

The clearance process is an essential safety tool to protect the crews from inadvertent switching actions that could cause a serious energized line contact The leading practice by utilities facing severe weather such as hurricanes, generally provide a process for decentralizing this clearance taking process In providing such a process, these utilities eliminate significant crew delays caused by waiting for clearance approval from system dispatchers without endangering other crews

[54] KEMA Interviews MK01, MK05
[55] KEMA Interview MK05
[56] KEMA Interview MK05

10.3.8.1 The abundance and backlog of clearance requests significantly delayed crews in the initiation of repairs.

It is normal to expect a significant increase in line clearance requests during major event restoration efforts and AmerenUE was no exception Industry leading practices in this area focus on two main themes

- The goal is to minimize the processing time between field crews and system dispatchers for issuing clearances This can be accomplished through a series of practices that include remotely pre-configuring the system during the night shift, staggering morning start times for crews to help level system dispatch office workloads, and having switching sequences pre-prepared reducing switching sequence transcription and preparation times

- When the system damage is sufficiently severe, delegate authority for issuing clearances to field agents who formally take functional accountability for both a complete substation and its feeders, or on a feeder by feeder basis, thereby eliminating the interface with the bottlenecked system dispatch office This agent retains the accountability for that part of the system until all restoration efforts are completed and formally returns accountability to the system dispatch office

During AmerenUE's restoration efforts, both in-house and foreign resources experienced delays in securing line clearances from the St Louis Distribution Dispatch Office (DDO) [57] Four factors compounded the delays in securing clearances [58]

- The inability to scale the number of desks and the associated staff and communication channels being operated at the DDO,

- No preparation during the night shift at the DDO or at the divisions for the coming day's clearance requests,

- A lack of staggered morning start times to level the inbound clearance request work volume, and

[57] KEMA Interviews MK06,MK08, MK09, MK14 & MK16
[58] KEMA Interviews MK16, MK03

- A feeder analysis needs to be performed to create the switching sequences for each line clearance request

At the time of the storms the DDO had three vacancies for 22 staff positions assigned to the function During regular day-to-day operations, six desks are staffed during two-day shifts and night coverage includes two dispatchers Exhibit 10-5 shows the shift coverage at the St Louis DDO During restoration efforts there is substantial overtime to go along with the opening of additional desks

Shift	Staff on Desks
6 AM – 2PM	6
2PM-10PM	6
10PM-6AM	2

Exhibit 10-5: St. Louis Dispatch Office Shift Coverage During Normal Operations

These 22 dispatchers are dedicated to the St Louis area and while system control activities via SCADA can be transferred to other AmerenUE dispatch offices, the issuance of line clearances to crews for the St Louis area must be handled at the St Louis distribution dispatch office This created bottlenecks in processing line clearance requests for restoration resources [59]

The dispatch office did not have prior knowledge of the planned work activities for the following day and consequently could not prepare switching orders during the night shift in advance of the morning workload for clearance requests

All restoration resources started their field activities at dawn and once arriving at the job site initiated clearance requests from the DDO Each morning, starting at around 8AM, line clearance requests inundated the six dispatching desks crippling the DDO's ability to handle clearances and adding delays to crews commencing work

Since the July storm, the DDO has prepared "canned" switching instructions for each isolating device in the St Louis metropolitan area In the future, this preparation will eliminate the need to write

[59] KEMA Interviews MK21, MK08

switching orders from scratch reducing clearance processing times However, a caution must be included with this comment as the current system state could be different from assumed in the "canned" switching orders Utilities that have adopted the practice of pre-preparing switching orders include a formal step of verifying the validity of the switching sequence with the current configuration of the system

10.3.8.2 **During Level III events, AmerenUE benefited from the introduction of an ad-hoc "Certified Functional Agent" process, delegating line clearance responsibility for a complete feeder or substation to a field agent, but has yet to formalize the practice.**

In the future, to alleviate the growing bottlenecks experienced during the first three days of the July storm for line clearances, AmerenUE created the Certified Functional Agent role Dispatching will delegate functional responsibility for complete feeders to "Certified Functional Agents" alleviating some of the DDO work volume This delegation of authority assisted in dispatching restoration resources more effectively and worked well in the latter half of the July storm However, given the safety implications and the ad-hoc fashion in which this practice was implemented, the "Certified Functional Agent" concept was not activated during the December and January events The benefits of a "Certified Functional Agent" were proven in July While 20-30 employees have been trained in this new role, there is no sense of urgency to formalize the "Certified Functional Agent" practice for adoption in future major events [60]

RESTORATION and VERIFICATION

10.3.9 AmerenUE's adoption of industry leading practices in prioritizing restoration work restored the largest number of customers as quickly as possible, but in some cases, may have inadvertently reduced productive repair time.

AmerenUE adopts industry-leading practices in prioritizing and working the restoration effort on a feeder The sequencing of restoration follows the priority, highest to lowest, of feeder backbone, laterals, and finally secondary/service

[60] KEMA Interviews MK09, MK13

connections This approach results in the largest number of customers being restored to service as quickly as possible [61]

While this is a leading practice, its implementation within AmerenUE during these severe storms actually made some crews less efficient by routing work based on number of customers likely to be restored This caused crews to hop around feeders and laterals sacrificing repair time for additional windshield time [62] Had the crews focused more on restoring a complete feeder first the windshield time would have been less Section Six of the Electric Emergency Restoration Plan references this approach

10.3.9.1 Limited 24-hour shift coverage by forestry contractors, allowed vegetation-clearing efforts to be conducted safely and to stay well ahead of line restoration crews.

Most of the utility industry has transitioned to provisioning vegetation management services on contract As long as contract terms and conditions encourage vegetation contractors to support storm restoration efforts, this industry accepted practice has not had any negative material impact on vegetation clearing during major events Generally, vegetation management resources work autonomously from line crews and ensure that clearing is done in advance of line crew restoration work at a specific location It is usual practice for forestry resources to operate with 15% -20% of its work force active during "Off-hours" of each day during major event conditions

AmerenUE had no difficulty mobilizing its five vegetation contractors to support clearing efforts Vegetation resources beyond the five property contractors were easily located and mobilized as the existing contract relationships offered access to supplemental vegetation crews during the storm Working autonomously from line crews and with 24-hour shift coverage, vegetation crews easily stayed ahead of the line crews Even though vegetation management resources operated in shifts with 24-hour coverage, safety

[61] KEMA Interviews MK01, MK06, MK08
[62] KEMA Interviews with division managers

performance was outstanding with no major incidences and only two minor vehicle accidents reported [63]

10.3.10 AmerenUE practices to repairing customers' weather head equipment vary between divisions affecting customer restoration and tainting the customers' perception of AmerenUE's restoration efforts.

During the latter stages of the storm event, the majority of the restoration work volume focused on restoring individual customer services While the weather head equipment on the customer's premise is not AmerenUE's responsibility, it is integral to the restoration of service Some region's restoration activities, Boone trail as an example, included temporarily or permanently fixing the customer's weather head equipment while restoring customer services [64] This practice lead to two responses from customers, neither of which is in support of improved customer satisfaction

- AmerenUE's call center staff received customer complaints located in divisions that did not restore service because of damaged weather head equipment The customer complaints focused on incurring cost and further delay before restoring service
- Customers from areas where field resources made temporary repairs to weather head equipment expressed frustration to call center staff when AmerenUE directed customers to third party electricians for permanent repairs [65]

This is an issue in many utilities and the majority of companies will not repair the service entrance after the weather head because of the potential liability the companies could create Further, there is the potential for carrying more materials associated with the repair However, one company did authorize service crews to make the repairs, saying they wanted to minimize the inconvenience to its already inconvenienced customers

[63] KEMA Interviews MK10, MK15
[64] KEMA Interview HS17
[65] KEMA Follow up communication with Call Center Manager

10.4 Recommendations

10.4.1 Enhance the internal informational dashboard displaying current and historical information during the progression of the restoration to provide customer outages and restoration resource levels.

Restoration dashboards are becoming increasingly popular for good reason, they put critical restoration information at the fingertips of all that need the information

Add the high-level restoration times by overall service area and districts as the underlying data becomes available The EOC should be prescreening the information and controlling the updating frequency to ensure a consistent messaging to all concerned

10.4.2 Define the process and enhance the communications between the EOC, Resource Management and the Divisions relating to resource volume and arrival times to assist Divisions in improving efficient crew dispatching.

Provide the divisions with advance warning of crew arrival times so the work can be ready for the crews minimizing any waiting time This will be more easily accomplished if the earlier recommendation of moving the crew receiving staging areas is moved to the perimeter of the service territory instead of at the local Division work staging areas Further, with AmerenUE's mobile crew dispatchers and escorts, this adjustment should be easily accomplished

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

The Restoration Work Island will apply only to areas of significant system damage and should be no larger than a substation and its feeders or a specific feeder It would be no smaller than a single feeder In essence, Division management in conjunction with the EOC will identify potential Restoration Work Islands One field supervisor will be assigned to manage all the restoration activities inside the Restoration Work Island boundaries

Level III or IV storm impacted areas, where there is only minor or spotty damage, will continue to have the restoration work priority set through the OAS

Restoration Work Island clearances will be issued through either the system dispatch office or a Functional Agent This determination will be the responsibility of the EOC manager or his designee The EOC manager is in the best position to determine the work load of the system dispatchers and the potential crew delays

The Restoration Work Island approach during restoration will provide the following benefits

- Crews will work in contiguous areas reducing windshield time, consequently completing more work in the same time period,
- Areas will be restored more consistently, and
- Crews will not have to wait for work assignments as they will be assigned to work a specific feeder or set of feeders

Achieving the above result will require the following AmerenUE actions

- Expand Section Six in the EERP to include a description of the Restoration Work Island strategy and approach, and
- Define processes and procedures for adopting a Restoration Work Island approach under Section Six storm restoration activities

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

The MCC is another leading practice for AmerenUE However, in Level III and especially Level IV storms, more MCCs are necessary to reduce burden on both the Division and EOC management teams Management should consider phasing in several more of these centers

Ideally, when the EOC or Division identifies the need for several Restoration Work Islands in a small geographic area, bringing in an MCC to field coordinate these restoration activities will ease the burden on all restoration management

AmerenUE management indicated that the future MCCs will have some configuration changes consistent with the evolving role the MCCs will play in future storms

10.4.5 Continue nurturing the strong working relationship AmerenUE already has with MODOT, the State EOC and local EOC's .

The model working relationship established with the Missouri Department of Transportation should continue to be fostered with other local and state agencies

10.4.6 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 DDO for clearance taking and ensure that the process is formalized in the EERP.

Providing non-AmerenUE crews with information cards explaining how to communicate with the dispatchers and the Function Agents during a clearance process will hasten the overall clearance process If possible, some of the specific crew information can be entered at the time the card is issued Then all that would be necessary is the OAS or feeder section information, depending on whether the crew is working under the dispatcher or a Functional Agent

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

AmerenUE's adoption of the Functional Agent is a leading practice This practice will greatly reduce the delays caused during the clearance granting process To enhance the process and ensure that the individuals trained for the role remain current in their understanding of the clearance methodology, KEMA suggests the following actions be included

- Provide work aids to ensure that the skills remain current even though there is infrequent use of the skills, and
- Participate in the DDO at some level of frequency to refresh skills

10.4.8 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.

AmerenUE has proven that tree removal work can be done safely and ready for line crews to work KEMA believes this practice should continue as long as the safety of the crews is preserved

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

Weather head replacement is a new leading practice being adopted by some utilities The benefit to the customer is shorter outage time, while the benefit to the utility is customer good will KEMA understands that there are at least two issues with this practice First, is the liability associated with making attachments to the customers' house and potentially certifying that the internal wiring is safe to reconnect Second, is the potential conflict with the local electrician's association, with respect to reducing their work AmerenUE should do a thorough evaluation of how best to proceed with such a program Specifically, AmerenUE should at a minimum

- Analyze and evaluate alternatives to include
  - Cost,
  - Supply chain implications,
  - Liability implications,
  - Regulatory requirements such as licenses,
  - Goodwill, and
  - The impact to local electricians needs to be assessed

11. Emergency Restoration – Information Systems and Processes

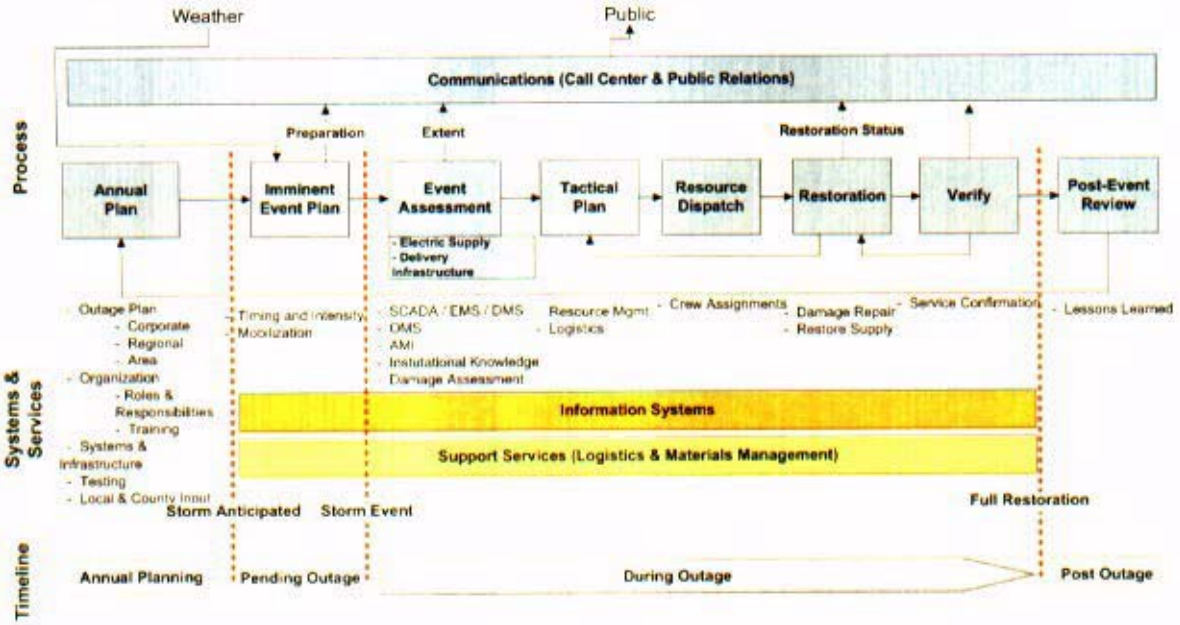


Exhibit 11-1: Outage Management Process – Information Systems

11.1.1 Industry Practices

Exhibit 11-2 below illustrates a leading set of integrated information systems for supporting outage management processes.

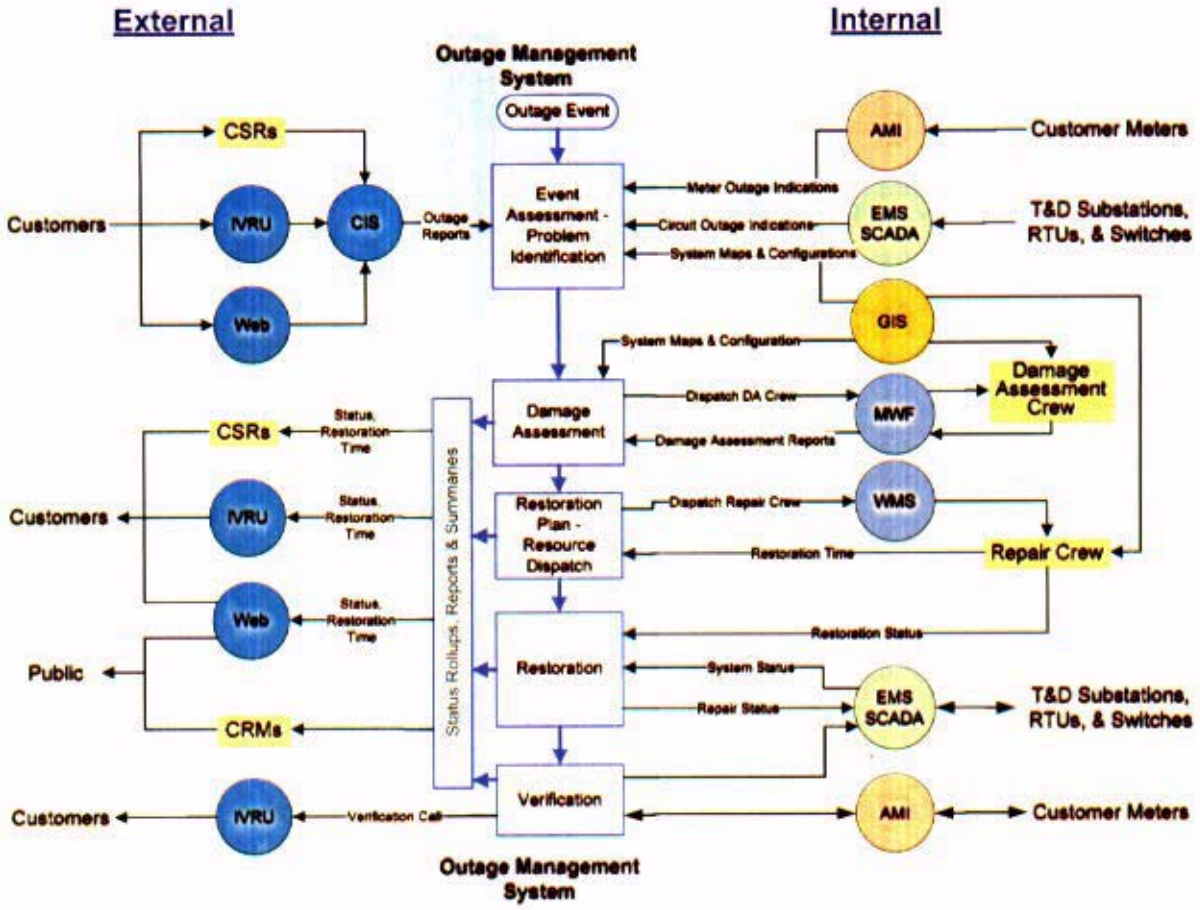


Exhibit 11-2: Leading Practice Integrated Systems for Outage Management Processes[66]

The key components of this solution include:

- **Customer Information System (CIS):** Managing information about customers, customer services, metering and billing, with supporting Interactive Voice Recognition Unit (IVRU), web posting and other customer and public communications.

- **Outage Management System (OMS):** Managing trouble tickets, outage analysis and assessment, crew dispatch and restoration process.

- **Advanced Metering Infrastructure (AMI):** Automated meter reading, meter data management, meter "last gasp" outage reporting and processing,

[66] KEMA IT Thought Leader

and automated remote interrogation of the AMI network for power restoration verification

- **Systems Operations Supervisory Control and Data Acquisition (SCADA), Energy Management System (EMS) and Distribution Management System (DMS):** Real-time monitoring of the electric transmission and distribution network, energy supply, equipment operating status, and remote switching and control

- **Geographic Information System (GIS):** Detailed geographic mapping of utility transmission and distribution facilities and equipment, network connectivity, equipment information and field configuration

- **Work Management System (WMS):** Work order processing and management, resource assignment, job status and completion tracking

- **Mobile Workforce Management (MWF):** Automates field crew operations with mobile workforce dispatch, scheduling and routing, remote electronic connectivity, and automatic vehicle location

- **Interactive Voice Response Unit (IVRU):** In the context of outage management, the IVRU routes calls to CSRs and enables allows customers to self-report and receive outage information

A leading OMS maintains an up-to-date distribution system connectivity model that reflects the current configuration of the electric system Reported outages are analyzed against the physical system model compared to the current operating status of key equipment, e g , substations, transformers, and switches

A leading OMS has business rules that allow the efficient management of large-scale outages and restoration efforts Proper integration of key systems, including CIS, IVRU, EMS, and MWF significantly reduces the need for manual and redundant data entry, and allows efficient transfer of data to those who need it

The SCADA/EMS systems supply valuable real-time information about operating conditions and system configuration When combined with the OMS connectivity model, circuit outages can be quickly identified and outage reports mapped and analyzed

A leading OMS provides a library of planned switching scenarios the switching coordinator uses to manage outages Restoration procedures and processes can

also be defined in the OMS to help with large-scale distribution outage restorations The procedure defines the correct sequence of events to safely and effectively restore circuits The sequencing is coordinated with the real-time system status from the EMS

Integration between the OMS and a mobile workforce management (MWF) system allows dispatching of OMS analysis results to field personnel Field information, such as outage validation, cause, and estimated time to restore are sent back electronically to the OMS, passing seamlessly to the CIS for call center notification and IVR message updates

Integrating GIS to the OMS allows electric connectivity data to regularly pass to the OMS for developing the model that reflects the as-operated configuration of the electric system in the field

A leading AMI system when integrated with OMS provides for automated reporting of customer outages using the "last gasp" capability of the meters OMS can automatically determine if a customer's meter matches a specific outage report and then provide a specific outage status This function can be operative within the utility's IVRU or implemented within the local carrier network for maximum volume [67]

The AMI system is an effective tool for outage restoration verification The process interrogates the AMI network to determine whether selected meters have power and are once again sending information While this technology has some inherent limitations (it is not designed for this primary purpose), this application can provide an automated capability for systematically verifying power restoration at some customer sites

11.2 AmerenUE Practices

AmerenUE has made a significant investment in its systems infrastructure and is on the leading edge of technology adoption within the industry Exhibit 11-3 summarizes AmerenUE's systems infrastructure as it supports outage restoration

[67] KEMA Principals' call center experience

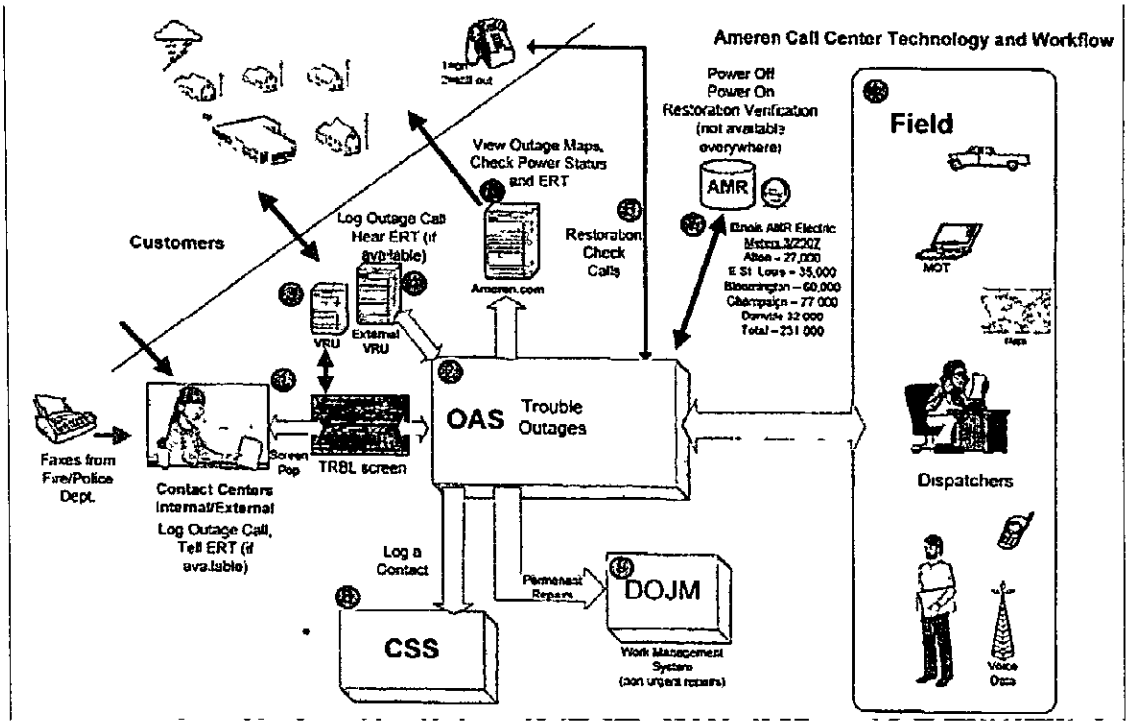


Exhibit 11-3: AmerenUE Call Center Technology and Workflow[68]

The following is a description of how outage events are handled on a day-to-day basis at AmerenUE [69]

1 Customer Service Representative (CSR) receive calls and logs outage reports into the Outage Analysis System (OAS) trouble screen The OAS provides an Estimated Restoration Time to the CSR as well as the dispatching status of the trouble ticket

The OAS, a mainframe based technology, was installed in 1993 Since that time, AmerenUE implemented continuous improvements/enhancements to the effectiveness of the system In addition, AmerenUE has greatly extended the system functionality through interfaces to other AmerenUE systems

2 The OAS analyzes customer calls to determine the most likely failed system device, automatically creates a restoration work order, and records specific details of an outage event

[68] KEMA Interview MK13
[69] AmerenUE Systems and work flow pdf

The OAS system implements business logic to determine the most likely failed system component This logic identifies the most likely upstream isolating device for a group of customers reporting an outage event and assigns a single trouble order to this customer group

3 Inbound customers outage calls are handled by Call takers (CSRs), and the Voice Response Unit (VRU) When available, the estimated restoration times are communicated

4 Outage call overflows are handled by a third party VRU, which accepts outage calls, and interfaces directly with the OAS OAS data is extracted every ten minutes to provide the external VRU with updated Estimated Restoration times, offering customer's handled by the third part VRU current restoration estimates

5 The AmerenUE com website provides customers an overview of AmerenUE's current system outages and restoration effort by zip code, and offers a means to determine the power status at their residence or business

Exhibit 11-4 and Exhibit 11-5 are examples of how this information is displayed on AmerenUE's website

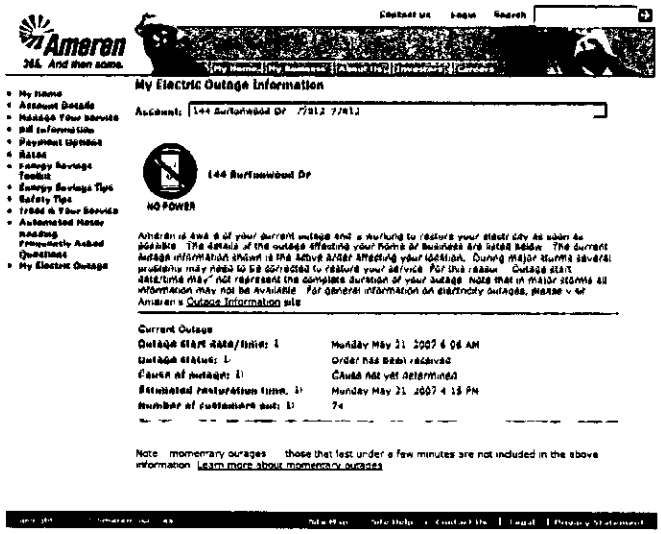


Exhibit 11-4: Example 1 of AmerenUE's web based outage information

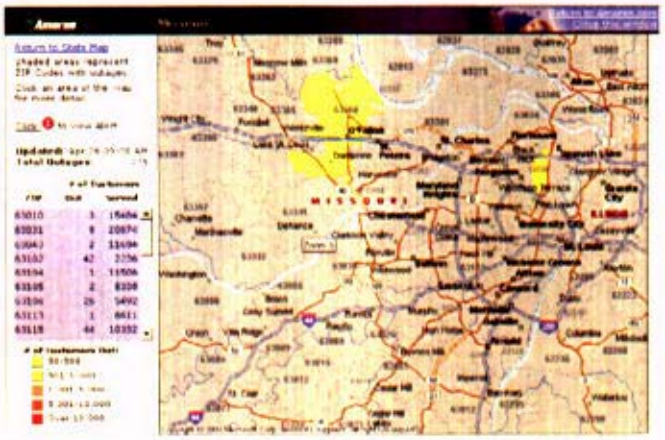


Exhibit 11-5: Example 2 of AmerenUE's web based outage information

6. When outage orders are completed, the OAS system automatically initiates outbound customer calls to confirm service restoration. Customers are only called between the hours of 7am and 10pm.

7. AmerenUE's AMI system automatically reports power outages and power restoration for some of the affected meters to OAS. In order to eliminate false outages from momentary interruptions the AMI system delays sending its information for 12 minutes. Outages sensed by the AMI meters are batch processed into OAS every five minutes. As a result, there can be a 12 to 17 minute delay from the occurrence of the event to being available to AmerenUE employees in the OAS.

In the event a feeder locks out, SCADA will automatically update OAS within seconds.

8. The Customer Service System is updated with the record of the customer's outage call. Customer outage history and reliability improvements, such as recent tree trimming, line maintenance, etc., are recorded in OAS, and made available to Call Center Representatives while addressing a customer's inquiry or complaint.

9. When a trouble event requires permanent repair after service restoration, OAS automatically generates a work order in the DOJM (Distribution Operations Job Management) system.

10. Troublemen and construction resources can access critical information systems including the OAS and Geographic Information System (GIS) system through field deployed hardened laptops with wireless connections.

In addition to the functionality described in the above paragraphs relating directly to outage handling, AmerenUE provides additional functionality by integrating systems with the OAS platform This includes

1 GIS Maps and Visual Dispatch – Through the integration of GIS Map viewing software with OAS, AmerenUE employees can easily identify the geographic location of a failed system device or outage orders Additionally, AmerenUE employees can easily review the geographic location of service outages, wires down, and other service problems The visual representation assists in quicker problem analysis and improvement management of field resources

2 Outage E-mails and Paging Service – Outage volumes are periodically monitored and e-mails and pages are automatically generated for operations employees at a set customer outage volume thresholds

3 Distribution Dispatch Office (DDO) storm management intranet site – An intranet site provides reporting of customer outage counts and outage orders by geographic location to the DDO and the Emergency Operations Center

4 FOCUS Reports – A collection of ad-hoc reports are available to monitor outage volume and activity These reports include hourly call volume, feeder damage summaries, a listing of open orders, alerts on excessively long restoration orders and a summary of estimated restoration times

Similar to many other electric companies in the industry, AmerenUE employs staff to monitor and service these systems during day-to-day and emergency events

11.3 Conclusions

11.3.1 The OAS outage determination logic and business reporting did not perform well under Level III events.

OAS functions extremely well in Level I and II restoration efforts OAS handled the full volume of calls and orders experienced during the July and December 2006 storms and provided critical insights into the extent and location of the storm damage However, the OAS Estimated Restoration time calculation module was not designed to fully support the magnitude of damage experienced during this level of storms OAS's calculations of Estimated Restoration times are known to be unreliable under these circumstances Following the August 2005 Missouri Public Service Commission (MOPSC) storm review, AmerenUE

implemented logic to disable the automatic reporting of Estimated Restoration times to customers, unfortunately this is the information that is most needed and desired by customers Two findings support our conclusion

11.3.2 Misinterpretation of OAS information led to incorrect information being manually summarized and reported to the public through press releases and press conferences. Due to the severity of the damage and the magnitude of restoration effort, inflated customer outage/restoration numbers were reported through media channels.

AmerenUE's OAS has two inherent weaknesses that result in the system producing misleading information major outage events Both issues stem from the breakdown of applying outage analysis logic originally designed for routine outage volumes to major event The two issues are

- The system's business logic groups in bound outage information, whether from customer calls, or CellNet, into a prediction of a single system failure, generally identified as the most likely upstream isolating device on the feeder or lateral The logic does not take into consideration that, during large-scale events, system damage has most likely occurred at additional downstream locations and is not isolated to the systems predicted single location The systems predicted restoration time estimates The repair time is the sum of repair times for a single damage location and does not factor in the non-linear relationship that repairs to downstream damage has on estimated restoration times [70] As a result, AmerenUE quickly turns off the Estimated Restoration Time function in OAS

- Once the system damage is repaired, field resources clear the OAS trouble ticket entry If the OAS has grouped multiple customers to this trouble ticket, upon clearing, the system assumes that all the grouped customers are restored During Level III events, this is rarely the case, as downstream damage is yet to be repaired or for that matter even identified [71] As Field checkers continue to identify downstream damage, or customers call for a second time, OAS issues new trouble orders This can result in double counting customer outage counts even though the customers were never originally restored to service

[70] KEMA Interviews MK13, KEMA Call Center Observation
[71] KEMA Interview MK19

11.3.2.1 AmerenUE's mainframe based outage analysis system allows incomplete entries and lacks quantity information of damaged assets, handicapping AmerenUE's ability to summarize damage information into actionable management reports of resource and materials requirements for restoration efforts.

The OAS supported the dispatch of construction and restoration crews during the storm events First responders, field checkers, and crews fleshed out each outage ticket with a detailed description of field damage facilitating efficient restoration resource dispatching Each outage ticket in OAS was coded with the major classification of equipment damage such as pole, or transformer, etc This damage information is supplemented with a free form text input format field in OAS and resulted in a wide variation in the specificity of the Field checkers' comments

The coded fields in the OAS system indicate the type of damage but do not provide quantity information An example of this would be for a location with pole damage where the OAS ticket indicates pole damage but does not indicate that three poles need repair This information may or not be entered in the free form text entry field, is not required, and cannot be easily summarized

Additionally, the specificity of the entries in the free form text field varied in the content of the entered information Some ticket entries had detailed information about the damage location while other entries only had cursory information if any at all

As a result, Divisional resources and the EOC management were somewhat handicapped in their ability to produce automatic reports of the extent of system damage Each division and the EOC uses different spreadsheet formats to collect, synthesize, and report high-level system damage [72]

11.3.3 AmerenUE improved its determination of restoration time estimates, for Level III events, integrating the information across several delivery channels.

AmerenUE recognizes the limitation of its OAS in accurately representing customer outage statistics and in providing estimated restoration times during

[72] KEMA Interviews MK03, MK06, MK19

Level III events This significantly handicapped effective public communication during the three restoration efforts In response, AmerenUE initiated a process review team to improve the field reporting and synthesis of area wide estimated restoration times during Level III events The major elements of the initiative include

- To provide more specific "area wide" estimated restoration time (ERT) information to supplement Corporate Communications information utilizing existing OAS functionality,
- To provide ERT information through AmerenUE's customer service channels (CSR's, VRU, and Web), and
- To execute a process that has clearly defined roles and responsibilities with the emergency Operations Center (EOC) as the process owner

The team has made significant progress in defining this process to circumvent the limitations in OAS restoration time reporting under Level III conditions This progress includes

- AmerenUE has expanded its use of Mobile Data Terminals and hardened laptops with remote connectivity capability directly to the OAS, to employees who have been trained for field damage assessment duties during major events,
- The AmerenUE com website's My Electric Outage functionality was enhanced in the spring of 2007 to provide additional clarification to customers of the many alerts and area restoration notifications, and
- The alerts were also integrated into the OAS screens used by Customer Service Representatives when answering customer outage calls

In addition, all outage statistics and reporting are now extracted from OAS and housed in the same database to ensure consistent customer outage counts and restoration progress numbers are available to all internal and external stakeholders

These improvements have been proven and tested during a small outage event in August of 2007 While AmerenUE has not experienced a Level III event since

implementing these improvements, AmerenUE believes they will be able to perform well in future major events [73]

11.3.4 AMI technology in place at AmerenUE could offer slight improvements in support of storm restoration activities.

AmerenUE's CellNet system is an early generation Automated Metering Infrastructure (AMI) solution, originally purchased for the primary goal of reading meters for revenue purposes Individual meters have a function to provide a "Last gasp" report when power is lost as well as a "Power Up" report when power returns AmerenUE has been using these features since the initial implementation of AMI This "Last Gasp" and "Power Up" functionality is fed into OAS, however, there are a number of inherent limitations in AMI technologies in this regard Regardless, AmerenUE is taking steps to integrate the system into outage restoration verification more effectively The following findings amplify the issues

11.3.4.1 During Level III events, AmerenUE does not interrogate the AMI network to determine the extent of customer outages nor to verify successful restoration of individual customers instead relying on a combination of pro-active customer callback procedures and passive public advisories to confirm service restoration.

AmerenUE is one of a handful of utilities that have gone to a fully AMI solution and has made a significant investment of approximately 1 2M electric and 130k gas AMR meters in Missouri alone [74] The CellNet technology's major purpose is to automate meter reading and is not designed as a primary system in support of outage analysis, management, or restoration Some features inherent in the CellNet system can support the outage management process, but must be considered a secondary benefit [75]

The CellNet technology allows AmerenUE to read its meters through a fixed radio network Meter information is fed back through a network of pole top collectors, distributed throughout the AmerenUE system, and ultimately fed to CellNet servers in Kansas City CellNet aggregates the meter information, processes and filters the reports,

[73] Ameren document ERT Storm Approach – MO General ppt
[74] KEMA Interview MK13
[75] KEMA Interview BS02

and forwards the information to AmerenUE's OAS system Logic filters applied to the raw information parse momentary interruptions and failing AMI meters from the data stream

A secondary benefit of the AMR system is the meter's "Last gasp" function When power is lost at the meter, the meter sends a signal over the same network ultimately producing an entry in OAS indicating a loss of power flow OAS treats this information in the same manner as if a customer called in an outage at their location

For small-scale outage events, the system is automated and provides outage reports for some of the affected meters However, several inherent issues have been identified with the outage reporting application in AMI technologies First, during outage events that affect hundreds or thousands of meters, the "last gasp" from many affected meters all at once create radio contention The signals clash and only a small subset of the events are heard on the system This one aspect renders the AMI outage reporting application as an ancillary benefit, providing additional information for the OMS analysis application, as opposed to a primary communication system to detect outage events

Major storm events are by definition associated with widespread power outages and are often associated with severe lightning Widespread power outages and lightning contribute to loss of third-party data communication providers, as well as interruption in the AMI network These interruptions can last many hours following a storm, prohibiting the normal functioning of the AMI network during this timeframe AMI networks rely on battery back-up support designed for only several hours These constraints, with respect to equipment damage, communication pathway loss, and limited battery back up, are inherent to the AMI system and further limit its ability to function as a primary tool in storm restoration management

During the severe storms of last July and December, there were also various parameters not set properly in the CellNet application The application locked up, rendering the AMI solution useless for a time

Additionally, AmerenUE has not integrated its AMI system's capability into routine Level I and larger Level II events The system

does not automatically check the AMI network to confirm service restoration AmerenUE's only confirmation that service is restored occurs through a call back process to customers that had previously reported an outage as well as through public advisories asking customers to call in again if their service is not restored [76]

In the view of AmerenUE management, the AMI application has potential value during some restoration efforts to identify the remaining single outages after both feeder backbones and laterals have been restored AmerenUE is currently working with CellNet on an automated, batch application for restoration verification The system would interrogate a sample of meters at the distribution transformer level, i e , one or two meters behind each transformer in an outage area to verify power restoration [77]

11.3.4.2 The AMI infrastructure had a difficult time handling the volume of outage data created during the storms.

During the July event, the large number of AMI meters reporting service outages, and "Last Gasp" reports, bottlenecked the data flow from individual meters, through CellNet's Kansas City data aggregation server, to OAS [78] The bottleneck resulted in the cessation of near real time AMI reporting to AmerenUE Upon service restoration, the system usually took up to 36 hours to clear the event history before the network became usable again [79] By this time, the backup batteries in the pole top collectors were exhausted This situation did not instill confidence in EOC personnel that the AMI system could be a valuable tool during outages This issue originated from poorly tuned system parameters compounded by a lack of consistent monitoring of the system by both CellNet and AmerenUE Since the July 2006 event, both CellNet and AmerenUE have been working to resolve these issues Another utility experienced similar issues during a recent major storm

Even on a normal day, there are a number of delays both inherent and incorporated by design into the collection and processing of

[76] KEMA Interviews MK03, MK13, MK19
[77] KEMA Interview BS01
[78] KEMA Interview RG01
[79] KEMA Interview MK13

"Last Gasp" data resulting in delays of 12-17 minutes before AmerenUE's OAS sees the data In the interim, during these major outage events, the SCADA system, where it is available, will have reported the feeder out and the DDO already taken corrective action In those cases, the AMI data is now providing old information Fortunately, the dispatchers have identified this data problem and manually ignored OAS entries originating from delayed AMI information in such cases Recently AmerenUE installed filters in OAS to ignore old AMI information

11.3.5 AmerenUE depends on its communications Network Operations Center (NOC) to support its internal information network. However, due to a lack of experience in handling Level III events, the NOC did not proactively monitor voice systems performance, nor was 24/7 coverage provided by voice network specialists for the call center during the July 2006 storm.

The NOC supports AmerenUE's operational systems through remote monitoring and on site trouble response The NOC has developed a storm operations plan since the July 2006 storm The plan calls for various levels of mobilization depending on the severity of the major event and includes the possible activation of 24-hour coverage and on premise support for resolving voice system issues

AmerenUE reported incidences where incoming customer calls were lost between exiting the Voice Response Unit and being answered by a call center representative During its 24-hour operation, the call center requested support from the NOC but was handicapped in resolving the issue due to a lack of 24-hour support [80]

11.4 Recommendations

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

Continue the enhancements to the OAS to further improve the determination of estimation of restoration times during Level II events This should include

[80] KEMA Interviews MK02, MK11

- Refining the handling of trouble tickets to avoid clearing entries associated with downstream damage on the feeders by amending the original outage ticket with Field Checker data on downstream events,
- Ensure the logic provides a means for reassigning customers to the closest known fault and decoupling the customers from the farthest upstream fault,
- Amending the OAS screens 62 and 63 to include counts of the damaged assets, spans down, poles down, etc , to support the estimation of resource requirements under Level III events,
- Improving OAS reporting functionality to support a quick damage assessment process for the EOC during its initial (0-6 hours) assessment of system damage and required resource requirements for restoration, and
- Test the recent enhancements to the OAS under simulated Level III and IV conditions to ensure it is functioning

11.4.2 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.

Continue to develop a batch verification process to automatically verify service restoration of distribution circuits and some groups of single outages

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

Continue the work between CellNet and AmerenUE to further identify and tune system parameters to alleviate bottlenecks associated with large data volumes during large-scale events

12. Emergency Restoration – Customer Service

12.1 Industry Practices

The leading practice in electric utility customer service functions is to provide the first two-way communication with the customer before, during, and after outage events As an outage event unfolds, the call center shifts from its initial role of receiving outage information from customers to providing restoration estimates designed to help customers cope with or react to the outage event Near the expected end of the restoration period, the call center shifts to receiving outage information from individual customers still without power

The customer service function includes the call center and its supporting technology Generally, the supporting technology includes an Automatic Call Director (ACD), an Interactive Voice Response Unit (IVRU), and the utility's network telecommunications provider's network ("cloud") and related contracted-for overflow or backup capabilities Utilities typically use various customer service and/or outage reporting systems to manage interaction with customers

The volume of calls received is dependent on the

- Severity of the outage,
- Customers' emergency preparations,
- Quality of the utility's external communications,
- Visibility and progression of the restoration,
- Availability and accuracy of restoration estimates, and
- Customers' communications capability during the outage event

The call center should have access to information requested by customers During outages, customers want specific actionable information to make their decisions Each customer call that does not provide requested information may increase future call volume, as well as the frustration levels of customers and Customer Service Representatives (CSRs) At the same time, the utility may not have yet completed damage assessment or developed a specific restoration estimate for each area or outage

12.2 AmerenUE Practices

AmerenUE's 250-seat virtual call center is consistent with industry leading designs The call center provides two-way communication with the customer before, during, and after outage events The call center is equipped with an ACD and IVRU The call center is designed to support and augment the CSRs and can handle 150 calls while the remainder of the inbound calls will be queued for CSRs or queued for the IVR ports when they become available AmerenUE provides both local and "800" numbers for customer contact, plus a dedicated number for police and fire calls The AmerenUE call centers are designed to be "virtual" with the ability to shift calls among AmerenUE facilities in Missouri and Illinois, home located CSRs, and, if necessary, to a 3rd party staff augmentation firm located in North Carolina AmerenUE also contracts for automated backup (overflow) service with the capacity of handling 30,000 calls per hour, shared among the Missouri and Illinois call centers This service uses a bank of IVR equipment with a script and logic similar to AmerenUE's VRU Information is shared from OAS every 10 minutes to ensure the Vendor IVR has information to communicate to customers Exhibit 12-1 shows the inbound call flows

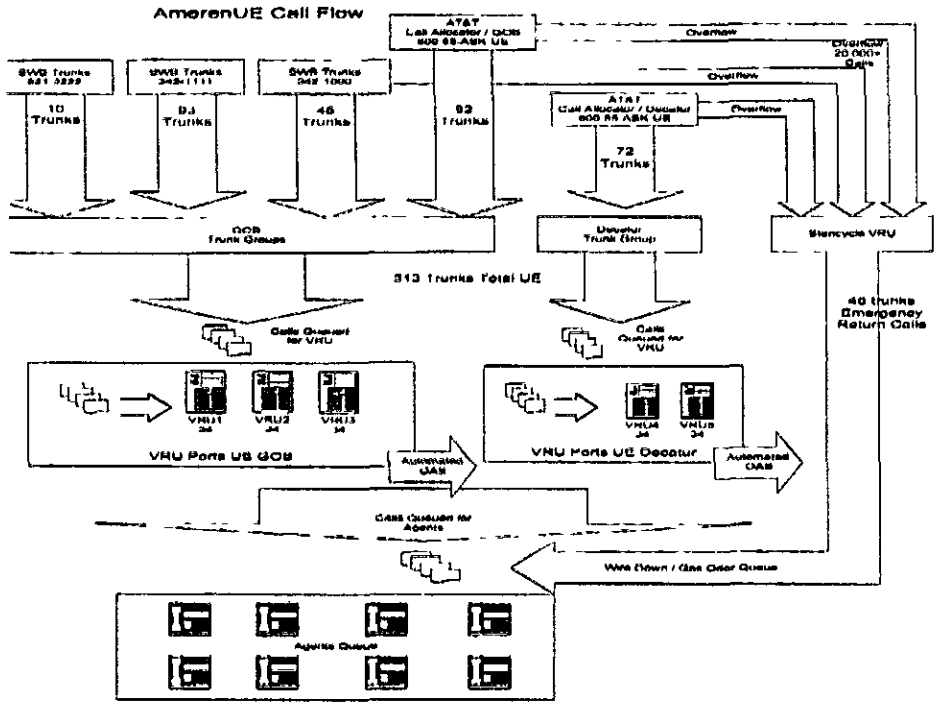


Exhibit 12-1: AmerenUE Inbound Call Flow

12.3 Conclusions

12.3.1 AmerenUE's OAS for limited restorations (Level I and II) effectively communicates the status and provides estimated restoration times to customers.

CSRs and other AmerenUE personnel are trained in the use of OAS and training is offered often The CSRs reviewed by KEMA were well versed in the use of OAS, and OAS performs in a timely manner [81] Customers can provide a notice of a service interruption by their entries into AmerenUE's IVRU or through contact with a CSR Customers can access outage and restoration information over the Internet during limited outages and review storm status by zip code or by direct entry based on service location account number or telephone number [82]

Customers cannot use the IVRU to get restoration status If a customer who has had a recently restored outage calls in, their call is automatically directed to a call-taker rather than allow them to log another "false" outage call Customers have learned that they can call the IVRU to get an updated ERT However, doing so, logs an outage call if they have been restored The routing of this call to the CSR helps prevent this issue

12.3.2 Because AmerenUE's OAS can take interruption data and provide timely restoration information from/to customers rapidly and effectively, during Level I and II restorations, AmerenUE has inadvertently raised customers' expectations during Level III restorations.

As discussed elsewhere, the OAS's capability to generate an estimated restoration time is not accurate or effective during a major storm (Level III), while damage is still being assessed and incremental foreign resources are being obtained AmerenUE does shutdown the automated capability when a storm is determined to be major [83] Additionally, during the July storm, AmerenUE was unprepared for the high volume on its Outage Map website resulting from the magnitude of the Level III storm and customers' desire for "real time" information [84]

[81] KEMA Call Observations HS10
[82] KEMA Capability Review
[83] KEMA Interviews HS01, HS09, MK11
[84] KEMA Review of press clippings (St Louis Post Dispatch, July 21, 2006) and KEMA review of Outage Information web page (7/24/06)

12.3.3 Customer service has established backup procedures to ensure that its call centers can continue to operate under a variety of potential problems.

The Call Center described its plans and procedures to operate without the support of OAS, if needed AmerenUE has prepared for the loss of the OAS by readying paper outage "tickets" procedures to respond to "wire down" or "gas leak" calls and expeditiously "running" the paper tickets to the DDO [85]

AmerenUE's virtual call center design further protects its operations if one call center should lose power, or otherwise become inoperable [86] As described above, AmerenUE has designed its call centers to operate in tandem and has the capability of transferring or redirecting calls between its call centers in Missouri and Illinois and its North Carolina collection contractor Further, AmerenUE's call centers are on one system and the employees have been cross trained (for outage information) between Missouri and Illinois [87] This "virtual" call center design provides the flexibility to response to outages that might affect one or more AmerenUE call centers

AmerenUE trains its CAD department employees annually to act as a resource for additional call center support [88] Additionally, AmerenUE can use former call center employees, however, their training may not be up to date [89]

AmerenUE's North Carolina service provider is trained to take certain calls, including outages AmerenUE has contracted for automated overflow service, which can provide further backup capabilities

12.3.4 AmerenUE reported two instances of the loss of calls during the storms.

During the July 2006 storm, AmerenUE's telecommunications network provider dumped calls due to its concern about overloading the public telecommunications network AmerenUE has reviewed this situation with the provider and steps have been taken to avoid a recurrence [90] During the January 2007 storm, AmerenUE's Automatic Call Director (ACD) placed approximately 4,275 calls in a dead queue

[85] KEMA Interview HS09
[86] KEMA Interviews HS01, HS09, MK11
[87] KEMA Interview HS01
[88] KEMA Interview HS01
[89] KEMA Interview HS01
[90] KEMA Interviews HS01, MK02, MK11

due to an equipment software failure Customer Service and IT are reviewing that situation and will be implementing a fix to remedy the software failure [91]

12.4 Recommendations

12.4.1 Complete the review of the loss of customer call situations.

AmerenUE should review the structure of its communications to determine opportunities for better service and avoid potential sources of lost calls Specifically, AmerenUE should

- Determine the needs of inbound communications stakeholders within and external to AmerenUE,
- Review potential call volumes during Level III and Level IV restorations,
- Determine the existing capabilities of its network provider and its virtual call center,
- Develop a series of realistic test scenarios for the external network and virtual call center, including appropriate loading on the network,
- Working with the external network provider, run the test scenarios under realistic conditions, and
- Evaluate the test results, and make appropriate changes

12.4.2 Use the 800 network in front of Customer Service System/IVRU to enhance call-taking capacity and capabilities.

Using the 800 network in front of the call center and IVRU will allow AmerenUE to handle a greater volume of calls This will eliminate the phone company's practice of pegging AmerenUE's incoming calls The increased call volume can then, through Automated Number Identification (ANI), have a unique restoration message while allowing non-emergency calls to proceed to the call center AmerenUE will be able to create real time messages for each of the ANI numbers and update as necessary An added benefit to this configuration, as shown in Exhibit 12-2, is a potential reduction in the number of trunk lines coming into the call center

[91] KEMA Interviews HS01, HS09, MK11

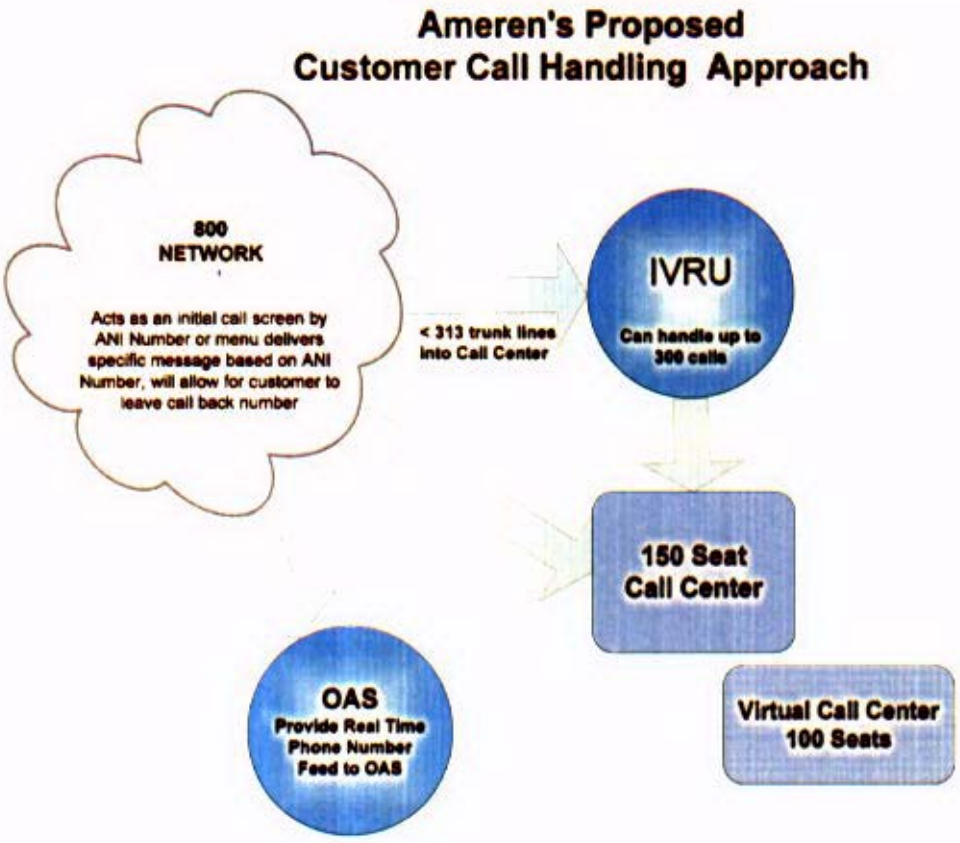


Exhibit 12-2: Using the 800 network as Front-end during Emergencies

13. Emergency Restoration – External Communications

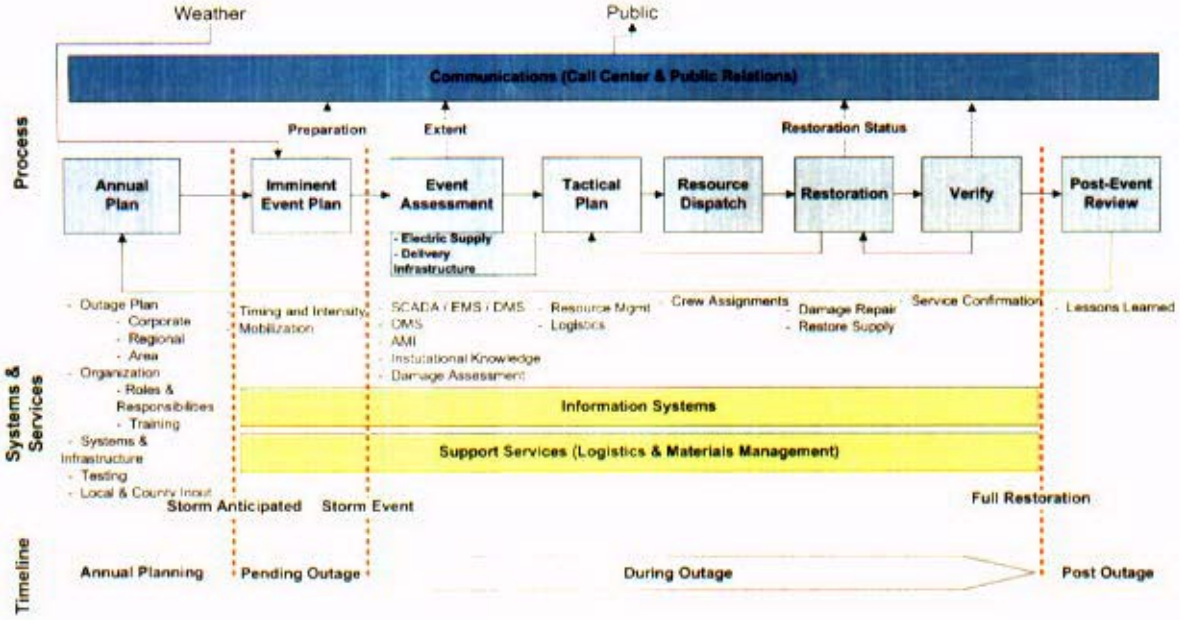


Exhibit 13-1: Outage Management Process – Communications

13.1 Industry Practices

A typical utility's external communications function provides information to customers before, during, and after outage events. External communications must also address the business community's needs to predict when service, and therefore, business, will be resumed. Government bodies such as local, county, state and regional authorities need restoration information to support public functions such as shelters, traffic control, food transportation and other essential public safety services such as healthcare and law enforcement. While it has similar functions as the call center, external communications is subject to customers' ability to receive TV, radio, print and internet media during outage events. Additionally, the media may act as a filter or interpreter, or even report news that dilutes the utility's intended message. Some utilities have messages pre-placed with radio stations to be played during storms to ensure the purity and clarity of its message gets to its customers. During restoration, the utility may decide to purchase radio time to send specific updated messages to its customers.

13.2 AmerenUE Practices

AmerenUE has a Corporate Communications organization, a Community Relations organization (functioning primarily in the metro St Louis area) and a Key Accounts organization that are positioned to deliver messages and local information to affected customers, communities and other governmental organizations and major accounts during emergency events All three departments rely on the twice-daily conference call initiated and managed by the EOC for timely and reliable information In the suburban and rural areas, Division management also has a significant communications function including Customer Service Advisors (CSA)

AmerenUE has developed a (2007) Corporate Emergency Communications Plan and Manual

13.3 Conclusions

13.3.1 The AmerenUE 2007 Corporate Emergency Communications Plan is comprehensive, well detailed and demonstrates that AmerenUE can develop appropriate communications processes.

The 2007 Corporate Emergency Communications Plan is detailed and defines key principles, the evaluation of emergencies, specific responsibilities, the establishment of the emergency news center (including the required support equipment), backup plans for loss of telecommunications capability, a step by step sequence of response actions to be made and detailed responsibility for the maintenance, distribution of the Plan [92] However, the Plan has not been integrated with the Electric Emergency Restoration Plan [93] The EOC provided, as an example, a less formal Emergency Communications Plan that dated from 1999 The 1999 version is very similar to the more polished and formal 2007 Corporate Emergency Communications Plan AmerenUE updates its Emergency Communications Plan every three to five years

[92] KEMA review of the Plan document
[93] KEMA Interview RG1 and KEMA review of Electric Emergency Restoration Plan

13.3.2 The EOC and its twice-daily conference calls are viewed as responsive to the information needs of the various communications functions, however during the first two storms actionable information for customers, such as estimated restoration times, was not provided.

The twice-daily conference calls are viewed as a very important, useful intra-company communications method by Corporate Communications, Key Accounts, Community Relations, Customer Service, Regulatory, and the Divisions [94] The EOC also provides information directly to state and county EOC and some localities upon request [95]

Although Corporate Communications attended the twice daily conference calls and visited the EOC often, restoration information was not forthcoming or was inaccurate, due again to its having been difficult to ascertain given the magnitude of the storms [96] During the July and December 2006 storms, no restoration time estimates were recorded as issued by the EOC This limited the information that could be provided to customers (see below)

13.3.3 Key Accounts was able to leverage its relationships with major customers and provide them with actionable information.

Key Accounts followed the restoration process by attending the twice-daily EOC conference calls and using the company's press releases Working as a team, Key Accounts contacted its customers twice daily and was able to provide key account customers with specific information about the overall timing of the restoration This allowed those customers to use this information to determine if they should obtain generators or plan for further facility shutdowns AmerenUE received many letters of thanks from key accounts [97]

[94] KEMA Interviews HS01, HS03, HS09, HS13, HS17, HS18
[95] KEMA Interviews MK19, HS16
[96] KEMA Interview RG1 and KEMA Data Request
[97] KEMA Document Request HS03-01

13.3.4 During the first two storms, AmerenUE's initial communications to customers lacked specificity and provided limited actionable information during the restoration. AmerenUE did not provide localized estimated restoration times. However, in the second half of the January storm, AmerenUE did provide this needed information to customers.

Instead of waiting for a definitive damage estimate, AmerenUE should have communicated the severity of the outage to its customers sooner Lacking specific information to communicate the severity of the outage in terms such as the expected length of the restoration (number of days), AmerenUE added additional stress to its customers during the restoration [98] Some concern was expressed that AmerenUE senior management was unwilling to release estimates of the full extent of the storm [99]

It is reasonable to expect that customers be informed of the potential extent of the storm event outage, even if a customer or area specific estimate cannot be provided early in the restoration process This information would have allowed customers to make better decisions about how to best cope with the outage Their options included staying in place, moving to relatives or friends with utility service, moving to a motel or hotel, or leaving the area The public is encouraged by government agencies[100] to plan for self -sufficiency for up to 72 hours before mobilization of governmental assistance

KEMA's review of AmerenUE's press releases for the three major storms indicate that terms such as number of customers out were used inconsistently by reporting numbers from different geographic focus [101] Similar press releases used differing numbers on the same day and further confused the issue by not including a specific time [102] There was no consistent format used to present the information to the public Some press releases did not include the release time although all did include the release date While AmerenUE did provide frequent press updates during the restoration process, its communications during that period did not use clear language nor provide a specific estimate of the number of days it may take to restore power The information necessary was simply not available AmerenUE should consider whether it issued too many press releases

[98] KEMA Interviews HS03, HS13, HS16, HS18, MK11, MK12
[99] KEMA Interview MK11
[100] http //www ready gov/america/getakit/index html
[101] KEMA Interview HS04
[102] KEMA review of communications materials and press releases (December storm)

Examples from the July storm include

- "will take at least 72 hours (7/20)",
- "may be out as long as 72 hours-and some could be out longer than that (7/21)",
- No restoration estimates were provided (7/21 @2 PM), (7/22 @10 AM & 4 30 PM), (7/23 @noon),
- "restoration time may slip into Tuesday or Wednesday" (7/23 @4 30 PM),
- "AmerenUE officials originally estimated that the majority of the affected customers will be restored by Tuesday night, with the remainder Wednesday and the very last customers on Thursday" (Monday 7/24 @4 30 PM),
- No restoration estimate (7/25 @9 PM), (7/26 @9 PM), (7/27 @9 PM), and
- There was no evidence of localized or tailored restoration estimates during the July storm [103]

Examples from the December storm include

- "Lengthy outages are expected" (12/1 no time on press release),
- No restoration estimates were provided (12/1 @5 PM) and (12/1 no time on press release),
- "Bulk expected to be restored by end of day Wednesday, Dec 6 with remainder Thursday and Friday" (12/5 @10 AM), and
- "Storm wrapping up today" (no date or time on press release) [104]

Examples from the January storm include

- "AmerenUE Illinois Utilities Prepare for predicted winter weather watch", (1/12)
- "A restoration update will be provided later today Lengthy outages are expected " (1/13 @8 AM), and

[103] KEMA review of communications materials and press releases
[104] KEMA review of communications materials and press releases

- No restoration estimate (1/13 @5 PM)

On January 14th at 5 PM AmerenUE began to provide specific restoration estimates by geographic areas and the information was provided on the subsequent press releases [105]

13.3.5 AmerenUE does not have a well defined media process to convey restoration information directly to customers and thus was subject to the media's discretion, editing and juxtaposing of AmerenUE's intended message.

Utilities have considered whether message boards or postings in places of public assembly would be useful during mass outages Some utilities purchase radio airtime to ensure their exact messages are delivered at specified times AmerenUE did not use or consider this method of communicating with customers [106] On occasion, AmerenUE has used existing media time or newspaper advertisements to communicate with customers during an outage

AmerenUE does use press releases, press conferences and the management interview to communicate with customers AmerenUE also uses email "Blasts" to share information Presently, 386,000 customers are registered to receive these email messages

By relying on the media's discretion to transmit AmerenUE's restoration messaging to customers, AmerenUE created the possibility that it would lose control of its intended message KEMA's review of press clippings indicated that preceding negative events such as restoration from storms in 2004 and 2005 and inadequate tree trimming expenditures were mentioned along with AmerenUE's storm messaging,[107] thus diluting AmerenUE's intended message and reducing the public's confidence in AmerenUE capabilities and outage restoration efforts

13.3.6 AmerenUE did not have a critical facility list or a methodology to define a critical customer facility. Therefore, it was not clear whether critical facilities receive the information they need.

Key Accounts and Community Relations have varying definitions of critical facilities and they can overlap in responsibilities for critical public service

[105] KEMA review of communications materials and press releases
[106] KEMA Data Request HS04, HS13, HS16 Fox, Gallagher, Cowan
[107] KEMA Review of press clippings (St Louis Post Dispatch, July 21, 2006, also July 22, 2006)

facilities such as water and sewer service [108] When requested, no one in the communications area produced a critical facilities list [109] Individual customers can self-report medical needs and AmerenUE tracks that information in its customer information system [110]

The EOC maintains two lists of priority customers, the first within OAS/CSS and covers all customer classes The Distribution Dispatch Office maintains a very short list of priority customers fed from the 34kV system (major hospitals, fire, and police) that can be restored by a troubleman The Divisions are responsible for prioritizing high priority customers not fed from the 34kV system [111]

13.3.7 Community Relations has offered tours of the EOC and meetings with Company personnel were well received. However, when offered an opportunity to be on AmerenUE's e-mail list for storm updates, interest was low.

To foster communications with Metro St Louis area communities, prior to the storm season AmerenUE's Community Relations manager arranged tours of the EOC to provide details of the restoration process In addition, maps showing the specific AmerenUE District boundaries and listing the names and phone numbers of key District personnel to contact on service related issues was distributed to St Louis metropolitan communities As a follow-up to all this AmerenUE offered to provide e-mail restoration updates during major outages Little interest was expressed by the participants Interest in the e-mail updates may have been low because many municipalities are accustomed to contacting AmerenUE's EOC directly by telephone as their information needs develop [112]

13.3.8 While a draft AmerenUE communications plan exists, there appears to be no corporate wide focus on communications.

A Communications Plan for Severe Storms[113] and a Corporate Emergency Communications Plan does exist (described above) [114] Without a defined corporate communications strategy, the efforts of Corporate Communications, Employee Communications, Key Accounts, Community Relations, Customer

[108] KEMA Interviews HS03, HS16
[109] KEMA Interviews HS03, HS11, HS16, HS17
[110] KEMA Data Request HS01, HS09, MK11
[111] KEMA Interviews HS17, MK19
[112] KEMA Interviews MK19, HS16
[113] KEMA Data Request HS13-1
[114] KEMA Data Request HS13-2

Service, Regulatory and Customer Service Advisors located at the Divisions appear unevenly supported and unevenly executed Effective communications with customers begins during periods of normal business and the relationship thus developed adds support during times of stress such as emergency restoration

13.3.9 Over a number of years, AmerenUE has reduced its outreach to the community. This reduction appears to have affected the level of goodwill and communications between AmerenUE and its customers.

During periods of adversity and operating performance problems, AmerenUE has limited or no "banked" goodwill and relationships to offset customers' perception of current events No formal program to encourage active participation by AmerenUE employees in charitable, community, volunteer activities, and appointment to governmental bodies exists [115] AmerenUE no longer has a Speaker's Bureau [116]

13.3.10 Division management augments its CSA by encouraging and supporting employees that volunteer to join and support groups such as the local chambers of commerce.

KEMA analyzed the coverage of local governmental meetings, participation in local and county EOC, boards and authorities, chambers of commerce and community organizations and found the coverage uneven across the divisions [117] To overcome limited communications resources, Division management encourages its employees to participate in community meetings, boards and chambers [118] This practice can provide important benefits to AmerenUE and career development opportunities to the employee Additionally, it creates a sense of goodwill and opportunities to explain restoration practices in advance of a storm However, because AmerenUE does not have a Corporate Communications Strategy or Plan the efforts within the Divisions differ in breadth and level of intensity [119]

[115] KEMA Data Request Gallagher, Davis, Cowan, General
[116] KEMA Interview HS16
[117] KEMA Data Request Division Manager Survey
[118] KEMA Interview HS17
[119] KEMA Data Request Division Manager Survey

13.3.11 While the recent J.D. Powers survey confirmed that AmerenUE is not viewed positively by its customers, many employees report that their immediate neighbors have a much better view of AmerenUE and its storm restoration efforts.

The recent survey ranked AmerenUE second worst in the Midwest [120] Anecdotally, AmerenUE employees report that their neighbors understand and recognize their extended efforts to minimize storm restoration times [121] This different level of customer opinion indicates that a broader or more intensive communications strategy may provide benefits to AmerenUE

13.3.12 While the Missouri Public Service Commission received a large number of customers' comments about AmerenUE during and after the three storms, the volume was not unusual or excessive considering the magnitude of the storms and the on-going rate case and other issues.

The Missouri Commission provided a detailed listing of AmerenUE customers' calls received by the Commission from 2002, with specific customer names and other identifying information removed. The calls covered a wide range of issues important to customers For a significant number of calls the caller's concern could not be ascertained from the information provided As expected, call frequency increased during and after the three storms The notations provided by the Commission support the conclusions within this report relating to estimates of restoration times, communications and operations KEMA analyzed the call data provided and considering the magnitude of the three storms, the number of calls received by the Commission do not appear to be excessive [122]

[120] KEMA Interview MK12, KEMA Data Request MK12-01
[121] KEMA Interviews HS05, HS08, HS09, HS12, HS15
[122] KEMA review of Commission supplied data

13.4 Recommendations

13.4.1 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.

AmerenUE must create public messages in line with the EOC restoration dashboard information Specifically, AmerenUE should

- Determine the needs of stakeholders (senior management, restoration employees, regular employees, suppliers, customers, key accounts, governmental entities, state and county EOC, regulators, etc) within and external to AmerenUE, including frequency of updates, format and content,
- Determine and arrange for reliable and timely sources for the information,
- Determine which AmerenUE communication function (Corporate Communications, Community Relations, Key Accounts, regulatory, Division Management, senior management, etc) is responsible for the delivery of information to a specific external stakeholder in the manner and format that meets their needs (phone, fax, e-mail, radio, other),
- Document the communications process including specific responsibilities,
- Develop and run realistic test scenarios that includes external stakeholders,
- Evaluate the test results and make appropriate adjustments, and
- Document the communications process and integrate within the ERP

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

AmerenUE must control the message content to its customers and other stakeholders, to the extent possible Consider implementing the following actions

- Evaluate media and other delivery methods (radio, text messaging, web, posting boards at mass assembly locations, dynamic billboards etc),

- Structure a trial process,
- Develop communications partners (radio stations (limited number with specific coverage), text, web and mass assembly locations),
- Document the communications process including specific responsibilities,
- Develop and run realistic test scenarios that includes external delivery methods,
- Evaluate the test results including penetration and timeliness and make adjustments, and
- Document the communications delivery process and integrate within the EERP

13.4.3 Enhance the newly created critical facility list and define responsibilities and expected outcomes.

For an effective restoration, and to minimize public inconvenience, AmerenUE must communicate with the operators of critical facilities and therefore needs to have a structured process to identify those facilities and determine the optimum communications method and the information required by the operators AmerenUE should undertake the following actions with regard to critical facilities

- Define critical facilities in conjunction with stakeholders (senior management, suppliers, customers, key accounts, healthcare, other utilities, cellular providers, governmental entities, state and county EOC, disaster recovery (Red Cross and other shelters), regulators, etc) within and external to AmerenUE,
- Identify critical facilities,
- Cross reference critical facilities to OAS, SCADA, CellNet, etc ,
- Determine specific information needs and delivery methods by type of critical facility,
- Assign specific responsibilities by type of critical facility to specific internal AmerenUE organizations,

- Document the critical facilities communications process including specific responsibilities,
- Develop and test realistic test scenarios that includes external stakeholders,
- Evaluate the test results and make adjustments, and
- Document the critical facilities communications process and integrate within the EERP

13.4.4 Refine the Corporate Communications Strategy.

AmerenUE's relationship with customers, regulators, and public officials' goodwill has been severely strained by the three storms AmerenUE should rebuild those relationships to ensure that the restoration process for future storms and outages are not impacted by poor relationships or unnecessary public comments AmerenUE should undertake the following actions with regard to a Corporate Communications Strategy

- Develop over arching goals for the Corporate Communications Strategy including performance measures,
- Document the needs of stakeholders within and external to AmerenUE,
- Consider alternative methodologies to reach goals (including strategies used by utilities and non- utility organizations),
- Determine a reasonable, sustainable long-term budget (including staffing additions), also consider reduction of unproductive or unrelated activities,
- Define which AmerenUE function (senior management, Corporate Communications, Community Relations, Key Accounts, Regulatory, Division Management, governmental relations, etc) is responsible for the communications with each specific external stakeholder in the manner and format that meets their needs,
- Document the Corporate Communications process including specific responsibilities and performance measures,
- Measure results, and
- Adjust the Corporate Communications Strategy as appropriate

14. Supply Chain

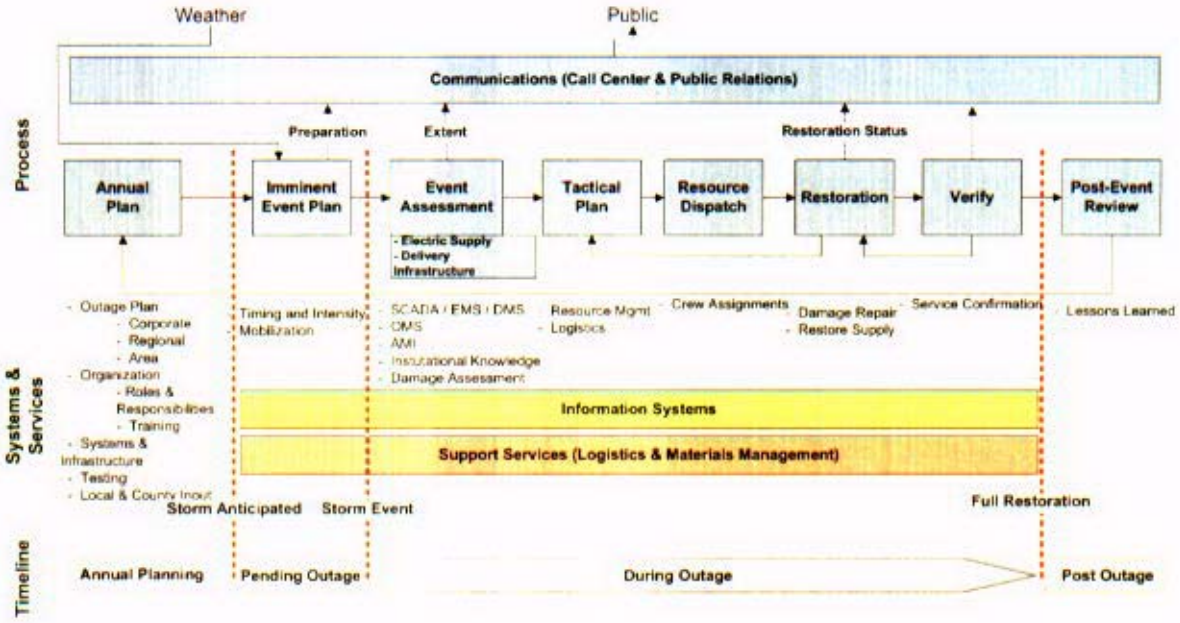


Exhibit 14-1: Outage Management Process – Supply Chain

14.1 Industry Practices

At all utilities, an outage event requires the availability of materials needed to repair or replace damaged infrastructure. These materials must be delivered to the right location in a timely fashion to maintain crew productivity. Supply Chain Operations must receive specific requests for materials from operating centers and must communicate delivery times and locations to field operations. The effectiveness of the Supply Chain directly affects the planning and execution of any storm event.

Due to long lead times for certain materials, Supply Chain Operations (purchasing, inventory control, storerooms, and distribution functions) requires planning to respond to an outage event. Pre-stocking of outage reserves within operating center storerooms or at other locations is needed to ensure rapid response and reduce transportation requirements during outage events. Further, major restorations consume materials at rates well above any reasonable level of outage reserves. The establishment of dedicated storm reserve stock is a small cost to ensure timely restoration from a major outage. Supply Chain Operations must have plans in place to manage rapidly changing inventories, restock storerooms and crews effectively and order, track and expedite materials from suppliers.

14.2 AmerenUE Practices

Purchasing and inventory control operate from AmerenUE's headquarters AmerenUE supports its Missouri restoration operations from its central Dorsett storeroom, other storerooms and a fleet of dedicated "storm trailers "

Based on previous experience, AmerenUE has detailed lists of required storm materials and begins the ordering process as the storm begins, in advance of the formal damage assessment

AmerenUE has a materials management information system and application that operated in a mainframe environment for the three storms, but now a replacement system operates in a client server environment These systems provide the needed functionality to source, request, procure, and issue materials To overcome some inherent time lags within the materials management information system, AmerenUE uses spreadsheets and on-site material management coordination ("eyeballs") at the storerooms

14.3 Conclusions

14.3.1 Supply Chain Operations performed very well before, during, and after each of the three storms.

At the beginning of each storm, inventory control placed large orders for the expected storm restoration materials usage AmerenUE drew upon its documented storm requirements in previous storms to improve the accuracy in defining these initial orders for each of the three major storms [123] One inventory control supervisor shifted from the corporate offices to the Dorsett storeroom to ensure that inventory levels were observed and confirmed first hand [124] Key Supply Chain Operations personnel also shifted to other locations as needed To insure clarity of roles, the responsibility for ordering was delegated to senior buyers, while the junior buyers assumed the expediting role [125]

AmerenUE's Supply Chain Operations implemented procedures to supply materials, in needed and appropriate quantities and lengths and to meter out supplies to crews during the early days of the storms [126] This attention to detail avoids material shortfalls As a result of experience from the July 2006 storm,

[123] KEMA Interviews HS02, HS14, HS15
[124] KEMA Interviews HS14, HS15
[125] KEMA Interview HS15
[126] KEMA Interviews HS05, HS06, HS08

AmerenUE's stores department developed methods to cost effectively retrieve excess materials from departing contractors [127]

AmerenUE's management worked collaboratively with the union and the bargaining unit employees supported the restoration effort well [128]

14.3.2 AmerenUE's manned "Storm Trailer" concept provides a well-managed, specific, and reserved inventory of commonly used restoration materials that can be staged close to affected area(s).

AmerenUE has innovatively implemented the "storm trailer" utility leading practice The AmerenUE storm trailers contain specific restoration material neatly organized in specially designed 53-foot over-the-road trailers There are inventory levels determined for the storm trailers[129] and a "crew" is designated to manage "a storm trailer The "crew" is staffed by experienced storeroom employees augmented by employees from AmerenUE's power plants,[130] thus expanding the capabilities of Supply Chain Operations These crews were trained to recognize distribution materials through an Overhead Line Familiarization Program To support the reordering of materials each Storm Trailer is equipped with laptops that can access AmerenUE's materials management system over a wireless network [131] Together the storm trailers, dedicated inventory levels, specifically trained and designated staffing and access to the materials management system forms a very innovative package Exhibit 14-2 and Exhibit 14-3 shows these Storm Trailers As shown in Exhibit 14-2 the cross arms are conveniently stored in a special rack under the trailer, leaving valuable interior space for small stock items

[127] KEMA Interviews HS06, HS08, MK09
[128] KEMA Interviews HS02, HS06, HS08, HS15
[129] KEMA Interview HS06
[130] KEMA Interviews HS06, HS08
[131] KEMA Interview HS06

Exhibit 14-2: Storm Trailer

Exhibit 14-3: Inside of a Storm Trailer

14.3.3 "EMPRV", the Materials Management Information System (MMIS) replacement, is a concern for Supply Chain Operations because it is slower than MMIS, which already requires the use of paper to support materials selection and order status.

This conclusion regarding the MMIS is supported by the following two findings

14.3.3.1 MMIS has now been replaced by a new materials system (EMPRV), which concerns Supply Chain Operations because it is slower than MMIS. AmerenUE has not investigated the limitations of EMPRV under storm restoration conditions, to determine the impact on timely receipt and delivery of materials.

Supply Chain Operations has expressed their concerns over EMPRV's slow response time to the IT organization, which has achieved some changes EMPRV is still considered slower than MMIS by many within Supply Chain Operations [132] An example includes long delays to assemble material status reports

If EMPRV is significantly slower than MMIS during storm conditions, AmerenUE's Supply Chain Operations performance could affect restoration efficiency Because the paper methodology is used to provide rapid service, it is a critical link to the EMPRV system AmerenUE should develop a program to investigate the EMPRV performance concerns

14.3.3.2 The MMIS was augmented by paper forms/reports to minimize the process time for both material selection and order status.

Because of concerns over the response time between MMIS and Oracle and handheld devices used for the pick function, a paper based methodology was developed and used in both inventory control and the storeroom [133] The paper methodology allowed more rapid supply and then the information was entered into the MMIS This accommodation was viewed positively by Supply Chain Operations

[132] KEMA Interviews HS08, HS14, HS15
[133] KEMA Interviews HS06, HS08, HS14, HS15, response to KEMA Data Request

14.3.4 During the first two storms, Standards Department employees were used as field checkers, which had an impact on information needed for substitutions when approved materials were not available. However, for the third storm Standards ensured that adequate support was available.

Standards personnel, who have strong knowledge about the distribution system, were wisely designated to perform the field checker role [134] However, when pre-qualified materials and/or suppliers are unavailable during a storm, Purchasing must obtain approvals for substitute materials from the Standards Department to maintain system integrity While no clear examples were cited of materials delays, Supply Chain Operations expressed concerns and Standards provided support as needed during the first two storms In response to Supply Chain Operations' needs, Standards ensured coverage was provided during the third storm [135]

14.4 Recommendations

14.4.1 Develop and perform a realistic test for EMPRV.

EMPRV needs to work well during a restoration effort Further, the tool should minimize the need for the use of paper except in the most extreme conditions where communications has been interrupted Consider the following recommended actions

- Determine the needs of supply chain stakeholders within and external to AmerenUE,
- Develop a series of realistic test scenarios for EMPRV, including unrelated loading on the client server and a backcast of the three storms,
- Run the test scenarios under realistic conditions,
- Evaluate the test results, and
- Determine if changes are required and make changes

[134] KEMA Interviews HS14, HS15
[135] KEMA Interviews HS14, HS15

15. Support Logistics

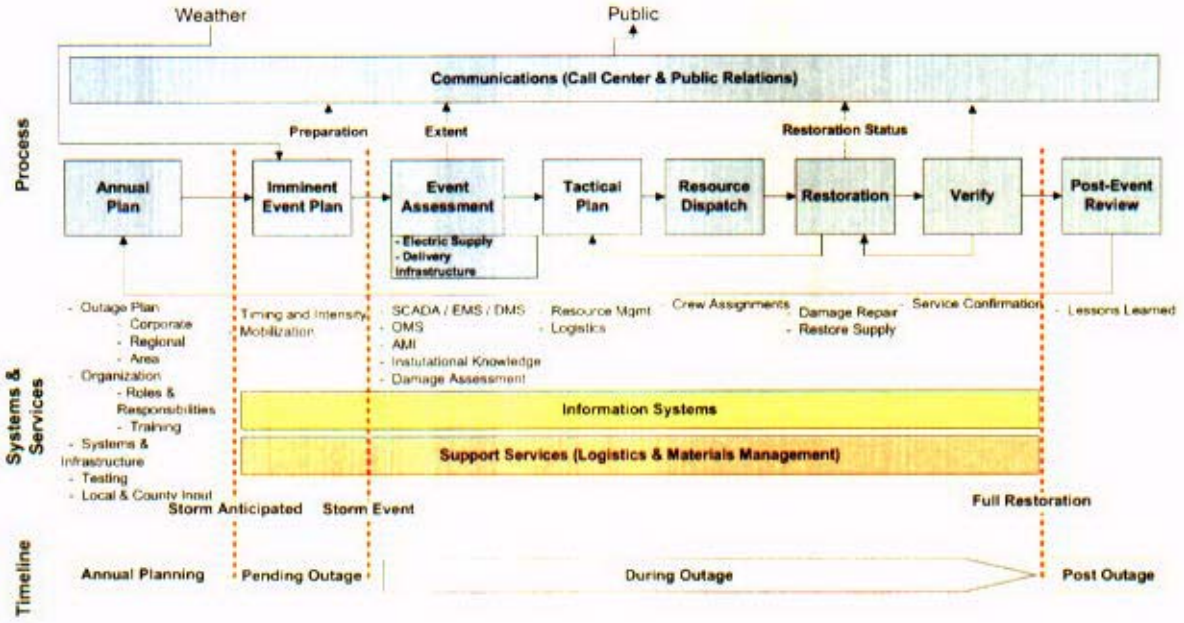


Exhibit 15-1: Outage Management Process – Support Logistics

15.1 Industry Practices

The typical utility must be prepared to provide support such as food and lodging for both its own employees while working long outage shifts and outside restoration crews. This requirement is complicated by the typical 16-18 hour shifts used during the early phases of restoration, which leave little time for needed rest and travel to accommodations.

For efficiency, many utilities arrange catering services that deliver lunches to crews at their work locations and provide breakfast and dinner at the beginning and end of the workday. This alleviates the need for crews to travel from the work site two or three times per day. The hotel/motel accommodations also require creativity, as the parking lots must be able to accommodate a large line trucks and other vehicles. In some circumstances, local hotel/motels cannot be used if they are still without power. A well-designed support logistics program avoids undue use of facilities that the utility's customers may also need such as hotel/motel rooms and restaurants.

15.2 AmerenUE Practices

AmerenUE provided the expected food and lodging, but also provided shuttle vans to move crews from their lodging to staging areas, security for Company facilities and vehicles parked overnight, and contracted for staging areas for foreign crews and vehicles Notably, AmerenUE contracted for a mobile laundry facility and employees volunteered to process line workers' clothing to maintain the pace of the restoration

15.3 Conclusions

15.3.1 To meet the unexpected needs to effectively lodge, provision, and support foreign contractors and mutual aid crews, AmerenUE developed cost effective support logistics methods. While a number of employees have experience during storms, AmerenUE has not documented its support logistics process for Level III storms.

In August 2005 AmerenUE centralized storm support logistics [136] For the July 2006 storm AmerenUE used two college dormitories to provide lodging for over 700 foreign crew members [137] This innovative concept reduced costs and eliminated competition for lodging with AmerenUE's customers AmerenUE arranged for buffet breakfasts and dinners to be catered at the lodging sites to manage costs and eliminate transit time to restaurants Box lunches were distributed before daily dispatch to eliminate crew time lost by traveling to and waiting to be served in restaurants

During the winter storms, the dormitories were not available and AmerenUE shifted its focus to geographically select accommodations that reduced transit and meal time [138] As necessary, AmerenUE provided buses to transfer crews from staging areas if the lodging did not have adequate parking space for work vehicles and provided security at the staging areas and lodging to protect line crews' work vehicles

Over 200 AmerenUE employees volunteered to assist with support logistics and provide local knowledge for foreign crews AmerenUE contracted for a mobile

[136] KEMA Interview MK12
[137] KEMA Interview MK12
[138] KEMA Interview MK12

laundry facility and AmerenUE employees volunteered to process line workers' clothing to maintain the pace of the restoration [139]

However, AmerenUE has not documented the process it used during Level III storms This leaves AmerenUE vulnerable to a lower level of performance if the designated employee is unavailable

15.3.2 To ensure safety and maximize its available work force, AmerenUE provided lodging to its own linemen if their home was without power.

Upon request, AmerenUE provided each lineman and his/her family one room if their home was without power [140] This accommodation was provided to ensure adequate rest for the employee and to eliminate their concerns about their family's safety

15.3.3 AmerenUE has not developed a rapid method to transfer the crew information available at the EOC to the support logistics function. Although AmerenUE has long term plans to use the capabilities of Resources on Demand it has not yet developed a plan to implement or test the software's ability to manage the support logistics function under storm restoration conditions.

Information was transferred by conferences among the relevant AmerenUE employees The status of support logistics was maintained on spreadsheets with data manually entered Minor problems including specific lodging requirements by crew and foreman and the timeliness of this information transfer occurred At present AmerenUE will continue to use spreadsheets for those functions [141]

AmerenUE will begin the implementation of version 3 0 of the software program "Resources on Demand", which is designed to track the resources available to the EOC and manage the support logistics function, however at this time implementation has not begun to extend the capabilities to support logistics [142] AmerenUE participated in the development of the changes to the software program for versions 2 5 and 3 0 and has plans to implement the tie between crew management and the support logistics capabilities of the program at some undetermined point in the future

[139] KEMA Interview HS12, KEMA Data Request MK12-0X
[140] KEMA Interview MK12
[141] KEMA Interviews MK12, HS12
[142] KEMA Interview HS12

15.4 Recommendations

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

Document all the work that has gone into managing the logistics processes supporting the restoration process Specifically, AmerenUE should

- Document the current support logistics process,
- Determine the needs of support logistics stakeholders within and external to AmerenUE,
- Determine the capabilities of Resources on Demand,
- Map the needs compared to the capabilities,
- Implement the support logistics function on Resources on Demand,
- Develop a series of realistic test scenarios, including unrelated loading on the client server and a backcast of the three storms,
- Run the test scenarios under realistic conditions,
- Evaluate the test results,
- Make appropriate adjustments to the support logistics Resources on Demand implementation,
- Retest and evaluate, and
- Document the support logistics function under Resources on Demand

16. Appendices

16.1 List of Exhibits

16.2 Comparative Data of Line Design and Pole Loading

COMPANY CODE	A	B	C	D	E	F	G
No of customers	4,700,000	310,000	520,000	2,202,625	650,000	5,271,365	4,400,000
Customer class distribution							
Residential	34%	60%	60%	91%	60%	88%	88%
Commercial	46%	35%	20%	8%	20%	9%	11%
Industrial	20%	15%	20%	1%	20%	1%	1%
Percent OH/UG	64/36	60/40	70/30	71/29	67 5/32 5	80/20	83/17
Pole loading/design criteria	CA GO 95	NESC	NESC Gr B	NESC	NESC	CA GO 95	NESC Hvy Ldg
Max wind speed for design	100 mph	85 mph over 60 '	-	-	60 mph	56 mph	NESC
(wood, steel, concrete, composite)	w, s, composite	w,c,s,comp	w s comp	w	w,c	w	w, com
Setting depths of poles	Generally 10%+2 feet w/ 6' min						
Typical span length (in feet)							
Feeders	200	250	200-300	200	200	150-300	138
Laterals	200	200	200-300	200-300	100	150-300	155
Software used for pole calcs	In-house	IDF-PRO	In-house,PLS	Unknown	O-CALC	In-house	In-house
Size of OH wire							
Feeders	336 ACSR	336 & 795	477	636 Al	336 Al	715 AA	336 AAC
Laterals	1/0 ACSR	#2	#2	1/0 ACSR	#2 AAAC	#4 ACSR	#4 & 1/0 ACSR
Use tree wire or spacer cable	Yes 1/0 ACSR	No	No	Yes,336&636	336/ 2/0 /#2	4/0 1/0	Yes
Type of insulators for storm prone areas	Porc & poly-clamp	Porc & poly	-	-	Porc-tie type	porc&poly/tie/clamp	n/a
Use different hardware to mount insulators	No	No	No	No	No	No	No
Framing used in storm areas	c-arm, delta	c-arm, vert	-	c-arm	c-arm,vert delta	c arm, delta	n/a
Any extra structural design for storm areas	Storm guys, washers	side guys	no	no	storm guys	no	no
Special UG design for storm areas	No	Bog shoes	No	No	No	Submersible	No
Special design for environ Sensitive areas	No	Yes	No	No	Ye	Yes	Yes
Use any break away devices	No	No	No	No	No	No	s/l pole bases
Use special wire to reduce wind load	No	No	T2-2 (4/0) dplx	No	No	No	No
Any other special products for storm loading	No	No	No	No	No	No	PLP dampers
Equip used to install heavy poles (>5K lbs)							
Investigating new construction/materials	No	No	No	No	Trng on pole calcs	No	No

Schedule RJM-E1-197