Utility Distribution Audit
Status Report

Presented to:
The Michigan Public Service Commission

Presented by:
The Liberty Consulting Group

1451 Quentin Road Suite 400 #343
Lebanon, Pennsylvania 17042
(717) 270-4500 (voice)
(717) 222-5122 (facsimile)
admin@libertyconsultinggroup.com

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I. Overview

A. Introduction

This report summarizes progress achieved to date on The Liberty Consulting Group's (Liberty) Utility Distribution Audit of Consumers Energy (Consumers) and DTE Electric (DTE) conducted on behalf of the Michigan Public Service Commission (MPSC). The audit is focusing on the identification of cost effective actions necessary to reduce the total numbers and durations of outages and of improvements to safety particularly with respect to the potential for contact with the electrical distribution system by the public.

B. Audit Scope Summary

The scope of the audit comprises two parts. Part One seeks to determine the conformity of both companies' distribution system infrastructure with company records, gather field observations, (including physical measurements where required) that seek to verify the extent of compliance with applicable standards, and to assess health and capability to perform in normal and upset conditions. These three assessments (physical conformity to records, standards, and operating needs) rely upon a statistically derived sample of facilities that accounts for broad differences in locations within the service territory, the range of immediate operating environments, infrastructure equipment used, and configurations employed.

The scope of Part Two will address programs and processes for emergency preparedness, storm restoration, distribution system maintenance, and investment to determine the degree to which they demonstrate sufficiency, equity, and consideration of climate change, and changing load conditions and profiles.

Liberty has organized work on this through three work streams:

- Part One: System Inventory and Assessment
- Part Two A: Distribution System, Organization, Staffing, and Resources
- Part Two B: Emergency Response.

Upon completion of audit work, Liberty will provide a final report addressing our examination of each audit scope element for each company. The final report will provide a description and explanation of the objectives of each scope element and will present findings by functional area. For each area, we will present a set of factual findings that describe objectively and without judgment what we have learned, observed, and quantified through audit work. We will present direct, clear conclusions regarding each element of the companies' operations and support them through a discussion of why they are material and what preceding findings support them. The findings and conclusions will also succinctly address and explain any identified deficiencies, and describe how other utilities have addressed the needs and circumstances involved. We will also present for each conclusion that reflects a concern, gap, or other reason to question current and expected practice and conditions, specific recommendations for improvements. Those recommendations will describe the specific changes that implementation can be expected to produce, the steps required for implementation, an assessment of the extent and magnitude of those benefits relative to the costs expected to achieve them, and reasonable timelines in which the company can implement them.

C. Audit Data Gathering Summary

Liberty has conducted significant data gathering activities to date. Key initial audit work involved the initiation of the data collection process with each company to begin the Part One System Inventory process. Data collection then moved to the issuance of requests designed to provide baseline data for the multiple Part Two audit tasks. With the receipt of responses to those latter requests, we have continued to issue data requests on a rolling basis. The following tables summarize data requests issued to date.

Consumers Data Request Summary

Part	Task Area	Number
1	Distribution System Installed Infrastructure	1
1	System Inventory	7
Part One Total		***8***
2	Asset Management, Vegetation Management, and Reliability	59
2	Background and Organization	7
2	Contractor Performance	8
2	Cost & Staffing	4
2	Electric Operations, Maintenance Management, and Asset Management	41
2	Electric System Planning and Load Management	4
2	Electric System Reliability and Smart Grid Activities	10
2	Emergency Preparation and Response	27
2	ETR Process	17
2	Municipal and Governmental Liaisons	5
2	Outage Communications	27
2	Utility Operations and Operations Organization	15
2	Wire Down Process	13
Part Two Total		***237***
Audit Total		***245***

DTE Data Request Summary

Part	Task Area	Number
1	Distribution System Installed Infrastructure	1
1	System Inventory	7
Part One Total		***8***
2	Asset Management, Vegetation Management, and Reliability	51
2	Background & Organization	7
2	Contractor Performance	8
2	Cost & Staffing	4
2	Electric Operations, Maintenance Management, and Asset Management	41
2	Electric System Planning and Load Management	4
2	Electric System Reliability and Smart Grid Activities	10
2	Emergency Preparation and Response	30
2	ETR Process	5
2	Municipal and Governmental Liaisons	6
2	Outage Communications	26
2	Utilities Operations and Operations Organization	15
2	Wire Down Process	13
Part Two Total		***220***
Audit Total		***228***

We have also held or scheduled all initial interview requests with company personnel. All Consumers initial interviews are scheduled for completion in December, while all DTE initial interviews are scheduled for completion in January. The following tables summarize interview requests held or scheduled to date.

Consumers Interview Summary

Part	Task Area	Number
2	Operations Organization	3
2	Emergency Repsonse	1
2	Emergency Response - Communications	11
2	LVD Overhead Lines	1
2	HVD Overhead Lines	1
2	Underground Assets	1
2	Maintenance of HVD and LVD Substation Assets	1
2	Electric Lines Construction Standards and Forensic Investigations	1
2	SCADA and System Protection and Relays	1
2	Outage Response and Restoration During Normal (Blue Sky and Non-Reportable Storms) Conditions	1
2	Vegetation Mangment	1
2	Pad Mounted Equipment	1
2	Reliability Index Calculation	1
2	Reliability Programs and Policies	1
2	Outage Reporting by Cause Code	1
2	Smart Grid Application	1

DTE Interview Summary

Part	Task Area	Number
2	Operations Organization	2
2	Emergency Repsonse	2
2	Emergency Response - Communications	7
2	LVD Overhead Lines	1
2	Underground Assets	1
2	Maintenance of Substation Assets	1
2	Electric Lines Construction Standards and Forensic Investigations	1
2	SCADA and System Protection and Relays	1
2	Outage Response and Restoration During Normal (Blue Sky and Non-Reportable Storms) Conditions	1
2	Vegetation Mangment	1
2	Pad Mounted Equipment	1
2	Reliability Index Calculation	1
2	Reliability Programs and Policies	1
2	Outage Reporting by Cause Code	1
2	Smart Grid Application	1

II. Part One: System Inventory and Assessment

A. Background

The first part of the Utility Distribution System Audit requires examining the installed infrastructure of distribution systems of both DTE and Consumers. This part of the audit includes

several tasks to facilitate a physical examination of installed distribution infrastructure to determine condition, measure compliance with engineering standards, and conformance with company records. We will then analyze these results and compare them to industry experience.

Our primary focus during this part is on the following six work tasks:

- Create a System Inventory to describe both company's distribution infrastructure
- Design and select stratified statistical samples of inventory for inspection
- Physically inspect representative samples of installed infrastructure
- Physically inspect assets in warehouse inventory
- Benchmark other utilities
- Analyze results.

B. System Inventory

The first task in this part of the audit involved the construction of a database that comprehensively describes the distribution systems of both utilities. This database not only supports activities in this part of the audit, but also provides data for analyses to inform Part Two. To begin this task, Liberty developed a list of key distribution infrastructure components and characteristics needed to describe the current state of each company's distribution system. Liberty identified available data points to begin the data collection process, through a series of meetings and follow-ups with each utility. Teams from both companies then provided the requested data points to Liberty.

Liberty built a relational database to house the compiled data. For each company, 20 separate tables store more than 2.5 million records in 200 plus distinct data fields. Each database can be sorted and searched by a variety of defining attributes such as geographic location, age, type, length, size, condition, reliability, and configuration. Key electrical components tracked in the system inventory include:

- High voltage distribution circuits
- Substations and transformers
- Overhead and underground distribution circuits
- Low voltage service transformers
- Poles and support structures
- Distribution automation – reclosers and smart grid schemes
- Conductors.

In addition, we collected asset-based information from each company to capture:

- Age or vintage
- Tree-trimming cycles
- Inspection and maintenance cycles
- Customers served, and
- Reliability.

We have designed database templates to support the review and analysis of the data and followed-up as needed with the companies to discuss any data anomalies and inconsistencies.

C. Stratified Statistical Sample

Populations of infrastructure, as described in the databases, will form the basis for the statistical sampling process. We are working closely with our statisticians to select the items to include in the sampling and determine a plan to address them in a way that will result in statistically valid observations in the field and in the warehouses. Statistical sampling can produce a wide range of items needing examination, depending on drivers like stratification, desired confidence level, and expected exception rates. In consultation with our statisticians, we are working to finalize our target populations and recommended sampling approach.

We will review our sampling plan with MPSC Staff prior to finalization to ensure that the level of sampling is commensurate with Commission objectives and realistic in terms of costs to complete. Following this review, we can begin the process to randomly sample the assets in the field and warehouse to be inspected from each company's database.

Using the selected list of assets to be sampled, we will coordinate with each company to determine the best routing paths and schedules to complete the field and inventory asset sampling inspections. Where possible, we will seek to group sampled components for examination to minimize travel and eliminate repeat trips. The results of this coordination will define our final sampling plan that we intend to follow.

D. Distribution Infrastructure Field Condition Assessment

We plan to conduct a substantial field examination, based on our statistically derived samples, to assess the current state of the distribution system. We developed field condition assessment criteria and evaluation forms to support the inspection process. These forms will be deployed on iPads or laptops to guide the field inspection effort and ensure that assets are reviewed and documented appropriately.

Using the routing path and schedule designed in the prior step, our team of engineers and field inspectors will visit and observe each randomly selected item to determine condition and compliance with NESC safety code and conformity with company records. Our inspection team will be guided by company personnel who can assist with locating and securing access to the assets. Each visit and condition assessment will be captured digitally and supported by photographs and other documentation, such as asset and vegetation maintenance records.

Field assessment information for each sampled item will be captured and downloaded into a database that can be used to review and analyze the results to determine compliance and conformity. The assessment results, supported by the photographic record, will inform our team as we consider findings and recommendations and will be used as needed in conversations with Commission staff and company management about the physical characteristics and conditions observed in the field.

E. Warehouse Inventory Condition Assessment

We will evaluate a similarly stratified sample of components held in inventory at company warehouses to provide statistically significant measures of physical inventory quality, condition, and functionality. Similarly, evaluation forms resident on iPads or laptops will be used to guide

the evaluation and document each inventory item that is sampled and assessed, along with a photographic record. As in the prior task, we will download results from this sampling process and assemble them in a database for analysis and reporting.

F. Other Utility Benchmarks

This task compares, where possible, each company's distribution system description to that of other utilities in similar climates - - a Michigan municipal utility serving 100,000 or more customers and two or more similarly sized and situated inventor-owned utilities serving customers in other states. Available information sources do not permit the same scope and level of detail in our benchmarking as in the current state assessment. Additionally, we will not be physically examining our benchmarking target companies. However, we will seek to identify data that may be available from our target benchmark companies to support the comparison. Using this data, we will develop a roster of attributes that can be used to compare DTE and Consumers to the benchmark utilities. To the extent possible these attributes will be focused on comparisons of asset age, maintenance practices, and improving reliability. This comparison will determine similarities and differences between DTE and Consumers and targeted benchmark companies. It will also identify distribution system best practices that might be applicable for DTE and Consumers.

G. Data Analysis

The final step in Part One leverages the databases describing each company's installed infrastructure and condition, supplemented by findings from the physical inspection, to complete the following analyses:

- Summary of the current state
- Reliability performance across a 10-year period – key metrics to be analyzed include SAIDI, SAIFI, CAIDI, CEMI, and CELID
- Operation and maintenance costs for underground and overhead service
- Customers served per service transformer — minimum, median, and maximum by size
- Compliance with ANSI electrical safety standards and company records
- Effectiveness of asset inspection and maintenance cycles.

Part One will provide a comprehensive and objective snapshot (database) of the current state of the distribution infrastructure at DTE and Consumers. Liberty will rely on this information as it examines and analyzes the distribution operations organization, practices, and performance in Part Two of the study, described in the following section.

Aside from the site visits, Liberty is working on the study requirements of Part One as it continues to conduct Part Two reviews and evaluations responses to data requests and completed initial interviews. Liberty is on course for the following Part One reviews and evaluations:

- Fully comprehensive description of the distribution system, including:
  - Including overall miles, locations, and vintages
  - Distribution primary circuit voltages
  - Distribution primary circuit lengths
  - Number of customers per circuit
  - Miles of overhead secondary and underground secondary conductors

  - Percentage of open versus triplex service drip wires
  - Distribution wire types
  - Distribution construction types
  - Ages of wire
  - Urban and rural
  - Rear lot locations
  - Looped or radial
  - Delta or wye
  - Pole mounted transformers and other equipment
  - Third party attachments
  - Comparison of costs for overhead vs. underground service and distribution lines
  - Service transformer categories (kVA), locations, and ranges of customers served by each size.
  - Ages by category (poles and substation transformers)
  - Max, average, and minimum numbers of customers (residential and commercial) served per transformer size
- Company areas
  - Equity of reliability among the areas
- Compare underground operations and maintenance costs to overhead
  - Cost of undergrounding compared to spacer cable, tree wire, and continued tree clearing
  - Compare the components installed underground to other similarly situated utilities.
- Compare age of components and average age when replaced
- Compare conditions to Lansing
- Compare 10-year reliability to other utilities.
- Average age of components and average age of components when replaced.

III. Part Two: Distribution System, Organization, Staffing and Resources and Emergency Response

A. Part Two A: Distribution System, Organization, Staffing, and Resources

1. Operations Organizations

Our study of the operational performance of the Consumers and DTE Distribution Operations organizations combines a top-down review of the efficacy of senior leadership planning, prioritization, and management with a bottom-up review of process and procedural execution efficiency and effectiveness.

A significant number of data request responses are being reviewed and a first round of interviews with senior executives and managers from both utilities will complete by the end of December, providing insights into the philosophies, structures, staffing and divisions of labor and responsibilities for each Distribution Operations organization. Our early emphasis focuses on understanding the effectiveness of senior management leadership, innovation, and influence.

Follow-up exploration will focus on understanding areas and levels of emphasis, effort, and investment for the two utilities – specifically the consistency with which talent, technology, funding, and *active* senior management attention are combined to drive each company's pursuit of rapid and sustained public safety and electric service reliability improvements. The following areas are being explored at a high level initially for comparison and contrast with industry norms and best practices after more detailed data analyses and functional-level interviews:

- The regular, formal processes used by the utilities to ensure executive and leadership responsibility and accountability in enhancing public, employee, and contractor safety and identifying and resourcing needed distribution system improvements, reinforcements, and additions.
- The processes used for assessing the changing conditions and needs of each utility's electric infrastructure and the employment of comprehensive, objective, and quantifiable system performance measures to guide investment and operating decisions and priorities.
- The delivery of important preventive engineering, operations, inspection, and maintenance practices that have a significant impact on minimizing storm damages, with emphases on data-driven reliability improvements including worst circuit programs protection schemes and the use of automation technology to minimize the frequency, duration, and extent of outages.
- The employment of regular, frequent, probing reviews of the results of reliability improvement initiatives, programs, and investments – objectively and critically comparing the results delivered with the targets and arguments used to originally justify and prioritized the initiative.
- The execution of vegetation management responsibilities through inspection, cyclical and ad hoc tree operations to improve electric reliability and enhance public and employee safety.
- The use of work management processes and technologies to manage crew and contractor scheduling and work production effectiveness and efficiency and to monitor job and crew planning, crew productivity, and job progress and completions.
- The processes, technology and communications strategies used to execute their distribution system operations and monitoring responsibilities including control room grid operations, the use of distribution automation and the execution of electric trouble dispatch and restoration functions, particularly in adverse weather and storm scenarios of escalating severity.
- The resourcing, staffing, training, development, equipping and support of the leadership, engineering, technical, financial, and operating personnel required to consistently deliver and sustain improved electric reliability performance.
- The regular application of lessons learned and continuous improvement principles to all areas of the Distribution Operations organizations.

After review of company organization charts and initial scoping discussions with both Consumers and DTE, Liberty issued data requests to gather cost and staffing information for approximately 40 functional area work groups. This review seeks to analyze changes in staffing and costs that we will review with management of each company. We will consider data and observations gained from other work in both parts of the audit as compared to the functional area cost and staffing changes for trending and analysis.

We also gathered data from each company to allow us to compare historical budget and actual capital and operations and maintenance expenditures by major cost source. Our examination of this data has begun to compare information received from both companies with our industry experience. As with the functional are cost information, our team is comparing observations about spending patterns as they review data and develop findings in both parts of the audit.

2. Asset Management, Vegetation Management, and Reliability Practices and Programs

a. Overview

We are currently reviewing and analyzing each company's approach to identifying and maintaining its electric grid. Work includes our investigating into the methods, programs and procedures utilized to capture overhead and underground field assets and inventory, it's the management of trees and brush that could intrude onto overhead lines, and their approach on implementing activities that reduce the numbers of outages, reducing the number of customers effected by outages (SAIFI), and reducing the average minutes customers are interrupted (CAIDI). Liberty has, to date, reviewed some 175 Consumers data request responses related to these topics and will conduct by the end of December a first round interviews with management personnel. Liberty has reviewed a similar number of DTE data responses, and Liberty has scheduled its first round of DTE interviews in this area.

Liberty is continuing to prepare additional data requests and requesting additional interviews, and in addition to Part One field work, Liberty plans to conduct field visits of self-selected distribution circuit sections, substations, corporate and regional offices, shops, stores, pole yards, and dispatch control centers. The purpose of those visits is to validate physical conditions and observe utility operations.

The purposes of Asset Management programs and Vegetation Management programs are to reduce the numbers of power outages caused by overhead and underground equipment failures and by tree contact with overhead lines. The purposes of Reliability programs are to proactively reduce the number of outages not caused by equipment (*e.g.*, animals and lightning), in addition to systematic replacement of poor performing grid components, i.e. certain types of insulators and fused cutout switches. Another benefit of the Reliability programs is to use remote control and automatic sectionalizing and load transfers to reduce the numbers of customers interrupted and the customer minutes of interruptions caused by outages.

The effectiveness of Asset Management, Vegetation Management, and Reliability programs to provide specific levels of reliability are functions of management efficiencies and appropriate levels of spending. If management is efficient and effective, it's a matter of cost versus reliability, operational, and safety benefits.

Current specific areas of inquiry include:

- Number and miles of OVH and UG circuits
- Number of substations
- Numbers of poles
- Number of pad mounted equipment
- Circuit voltages
- Delta circuits
- Number of service transformers and sizes
- Ranges of customers per service transformer
- Standards compliance to NESC
- Feeder and substation design standards
- Central and Field Organizations
- Policy/Strategy
- Scorecard KPIs
- O&M and capital spending
- Monitoring Grid Conditions
- Correcting operating criteria issues
- Crews
- First Responders
- Training
- Use of contractors
- URD cable issues
- Urban underground and manholes
- Circuit, pole, and substation inspections
- Health scoring
- Types of equipment failures
- Forensic analyses
- End of life
- Grid inspection programs
- Corrective maintenance programs
- Preventive maintenance programs
- Prioritization
- Completion performances
- Grid modernization programs
- GIS accuracy
- Tracking in-service and spare inventory
- Removing obsolete/damaged inventory
- Spare inventory stores and pole yard locations

b. Asset Management

Asset Management comprises the process of monitoring the condition of electric distribution equipment by various types of inspections and testing, by timely repairing or replacing equipment or components before causing operating failure, by quickly addressing emergent overhead and underground equipment failures, and by using optimum preventive and proactive maintenance procedures on schedules that efficiently and effectively extend the operating life of equipment or components, at least until the end of effective life. Good inspection, maintenance, and replacement practices provide one of the baselines for providing reliable electric service.

Liberty is currently evaluating both companies' Asset Management programs and practices, the extent to which each comply with their programs, the effect of equipment outages on system reliability, and the logic of its approach to managing its assets, in terms of organization, formal policies, goals, procedures, and work completion monitoring. Liberty is also reviewing and evaluating Consumers' and DTE's ability to accurately identify its assets and asset locations, and the adequacy of its spare inventory and inventory locations. All evaluations are based on conformity with good utility practice for similar electric utilities and on the reliability required for customers.

c. Vegetation Management

Tree contact with overhead power lines is a primary cause of outages and resulting customer interruptions on Michigan electric grids. Maintaining adequate tree clearances comprises a basic duty of any electric utility with overhead lines. Tree clearing is expensive, but necessary, to minimize tree-related outages and if tree trimming cycles exceed tree limb growth and if the removal of weak, decayed, or dead trees that can strike overhead lines are not timely addressed, tree-related outages will be unacceptable leading to excessive damage to utility facilities resulting in long outages. It is Liberty's experience that when adequate trim cycles have not adhered to over many years, attaining effective tree clearing cycles will require an intense short-term tree clearing program at least until an electric grid has an acceptable level of tree-related outages.

Liberty is currently evaluating Vegetation Management programs and practices to determine the extent to which Consumers and DTE comply with their programs, the effect of tree-related outages on system reliability, and the logic of its approach to managing its tree clearing activities and cycles, in terms of organization, formal policies, standards, goals, procedures, and work completion monitoring.

Current specific areas of inquiry include:

- Miles of circuits requiring tree clearing
- Central and field organization
- Use of contractors
- Tree clearing and removal standards
- Prioritization
- Tree clearing program cycles
- Miles of trees cleared and removed
- Proposed tree clearing cycles
- Cost of tree clearing and removal

d. Reliability

Reliability is measured primarily by SAIFI, CAIDI and SAIDI (though this audit will also include a review of metrics that include ASAI, MAIFI, CEMI 0 through 10+, CELID8, CELID24, and CELID48). SAIFI indicates how often an average customer is interrupted each year and CAIDI reports how many minutes electric service to an average customer is interrupted each year. SAIDI combines SAIFI and CAIDI. Reliability is also measured in terms of customers experiencing multiple interruptions, the numbers of customers experiencing exceedingly long interruptions, and customers served by circuits and circuit zones that have the worst reliability in an electric grid. Improving reliability to these pockets of customers may have less of an impact on system SAIDI, but doing so is necessary for equity reasons.

SAIFI is reduced by minimizing outages caused by equipment failures, contact by trees, animals, lightning, etc., and by reducing the number of customers served within zones of mainline and lateral circuit segments. CAIDI is reduced by applying remote control and automatic reclosing and load transfer devices; and by quick identification and response by dispatchers and first responders, assisted by fault locating tools such as SCADA recloser monitoring, line sensors and AMI metering. CAIDI is affected by a combination of first responder and repair crew response times, time to obtain repair components, such as poles and wire, and time to make at least temporary fixes. Total restoration time is affected by distribution control center effectiveness, use of fault location tools, by the numbers, locations, and 24/7 responsiveness of first responders, and the locations and stock of stores facilities and storage yards.

Liberty is currently reviewing reliability indices, and evaluating its reliability organizations, programs, and activities for providing reliable service, and the logic of its approach to managing its reliability activities, in terms of organization, formal policies, goals, procedures, and work completion monitoring.

Current specific areas of inquiry include:

- Central and field reliability organizations
- Past and current reliability indices by system, area, voltage, outage causes, and system
- Addressing localized poor reliability
- Ranking to other similar utilities
- Reliability goals
- Company programs to improve reliability
- Prioritization
- SCADA
- Protective devices, including relays
- Sectionalizing and automatic transfer switches

- Customers per protected zone
- Lateral protection
- Fault locating tools
- Distribution control
- First responders
- Grid equipment storage locations
- Reliability programs O&M and capital spends.

B. Part Two B: Emergency Response

1. Overview

Audit activities are focused on the effectiveness and efficacy of DTE's and Consumers' Emergency Planning and Response (EP&R) functions as they relate to storm, or weather-related events, as distinguished from other emergencies such as those experienced, for example, due to a physical or cyber-attack. While certain activities would be the same across all threats to the grid, weather related emergencies are the predominant focal point of utility EP&R organizations.

We are pursuing three primary subject areas in examining the companies' EP&R function:

1. A review and audit of the company's emergency preparedness programs and processes, including how the companies:
    a. Monitor incoming inclement weather and how far in advance weather is monitored.
    b. Pre-stage storm restoration assets and personnel.
    c. Secure wire down guard resources and communicates downed wire safety reminders to potentially affected areas.
    d. Coordinate mutual assistance.
    e. Interact with first responders, state/local government officials and emergency managers in the hours leading up to an anticipated storm as well as during and after the storm, and
2. A review and audit of storm restoration program and processes, including how the companies:
    a. Become aware of downed wires both during the storm and after, and the policy for guarding downed wires.
    b. Prioritize repairing downed wires.
    c. Become aware of outages.
    d. Determine at what point the transition to active storm operations versus normal operations is recognized.
    e. Post event learnings are captured and implemented for future events.
3. Assess the company's performance toward complying with reliability and restoration metrics utilities must adhere to in the MPSC's rules and proposed rules.

Liberty is addressing these areas using the multi-step structural model as presented in its Proposal, modified where necessary to reflect the results of interviews and data requests that serve to enhance review areas of significant importance, *e.g.*, communications, and lessen emphasis on areas that do not directly impact, or impact only to a small degree, customer experience due to storm responsiveness.

We began our review with requests for documents from both companies describing their practices and processes pre-storm, during the event, and post-storm. We have reviewed data and results from various storm related activities, such as outage prediction accuracy, estimated time of restoration development, customer satisfaction surveys, and post-storm debriefings to better understand how each utility addresses issues and attempts to improve the relevant processes. We are examining how such processes and results have evolved over time. We have begun interviews with subject matter experts and management about these processes. We plan to meet with all levels of management to hear how they plan and manage key storm related functions during large and small outages and storms, and more importantly, how they plan to improve the processes going forward.

Our work to date has identified the following initial focus areas.

2. *Emergency Preparedness Plans and Organization*

Emergency plans comprise a ubiquitous aspect of every electric utility emergency preparedness toolkit. They provide a ready source of information, direction, processes, procedures, organization, schedule, notifications, and contact data, among other subject areas, to company and external personnel involved in planning for and executing restoration activities following events that cause a service disruption. The plans are typically comprehensive in nature, widely and easily available to response personnel, well-structured for ease of communication and understanding, and reflect current organizational structures, position roles and responsibilities, reporting requirements, and processes and procedures. We are examining in detail the companies' plans, including training and drill exercises, and the processes for continual improvement.

3. *Emergency Event Forecasting*

Forecasting event type, characteristics, magnitude, timing, and potential impacts results from an interplay of numerous inputs, from hard data, such as weather parameters, which change constantly, to estimates of the downstream storm impacts and the resources necessary to provide adequate, timely, and effective service restoration. Weather forecasting serves as the foundation for event forecasting, which then provides a means to estimate storm damage and resource requirements, which then provides the basis for appropriate event classification to effectively mobilize and scale the companies' emergency response organization. We are examining the companies' weather services function and organization, and their use of outage prediction modeling, which provide estimates of the number of outage and or affected customers for a given event that, combined, provides the basis for event classification.

4. *Support Organization Management*

Storm event declaration is the catalyst for the mobilization, pre-staging, and deployment of resources and material throughout the organization. The logistics function is a key element of storm support and is an area of focus in the review.

5. *Authority and Process of Securing Resources*

Storms vary widely in size and require varying levels of resources, such as lineman and tree clearance workers. We are examining the process, responsibility, and timeliness of resource needs

identification and the subsequent effective mobilization, deployment, management of those resources.

6. Wire Down Process and Management

Wire down processes and management, including identification, reporting, prioritizing, and the timeliness and adequacy of resource deployment is critical audit area of review. We are examining the processes used to dispatch trained resources to investigate and secure downed wires or other safety hazards. There have been numerous, serious issues in the recent past regarding down wires and wire down management represents a high priority area of our examination.

7. Response and Resource Status

Once an event has been declared and the emergency planning and response organization has been activated, typically by standing up an Incident Command Center, the people, processes and technology associated with storm response move to center stage. We are examining outage management systems, restoration status monitoring and reporting, and resource deployment prioritization and management, among other activities.

8. Communications

Customers need to have a basis for planning to meet their needs in alternate ways during extended service disruptions. Management cannot provide full precision or accuracy in letting them know when to expect service restoration; however, a sound, well-communicated process for giving them the best information available has central importance in effective event response. Particularly for major storm events, continuing damage assessment activities will cause changes in estimates. A process for updating estimates and communicating them therefore becomes important. Major storms affect not only utility service continuity; they also disrupt many local and sometimes state government services and private businesses that depend on electricity availability, or on street clearing performed by utilities to gain access for electricity restoration. Thus, realistic service restoration estimates prove critical to governments and communities as well.

Not only what is communicated but how becomes critical as well in effective storm response. Communications in today's world use a much greater variety of channels; an electric utility should have the capacity to use and should use them all and to give customers willing and able to do so the ability to both provide and secure information without human intervention. Using the phone or visiting the website or an app to report an outage at home helps confirm Outage Management System diagnoses and aids in planning and executing restoration efforts. Customer trouble and outage reporting remains an important part of outage management data collection.

Even during normal conditions, it remains important for electric utilities to keep government officials apprised of plans and activities. Utilities occupy the same rights-of-way and the services electric utilities provide are essential to the continuity of many government services. In addition, residents, businesses, and institutions expect their government officials to remain aware of what is happening in their jurisdictions - - irrespective of whether it is utility-related. Thus, a utility activity with public significance can turn out to be one for which voters expect their elected officials to be cognizant. Responding to such needs takes a coordinated approach to ensuring that government

officials know from whom to expect to hear regularly and to whom to turn if they have a question or concern.

We are examining the effectiveness of communications with customers and other stakeholders during a outages and storms. This includes reviewing how companies incorporate communications activities into emergency and storm planning as well as understanding performance during recent storms. To better understand each company's performance during an outage or storm we will seek to understand whether each utility:

- Communicates effectively with customers and stakeholders
- Is accessible to customers and stakeholders
- Keeps emergency and government officials informed
- Communicates effectively with the public regarding public safety and expected restoration times.

To understand how well the companies communicate during a storm or outage and whether the companies conform to good utility practice, our review focuses on the following areas:

- Customer experience
- Call Center and digital channels
- Public communications
- Community relations.

9. Post Event Analysis

Continuous improvement can only take place if areas in need of improvement have been identified and follow up actions have been assigned and completed. It is common practice for After Action Reports (AARs) to be completed for most storms. We are examining the frequency of AARs, their comprehensiveness, and whether follow up improvement actions have been assigned, completed and documented.

10. Compliance with MPSC Rules and Metrics

We are identifying and reviewing all Commission related rules and metrics related to storm responsiveness and the companies' adherence to those rules and performance against the metrics.