CHAPTER VII

Best Practices for Electric Utilities

Chapter Structure

A. BACKGROUND

There is no manual or reference that provides a list of best practices for the electric or telecommunications industries. The best practice for any process is developed on a case by case basis by a utility or group of utilities. For this assessment, a list of "best practices" was developed using information from the New Hampshire utilities, utilities across the country, and past experience. This list includes practices that are successfully used in the utility industry and are appropriate for all utilities to consider when designing and building their systems to resist the effects of future natural disasters. These "best practices" should be a part of each utility's effort to achieve excellence.

The best practices in this chapter are listed separately from the recommendations of this report. The recommendations are there to aid the utilities in following good utility practice and some of those recommendations are similar to the best practices listed in this chapter. Even when not listed within this report's recommendations, the best practices, if followed, will aid each utility in making improvements to their operations and attain a higher that average ranking within the industry. Each utility should compare its practices with those listed here and evaluate where it stands in relationship to the industry.

B. BEST PRACTICES

Emergency Planning and Preparedness

1. A utility should base their emergency operations on the concept of the Incident Command System (ICS), now referred to as the Incident Management System.

The Incident Command System has been adopted throughout the United States and other parts of the world as a method for managing emergencies. ICS (now integrated under the National Incident Management System-NIMS) is universally used by federal, state and local agencies and was originally developed for forest and grassland firefighting.[1] Its use is required in order for these agencies to receive federal funding. Utilities across the United States and Canada are adopting ICS in at least a modified version. In practice the ICS has proven to have a number of attributes that have made it just as useful to utilities as it has been to first responders. Benefits of the system are as follows:

- It is a proven approach having been in existence for nearly 30 years.
- It allows everyone to "speak the same language", thus vastly improving communications with police, fire, and government emergency management personnel.
- Training is readily available through FEMA's Emergency Management Institute for minimal cost.[2]
- It is suited to large scale electric emergencies due to its scalability, flexibility and ability to manage large influxes of resources.

2. A utility should have a dedicated emergency operations organization and facilities.

Utilities have recognized that "emergency operations" is a discipline that requires special training. Just as other areas of a utility require specialized and dedicated staff and facilities, so does emergency operations. The staff of the dedicated emergency operations organization should be permanent and full time. The staff should be responsible for drills, preparation and updates of the emergency plans and training.

Full time dedicated facilities are becoming standard in utilities following best practices. The costs of such facilities are relatively minor compared to even a small storm restoration. The actual makeup of the "storm room" varies by utility and their particular needs.

[1] National Interagency Fire Center. http://www.nifc.gov/. (Accessed August 26, 2009).
[2] Emergency Management Institute. "Integrated Emergency Management Course," May 15, 2008. http://training.fema.gov/EMIWeb/IEMC/. (Accessed August 26, 2009).

3. At the first indication of a storm, a utility should preposition its restoration workforce, which should include damage assessors and crews. The initial damage assessments should begin as soon as possible after a storm has passed and should be used to develop initial restoration time estimates.

In the aftermath of a major storm it is often difficult to move damage assessment personnel into the areas where damage has occurred for various reasons, including downed trees, ice covered roads, snow, flood waters etc. Such conditions can create major delays as utility personnel attempt to investigate damage and begin repairs. A best utility practice would be to pre-position damage assessors and crews in the field prior to the storm. This may result in increasing costs if employees are pre-positioned for a possible storm that does not materialize. However, for the storms that are correctly predicted, prepositioning of crews can help reduce the initial damage assessment time by several hours, and shorten restoration time by hours or even days.

4. A utility should never underestimate the potential damage of a forecasted storm.

A utility should anticipate a "worst case" scenario and be prepared. Underestimating the damaging effects of a storm will result in longer response times and longer outages. In the case of the December 2008 ice storm, none of the utilities correctly estimated the extent of damage which eventually occurred.

5. A utility should have a plan in place to communicate with public officials and emergency response agencies. The utility should open communications early and maintain constant communications throughout the event.

A utility should have a defined set of criteria including estimated storm damage and storm foot print which trigger direct contact with public officials and emergency first responders. These criteria should be consistently followed and should be known to all parties. The communication should be part of a utility's emergency plan. There should be dedicated EOC staff members at each utility whose sole function is to communicate with public officials and first responders.

A utility's response to a major storm should include more than the field work required to restore service to customers without power. It should include establishing and maintaining communications with the news media, public officials, emergency response agencies, and customers in the affected communities. This communication is necessary in order to provide warnings of an impending storm. It is also needed to provide instructions regarding safety and other information to the public during a power outage. In order to complete repairs safely and efficiently, the utility must also coordinate restoration efforts with local fire, police, other utilities, and public works departments. The information provided by this communications plan will aid businesses who must decide when to ask employees to report for work and aid families who need to know if they should find shelters or travel to other locations until the power and phone service is restored.

6. A utility should extensively use "nontraditional" employee resources.

Nontraditional resources are those individuals employed by a utility or contractor who do not normally participate in operations or provide field support. Such resources may also include utility retirees. The tasks to which nontraditional workers may be assigned include such things as wire watchers, crew guides, communicators, or simply delivering lunches to crews. All the employees within an organization, along with retirees and contractors, can be used as nontraditional support during the restoration effort.

In a major storm, one of the greatest challenges is managing the large influx of crews required to accomplish all the work needed for restoration. Managing these nontraditional resources will add to this challenge and a plan must be in place so they can be efficiently used.

7. A utility should have pre-staged materials, which may include such things as storm trucks or storm boxes.

One of the critical elements in the restoration of power after a major storm is getting the materials to the crews in the field. For utilities such as National Grid which has a small service territory in New Hampshire, using materials and supplies in the local operating center may be sufficient. However, when dealing with larger geographical areas, the use of storm trucks or storm boxes may speed restoration of service by quickly delivering repair materials to where they are needed. A storm truck consists of a trailer carrying an inventory of standard storm restoration material. A storm box consists of dedicated, prepackaged storm restoration materials that can be quickly placed on a truck.

System Planning, Design, Construction, and Protection

8. A utility should include 50 year return values for wind and ice loading in their load cases for designing all line structures.

New Hampshire has adverse weather conditions including ice and wind values that exceed the standard construction practices required by the National Electrical Safety Code (NESC). (See Appendix F on Pole Line Construction). In order to provide a robust and reliable system, all lines should be designed to resist the conditions that may be expected to return every 50 years. All structures, regardless of their height, should be designed to meet 50 year return values for wind, and ice with concurrent wind, as defined by the American Society of Civil Engineers (ASCE) standards and the latest edition of the NESC. The NESC, which is the code being followed by all the electric utilities, only requires this criteria for structures above 60 feet, allowing less rigorous criteria (district loading) to be used for structures below 60 feet. Since all structures, no matter their height, could see the 50 year return values of ice and wind, best practice would dictate that the same design methods should be used for structures of any height. All lines should be designed for the following loading conditions:

- NESC heavy district loading

- NESC extreme wind using the maps contained in ASCE 7 and the latest version of the NESC
- NESC extreme ice with concurrent wind using the maps contained in ASCE 7 and the latest version of the NESC

Due to the number of customers that may be affected by a line failure at higher voltages, all lines 35kV class and above should be designed as Grade B as suggested by Rural Utility Services (RUS) Standards. Distribution lines below 35kV should be designed as required by the latest version of the NESC.

9. A utility should use an automatic distribution line high-speed source transfer scheme.

It is becoming common in many distribution systems to loop feeders from one substation to another substation. This is done by connecting one end of the feeder to one substation using a recloser, and the other end of the feeder to a second substation using another recloser. This produces a looped system which makes possible supplying the loads on the distribution feeder from either substation and disconnecting the feeder, or parts of the feeder, from either of the substations when necessary. The result is that if one substation has an outage, customers can still be supplied from the second substation. It is also common practice for switches or reclosers to be placed along sections of the feeder so parts of the feeder can be isolated from the rest when a fault occurs. At times, a switch is placed in the center of the feeder which is normally kept open, isolating the substations from each other, and allowing each substation to feed half of the feeder. When necessary this switch can be closed, and one of the reclosers connecting the feeder to a substation can be opened, making it possible to supply the entire feeder from either of the substations.

In New Hampshire a large number of these looped feeders have open, mechanically operated switches, located at the half-way point on the feeder, which divides the feeder in half and isolates the two substations. If a substation or part of a distribution line is lost, the tie switches can be manually closed to restore power to the rest of the feeder, minimizing the number of customers who experience a power outage. Unfortunately, in most cases this requires that a lineman be dispatched to close the manual switch before power can be restored.

A number of electric utilities are replacing these mechanical line switches with automatic, electrically operated switches, such as a reclosesrs. These electrically operated switches have automatic or communications assisted controls allowing them to isolate faulted sections of the line and restore power to line sections that are still intact. The automatic nature of this scheme, and its ability to be remotely controlled, greatly reduces outage times for customers and improves reliability. The use of this automatic distribution line source transfer method has resulted in Public Service Electric and Gas (PSE&G) of New Jersey being named America's most reliable electric utility for attaining award winning reliability indices.[3]

10. A utility should replace its traditional electro-mechanical relays with microprocessor-based protective relays.

During the past twenty years, the technology of protective relaying has improved dramatically. The use of microprocessor based technology in system protection has reduced many long term failures into short interruptions.[4] Older electro-mechanical relays are analogous to the vacuum tube radios prior to 1960 and should be replaced with devices using modern day technology.

A large percentage of the electromechanical relays still in service have been there for many decades. Electro-mechanical relays have more reliability issues than microprocessor based relays and many are becoming obsolete as virtually 100% of all new relay installations are using microprocessor based relays. In most cases the procurement, installation, and maintenance costs of microprocessor based relays are a small fraction of the cost for equivalent electro-mechanical relays.

Microprocessor based relays provide numerous features not found in electromechanical relays including sequence of events recording, recording fault analysis data, and selectable relay settings that can be switched during storms to provide improved performance for storm related outages. For example, during normal weather conditions, a utility's protection philosophy may be to block a feeder instantaneous relay function. A fault under these conditions would probably be permanent and a lineman would have to be dispatched to repair the problem. Blocking the instantaneous function would allow a downstream fuse to open before the feeder relay opens. This would allow uninterrupted power to most customers while the few customers downstream from the fuse would see power interrupted until a lineman could be dispatched to fix the problem and replace the fuse. During storm conditions, however, most faults would be temporary and caused by lightning. Under these conditions the instantaneous function will be unblocked. This will allow the feeder protection to trip the feeder off before a downstream fuse can open. Since the fault is temporary, when the feeder breaker recloses all customers would see their power return without a fuse having opened. This saves a lineman from having to be dispatched to replace the fuse for a temporary fault that could have been cleared without opening the fuse. This type of logic is easy to implement with microprocessor based relays and nearly impossible with electromechanical relays.

[3] PSEG Press Releases, n.d. "Reliability One Award winner in the Mid Atlantic Regions 2001-2007." http://www.pseg.com/media_center/pressreleases/articles/Attachments/izzoremarks2008shareholdermtg.pdf (Accessed August 26, 2009).
[4] Islam A. and Domijan A."Weather and Reliability." *IEEE-Power Engineering Society General Meeting*, 2007.

11. A utility should install electronically controlled single and three-phase reclosers where appropriate in order to improve system reliability.

Electronically controlled reclosers are an effective and economical device to properly sectionalize major feeders and major feeder taps. Single-pole reclosers with electronic controls contain the technology to isolate only the faulted phase on a three-phase circuit, instead of opening all phases during a single-phase fault. This can reduce the number of customers affected by the fault to 1/3 of the number who otherwise would have been disconnected by a traditional device, which would have disconnected all three-phases for a fault of this type. While single phase tripping technology is not practical in some urban areas with commercial and industrial three phase loads, it is practical for residential and rural lines.

Operations, Maintenance, and Vegetation Management

12. A utility should have an effective Outage Management System (OMS) that works even during major outage events.

Outage Management Systems have become standard in U.S. electric utilities. Unfortunately, many of those systems have not performed well during major storm events. This has caused some utilities to upgrade their equipment to newer OMS that are better able to handle major events.

During the December 2008 ice storm, none of the four electric utility OMSs functioned well during the storm. However, each utility was able to make better use of their OMS during system restoration. The National Grid OMS functioned better than the others, though the system is relatively old. The NHEC OMS operated reasonably well but was underutilized due to limited staff operating the system. The Unitil OMS was probably the best system among the four; however, it was not functioning due to the loss of third party communications lines. The PSNH OMS was the worst performing system of the four electric utilities. (See Appendix G for a more thorough discussion of OMS).

13. A utility should strive for regular inspection of its entire distribution system on a two-year cycle, using a combination of circuit inspection, tree trimming inspection, and pole ground-line inspection.

Many utilities have found that regular inspection of the entire distribution system is important for its proper maintenance. Since the inspection of a distribution line typically involves a circuit inspection, tree trimming inspection, and a pole ground-line inspection, the best utility practice in the industry suggests combining the efforts of these regularly scheduled inspection programs to ensure that the utility performs an inspection of each circuit bi-annually. To make this possible the following processes are used:

- Implementation of a four-year distribution circuit inspection program
- Implementation a four-year vegetation management cycle

- Implementation a 10-year pole ground-line inspection

By properly training the vegetation management personnel to perform a circuit inspection and by properly staggering the four-year circuit inspection program with the four-year vegetation management cycle, the maximum time between having a utility representative inspecting 100% of each distribution circuit is two years. The 10-year pole ground line inspection is one more opportunity for an inspection of the circuit and it could be used for one of the two-year inspection cycles during a particular year.

14. Where practical, a utility should use the wire-zone border-zone electric right of way (ROW) vegetation management practice on sub-transmission lines.

The vast majority of power outages and damage to the electric system in New Hampshire during the December 2008 ice storm was the result of ice laden tree limbs and trees falling onto power lines. Trees located outside of the ROW may have limbs that overhang the power lines. One of these limbs falling on a line would be classified as an outside of the ROW tree event. Proper wire-zone border-zone vegetation management would eliminate this type of damage.

The wire-zone consists of that portion of the ROW immediately under the power line plus 10 feet on each side.[5] Only grasses and low growing shrubs are allowed to grow in the wire-zone. Low growing shrubs and trees fill the border-zone and extend from the edge of the ROW to the natural forest. In addition to better protecting the line from tree related outages, the wire-zone border-zone concept of vegetation management has had a remarkably positive environmental impact on wildlife, providing a good habitat for small mammals, songbirds, amphibians, reptiles, and butterflies.

15. A utility should utilize a four-year vegetation management cycle for clearing trees around power lines.

New Hampshire is the second most heavily forested state in the nation. A major cause of the December 2008 loss of power to customers was ice laden tree limbs and whole trees falling onto power lines. Based on these two factors alone, each New Hampshire electric utility should take a very aggressive approach to vegetation management.

Where proper vegetation management practices are allowed, the utilities should adhere to a four-year vegetation management cycle regardless of the voltage level of the line in the ROW. Where vegetation management is restricted along scenic roads, a one, two, or three-year cycle may be required. Consideration should be given to placing a surcharge on the electric bills of the municipalities that have these restrictive vegetation management cycles since they add to the cost of the utilities' operations.

[5] Quattrocchi, S. "Achieving the Perfect Transmission Right of Way." *Electric Light and Power*. January/February 2007. http://www.elp-digital.com/elp/200701/?pg=26.

Trimming on a four-year cycle, if properly adapted to local growth rates, should maintain sufficient clearances between trees and conductors to allow maintenance trimming to be performed safely and efficiently. Reducing the interval between trimming operations while striving for sustainable clearance specifications will ultimately reduce annual costs and improve reliability.

16. A utility should adhere to the proper vegetation management practices. These practices include:

- The utility's trimmers should not strip foliage and side limbs from the part of the branch nearest the trunk and leave foliage at the outermost end of the branch. This practice, called "lion-tailing" and illustrated in Figure VII-1, leads to excess weight at the end of limbs and the reduction of limb diameter over time.

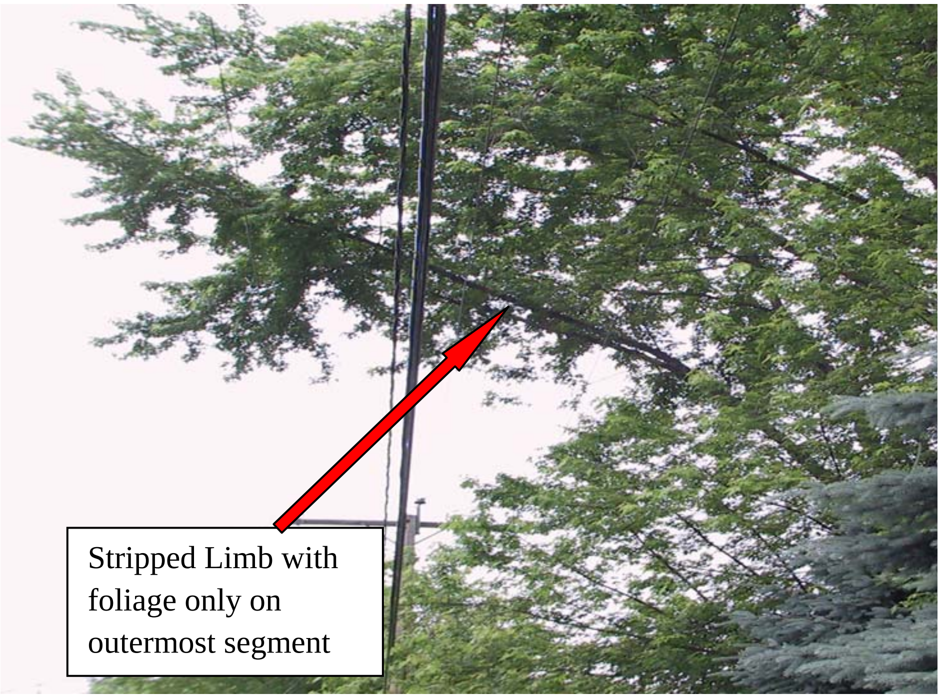

Figure VII-1 - Example of "lion-tailing." (Photo by NEI)

- The utility should use directional pruning to remove live limbs growing toward lines. These should be removed at the point where they connect to the trunk. This encourages growth away from the lines.
- The utility should avoid leaving trees standing with poor stem to crown ratios. The stem to crown ratio is defined as the diameter of the trunk divided by the diameter of the reach of the branches at the widest part of the crown. A high ratio (a narrow crown) leaves a tree that is set up for decline. A low ratio (a wide crown) leaves a tree unstable and subject to failure.

- Before beginning work, the utility should perform a basic hazard evaluation of every tree to ensure workers and the public are safe as well as minimize the probability of property damage from a hazardous tree.
- The utility should create a tree inventory identifying trees along major three-phase circuits. These inventories can help define future vegetation management requirements.
- The utility should review and apply the requirements of the Tree Line U.S.A.[6] program, which requires pruning according to the ANSI 300 standard for utility line clearance.
- The utility should require that lines being worked on are grounded when insulated tools cannot be used or minimum separation distances cannot be maintained.
- The utility should require that each tree contractor working near electrical lines must document its adherence to an electrical hazard awareness program (EHAP).

Post Storm Actions and Processes

17. A utility should both determine the global estimated restoration times and publish that information within 24 to 48 hours.

As soon as possible after an outage occurs, customers need to receive information on the magnitude of the storm, the duration of the storm, and an estimate of the how long customers should expect to be without power. There are several reasons for this practice. Businesses need to know when to ask employees to report for work, families need to know whether to stay home and wait or find shelters or other temporary lodging, homeowners and restaurants need to make provisions for perishable food supplies, and critical care facilities need to plan for maintaining and refueling emergency generators. Developing and publishing the estimated time to restoration early in the response provides customers with necessary information on the duration of the time they will be without power.

18. A utility should have a restoration strategy that targets the restoration of power to the greatest number of customers within the shortest amount of time.

Second only to safety, the most important aspect of storm restoration is efficiency in restoration of service. Efficiency is best measured by the number of customers restored per hour or day. The utility's objective during a major power outage should be to restore service to as many customers as possible within the shortest amount of time even though this might result in isolated groups of customers remaining without power long after other customers have been restored.

19. A utility should not limit its requests for supplemental crews to the local mutual aid groups and other local utilities.

When a major storm is predicted, the search for mutual aid crews should not be limited to only those in the vicinity of the storm. In many cases, local utilities will be reluctant to commit to

[6] Arbor Day Foundation, n.d. "Tree Line U.S.A."http://www.arborday.org/programs/treeLineUSA.cfm (Accessed August 27, 2009).

providing crews to another utility until they are certain that their crews will not be needed for their own restoration work. Each utility should have a plan to expand the search for mutual aid crews well beyond the local area. The utilities should establish agreements and contacts with sources outside their local area well in advance of the next storm.

20. A utility should strive to make sure that all communications are correct and consistent.

During storm restoration it is very important that all communications from the utility to any other entity are correct and consistent. In order to accomplish this, it is mandatory to establish specific sources of information within the utility that are assigned to communicate with the various representatives of the necessary entities. Once established, these personnel assignments and sources of information should not be changed.

21. A utility should implement lessons learned in a timely manner. Implementation plans that include specific tasks and scheduled completion dates should be developed and tracked.

Lessons learned from storm restoration efforts are always more effective when compiled as quickly as possible after the event. The ultimate objective should be to identify policies and practices that were not effective and find ways to improve them. It is important to develop implementation plans and fixed deadlines for specific items that need attention prior the next emergency event.

The following four tables indicate the extent to which each of the utilities incorporates the best practices discussed in this chapter. These tables were not prepared to compare one utility with another. The four utilities are very different and face different problems and issues in operating their systems. The meanings of the symbols used in the tables are:

○	The utility has not implemented the best practice.
◐	The utility has implemented some aspects of the best practice.
●	The utility is meeting the best practice.

Table VII-1 – PSNH best practices evaluation matrix.

1) EMERGENCY PLANNING AND PREPAREDNESS	
1. The utility bases their emergency operations on the concept of the incident command system (ICS) now referenced as the incident management system.	●
2. The utility has a dedicated emergency operations organization and facilities.	◐
3. At the first indication of a storm, the utility pre-positions its restoration workforce which includes damage assessors and crews. The initial damage assessments begin as soon as possible after a storm has passed and the damage assessments are used to develop initial restoration time estimates.	◐
4. The utility never underestimates the potential damage of a forecasted storm.	◐
5. The utility has a plan in place to communicate with public officials and emergency response agencies, and the utility opens communications early and maintains constant communications throughout the storm or event.	◐
6. The utility extensively uses "non-traditional" employee resources.	●
7. The utility has pre-staged materials which may include such things a storm trucks or storm boxes.	◐

2) SYSTEM PLANNING, DESIGN, CONSTRUCTION AND PROTECTION	
8. The utility includes 50 year return values for wind and ice loading in their load cases for designing all line structures.	◐
9. The utility commonly uses automatic distribution line high-speed source transfer schemes.	○
10. The utility replaces its traditional electro-mechanical relays with microprocessor-based protective relays.	◐
11. The utility installs electronically controlled single and three phase reclosers where appropriate in order to improve system reliability.	◐

3) OPERATIONS, MAINTENANCE AND VEGETATION MANAGEMENT	
12. The utility has an effective outage management system (OMS) that works even during major outage events.	◐
13. The utility strives for regular inspection of its entire distribution system on a two year cycle utilizing a combination of circuit inspection, tree trimming inspection and pole ground line inspection.	○
14. Where practical, the utility uses the wire zone-border zone electric ROW vegetation management practice on sub-transmission lines.	◐
15. The utility utilizes a four-year vegetation management cycle for clearing trees around power lines.	○
16. The utility adheres to the vegetation management practices mentioned above.	○

4) POST STORM ACTIONS AND PROCESSES	
17. The utility determines the global estimated restoration times and disseminate that information both within 24 to 48 hours.	○
18. The utility has a restoration strategy that targets the restoration of power to the greatest number of customers in the shortest amount of time.	●
19. The utility does not limit requests for supplemental crews to the local mutual aid groups and other local utilities.	◐
20. The utility strives to make sure that all communications are correct and consistent.	◐
21. The utility implements lessons learned in a timely manner. Implementation plans that include specific tasks and scheduled completion dates are developed and tracked.	◐

Table VII-2 – Unitil best practices evaluation matrix.

1) EMERGENCY PLANNING AND PREPAREDNESS	
1. The utility bases their emergency operations on the concept of the incident command system (ICS) now referenced as the incident management system.	○
2. The utility has a dedicated emergency operations organization and facilities.	○
3. At the first indication of a storm, the utility pre-positions its restoration workforce which includes damage assessors and crews. The initial damage assessments begin as soon as possible after a storm has passed and the damage assessments are used to develop initial restoration time estimates.	◐
4. The utility never underestimates the potential damage of a forecasted storm.	◐
5. The utility has a plan in place to communicate with public officials and emergency response agencies, and the utility opens communications early and maintains constant communications throughout the storm or event.	◐
6. The utility extensively uses "non-traditional" employee resources.	◐
7. The utility has pre-staged materials which may include such things a storm trucks or storm boxes.	◐

2) SYSTEM PLANNING, DESIGN, CONSTRUCTION AND PROTECTION	
8. The utility includes 50 year return values for wind and ice loading in their load cases for designing all line structures.	◐
9. The utility commonly uses automatic distribution line high-speed source transfer schemes.	○
10. The utility replaces its traditional electro-mechanical relays with microprocessor-based protective relays.	○
11. The utility installs electronically controlled single and three phase reclosers where appropriate in order to improve system reliability.	◐

3) OPERATIONS, MAINTENANCE AND VEGETATION MANAGEMENT	
12. The utility has an effective outage management system (OMS) that works even during major outage events.	◐
13. The utility strives for regular inspection of its entire distribution system on a two year cycle utilizing a combination of circuit inspection, tree trimming inspection and pole ground line inspection.	○
14. Where practical, the utility uses the wire zone-border zone electric ROW vegetation management practice on sub-transmission lines.	◐
15. The utility utilizes a four-year vegetation management cycle for clearing trees around power lines.	○
16. The utility adheres to the vegetation management practices mentioned above.	○

4) POST STORM ACTIONS AND PROCESSES	
17. The utility determines the global estimated restoration times and disseminate that information both within 24 to 48 hours.	○
18. The utility has a restoration strategy that targets the restoration of power to the greatest number of customers in the shortest amount of time.	○
19. The utility does not limit requests for supplemental crews to the local mutual aid groups and other local utilities.	◐
20. The utility strives to make sure that all communications are correct and consistent.	◐
21. The utility implements lessons learned in a timely manner. Implementation plans that include specific tasks and scheduled completion dates are developed and tracked.	◐

Table VII-3 – National Grid best practices evaluation matrix.

1) EMERGENCY PLANNING AND PREPAREDNESS	
1. The utility bases their emergency operations on the concept of the incident command system (ICS) now referenced as the incident management system.	●
2. The utility has a dedicated emergency operations organization and facilities.	●
3. At the first indication of a storm, the utility pre-positions its restoration workforce which includes damage assessors and crews. The initial damage assessments begin as soon as possible after a storm has passed and the damage assessments are used to develop initial restoration time estimates.	◐
4. The utility never underestimates the potential damage of a forecasted storm.	◐
5. The utility has a plan in place to communicate with public officials and emergency response agencies, and the utility opens communications early and maintains constant communications throughout the storm or event.	◐
6. The utility extensively uses "non-traditional" employee resources.	●
7. The utility has pre-staged materials which may include such things a storm trucks or storm boxes.	◐
2) SYSTEM PLANNING, DESIGN, CONSTRUCTION AND PROTECTION	
8. The utility includes 50 year return values for wind and ice loading in their load cases for designing all line structures.	◐
9. The utility commonly uses automatic distribution line high-speed source transfer schemes.	○
10. The utility replaces its traditional electro-mechanical relays with microprocessor-based protective relays.	◐
11. The utility installs electronically controlled single and three phase reclosers where appropriate in order to improve system reliability.	◐
3) OPERATIONS, MAINTENANCE AND VEGETATION MANAGEMENT	
12. The utility has an effective outage management system (OMS) that works even during major outage events.	●
13. The utility strives for regular inspection of its entire distribution system on a two year cycle utilizing a combination of circuit inspection, tree trimming inspection and pole ground line inspection.	○
14. Where practical, the utility uses the wire zone-border zone electric ROW vegetation management practice on sub-transmission lines.	◐
15. The utility utilizes a four-year vegetation management cycle for clearing trees around power lines.	○
16. The utility adheres to the vegetation management practices mentioned above.	◐
4) POST STORM ACTIONS AND PROCESSES	
17. The utility determines the global estimated restoration times and disseminate that information both within 24 to 48 hours.	○
18. The utility has a restoration strategy that targets the restoration of power to the greatest number of customers in the shortest amount of time.	●
19. The utility does not limit requests for supplemental crews to the local mutual aid groups and other local utilities.	◐
20. The utility strives to make sure that all communications are correct and consistent.	◐
21. The utility implements lessons learned in a timely manner. Implementation plans that include specific tasks and scheduled completion dates are developed and tracked.	◐

Table VII-4 – NHEC best practices evaluation matrix.

1) EMERGENCY PLANNING AND PREPAREDNESS	
1. The utility bases their emergency operations on the concept of the incident command system (ICS) now referenced as the incident management system.	◐
2. The utility has a dedicated emergency operations organization and facilities.	◐
3. At the first indication of a storm, the utility pre-positions its restoration workforce which includes damage assessors and crews. The initial damage assessments begin as soon as possible after a storm has passed and the damage assessments are used to develop initial restoration time estimates.	◐
4. The utility never underestimates the potential damage of a forecasted storm.	◐
5. The utility has a plan in place to communicate with public officials and emergency response agencies, and the utility opens communications early and maintains constant communications throughout the storm or event.	◐
6. The utility extensively uses "non-traditional" employee resources.	◐
7. The utility has pre-staged materials which may include such things a storm trucks or storm boxes.	◐
2) SYSTEM PLANNING, DESIGN, CONSTRUCTION AND PROTECTION	
8. The utility includes 50 year return values for wind and ice loading in their load cases for designing all line structures.	◐
9. The utility commonly uses automatic distribution line high-speed source transfer schemes.	○
10. The utility replaces its traditional electro-mechanical relays with microprocessor-based protective relays.	◐
11. The utility installs electronically controlled single and three phase reclosers where appropriate in order to improve system reliability.	●
3) OPERATIONS, MAINTENANCE AND VEGETATION MANAGEMENT	
12. The utility has an effective outage management system (OMS) that works even during major outage events.	●
13. The utility strives for regular inspection of its entire distribution system on a two year cycle utilizing a combination of circuit inspection, tree trimming inspection and pole ground line inspection.	○
14. Where practical, the utility uses the wire zone-border zone electric ROW vegetation management practice on sub-transmission lines.	◐
15. The utility utilizes a four-year vegetation management cycle for clearing trees around power lines.	○
16. The utility adheres to the vegetation management practices mentioned above.	○
4) POST STORM ACTIONS AND PROCESSES	
17. The utility determines the global estimated restoration times and disseminate that information both within 24 to 48 hours.	○
18. The utility has a restoration strategy that targets the restoration of power to the greatest number of customers in the shortest amount of time.	●
19. The utility does not limit requests for supplemental crews to the local mutual aid groups and other local utilities.	◐
20. The utility strives to make sure that all communications are correct and consistent.	◐
21. The utility implements lessons learned in a timely manner. Implementation plans that include specific tasks and scheduled completion dates are developed and tracked.	◐