Control Number: 47552

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PROJECT NO. 47552

ISSUES RELATED TO THE DISASTER RESULTING FROM HURRICANE HARVEY	**§ § §**	**PUBLIC UTILITY COMMISSION OF TEXAS**

Summary of Preparedness Activities in Response to Lessons Learned from Hurricane Harvey by the Working Group of Commission Staff and Electric Utilities

December 14, 2018

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I. Introduction

Hurricane Harvey made landfall as a Category 4 hurricane on August 25, 2017, at 10:00 p.m. with winds in excess of 130 miles per hour and a record-breaking storm surge. The storm inflicted massive disruptions on the electric power system in the Corpus Christi, Houston/Galveston, and Beaumont/Port Arthur areas of Texas. As Hurricane Harvey moved inland, the storm stalled, causing excessive rain in parts of southeastern Texas and flooding large areas of Houston and inland as far as Austin.[1]

As part of its review of the impacts of Hurricane Harvey, the Commission commended electric utilities and Commission staff for their response to Hurricane Harvey. In addition, the Commission directed its staff to work with utilities to increase preparedness for future major weather events through increased collaboration and consideration of additional infrastructure-related preparedness actions by individual utilities, based on the lessons learned from Hurricane Harvey.[2] As part of these efforts, Commission staff and utilities worked with the Texas Department of Public Safety's Texas Division of Emergency Management (TDEM), which manages the State Operations Center.

Commission staff conducted a workshop with the utilities and TDEM to share information about activities related to Hurricane Harvey. After the workshop, Commission staff and utilities created a working group, which in turn created four task forces to accomplish the needed work. Most of the work was completed by July 2018, with additional documentation and refinements occurring beyond that time. The work was completed in an efficient, collaborative manner, with most of the work accomplished through conference calls and emails. The work of the four task forces is described in the following sections. Questions about this summary and the working group and task forces may be directed to Keith Rogas, Director of the Commission's Infrastructure and Reliability Division.

II. Task Force 1 – Utility and Commission Staff Collaboration with the State Operations Center

Task Force 1 improved collaboration with the State Operations Center (SOC). The SOC coordinates state emergency assistance to local governments that have experienced an emergency situation that local response resources are inadequate to address. During a major emergency, the SOC management team, state agencies and volunteer groups that make up the

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[1] Hurricane Harvey Event Analysis Report, North American Electric Reliability Corporation (March 2018), p. 5.

[2] Commission's September 28, 2017 open meeting, transcript, p. 15, l. 17 – p. 75, l. 11. The North American Electric Reliability Corporation – a federally mandated organization that supports the reliability of the electric grid - identified a number of what it characterized as good industry practices that were used by impacted utilities in the response to Hurricane Harvey. The identified practices included the following collaborative practices:

- Collaborative efforts with other Texas utilities, ERCOT [Electric Reliability Council of Texas, Inc.], and regional mutual assistance groups worked well during this event. It is important to touch base with contract resources and adjacent utilities prior to the storm event to establish communication chains.
- Establishment of contacts with State and Local Emergency Management coordinators and key stakeholders was key in maintaining continuity and prioritization of the recovery effort.

State of Reliability, 2018, North American Electric Reliability Corporation (June 2018), p. 181.

state Emergency Management Council, and federal liaison teams convene at the SOC to identify, mobilize, and deploy resources to respond to the emergency.[3] Task Force 1 addressed improved collaboration with the SOC on identification and use of resources by utilities that are available through the SOC; re-entry by utilities into impacted areas for the purpose of electric service restoration; and reporting to the SOC of outages and service restoration estimates. Attachment 1 of this document contains the summary notes of Task Force 1.

III. Task Force 2 – Utility-Specific Actions

Task Force 2 summarized infrastructure-related preparedness actions by individual utilities that operate along the Texas Gulf Coast and that are fully regulated by the Commission: AEP Texas, CenterPoint Energy, Entergy Texas, Inc. (ETI), Lower Colorado River Authority Transmission Services Corporation (LCRA TSC), Sharyland Utilities, and Texas-New Mexico Power Company (TNMP). Task Force 2 addressed hurricane-related flood protection for electric utility facilities, other storm hardening actions, and purchase of facilities and materials in preparation for storm season. Attachment 2 of this document contains the report of Task Force 2.

IV. Task Force 3 – Utility Collaboration through Mutual Assistance

Task Force 3 addressed improved Texas-based mutual assistance for electric utilities in Texas through increasing the membership of the Texas Mutual Assistance Group (TXMAG); increasing the sharing of mobile substations and other resources through TXMAG; and evaluation of best practices of mutual assistance groups. Attachment 3 of this document contains the report of Task Force 3.

V. Task Force 4 – Collaboration between Electric Utilities and Commission Staff

Task Force 4 addressed improved collaboration between electric utilities and Commission staff through the following activities: development of a standardized outage definition for use during an event and post-event recovery by utilities in reporting to the Commission staff's Emergency Management Response Team when the SOC is activated; development of a streamlined outage and restoration reporting process; and compilation of materials that will be useful to electric utilities and Commission staff in responding to major weather events in the future.

VI. Conclusion

Under the direction provided by the Commission, Texas electric utilities and Commission staff improved their preparedness for major weather events.

[3] https://www.dps.texas.gov/dem/Operations/index.htm

Attachment 1

Public Utility Commission of Texas Project No. 47552

Issues Related to the Disaster Resulting From Hurricane Harvey

Public Utility Commission-State Operations Center Task Force

I. **Background**

A. Project goal: increase the preparedness of electric utilities and the Public Utility Commission of Texas (PUC) for a major weather event based on lessons learned from Hurricane Harvey.

II. **PUC-State Operations Center (SOC) Task Force: SOC Related Issues**

A. Resources Available at the SOC for Electric Service Restoration

1. Develop a list of SOC resources available to utilities

a) See Exhibit A.

2. Expectations and process for utility access to SOC resources.

a) Investor-Owned Utilities (IOUs), Texas Electric Cooperatives (TEC), Texas Public Power Association (TPPA), (collectively "utilities") agree that 24/7 contact information of those who can staff the SOC will be current and provide redundancy.

b) The PUC's Emergency Management Response Team (EMRT) will make the initial request for utility staffing.

(1) EMRT will work with the SOC to determine if utility staffing at the SOC is necessary or if having 24/7 contacts available could accomplish the same result.

c) Due to space limitations, a maximum of 10 utility personnel may staff the SOC at any one time.

d) Utilities agree to activate to the SOC within 3 hours of EMRT request.

e) Duration of staffing at the SOC.

(1) TBD by the particular event. EMRT will work with utilities and the SOC to determine when staffing is no longer needed.

B. Disaster-Area Re-Entry

1. Texas Division of Emergency Management's (TDEM) Initial Re-entry Assessment Team (IRAT)

a) Utility participation in IRAT process.

(1) See Exhibit B. Agreement among utilities, TDEM and EMRT that assistance prior to activation of the IRAT provides the most benefit.

(2) Depending on the utility resources, utility personnel may be able to accompany the IRAT for areas with a narrow focus and clearly defined start and stop points. Many smaller utilities may not have the resources to provide this service.

(a) Although rarely requested to accompany the IRAT, utilities should identify who in their organization could perform this task if TDEM makes the request.

2. Clearance of downed power lines, especially in areas with more than one utility.
    a) See Exhibits C and D.
3. Escorts for mobile substation/utility infrastructure transport.
    a) All requests for a DPS escort need to go through the SOC.
        (1) EMRT may request a DPS escort.
        (2) Utility may request a DPS escort through its local DDC.
    b) Prioritizing requests for DPS escorts.
        (1) If resources allow, DPS will fill the request.
    c) Requests for local police escorts
        (1) Requests for local police escorts may be made at the local level.
4. Waivers of Permits for oversize/overweight utility infrastructure.
    a) Oversize/overweight permits are issued by the Texas Department of Motor Vehicles: http://www.txdmv.gov/motor-carriers/oversize-overweight-permits
    b) Waivers for oversized utility infrastructure
        (1) Waivers for oversized utility infrastructure are not granted. Because oversized utility infrastructure can cause major damage to roadways, a utility escort to measure roadway heights is essential.
    c) Waivers for overweight utility infrastructure
        (1) Waivers for overweight loads can be granted. Utilities can be re-routed on roads that support the weight.
5. Information about road conditions.
    a) TX DOT map of road conditions: https://drivetexas.org
    b) Assistance to utilities
        (1) Because Drive Texas is not always current, the EMRT will work with TX DOT and DPS to provide utilities with the latest information on road conditions.
    c) Assistance to TX DOT
        (1) Utilities may contact EMRT or the local DDC to report blocked roadways. This information will be passed on to DPS and TX DOT. If the Emergency Management Council is not activated to the SOC, utilities should report roadway conditions to their local government.
6. Letter of Access/Invitation (LOI). See Exhibit E.
    a) Utilities provide LOIs to their mutual aid workers and contractors to facilitate access into evacuated areas in order to assess damage and restore power and damaged infrastructure.

b) PUC-SOC Task Force discussion also envisioned use of the LOI in instances where a fuel tanker and driver, contracted by a utility but not previously credentialed by a fuel refinery, seeks to load fuel.

C. Outage Reporting and Service Restoration Time Estimates

1. Outage Reporting and Restoration Time Estimates.
   - a) TDEM, EMRT and utilities agree that utilities will provide outages and restoration time estimates twice a day to align with reporting requirements at the SOC during activations. In addition to the SOC, the EMRT will distribute the reports to Texas Health and Human Services Commission (HHSC), DOE, and FEMA.
   - b) TDEM, EMRT and utilities agree that additional reports will be prepared, if required, to brief the Governor.
2. Utility issues/concerns regarding provision of restoration timeline estimates.
   - a) Acknowledgement between TDEM, EMRT, and utilities that restoration timeline estimates can change during an emergency event but that estimates must be provided to allow state agencies to position needed resources. The EMRT will include standard verbiage on situation reports provided to the SOC that indicates that the initial restoration timeline estimates are general until assessment is complete.
   - b) Acknowledgement between TDEM, EMRT, and utilities that until surveys of damaged infrastructure takes place, utilities will provide a range of the estimated restoration time based on the data available and lessons learned from previous severe weather events.

EXHIBIT A

State Operations Center (SOC) Resources Available to Electric Utilities

Resources available to the PUCT's Emergency Management Response Team (EMRT) and electric utilities when the Emergency Management Council is activated to the SOC include:

1. **Texas Department of Transportation (TX DOT)**
    a. Provide current status of road conditions. Rapidly changing road conditions can quickly make DriveTexas road closure information out of date.
    b. Clear roadways essential to restoration efforts.

2. **Department of Public Safety (DPS)** – Subject to DPS staffing constraints, on-duty officer escorts for:
    a. Utilities re-entering a disaster area to assess damage and restore power/damaged infrastructure; or
    b. Transport of oversize/overweight utility infrastructure like mobile substations.

3. **Texas Division of Emergency Management's (TDEM) Fuel Team** – Contact information for TDEM's private fuel contractor when fuel availability is scarce during an emergency; and/or confirmation that the loading racks at the refineries will not exclude utility-contracted 18 wheelers from fuel loading.

4. **Texas National Guard Air Operations Center (contact through DPS Aviation)**
    a. Provision of squawk numbers for helicopter flights to assess damage during periods of temporary flight restrictions in place due to Search and Rescue (SAR) operations.
    b. Requests for air clearance for utility drones to assess damage during periods of temporary flight restrictions in place due to Search and Rescue (SAR) operations

EXHIBIT B

Electric Utility Process to Assist Texas Division of Emergency Management (TDEM) Initial Re-entry Access Team (IRAT)

Utility Assistance with TDEM/IRAT Re-Entry Process

1. **Pre-Planning Process for TDEM/IRAT Re-Entry During a Hurricane Event** (Emergency Management Council Activation)
    a. TDEM/IRAT will supply potential re-entry routes to pre-designated areas, based upon previous hurricanes.
    b. Hurricane event where landfall and hurricane path is known:
        i. TDEM/IRAT will supply the re-entry route into a given area, approximately 24 hours prior to the departure of the IRAT, or as soon as reasonably possible.
    c. Utilities will review the potential re-entry routes or chosen re-entry route and confirm re-entry route(s) where they have facilities.
        i. Confirmation can be in written format; a utility-provided map designating areas with facilities along the route that could potentially be in the path; or confirmation of areas with facilities along the potential re-entry routes on TDEM's map.
2. **Process for any event where TDEM/IRAT is activated**
    a. Utilities with facilities along the re-entry route will provide:
        i. Confirmation that they have facilities along the re-entry route.
            1. Confirmation can be in written format; a utility-provided map designating areas with facilities along the route that could potentially be in the path; or confirmation of areas with facilities along the potential re-entry routes on TDEM's map.
        ii. Contact name/number for coordination/discussion of downed power lines in the path.
        iii. Scouting, within the resource constraints of the utility (particularly those of small utilities) and as soon as it is safe, of the re-entry route in areas where it has facilities that could potentially be in the path.
        iv. Utility's assessment of the re-entry route based on the areas it could scout.
        v. Estimated time to clear its downed facilities, if applicable.

EXHIBIT C

Clearance of Downed Utility Lines

Following significant weather events, damaged or downed poles and power lines require crews to assess the damage and make the facilities safe. In areas served by multiple utilities, it is not always immediately clear which electric utility owns and operates the damaged facilities. However, for the reasons outlined below, work should only be performed by crews under the direction of the utility which owns the facilities.

The utility owning the facilities must know at all times which crews/individuals are working on their facilities and where they are located. This is essential to protecting those individuals from safety risks such as re-energizing the line while the crew is in contact, or having the crew inadvertently energize a line on which other crews are working. At the same time, crews must be familiar with the owning utility's procedures and equipment so that they will know how to safely work within the environment. This is a fundamental reason why utilities have adopted procedures designed to specifically direct where work is being performed.

Many utilities employ language to clear a circuit which is similar but not exactly the same across utilities. This presents a significant risk to a foreign (outside) crew (one not currently working under the owning utility's direction) if they are unfamiliar with the terminology. When an outside crew comes across an unknown line, it can be difficult to determine ownership. Once ownership is determined, there would still be issues in getting the outside crew inserted into the owning utility's processes to ensure that facilities could be restored safely.

Distribution facilities frequently have attached communications infrastructure which may also be downed during an event. Many of these communications circuits support public communications such as schools and wide area city networks that, if damaged, can impair infrastructure needed for emergency communications. The electrical circuit can be out but the communications could still be functional. For all crews, care needs to be taken to properly identify downed lines. Cutting conductor with incased fiber can cause degradation in protection systems required to protect the line.

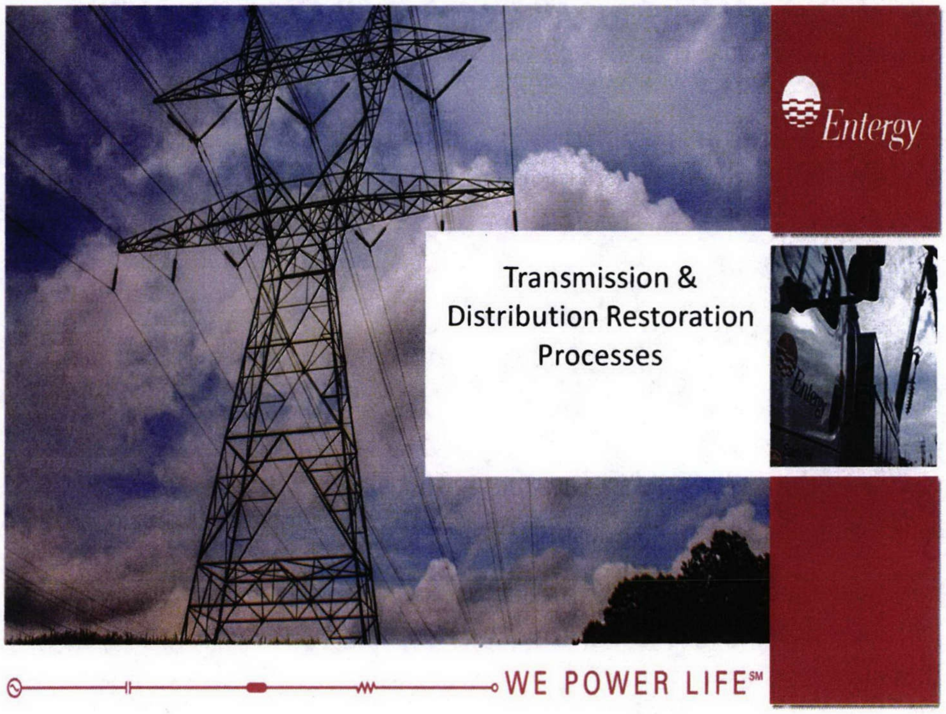
Most utility employees have a general knowledge of power line ownership within their service area. When a downed power line that does not belong to the utility is encountered, and the employees know who owns it, they will report the downed wire to their dispatch center employees to contact the appropriate neighboring utility. Likewise, if the downed wire belongs to a local telephone company or to a cable TV company, utilities will attempt to contact the appropriate person for the area.

Furthermore, most utilities have wire down procedures in place with their local fire/police agencies which is usually initiated by dialing 911. Generally, these procedures are the safest practice for the public, the emergency first responder, and any respective utility crew, and should be followed. Following a severe weather event, however, first responders or the IRAT may require direct contact with the utility.

During severe weather events, the Public Utility Commission of Texas' Emergency Management Response Team (EMRT) uses, and has provided to the State Operations Center (SOC), a Geographic Information System (GIS) map that shows the utilities' approximate service area boundaries. The PUC's EMRT uses this map to fulfill a variety of SOC requests such as facilitating quicker contact with the owning utility and dispatching of utility crews to clear downed lines. This process can work for both transmission and distribution owned circuits and ensures that vital emergency communications will not be interrupted during the restoration process.

EXHIBIT D

Transmission and Distribution Restoration Processes



Restoration
activities for downe

EXHIBIT E

Sample Letter of Access/Invitation

SAMPLE - TEMPLATE LETTER OF ACCESS/INVITATION

Entergy

Louis S. Dabdoub III
Entergy System Incident Commander
Entergy Services, Inc.
P.O. Box 61000
New Orleans, La. 70113

Affiliation Documentation — Letter of Access/Invitation

Invitation Issued By: ***Entergy Corporation***

Access and Invitation in Response to ***Hurricane NEXT*** affecting the States of ***Arkansas, Louisiana, Mississippi and Texas.***

Access and Invitation Activation Date: ***XX/XX/XX***

Access and Invitation Expiration Date: ***XX/XX/XX***

To Whom It May Concern:

This Letter of Access/Invitation verifies that the bearer is affiliated with ***Entergy Corporation*** and is authorized by ***Entergy Corporation*** to enter incident sites or restricted areas for the purpose of assessing damage, supporting electric service restoration workers and restoring the electric utility infrastructure in emergency restoration activities. Please allow appropriate access as required to restore electric utility services and facilities during this crisis.

If further verification of affiliation and invitation of individuals or compact agreement companies providing assistance is required, please call:

Entergy System Command Center ***601-952-2342***

It is vitally import for the bearer to return to their home location in order to maintain their own utility operations. Therefore, upon conclusion of the above named event, please facilitate the immediate return to their home destinations by affording them the same courtesies and exemptions as afforded upon their initial deployment to assist during this crisis.

This document has been designed to meet the requirements of the ***National Incident Management System (NIMS) Guideline for the Credentialing of Personnel, Section 4, (Model Standards and Guidelines for Private Sector Organizations and Critical Infrastructure Owners and Operators)*** to allow ***Entergy Corporation*** employees, affiliates, supporting contractors and responding mutual assistance workforce access to incident areas or routes deemed passable but not open to the general public.

Thank you.

Louis S. Dabdoub III

Entergy Corporation
Louis S. Dabdoub III
Entergy System Incident Commander

EXHIBIT E

Sample Letter of Access/Invitation

Entergy

Authorized Emergency Response Team

Hurricane Next

Activation Date: **Month, Date, Year**
Expiration Date: **Month, Date, Year**

Attachment 2

Task Force 2 Issues

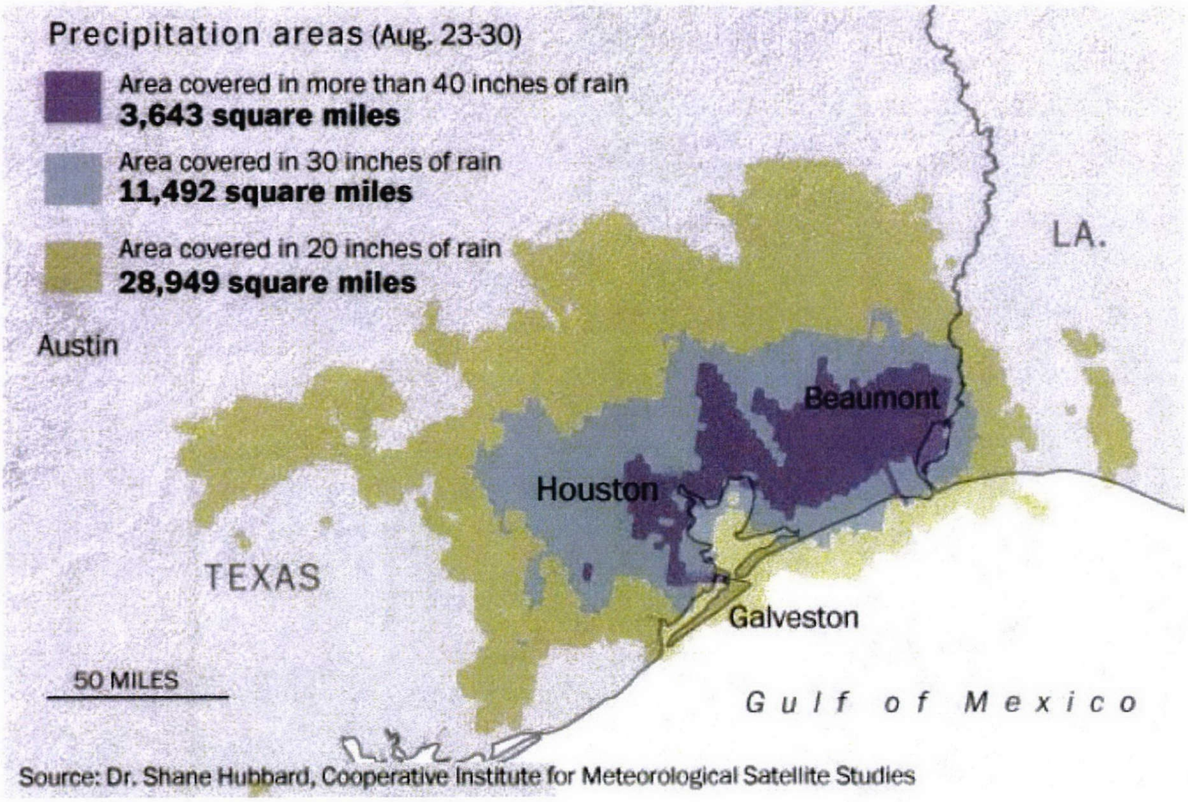
Summary of Hurricane Harvey Follow-Up

(See Attachment (Utility Responses) for detailed utility specific responses)

I. Hurricane-Related Flood Protection for Electric Utility Facilities

A. Describe the extent to which your facilities (e.g. a substation) were flooded as a result of Hurricane Harvey and compare that flooding to prior flooding in at least the 15 years before Hurricane Harvey.

In general, Harvey caused major wind and some storm surge damage from Matagorda Bay and south while making landfall and then caused major flooding over the following days from Victoria and north generally within 90 miles of the coastline along major rivers and tributaries. Some utilities have experienced previous flooding events, but not to the magnitude of Harvey, with the exception of CenterPoint during Allison in 2001. Below is a summary of the rainfall totals and notable damages due to flooding during Harvey, with a note of previous substation flooding if applicable.



HURRICANE HARVEY - NOTABLE FLOOD DAMAGE TO FACILITIES								
Utility	Flooded Substations					Transmission Line	Distribution Line	Other Facilities
	Major	Minor	Storm Surge	Previous				
ETI	6	11		2			Yes	
TNMP	0	1					Yes	1
AEP TX	0	0	Yes					
CNP	8	0	0	Yes		3 River Crossing Structures	Yes, and 83 URD Vaults	
LCRA TSC	0	0	0	Yes		No	No	No
Sharyland	0	0	0	0		No	No	No

Major - Significant water in control house affecting electronics and/or water affecting electrical equipment within the substation fence.
URD - underground.

B. Describe the steps that you have taken or plan to take in response to flooding resulting from Hurricane Harvey, in order to reduce the risk of flood damage to your facilities in the future.

The 14 substations noted above as having major flooding due to Harvey are in various stages of being rebuilt. The goal is to rebuild the substation equipment above the Harvey flood levels; however, this is impractical in some cases. The water sensitive equipment in the major flooded substations are in the process of being raised above the Harvey flood event water levels when practical. For example, during the restoration of the flooded control houses which required complete replacement of the control house, the foundations were raised at the time of replacement. This also required replacing all the control wiring from the control house to the controls in the yard. The yard equipment is also in the process of being raised, but in some instances this was limited due to the clearance to the substation bus. In these instances, the equipment could not be raised above the Harvey flood level without rebuilding the substation bus framing, which is considered to be impractical. For the substations noted as having minor flooding, flood mitigation plans are being developed and will be implemented as appropriate to mitigate damaging the water sensitive equipment. Items being considered include: Installation of levees, raising equipment, deployment of tiger dams and the use of sandbags at the time of the next event. The three river (San Jacinto River) crossing transmission structures were damaged due to floating debris and bank erosion. The new permanent crossings will be constructed using steel poles with deep drilled shafts, and set farther back from the river bank to minimize the impact of floating debris. CNP has also initiated a study to further understand the options available for protection of transmission structures, in or near flowing water, from floating debris, bank erosion, etc. Learnings will be evaluated for application throughout the CNP system.

While the Utilities are conducting studies in regard to flood mitigation caused by Hurricane Harvey and on a case by case basis of a 500 year flood event on certain other facilities, the utilities have not conducted a Harvey level, wide area, flood impact analysis on the existing grid beyond the impacted area's actual experience during Harvey. In order to perform a wide area flood impact analysis, numerous assumptions would need to be made, substantial data acquired and outside expertise consulted to adequately model the types of impacts that could occur. For example, the pre- and post-landfall states of the wide area to be studied, including ground saturation, water levels of rivers, creeks, tributaries, lakes and reservoirs, rainfall rates and coverage, duration of the storm, release rates from affected dams, along with other hydrologic and geologic data and forecasting methodologies would have to be incorporated into the analysis. The utilities believe such a broad, wide area study is currently beyond the capabilities of the utilities' experts, requiring the use of outside resources, expertise and significant effort to develop consensus on the assumptions to be studied.

C. Explain the elevation standard used for facility construction before and after Hurricane Harvey and explain any changes.

The Utilities are not aware of an industry standard for substation elevations. As such the utilities have developed their individual standards depending on factors such as existing floodplains, coastal storm surge, past experiences, and likelihood of flood events.

The attached spreadsheet summarizes the utilities' elevation standards.

D. What data is used to determine current floodplains / base flood elevations ("BFE")? Is there a standard "high-water" elevation, for example: 100 year BFE, 12" above 100 year BFE, 500 year BFE, 12" above Category 5 Storm Surge, 2' above the 1% FEMA level, 13' above sea level.

The Utilities are not aware of an industry standard. The Utilities use various sources, but all consult the FEMA flood plain maps and currently use a minimum of at or one to two feet above the 100 year flood plain.

II. Hardening Measures

A. Explain whether any hardening measures you took before Hurricane Harvey improved the resilience of your facilities to Hurricane Harvey. If they did, describe the hardening measures and what caused you to implement them.

The Utilities in Texas have been implementing storm hardening strategies for decades. Each storm provides the opportunities for improvements on how we prepare and respond to future storms. These storm hardening strategies have certainly improved the resiliency of the utility grid. Please refer to the Attachment for details of each utility response.

B. Describe the steps that you have taken or plan to take in response to wind damage from Hurricane Harvey, in order to reduce the risk of wind damage to your facilities in the future.

Harvey was not a significant wind event for ETI, TNMP, CNP, LCRA TSC or Sharyland; as such they will continue with implementing their current storm hardening strategies as it relates to wind mitigation.

Harvey was a significant wind event for AEP; as such AEP has taken steps to increase resilience and to promote effective and efficient restoration. For example, new or replacement facilities will be planned and constructed in alignment with the Company's current design standards which incorporate lessons learned from extreme weather events such as Hurricane Harvey. For additional information, please refer to the Utility Responses attachment.

III. Explain whether you purchase facilities and materials (e.g. poles) in preparation for hurricane season.

The Utilities in Texas maintain supplies in anticipation of storms. As a particular hurricane approaches, materials may be moved in anticipation of where the damage is expected. Most of the distribution line material supply is handled by individual utilities, some of which can rely on other companies within the same corporation. The Utilities are also in contact with vendors where there are contracts in place for emergency response and expedited availability. For larger equipment, each utility has its own inventory of spares which can be shared as part of the mutual assistance groups. The Utilities have damage prediction models, based on past experience, that can predict the damages based on the forecasted track. If necessary, the utility can place additional equipment orders ahead of the storm.

Task Force 2 Issues

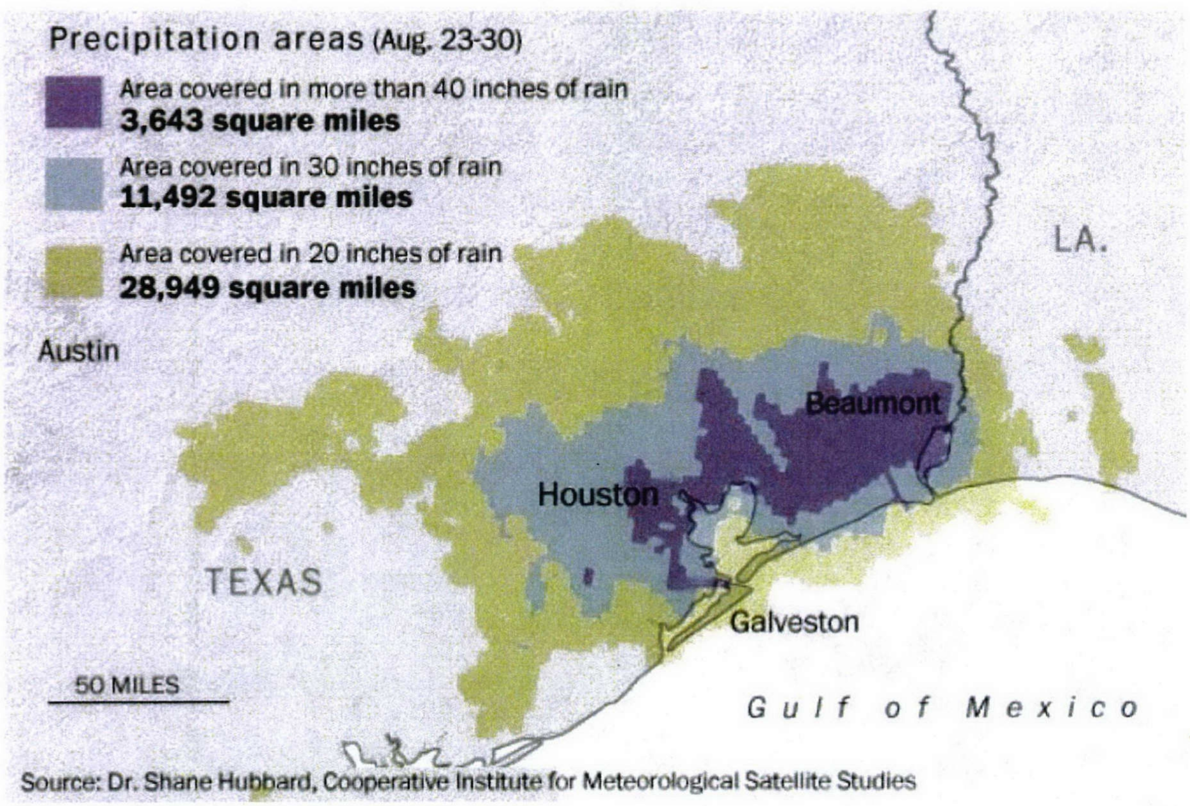
Hurricane Harvey Follow-Up

(Utility Responses)

I. Hurricane-Related Flood Protection for Electric Utility Facilities

A. Describe the extent to which your facilities (e.g. a substation) were flooded as a result of Hurricane Harvey and compare that flooding to prior flooding in at least the 15 years before Hurricane Harvey.

In general, Harvey caused major wind and some storm surge damage from Matagorda Bay and south while making landfall and then caused major flooding over the following days from Victoria and north generally within 90 miles of the coastline along major rivers and tributaries. Some utilities have experienced previous flooding events, but not to the magnitude of Harvey, with the exception of CenterPoint during Allison in 2001. Below is a summary of the rainfall totals.



ETI Response:

Seventeen substations are considered to have taken flood waters, most with minor repairs. Six substations were completely flooded.

Substation	Harvey Damage	Previous Flooding
Kountze Bulk 138 kV	• Three feet of water was observed in the raised control house. • All breakers submerged (Three feeder breakers, one main breaker, three EHV breakers). • Transformer control cabinet submerged.	Yes Control house flooding damaging IT equipment batteries, protective relaying and RTU
Amelia Bulk 230 kV and 69 kV	• Over four feet of water observed at control house that had previously installed 3.5 feet of flood mitigation. • Transmission breaker flooding. • Transformer control cabinet submerged.	Yes. Control house flooding damaging IT equipment batteries, protective relaying and RTU
Bevil 230 kV	• Over six feet of water observed at control house. • All breakers submerged • Transformer control cabinet submerged	No
Vidor 69 kV	• Three feet of water inside control house • All breaker control cabinets were submerged. • Transformer control cabinet submerged.	No
McDonald 230 kV	• Over five feet of water observed at the control house • All breakers submerged • Transformer control cabinet submerged.	No
Viway 138 kV	• Over six feet of water observed at the control house. • All breakers submerged. • Transformer control cabinet submerged.	No
11 Additional Substations*	• Minor flooding. • Minor repairs	No

*AMELIA NORTH, DEWYVILLE JNE, ECHO, FAWIL, GULFWAY, MAYHAW, ORANGE BULK, PORT ACRES BULK, RAYWOOD, SABRA, STOWELL

TNMP Response:

TNMP had a single distribution substation (Dickinson Substation) in its Gulf Coast service territory which experienced significant flooding which resulted in the need to remove it from service until the flood waters receded. As far as the extent of the flooding, water broached the control house which resulted in some water damage to panels internal to the control house and water also broached some older circuit breaker cabinets in the substation itself. Once crews were able to access the area the actual repairs were minor before service could be restored. Most other TNMP substation and switching station facilities fared quite well during the event. The only other significant facility which was flooded was the Construction Center/Engineering Offices located in Texas City which resulted in office flooding that required clean-up and repair. The remainder of Harvey damage related to flooding was mostly focused on distribution facilities that were installed both above and below-ground in the form of padmount/UG transformers, cable and pedestal metering installations.

As far as prior flooding events within the previous 15 years TNMP had not experienced an event this large in either substations or any of its other facilities. This was truly an unprecedented event related to storm issues from a water perspective as TNMP had experienced wind and rain damage during Hurricanes Ike and Rita but those storms did not have the same impacts across TNMP's system.

AEP Texas Response:

AEP Texas facilities (e.g., a substation) were not subjected to flooding as a result of Hurricane Harvey. While AEP Texas did have some flooding at the El Campo Station in 2004, the flooding was not hurricane-related. Similarly, AEP facilities have not suffered hurricane-related flooding in at least the 15 years before Hurricane Harvey.

For the AEP Texas Transmission system, the intense winds and airborne debris were the primary source of damage, with some additional damage to substations due to storm surge flooding. A combination of debris impact and storm surge damaged fencing, collapsed steel structures, caused some erosion and damaged components in control cabinets, including relays and associated components such as fuse blocks, terminal blocks and auxiliary relays. In some instances, cooling fan motors on transformers were damaged and station battery banks failed.

CNP Response:

Three San Jacinto River transmission crossings were damaged during Harvey. This represents unprecedented transmission system flood damage at least as far back as Tropical Storm Allison (2001).

Eight substations were impacted, and nine additional substations were inaccessible, due to Harvey flooding. CNP has experienced some level of substation flooding during prior events.

- Allison flooding impacted mainly the Houston Downtown District (HDD) and Texas Medical Center (TMC) areas. Post Allison, flood walls were installed at two substations. One of these substations would have been impacted by Harvey if the flood wall had not been in place.
- Hurricane Ike (2008) flooding/storm surge impacted coastal substations in the Galveston and Freeport areas. In response, CNP has addressed storm

surge at coastal substations in the Galveston and Freeport areas. None of these substations were impacted by Harvey.

- The Memorial Day (2015) and Tax Day (2016) floods impacted one substation. In response to the Memorial Day event, CNP implemented an operational solution to mitigate the impact of flooding in this substation. The operational solution was also implemented during the Tax Day flood and Harvey.

Harvey impacted 83 dedicated underground vaults in the HDD area, while Allison impacted 355 dedicated underground vaults in the HDD and TMC areas.

Compared to damage experienced during more typical weather events (i.e. heavy thunderstorms, minor localized flooding, etc.), CNP's distribution system experienced a slight increase in damage due to Harvey. The types of equipment impacted by this increase in damage were URD Transformers, Pole Mounted Electronics, and Meters. One exception to more typical weather events is that four distribution river crossings were impacted.

- This statement speaks primarily to the performance of CNP's Underground Residential Distribution (URD) facilities. Harvey resulted in the following URD related outages vs historical outage rates over for a similar time period (i.e. typical is summer in this case).
    - Failed URD Transformers = 192 (typical = 80, 240% increase)
    - Blown URD Transformer Fuses = 1,246 (typical = 89, 660% increase)
    - Blown URD Terminal Pole Fuses = 42 (typical = 9, 470% increase)
- CNP has seen similar outage rate increases on the URD system for past flooding events that significantly impacted heavy residential areas with URD facilities.
- The totals above are based on outages over a 13 day period.
- CNP defines Harvey as the 13 days from when CNP Trouble Level 1 (TL1) was exceeded to when CNP returned to TL1).
- Approximately 10,000 meters were also replaced. These meters were identified through CNP's Advanced Meter System and verified with field inspection.
    - This would not have been a typical flood related issue because past flooding events did not reach the flood levels (i.e. height of flood water) experienced with Harvey.

LCRA TSC Response:

LCRA TSC did not have any substations with flood water damage during hurricane Harvey. However LCRA TSC did have the following transmission lines get damaged by high winds and debris during the event:

- Rockport to Fulton - T474

  The Rockport to Fulton 69kV line is approximately 7.4 miles long and generally runs parallel to Hwy 1069 connecting the Rockport Substation with the Fulton substation. The single circuit, single conductor line is constructed in delta configuration on steel monopoles. The center phase had broken bolts that connected the insulators to the pole, damaged brace post insulators and significant wire damage at dozens of locations along the phase.

- North Padre Tap to Port Aransas - T477

  The North Padre Tap to Port Aransas 69 kV single circuit line is approximately 15 miles long and runs parallel to HWY 361 on Mustang Island connecting the Naval Base Substation with Port Aransas Substation. The line is cut in the middle by the Mustang Island substation. The line is constructed with both steel and concrete monopoles on a variety of foundation types. The North Padre Tap to Port Aransas line received minimal apparent damage from the impacts of Hurricane Harvey.

- Rincon to Rockport - T473

  The 138 kV Rincon to Rockport line is a single circuit line that parallels HWY 188 and County Road 1258 for most of its 15.1 miles. The line received minimal apparent damage and was re-energized on 8/30/2017 at 19:56, connecting the Rincon Substation with the Rockport Substation.

Sharyland Response:

Sharyland Utilities' transmission and substation facilities in the Brownsville area of the Lower Rio Grande Valley were not impacted by wind or water during Hurricane Harvey. The facilities went into service in mid-2016 and have not been subjected to other hurricanes during the past 15 years. The facilities referenced include:

- The 138 kV Stillman switching station under construction.
- The 138 kV lines under construction that will connect the Stillman switching station with the 345 kV to 138 kV Palmito substation

- The 345 kV to 138 kV Palmito substation.
- A majority of the 47 miles of 345kV line from the 345 kV to 138 kV Palmito substation halfway to AEP's North Edinburg station
- The .58 miles of 138kV line currently connecting the Palmito substation to Brownsville Public Utilities Board's Loma Alta station. Upon completion of the Stillman switching station, the .58 miles of 138kV line will connect the Stillman switching station to Brownsville Public Utilities Board's Loma Alta substation and in the future other lines to the AEP La Palma substation along with other connections.

B. Describe the steps that you have taken or plan to take in response to flooding resulting from Hurricane Harvey, in order to reduce the risk of flood damage to your facilities in the future.

ETI Response:

ETI will: 1) Rebuild completely flooded stations to a minimum of 100 year Base Flood Elevation. Most will be greater than 500 year BFE, but limited by existing station site elevation and structure type. 2) Develop a proposed flood mitigation plan for other flooded and high impact stations. 3) Revise the Station Elevation section of the Entergy Substation Design Guide to provide increased protection from flooding in new stations and major additions to existing stations. 4) Reassessment of spare and mobile substation levels.

The 6 substations noted above as having major flooding due to Harvey are in various stages of being rebuilt. The goal is to rebuild the substation equipment above the Harvey flood levels; however, this is impractical in some cases. The water sensitive equipment in the major flooded substations are in the process of being raised above the Harvey flood event water levels when practical. For example, during the restoration of the flooded control houses which required complete replacement of the control house, the foundations were raised at the time of replacement. This also required replacing all the control wiring from the control house to the controls in the yard. The yard equipment is also in the process of being raised, but in some instances this was limited due to the clearance to the substation bus. In these instances, the equipment could not be raised above the Harvey flood level without rebuilding the substation bus framing, which is considered to be impractical. For Entergy, five control houses are in the process of being raised above Harvey flood levels. For the substations noted as having minor flooding, flood mitigation plans are being developed and will be implemented as appropriate to mitigate damaging the water sensitive equipment. Items being considered include: Installation of levees, raising equipment, deployment of tiger dams and the use of sandbags at the time of the next event.

TNMP Response:

TNMP will evaluate controls that can be instituted in short order to help alleviate or prevent future flooding events for the stations that we now know are prone to flooding plus key facilities (ex., construction centers in Texas City/Brazos areas) and will have access to them hopefully in sufficient time before the storm hits. What is meant by the phrase "will have access to them hopefully in sufficient time before the storm hits" is to demonstrate that each storm's circumstance is different as will be proactive preparations. These preparations will be determined by mainly the storm's forecast of: intensity, nature of rainfall/wind damage, storm location, timing, etc., and that forecast will influence what and how far in advance TNMP will procure additional materials, mitigating equipment or other necessary preparations. TNMP typically doesn't stock things such as concrete barriers, sandbags or large scale pumps and would have to procure them if available. Items that were not deployed but could be deployed for future events include:

- Proactive sandbagging of facilities that proved to be vulnerable during Harvey (ex., control houses and Region Office entry paths);
- Obtaining portable pumping facilities to be installed at those same facilities;
- Diversion concrete barriers to be installed around substations if necessary;
- Raising of equipment and document storage facilities that are at ground level where feasible.

AEP Texas Response:

While AEP Texas did not experience significant flooding of facilities resulting from Hurricane Harvey, the company is monitoring the activities of those companies that did experience significant damage and is applying those lessons learned into our continuous improvement efforts. For example, AEP Texas replacement control buildings have been built at a higher elevation to protect from storm surge damage and the protective relays in the distribution breakers are being installed in the new buildings to mitigate possible exposure to future storm surge.

CNP Response:

The transmission towers that made up the San Jacinto River crossings were damaged due to floating debris and bank erosion. The new permanent crossings will be constructed using steel poles with deep drilled shafts, and set farther back from the river bank to minimize the impact of floating debris. CNP has also initiated a study to further understand the options available for protection of transmission structures, in or near flowing water, from floating debris, bank erosion, etc. Learnings will be evaluated for application throughout the CNP system.

One substation is being completely rebuilt to an elevation above the Harvey flood level (targeted completion is Q3 2018). Another substation is having the control cubicle and other flood susceptible equipment elevated above the Harvey flood level (targeted completion is Q4 2018). In both cases, the Harvey flood level was above the 500-year flood plain. The other substations impacted by Harvey are being evaluated for implementation of flood mitigation measures. This evaluation is targeted for completion in Q3 2018, with mitigation measures targeted for implementation in subsequent years.

CNP has implemented a requirement that all dedicated underground vaults be constructed one foot above the 500-year flood plain.

Alternatives to re-establishing the impacted distribution river crossings are being evaluated. If these crossing must be maintained, or future river crossings are required, they will be built to a standard like a transmission crossing (i.e. steel/concrete poles, additional set back from river bank, etc.).

LCRA TSC Response:

LCRA TSC experienced significant flooding at its substations twice in the past few years. Neither incident was related to Hurricane Harvey. Flood waters experienced during both events exceeded the 100 year flood elevation. Prior to the Harvey event LCRA TSC established new substation standards for substations in or near a 100 year flood plain. Our current standard is 2 feet above the 1 percent FEMA designated flood levels.

LCRA TSC's engineers and technicians review and inspect transmission lines annually and conduct storm hardening/mitigation evaluations. New capital improvement projects may be added to LCRA TSC's capital plan as a result of the storm hardening evaluations. Hurricane Harvey did not present significant issues in LCRA TSC's transmission system and did not require significant changes to current storm hardening practices.

Moving forward LCRA TSC will be making recommendations in its capital plan for hardening/mitigation of substation control houses due to high winds.

Heinz substation is a new station that will be constructed in close proximity to the coast. Heinz substation equipment will be lifted on piers to mitigate flooding due to storm surge and designed to withstand the wind loads in the Corpus Christi Area.

Sharyland Response:

Sharyland Utilities did not incur flood damage as a result of Hurricane Harvey. Sharyland's engineering and construction process takes into account the area where the facilities are located and designs for that area, applying applicable standards at the time of design. Based on a review of elevations being used by other utilities, for future design in a hurricane evacuation zone, Sharyland will design control house foundations to be a minimum of 1 foot above the FEMA flood water level elevation, with the equipment control cabinets being 2 feet above the FEMA flood water level elevation.

C. Explain the elevation standard used for facility construction before and after Hurricane Harvey and explain any changes.

ETI Response:

Pre Hurricane Harvey:

If possible, the substation site should not be located in the floodplains that are susceptible to heavy flooding due to rains and poor drainage. Whenever feasible, the substation site should be above the high water elevation related to base flood. Flood plain maps are available from local jurisdiction, FEMA, or USGS. Maps of FEMA and USGS shall be reviewed to determine if the planned substation site is in the floodplains. Typically, the foundation top elevations should be at or above the known "high-water" elevation, related to 100 year flood recurrence.

Post Hurricane Harvey:

Flood Risk Mitigation Clarifications Points:

1) Terminology/Approach.

a. Flood risk should be evaluated for all new substations and for major additions/modifications to existing substations.

b. The control house elevation shall be coordinated with the elevation of the lowest equipment control cabinet in new substations.

2) Evaluation Process.

a. Evaluate local development and potential impacts to flooding since the Flood Insurance Study (FIS) was performed.

b. If the substation site is not within a FEMA Special Flood Hazard Area SFHA, the FIS was performed over 10 years ago, or a Base Flood Elevation

(BFE) is not otherwise available, the project team will review known data and decide if a formal Hydrologic and Hydraulic study is needed.

3) Customer Coordination: If a substation directly serves or is being built to serve a specific customer, the site and equipment elevations shall be coordinated with that customer's site and equipment elevations. A site elevation higher than the BFE, up to the 500 year flood elevation, should be considered for critical customers.

4) Decision Documentation: Evaluation of potential flooding shall be documented in the Project Execution Plan (PEP). Decisions made with respect to the site and equipment elevations shall be documented in the PEP and elevations documented on applicable drawings.

Major changes to Entergy's substation elevation standard include: 1) More direction on data to review to select station elevation. 2) Requirement to better document the reason for the station elevation chosen. 3) Assure coordination with customer's site and equipment elevations, if applicable. 4) Coordination of the control house elevation with that of equipment cabinets in the yard. This will ensure that the control house does not flood if all other equipment in the yard remains dry.

TNMP Response –

TNMP builds to a 100 Year Flood plus 12" standard for all of its substation facilities on new construction. New facilities are sited in areas that carry the least flooding exposure as possible as well. As was shown during Harvey from a substation perspective this standard performed well as all of our new construction did not have flooding damage. Dickinson Substation is an older vintage TNMP substation and the mitigation measures discussed above will be utilized to evaluate any needed changes.

- The Construction Center offices were remodeled as part of the reconstruction and TNMP better understands that facility's risk profile and can put in short-term measures for future events if needed.

AEP Texas Response:

AEP uses AEP Standard SS-160103 Technical Specification for Substation and Switching Station and SS – 7000001 Substation and Switching Station Site Guideline in which the location for substation sites is reviewed against the 100-year flood elevation. When practicable, the site will be developed such that the final grade will be at or above 100-year flood elevation, although some of the older stations may not meet this location practice. Additionally, AEP stations near the Gulf Coast are built to withstand 135 mph winds. AEP believes that utilizing AEP's 135 mph guideline is a more conservative approach than ASCE's 7-10 150 mph criteria for structures less than or equal to 50 feet and is slightly less conservative for equipment structures that are taller than 50 feet.

At this time, no changes have been made to the standard employed by AEP Texas as a result of Hurricane Harvey. Nevertheless, because there was some storm surge flooding in the coastal areas AEP has designed the new Drop in Control Module (DICM) building floor elevation to accommodate Category 3 or Category 4 Hurricanes. The control buildings are built at the factory with the relay panels and associated wiring installed and ready for delivery. The building is delivered to the station site and "dropped in" place. These DICM buildings will replace the Control House buildings that were damaged within the affected area.

CNP Response:

CNP has not utilized a flood elevation standard for the transmission system, but does attempt to limit the placement of transmission structures in flood prone areas, as well as areas with flowing water.

Prior to Harvey (i.e. since Allison), substation design has utilized an elevation standard of at least one foot above the 100-year flood plain, 500-year flood plain or one foot above the expected CAT 5 storm surge, whichever achieves the higher elevation. CNP utilizes the following references for this analysis.

- U. S. Department of Homeland Security FEMA flood plain maps.
- Category 5 NOAA National Storm Surge Hazard maps

Prior to Harvey, dedicated underground vaults in the TMC were required to be one foot above the 500-year flood plain, and those in the University of Texas Medical Branch in Galveston (UTMB) were required to be 13 feet above sea level. All other dedicated underground vaults were required to be one foot above the 100-year flood plain. Post Harvey, all dedicated underground vaults are required to be one foot above the 500-year flood plain while vaults in the coastal storm surge areas will be required to be 15 feet above sea level.

CNP is also evaluating the availability of other data sources, including the actual flood data from Harvey that may be incorporated into our design processes.

LCRA TSC Response:

LCRA TSC designs substation facilities according to its L4328 - Substation Civil Engineering Design Criteria:

- Finished floor elevations of control houses and critical equipment shall typically be placed a minimum 2 feet above the 1 percent FEMA designated flood levels.
- In coastal areas prone to hurricane storm surge, the National Storm Surge Hazard Maps produced by NOAA/NWS/NHC shall be consulted to determine the predicted depth of water at the substation site. Finished floor elevation of control houses and critical equipment shall typically be placed a minimum of 2 feet above the Category 4 Storm Surge predicted maximum water level.

Sharyland Response:

Sharyland Utilities' engineering and construction process takes into account the area where the facilities are located and designs for that area, applying applicable standards at the time of design. Sharyland's operational facilities in the Brownsville area of the Lower Rio Grande Valley went into service in mid-2016, and Sharyland is currently constructing additional facilities as described in the response to Question I.A.

At the time of design, the FEMA Flood Insurance Rate Map showed the area of the substation locations to be within Zone A8. Within Zone A8, there were two water level elevation areas, one at 13 feet above sea level and one at 12 feet, with the Palmito Substation location straddling the two elevation areas and the Stillman Substation within the 13-foot elevation area. Sharyland implemented the 13-feet above sea level minimum elevation for the 100-year flood interval for both the Palmito and Stillman Substations. Since the original design of the respective Substations, the FEMA Flood Insurance Rate Map has been updated and no longer uses the A8 zone designation, and the FEMA flood water level elevations applicable at the Palmito Substation location now range from 6.9 feet to 7.8 feet above sea level, while the water level elevations at the Stillman Substation location now range from 8.8 feet to 9.45 feet with a Base Flood Elevation of 10 feet. The elevation used in the original design exceeds the ranges shown on the new FEMA map.

The control houses and other major equipment are above the 100-year flood elevation of 13 feet above sea level that existed at the time of design. Grading for the substation sites is designed such that site drainage may be achieved through the use of surface runoff. The substation pads are engineered utilizing the 25-year storm interval. In the event a station is impacted by a storm with a recurring interval greater than 25 years, the station pad is engineered to flood. The site surface runoff drainage design uses a minimum slope of 1/150, or 0.67%.

Based on a review of elevations being used by other utilities, for future design in a hurricane evacuation zone, Sharyland will design control house foundations to be a minimum of 1 foot above the FEMA flood water level elevation, with the equipment control cabinets being 2 feet above the FEMA flood water level elevation.

D. What data is used to determine current floodplains / base flood elevations (BFE)? Is there a standard "high-water" elevation, for example: 100 year BFE, 12" above 100 year BFE, 500 year BFE, 12" above Category 5 Storm Surge, 2' above the 1% FEMA level, 13' above sea level.

ETI Response:

We are not aware of an industry standard. The primary source of information is the FEMA maps designating Special Flood Hazard Areas (SFHA). The Sea, Lake and Overland Surges from Hurricanes (SLOSH) models are available for use as needed if constructing in areas subject to storm surge. We also obtain information on any local ordinances with regard to development in a SFHA as well as any historical and/or local knowledge we can find. If the site is not located in a FEMA SFHA, the Flood Insurance Study (FIS) was conducted more than 10 years ago, or the BFE s not otherwise available, engineering judgement will be utilized to determine if a Hydrologic and Hydraulic study should be conducted.

Entergy uses the 100 year BFE as the minimum elevation for the substation site. A higher site elevation, up to the 500 year flood, may be used based on the criticality of the station to BES reliability. If the station is being constructed to serve a specific customer, the elevation will be coordinated with that customer. The top of concrete (TOC) should be 1 foot above the site elevation at a minimum, The TOC is selected to keep the bottom of all equipment control cabinets a minimum of 2 feet (preferably 4 feet) above the site elevation. The control house floor should be at or above the bottom of the lowest equipment cabinet.

TNMP Response:

- There is no industry standard to our knowledge.
- CNP currently utilizes the following maps;
  - U.S. Department of Homeland Security FEMA flood plain maps
  - Category 5 NOAA National Storm Surge Hazard maps

AEP Response:

AEP is not aware of an industry standard "high water" elevation. AEP utilizes U.S. Department of Homeland Security FEMA flood plain maps and NOAA National Storm Surge Hazard maps.

CNP Response:

- There is no industry standard to our knowledge.
- CNP currently utilizes the following maps;
    - U.S. Department of Homeland Security FEMA flood plain maps
    - Category 5 NOAA National Storm Surge Hazard maps

LCRA TSC Response:

The base elevations are obtained from FEMA online maps. If the elevation is not available further studies are performed.

Finished floor elevations of control houses and critical equipment shall typically be placed a minimum 2 feet above the 1 percent FEMA designated flood levels. ASCE 24 is used as the basis for this design criteria.

In coastal areas prone to hurricane storm surge, the National Storm Surge Hazard Maps produced by NOAA/NWS/NHC shall be consulted to determine the predicted depth of water at the substation site. Finished floor elevation of control houses and critical equipment shall typically be placed a minimum of 2 feet above the Category 4 Storm Surge predicted maximum water level.

Sharyland Response:

There is not a single, standard "high-water" elevation. FEMA "high-water" elevations vary by region and can change over time. Sharyland utilized the FEMA Flood Insurance Rate Map available at the time of design of the Palmito and Stillman Substations. See also, Sharyland's response in Section I.C.

II. Hardening Measures

A. Explain whether any hardening measures you took before Hurricane Harvey improved the resilience of your facilities to Hurricane Harvey. If they did, describe the hardening measures and what caused you to implement them.

ETI Response:

ETI's storm hardening strategies are based on the Entergy Hurricane Hardening Study completed in 2007. For ETI's transmission system, the following strategies have been employed: 1) When necessary to replace existing wood poles, replacement shall be with concrete or steel poles. 2) Use steel or concrete poles for construction of new facilities. 3) In order to concentrate on the major roads that could be used for bringing in emergency response resources to impacted areas, convert interstate crossings from wood pole construction to concrete or steel construction. For ETI's distribution system, the following strategies have been employed: 1) Install minimum class 3 or larger, 45 ft. or taller poles on trunk feeders for new construction or replacements. Note: prior to 2017, the use of these larger poles was limited to areas south of I-10 (i.e. coastal areas subject to high winds). In ETI's 2017 Storm Hardening Report, PUCT §25.95, ETI indicated the following was a material change to the 2016-2020 Storm Hardening Plan. "Distribution Standards were revised and expanded to include all of ETI's service areas which specifies the installation of minimum class 3 poles or larger, 45ft. or taller poles on trunk feeders for new construction or replacements." Also note that in ETI's 2018 report, ETI introduced a pilot program for the use of Composite poles. 2) Expand installation of storm guys. 3) In order to concentrate on the major roads that could be used for bringing in emergency response resources to impacted areas, convert existing wood pole interstate crossings with steel poles. In regard to emergency response plans, the company relies upon various plans, policies, and procedures designed to protect the reliability of the electrical system and to facilitate the restoration of electric service to customers in a rapid, orderly and safe manner. Each plan is reviewed and tested annually by a planned exercise and/or an actual event. Each major event such as Ike, Rita and the Baton Rouge flooding of 2016 allows us the opportunity for improvements on how we prepare and respond to future storms such as Harvey.

Due to the storm hardening strategies being integrated into new construction as well as maintenance, it is difficult to pinpoint exact projects and their incremental effect on storm resilience. However, as part of the annual filings for PUCT §25.94-Infrastructure Improvement and Maintenance Report, PUCT §25.95-Storm Hardening Plan Summary, and PUCT §25.96-Vegetation Management Report, ETI attempts to identify the projects completed as part of its storm hardening plans, as well as its distribution vegetation management activities. In regard to substation flooding, the following provides a brief summary of projects implemented prior to Hurricane Harvey:

- Installation of Tiger Dams at Hartburg Substation – Improved resilience.
- Relied on flood mitigations already installed at stations with prior flooding issues:
  1) Amelia - Concrete wall with permanent pump installation – No Improvement.
  2) Kountze Bulk - Elevated Control House - Limited Damage.
  3) Sabine - Concrete wall with permanent pump installation – Limited Damage.
- All Hardening Measures taken due to experience during other flooding events.

TNMP Response:

TNMP did take some hardening measures before Hurricane Harvey which did improve the resilience of TNMP system facilities. These measures were taken mostly as a result of damage incurred as a result of Hurricane Ike, operating conditions resulting from operations in a petrochemical environment and other general reliability improvements needed to improve service. Samples of these types of activities include:

- Utilization of hardened distribution facilities construction such as concrete poles/ additional guying to help with wind loading and improved waterproofing of ground mounted facilities;
- Increased IR and physical station inspections for key facilities;
- Infrastructure purchased and upgrades due to capacity needs that replaced older equipment prone to issues during storms (ex., fused substation transformers replaced with breaker stations instead);
- Transmission protection equipment upgrades resulting in more secure and less frequent transmission system operations;
- Replacement of equipment prone to contamination with newer technology (ex., glazed substation insulators)

AEP Texas Distribution Response:

Pinpointing specific hardening measures implemented prior to Hurricane Harvey that directly improved resilience of the AEP Texas distribution system is challenging, due mainly to the large geographic area sustaining damage as well as the unprecedented nature of flying debris throughout the area affected by the storm. Anecdotally, restoration crews indicated that newer facilities fared better than older facilities unless flying debris, such as roofing material, billboards or vegetation, contributed to the facilities' failure.

In general, AEP Texas strives to continually improve the resilience and reliability of its system. As such, the Company designs, builds and maintains distribution facilities to meet and/or exceed the current National Electric Safety Code (NESC) and American National Standard Institute (ANSI) standards established for the geographic areas served. .AEP Texas has taken steps to strengthen its distribution system to withstand extreme weather conditions and minimize customer outage time. The AEP Texas hardening practices are generally described in reports submitted by AEP Texas in two Commission projects:

- Project No. 38068, Report for Utility Infrastructure Improvement and Maintenance Required by 16 TEX. ADMIN. CODE §25.94
- Project No. 39339, Report for Electric Utility Infrastructure Hardening Required by 16 TEX. ADMIN. CODE §25.95

AEP Texas Transmission Response:

AEP Texas currently designs, builds and maintains its transmission facilities to meet or exceed the current NESC and ANSI standards established for its particular geographic areas. AEP Texas also adheres to North American Electric Reliability Corporation (NERC) standards and Electric Reliability Council of Texas (ERCOT) protocols and guides. Collectively, these standards establish guidelines for the practical safeguarding of persons during the installation, operation and maintenance of electric lines and associated equipment. The NESC and ANSI standards contain the basic provisions that are considered necessary for the safety of employees and the public under the specified conditions, and also include provisions for areas susceptible to hurricane force winds. AEP Texas exceeds the NESC extreme wind criteria standard by using a 140 mph wind speed criteria on its transmission line designs within approximately 50 miles of the coast. From there, the wind speed design criteria drops down to 100 mph, and eventually to the standard 90 mph criteria for the Company's non-coastal footprint.

AEP implemented these transmission line design specifications approximately 20 years ago, specifically to improve system resiliency to adverse weather. The transmission lines that sustained significant damage during Hurricane Harvey were built prior to the implementation of current design standards, and these lines are included in the Company's plan for future rebuild to AEP's current standards.

CNP Response:

Harvey was a flooding event for CNP. In response to Allison, numerous flood hardening activities were implemented that had a positive impact during Harvey.

- CNP installed permanent concrete flood walls at two substations in the TMC and HDD areas. The substation in the TMC area would have been impacted by Harvey flooding.
- The TMC installed flood gates and encouraged their member institutions to relocate customer owned, electrical service facilities located in building basements to a minimum elevation of one foot above the 500-year flood plain. In conjunction with these activities, CNP relocated dedicated underground vaults to the same minimum elevation. CNP also modified the system configuration so that elevated services would not be impacted by non-elevated (i.e. flooded) services. Where system reconfiguration was not possible, CNP installed isolation switch rooms to isolate flood prone facilities from elevated facilities.

- The HDD installed flood gates in at least a portion of the downtown tunnel system. Building services, and CNP facilities, were impacted by tunnel flooding during Allison.
- CNP increased the utilization of submersible equipment in the construction and rehab of dedicated underground vaults.

Based on the Harvey flooding, the above resiliency efforts kept 105 of CNP's dedicated underground vaults from being impacted. In addition, the use of submersible equipment allowed 59 of 83 impacted dedicated underground vaults to be restored by just drying out the equipment (i.e. no necessary repairs).

LCRA TSC Response:

For the past five years, LCRA TSC has been performing storm hardening/mitigation planning. As a result, LCRA TSC was well prepared for the possibility of a major storm hitting the Texas coast. LCRA TSC facilities along the coast performed well during the Hurricane Harvey event. LCRA TSC has not changed its storm hardening measures due to Hurricane Harvey.

Sharyland Response:

Sharyland Utilities' transmission facilities in the Brownsville area of the Lower Rio Grande Valley were not impacted by Hurricane Harvey. Sharyland's transmission line facilities in the area are designed using the 140 mph wind speed criteria as per NESC 250C. For increased reliability, a load factor of 1.1 was applied to the high wind loads, which exceeds the NESC minimum of 1.0. The control houses and other major equipment are above the 100-year flood elevation of 13 feet above sea level that existed at the time of design. Grading for the substation sites is designed such that site drainage may be achieved through the use of surface runoff. The substation pads are engineered utilizing the 25-year storm interval. In the event a station is impacted by a storm with a recurring interval greater than 25 years, the station pad is engineered to flood. The site surface runoff drainage design uses a minimum slope of 1/150, or 0.67%.

B. Describe the steps that you have taken or plan to take in response to wind damage from Hurricane Harvey, in order to reduce the risk of wind damage to your facilities in the future.

ETI Response:

For ETI's service territory, Harvey was primarily a flooding event. ETI does not plan to change its storm hardening strategies in regard to wind events (as described in section II.A. above).

TNMP Response:

For TNMP Harvey was primarily a flooding event so TNMP does not expect to change any plans related to wind damage.

AEP Texas Distribution Response:

Hurricane Harvey was the first Category 4 hurricane to make landfall on the Texas coast in 56 years. The scope and scale of the damage sustained in the AEP Texas service area was unprecedented in the Company's history. AEP Texas continues to review its distribution system hardening philosophy, specifically considering the actual wind speeds experienced during Hurricane Harvey, to determine whether updates to the Company's current system hardening policies and procedures are appropriate. Similarly, AEP Texas will include Hurricane Harvey wind profiles in the distribution system damage prediction modeling tool to continue to support the Company's ongoing model validation process.

AEP Texas Transmission Response:

AEP Texas Transmission has taken steps to improve resilience and to promote effective and efficient restoration including:

- Developed a model for damage/outage prediction during hurricanes using data from its transmission line databases and data provided by the National Hurricane Center
- Utilized emergency patrols for transmission damage assessment and considering potential updates to current processes and tools
- See above modern design standards, and associated resilience improvement

CNP Response:

While Harvey was not a "wind damage" event for CNP's service territory, CNP does have transmission, substation and distribution hardening activities in place. These activities are largely described in the following documents.

- P.U.C. Subst. R. 25.94 (Project 38068)
- P.U.C. Subst. R. 25.95 (Project 39339)

In addition, CNP is evaluating additional opportunities to improve grid resiliency in all operating areas.

LCRA TSC Response:

Based on the minimal amount of damage seen during the Hurricane Harvey event, LCRA TSC is not adjusting its current design standards in the coastal area. Substation structures are designed according to LCRA TSC's L 4300 - Substation Structural Engineering Design Criteria. Wind loads shall be determined from ASCE 7, Minimum Design Loads for Building and Other Structures.

Heinz substation is a new station that will be constructed in close proximity to the coast. Heinz substation equipment will be lifted on piers to mitigate flooding due to storm surge and designed to withstand the wind loads in the Corpus Christi Area.

Sharyland Response:

Sharyland Utilities did not incur wind damage as a result of Hurricane Harvey, and has not changed its storm hardening practices. Sharyland's engineering and construction process takes into account the area where the facilities are located and designs for that area, applying applicable standards at the time of design. Sharyland's transmission line facilities in the Brownsville area of the Lower Rio Grande Valley are designed using the 140 mph wind speed criteria as per NESC 250C. For increased reliability, a load factor of 1.1 was applied to the high wind loads, which exceeds the NESC minimum of 1.0.

III. Explain whether you purchase facilities and materials (e.g. poles) in preparation for hurricane season.

ETI Response:

Entergy maintains storm kits at the Beaumont central distribution center for materials typically consumed during incident response. In addition, Entergy has storm kits at other State central distribution centers that can be transferred to ETI to supplement the storm material demands. Entergy has supplier owned inventory agreements for additional supply of storm restoration material. In general, Entergy does not purchase permanent facilities specifically for weather events. Entergy does engage with local available strategic space for internal and external resources staging sites and logistics service providers depending on the level of engagement and damages to infrastructure for temporary housing and catering services.

TNMP Response:

TNMP does make purchases prior to storm season (usually during first quarter) and works with its integrated supplier to ensure common system materials will be on hand and available. Distribution poles, cross-arms, transformers, fuses, insulators and other general equipment are inventoried at the Gulf Coast Region's construction centers and then compared with desired storm stock and refilled as needed. TNMP's integrated supplier also puts on notice manufacturers of TNMP's needs both prior to and during storm events and suppliers are positioned to respond accordingly. TNMP's integrated supplier operates a storm trailer that will arrive on scene shortly after an event to supplement and replace storm stock that was previously on hand.

AEP Texas Transmission Response:

AEP Texas does not acquire and stockpile transmission facility components for use during the hurricane season. AEP utilizes a sparing strategy in which available spare units and options available for responding to an unplanned outage enable AEP Texas Transmission to have necessary equipment and supplies available to restore service effectively and efficiently. In other words, if materials were to become limited, AEP Texas could rely on other districts of AEP Texas or other AEP utilities such as SWEPCO and PSO, or those in the eastern portion of the AEP footprint. AEP also utilizes planned construction materials to support emergency restoration such as hurricane response. Lastly, AEP calls upon its many vendor relationships and peer mutual assistance partners to supply materials during such emergencies.

AEP Texas Distribution Response:

AEP Texas Distribution mobilizes material resources in preparation for a hurricane. The Company maintains storm stock during each storm season based on anticipated requirements for at least the first 7-10 days of the restoration. This stock is held in central stores and is pre-staged in strategic locations throughout the service territory. Some of this inventory is put on pallets for use at staging sites or at service centers. For example, for Hurricane Harvey, pallets of the material located at Kingsville Regional Distribution Center and surrounding service centers consisted of 250-500 pallets of material, plus wire and cable. Several sets of pallets of material were established around the system. Key suppliers, including our distribution materials distributor, transformer supplier, wire and cable suppliers, key pole line hardware and related material manufacturers, and wood pole supplier are provided with inventory requirements, and in some cases raw material inventory requirements, so that they are able to respond quickly to replenish the Company with materials after the initial five days of restoration.

Additionally, the AEP Texas Incident Command System (ICS) Material Ordering Manager maintains a storm stock list that anticipates material demands to restore the system. From this list, pallets of the anticipated materials are developed and made ready for delivery to the locations of need. The list also serves as the basis for the initial storm orders of material to replace that used during the early stages of restoration. The materials list is developed with different assumptions for Category 1 through 5 hurricanes, as well as projected daily usage, and is continuously refined and updated as materials become obsolete and replaced with new technology or specifications.

The company also placed orders for approximately two million dollars of material two days before Harvey's landfall. Additionally, if materials were to become limited, AEP Texas could rely on other districts of AEP Texas or other AEP utilities such as SWEPCO and PSO, or those in the eastern portion of the AEP footprint.

CNP Response:

CNP receives Emergency Operating Plan (EOP) transmission materials prior to hurricane season.

CNP relies on its substation and major underground emergency inventory levels and sparing strategy to address storm response.

Distribution system storm kits of common restoration materials are distributed through the system prior to hurricane season. In addition, EOP material lists have been developed based on the expected severity of the storm. CNP works closely with suppliers such that material orders can be placed 72 hours before expected landfall, with material deliveries expected within 3-7 days of order. CNP is also working with neighboring utilities to cross reference materials that can be shared during an event.

LCRA TSC Response:

LCRA TSC purchases and inventories critical spares to support system reliability for failure events. The determination for critical spares is made by our system reliability, engineering, inventory management and system planning teams based on supporting current assets in service. LCRA TSC also maintains long term agreements with vendors for both reliability and capital needs. These long term agreements for both material and contract labor include emergency response and expedited availability.

Prior to potential hurricane events, LCRA TSC also tops off fuel tanks and ensures availably of water supplies and Meal Ready to Eat (MREs) for event restoration crew members.

Sharyland Response:

Yes, Sharyland Utilities retains an inventory of material in the event of needed restoration and will be relocating a mobile substation to the Rio Grande Valley area. Sharyland maintains a warehouse in the Rio Grande Valley that stores transmission materials. Sharyland also has agreements with equipment vendors and contractors for emergency response in the event of restoration needs.

ELEVATION STANDARDS						
	Entergy	TNMP	AEP	CNP	LCRA TSC	Sharyland
Pre-Harvey						
Outside Floodplains If Possible	Yes	Yes	Yes	Yes	Yes	Yes
Top of Control House Foundations & Control Cabinets	At or above 100-yr FP	+1 ft. (minimum) above 100-yr FP	At or above 100-yr FP	Minimum standard of +1 ft. above 100-yr FP, +1 ft above 500-yr FP, or +1 ft. above CAT 5 Storm Surge (whichever provides the highest elevation)	+2 ft. above the 1% FEMA designated flood levels	At or above 100-yr FP
Underground Vaults	NA	NA	NA	+1 ft. above 500-yr FP (TMC), 13 ft. above sea level (UTMB), +1 ft. above 100-yr FP (all others)	NA	NA
Post-Harvey Changes						
Top of Foundations	+1 ft. (minimum) above 100-yr FP			CNP is adding +1' minimum above Harvey flood levels if they are known.		+1 ft. (minimum) above 100-yr FP
If no known Base Flood Elevation	Determine if study is needed.					
Customer Specific Substation	Coordinate with Customer, BFE up to 500-yr FP, depending on criticality			CNP is evaluating the inclusion of CNP flood/storm surge critiera in the Specification for Customer Owned Substations		
Equipment Control Cabinets	+2 ft. (minimum) above 100-yr FP					+2 ft. (minimum) above 100-yr FP
Control House & Control Cabinet elevation coordination	Yes					
Document decision on site/equipment elevation	Yes					
Underground Vaults	NA	NA	NA	+2 ft. above 500-yr FP to meet new expected City of Houston requirements, 15 ft. above sea level (storm surge areas)	NA	NA

Attachment 3

Final Report: Hurricane Harvey Follow-Up
Task Force 3

December 14, 2018

Table of Contents

Section 1: Hurricane Harvey Task Force 3 Summary

At the request of PUC staff, electric utilities participated in Hurricane Harvey Task Force 3 to address the following issues:

- Mutual Assistance – An overview of the mutual assistance programs for the Texas Mutual Assistance Group (TXMAG), Texas Electric Cooperatives (TEC), and Texas Public Power Association (TPPA) and how these organizations work together during a catastrophic event that causes mass electric utility outages to ensure the safe and timely restoration of service to customers in Texas.
- Mobile Substation Resources – A look at how TXMAG will track mobile resources and facilitate discussions between TXMAG, TEC, and TPPA members in need of mobile resources.
- Best Practices of California and Florida Regional Mutual Assistance Groups – A review of California and Florida mutual assistance programs.

Steve Greenley, CenterPoint Energy, chaired the task force. Membership in the task force was voluntary and consisted of electric cooperatives, investor owned utilities, municipally owned utilities, and river authorities. The task force met in person and by conference call four (4) times.

Participants included: AEP Texas[1], Southwestern Electric Power Company (SWEPCO), CenterPoint Energy, Entergy Texas, Lower Colorado River Authority Transmission Services Corporation (LCRA TSC), Lone Star Transmission, Oncor Electric Delivery, Sharyland Utilities, Texas Electric Cooperatives (TEC), Texas New Mexico Power (TNMP), Texas Public Power Association (TPPA), and Xcel Energy.

[1] Including Electric Transmission Texas (ETT). ETT is a joint venture between subsidiaries of American Electric Power (AEP) and Berkshire Hathaway Energy Company (BHE). ETT has no employees, so it utilizes the same resources as AEP Texas for Transmission related services. AEP Texas participates in TXMAG and represents ETT interests.

Section 2: Mutual Assistance

Texas Mutual Assistance Group

The Texas Mutual Assistance Group (TXMAG) is a Regional Mutual Assistance Group (RMAG) that is dedicated to effectively and collaboratively sharing resources. It is one of seven RMAGs across the country and was established to promote and encourage mutual assistance among member utilities while promoting safety for employees and customers; restoring service in an effective and efficient manner; and maintaining a strong customer focus (including repair, restoration, and review of events). There are two categories of membership: voting and non-voting. Voting members are typically investor owned utilities (IOUs) or municipally owned utilities (MOUs) while non-voting members are typically contract utility companies that provide services to IOUs or MOUs.

Voting members of the Texas Mutual Assistance Group in May 2018 included:

1. AEP Texas
2. Austin Energy
3. CenterPoint Energy
4. CPS Energy
5. Cleco
6. El Paso Electric
7. Entergy Texas
8. Lone Star Transmission, LLC
9. LCRA TSC[2]
10. Mississippi Power
11. Oklahoma Gas and Electric
12. Oncor Electric Delivery
13. SWEPCO
14. TNMP

Current non-voting members include:

1. Asplundh
2. Can-Fer
3. Davey Tree Surgery
4. Great Southwestern
5. Hargave
6. L.E. Myers
7. Mesa Line Services
8. North Houston Pole Line
9. Pike

[2] LCRA TSC is the owner or operator of transmission for 8 cooperatives (co-ops) and interconnects with 37 municipally owned utilities (MOUs). LCRA TSC represents and serves as a point of contact for these co-ops and MOUs in matters regarding transmission storm restoration efforts. LCRA TSC does not operate any distribution facilities for these entities.

10. Quanta Services
11. Trees Inc.
12. Willbros T&D Services
13. Wright Tree Service

As part of the Hurricane Harvey Task Force 3 initiative, several other companies were added to TXMAG as voting members. These new members are:

1. Xcel Energy (SPS)
2. Sharyland Utilities
3. Wind Energy Transmission of Texas (WETT)
4. Cross Texas Transmission

With the addition of these utilities, all IOUs in Texas participate in TXMAG.

Texas Municipally Owned Utilities' (MOUs') Mutual Aid Agreement Program

Municipally owned utilities in Texas are part of the American Public Power Association's (APPA's) Mutual Aid Program and participate in mutual aid efforts coordinated by the Texas Public Power Association (TPPA). APPA segments the MOUs into ten public power mutual aid regions, which are based on the Federal Emergency Management Agency regions. Texas is in Region VI along with New Mexico, Oklahoma, Arkansas, and Louisiana.

The Mutual Aid Working Group has developed a Public Power Mutual Aid Playbook (Playbook) for public power utilities, network coordinators, and the associations to refer to during disasters to ensure efficient power restoration after outages. The Playbook ensures a coordinated response with state and federal government officials and lists roles and responsibilities of utilities, network coordinators, and national coordinators. The Playbook also provides resources, such as sample mutual aid agreements, damage assessment templates, and resource request and approval forms to help utilities before, during, and after an event.

TPPA maintains and updates an emergency restoration contact list of Texas MOUs. During a large-scale event in Texas, TPPA coordinates calls among affected and non-affected MOUs to discuss outages and mutual aid efforts. During Harvey, APPA and TPPA held calls each morning with affected Texas and other Region VI MOUs to coordinate mutual aid efforts. If needed, MOU members in Texas can work through TPPA and APPA to coordinate assistance from public power systems nationwide.

Texas Electric Cooperatives' Mutual Aid Agreement Program

In Texas and across the US, electric cooperatives participate in a long-standing mutual aid agreement program. At the national level, cooperatives participate in mutual aid facilitated through the National Rural Electric Cooperative Association (NRECA), which can leverage the resources of its more than 900 members. Every member electric cooperative has signed a mutual aid agreement, committing resources to assist one another in recovery efforts when needed. Because the national network of transmission and distribution infrastructure owned by electric cooperatives has been built to federal rural utility standards, line crews from any cooperative in America can arrive on the scene ready to provide emergency support, with full knowledge of the system's engineering and design.

Texas Electric Cooperatives (TEC), the statewide association, functions as the point of contact and coordinates the movement of crews and resources in Texas. In the event of a large-scale recovery effort, electric co-ops will communicate a need to a single point of contact at TEC, who then sends a call to the membership, pairing available resources from unaffected co-ops with those in need. If necessary, cooperative crews from outside of Texas can be brought in to provide mutual aid as well. This network of mutual assistance enables quick and efficient restoration of service for members of electric cooperatives in Texas during major weather events.

Section 3: Mobile Substation Resources

Resource Sharing

The Texas Mutual Assistance Group can assist with more than utility linemen and vegetation management resources when needed. At the recent annual conference, TXMAG established four new working teams to better serve its members: (1) Logistics, (2) Specialized Equipment, (3) Mobile Substations, and (4) Mutual Assistance Materials Support. These teams have begun working on improved processes for the sharing of resources, material, and equipment.

TXMAG also recently established a new website, which is located at https://texasmutualassistancegroup.org/Pages/Home.aspx. The website went live in the fourth quarter of 2018. On this website, TXMAG has basic information available to anyone who is interested, as well as details about how to join the group or get more information. Furthermore, there is a member's section that houses information useful to the membership related to the working teams listed above and any documents that give members more information on available equipment and resources. One specific action item taken on by TXMAG after Harvey was the development of a listing of mobile substations.

Mobile Substation Resource Tracking

TXMAG is assisting in the effort to identify mobile substation resources in the state of Texas. Representatives from various companies were contacted to provide input. The initial task was to identify the mobile substation resources that are currently in Texas and review their compatibility. There are many factors that need to be considered when sharing a mobile substation with another utility. To move the process along, the team focused their initial efforts on high level interoperability ratings, such as voltages and mega-volt-amp rating MVA. The initial inventory list was made in July 2018, and has already proved helpful to utilities.

This is not intended to be static document, but will continue to grow and be updated as utility resources change and additional utilities provide information. For this final report of the Task Force 3 team, the following utilities have shared information about their substation resources: AEP Texas, Austin Energy, CenterPoint Energy, CPS Energy, Entergy Texas, LCRA TSC, Oncor Electric Delivery, TNMP, and SWEPCO. As noted in Section 2 of this document, the MOUs in Texas have a long standing mutual aid agreement that allows them to be in contact with their members to identify needs, and have agreed to provide a single point of contact with TXMAG that would enable information sharing and requests to their member group. An example of the current document is shown below (for illustrative purposes only, this document will change as information is modified).

TXMAG Mobile Substation Resources								
General Info				Included Equipment				
Owner	MVA Rating	Highside rating(s) kV	Lowside rating(s) kV	Highside Switch	Regulator/ Tap Changer	Breaker(s)	Location	Comments
Company A	50	141 x 70.5	37.5 x 12.5	Y	Y	Y	[redacted]	
Company A	50	141 x 70.5	37 5 x 12.5	Y	Y	Y	[redacted]	
Company A	50	141	36	Y	Y	N	[redacted]	
Company A	25	138 x 69	35 38 x 12.72	Y	Y	N	[redacted]	
Company B	25	138 x 69	25 x 22 x 12 x 4	Y	Y	Y	[redacted]	
Company B	10 5	69 x 25	25 x 12	Y	N	Y	[redacted]	
Company B	3.75	66 x 22	22 x 12 x 4	Y	N	Y	[redacted]	
Company C	15	138X69	12.47	Y	N	Y	[redacted]	High Side CS on separate trailer
Company C	30	138x69	12.47	Y	N	Y	[redacted]	High Side CS on separate trailer
Company C	26	138x69	12 47x24.9	Y	Y	Y	[redacted]	High Side CS on separate trailer
Company C	50	138	69	N		N	[redacted]	Transformer Only
Company C	24	138X69	12.47x24 9	Y	Y	Y	[redacted]	
Company C	25	138X69	12.47	Y	Y	Y	[redacted]	High Side CB on separate trailer
Company C	15	138X69	13.09	Y	N	Y	[redacted]	
Company C	15	138X69	13 09	Y	Y	Y	[redacted]	High Side CB on separate trailer
Company C	12	69	13.09	Y	Y	Y	[redacted]	
Company C	15	138x69	13.09	Y	Y	Y	[redacted]	
Company D	30	138 x 69	12 47	Y	Y	Y	[redacted]	High Side CB on separate trailer
Company E	50 MVA	138 X 69 KV	34 5 X 13.8 KV	Y	N	Y	[redacted]	
Company E	7 5 MVA	69 X 34.5 KV	13 8 X 4 KV	Y	N	Y	[redacted]	High Side Switch & Fuses
Company E	25MVA	134Kv/67Kv	34 5/13.8Kv	Y	Y	Y	[redacted]	
Company F	2	67.2	12.5Y x 4 2Y	Y	N	N	[redacted]	High Side Switch on separate trailer
Company F	4	69	2 5Y x 4 2Y x 7 2D x 2.4	Y	N	Y	[redacted]	High Side Switch on separate trailer
Company F	7 5	69	12 5Y x 4 2Y x 2 4D	Y	N	Y	[redacted]	High Side Switch on separate trailer
Company F	7 5	138 x 69	.4Y x 12 5Y x 4.2Y x 2.	Y	N	N	[redacted]	High Side Switch on separate trailer
Company F	15	69	12 5Y	Y	N	Y	[redacted]	High Side Switch on separate trailer
Company F	15	138 X 69	22 8Y x 13 2Y x 4.4Y	Y	N		[redacted]	High Side Switch on separate trailer
Company F	15	138 x 69	9Y x 21.6Y x 12.5Y x 4	Y	N	N	[redacted]	High Side Switch on separate trailer
Company F	15	138 x 69	12 5Y x 4 2Y	Y	N	N	[redacted]	High Side Switch on separate trailer
Company F	15	138Y x 69Y	13 85Y x 4 2Y x 2.4D	Y	N	N	[redacted]	High Side Switch on separate trailer
Company F	16	138 x 69	24 6Y x 12 5Y	Y	Y	N	[redacted]	
Company F	25	138 x 69	a) x 4.2Y (10 mva) x 2	Y	N	Y	[redacted]	High Side Switch on separate trailer
Company F	25	138 x 69	24 9Y x 21 6Y x 4 2Y	Y	N	Y	[redacted]	High Side Switch on separate trailer
Company F	30	138 x 69	26.4Y x 13 2Y	Y	Y	Y	[redacted]	
Company F	42	138 x 69	24 9Y x 12 5Y	Y	N	N	[redacted]	High Side Switch on separate trailer
Company F	45	138Y x 69Y	28 4Y x 14.2Y	Y	Y	Y	[redacted]	
Company F	47	138	13 2Y	Y	N	N	[redacted]	High Side Switch on separate trailer
Company F	47	138 x 69	22 1Y x 13.8Y	Y	Y	Y	[redacted]	
Company F	50	138	26 4Y x 13.2Y	Y	N	N	[redacted]	High Side Switch on separate trailer
Company F	50	138 x 69	26 7Y x 13 2Y	Y	Y	Y	[redacted]	
Company G	35 MVA	138	13 8	Y	Y	Y	[redacted]	
Company G	40 MVA	138	13.8	Y	Y	Y	[redacted]	
Company G	60 MVA	138	35	Y	Y	Y	[redacted]	
Company G	47 5 MVA	138	35	Y	Y	Y	[redacted]	

Section 4: Best Practices

California Utilities Emergency Association

Task Force 3 contacted utilities in California to better understand their utilization of the California Utilities Emergency Association (CUEA). The CUEA was first established in 1952 as part of the state's Civil Defense Plan and has a full-time staff led by an Executive Director. The CUEA serves as a point of contact for critical infrastructure utilities (including electric, water, wastewater, and natural gas), the California Office of Emergency Services (Cal OES) and other governmental agencies before, during and after an event to:

- Facilitate communications and cooperation between member utilities and public agencies; and with non-member utilities (where resources and priorities allow).
- Provide emergency response support wherever practical for electric, petroleum pipeline, telecommunications, gas, water and wastewater utilities.
- Support utility emergency planning, mitigation, training, exercises and education.
- Provides support to the state and serves as an active operational component of the State Operations Center (SOC) or Regional Emergency Operations Centers (REOCs) serving in the capacity of the Utilities Branch within the Operations Section. The SOC and REOCs activate under the authority of California Standardized Emergency Management System (SEMS).
- Being co-located at Cal OES headquarters in Mather, California allows CUEA immediate access to regional, state and federal information. CUEA, via the Executive Director, actively participates in senior leadership and executive level planning sessions and working groups. The Executive Director serves as the Cal OES Utilities Branch liaison at the SOC or one the REOCs, representing the CUEA Member utilities.

Task Force 3 does not believe replicating this model in Texas would provide meaningful improvement within the state. Texas utilities are already engaged with state leadership at the State Operations Center (SOC) when it is activated. Establishing an organization similar to CUEA would add a layer in the middle and also add costs by creating a new organization in need of funding.

Florida Electric Power Coordinating Group, Inc. (FCG)

Task Force 3 also reached out to Florida utilities to obtain more information regarding the Florida Electric Power Coordinating Group, Inc. (FCG). The FCG has operated since approximately 1975 as a private, non-profit corporation and has a paid, full time staff in place to accomplish its mission. FCG assists its member public utilities in finding opportunities to collaborate with and provide information to local and state agencies, industry organizations, and industry experts. FCG conducts an annual Statewide Mutual Aid Assistance Workgroup conference, with presentations by Florida utilities, state and federal agencies, and consultants. FCG also provides a mutual assistance mechanism.

Task Force 3 does not believe the FCG model would improve current disaster preparation and recovery as it would duplicate efforts already underway in Texas and at significant additional costs in money and time. As noted above, Texas public utilities, MOUs, and electric cooperatives already have mutual aid mechanisms in place. TXMAG offers an annual meeting substantially similar to the FCG conference; and TPPA and TEC also conduct annual meetings. Finally, Texas utilities interact with Texas governmental agencies and participate in activities with respect to mutual assistance through coordinated efforts with the Commission. These activities, along with Electric Reliability Council of Texas (ERCOT) drills and the organization and design of the SOC during emergencies, already provide opportunities for Texas utilities and the Commission to coordinate with other state and federal agencies.

Emergency Planning Drill with ERCOT

Task Force 3 discussed the opportunities to create a joint emergency planning drill with ERCOT and the recommendation is that the Commission should not plan an additional annual drill. However, Task Force 3 does recommend that the leadership of TXMAG, TPPA, and APPA attend and participate in the annual exercise that ERCOT already executes. By expanding the participating groups, the same benefits, including enhanced communication and collaboration, can be achieved without adding an additional exercise. Task Force 3 has had early discussions with leadership at ERCOT about this recommendation and all parties support the recommendation. Representatives from Task Force 3 will be coordinating through the Operations Training Working Group responsible for ERCOT's annual exercise prior to next year's event to ensure these groups are participating as proposed.