Study Regarding the Provision of Electricity During a Natural Disaster or Emergency

Public Utility Commission of Texas

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The 81st Texas Legislature passed Senate Bill 1492 and House Bill 1831, which require the Public Utility Commission of Texas (PUCT or the Commission) to conduct and complete a study to evaluate and examine the following items:

- Locations in Texas that are most likely to experience a natural disaster or other emergency;
- The ability of utilities to prepare to purchase power in the event of a natural disaster or emergency;
- What steps utilities must take in order to purchase power from or sell power to other utilities in emergencies;
- Review how utilities have received power during emergencies; and
- Address each utility's potential for distributed generation to strengthen the reliability of electric service during a natural disaster or other emergency.

This study was completed by November 1, 2009 and was made available to the public through the Commission's website. By January 15, 2011, a report based on this study will be submitted with the Commission's Report on the Scope of Competition in Electric Markets, which will include recommendations to the legislature.[1] To prepare this study, commission staff solicited responses from transmission and distribution utilities (TDUs), including investor-owned utilities (IOUs), and municipally owned utilities (MOUs), and from electric cooperatives, power generation companies (PGCs), exempt wholesale generators (EWGs) and power marketers across Texas. **Attachment A** of this report details the Request for Information sent to the above described entities.

Senate Bill 1492 provides that the PUCT, upon declaration of a natural disaster or other emergency by the governor, may require an electric utility, MOU, electric cooperative, qualifying facility, PGC, exempt wholesale generator, or power marketer to sell electricity to an electric utility, MOU, or electric cooperative that is unable to supply power to meet customer demand due to the natural disaster or other emergency. The statute further provides that the

[1] *See* Public Utility Regulatory Act, TEX. UTIL. CODE ANN. § 31.003 (Vernon 2007 & Supp. 2009) (PURA) (requiring the Commission to report on the Scope of Competition in Electric Markets by January 15 of each odd-numbered year).

PUCT may order an electric utility, MOU, or electric cooperative to provide interconnection service to facilitate a sale of electricity.

I. Locations in Texas Most Likely to Experience a Natural Disaster or Other Emergency

Texas is a very large and geographically diverse state. It is common for one part of Texas to experience record drought while another part of Texas experiences record rainfall. During hurricane season, while the coastal communities may be significantly affected by high winds, rain, and flooding, many parts of the state will remain completely unaffected. Over the past decade, Texas has experienced numerous types of natural disasters including hurricanes, floods, tornadoes, severe thunderstorms, ice storms, and wild fires. **Attachment B** of this report details the types and locations of disasters that have occurred in Texas during the past 10 years. This list is limited to federally-declared disasters in Texas as defined by the Federal Emergency Management Agency (FEMA), and does not include smaller-scale storms and disasters that have occurred during the past 10 years. This list gives an accurate representation of the types of disasters Texas is prone to experience and where they occur. During the past decade, Texas has had 17 major disaster declarations:

- September 13, 2008: Hurricane Ike
- July 24, 2008: Hurricane Dolly
- October 2, 2007: Tropical Storm Erin
- June 29, 2007: Severe Storms, Tornadoes, and Flooding
- May 1, 2007: Severe Storms and Tornadoes
- August 15, 2006: Flooding
- January 11, 2006: Extreme Wildfire Threat
- September 24, 2005: Hurricane Rita
- July 17, 2003: Hurricane Claudette
- November 5, 2002: Severe Storms, Tornadoes and Flooding
- September 26, 2002: Tropical Storm Fay
- July 4, 2002: Severe Storms and Flooding
- June 9, 2001: Severe Storms and Flooding
- January 8, 2001: Severe Winter Storm
- April 7, 2000: Severe Storms, Tornadoes and Flooding
- August 22, 1999: Hurricane Bret
- May 6, 1999: Severe Storms and Tornadoes

While a few utilities may be fortunate enough to have never experienced damaged infrastructure or loss of service to customers as a result of a natural disaster, the odds are great

that most utilities will experience this at some point in time. It is important to note that no area of the state is immune from natural disasters, particularly severe thunderstorms, wildfires, and flooding. Utility providers in coastal communities are more likely to experience damage and loss of power as a result of hurricanes. Utilities cannot prevent such natural disasters and damage to their infrastructure, but they can mitigate the outcome of these events significantly. By implementing lessons learned from previous storms and emergencies, revising existing plans, contracts and agreements, learning new ways to interconnect with one another to provide power to devastated areas, and exploring and expanding the potential for distributed generation, utility providers will strengthen the reliability of electric service when a disaster occurs and utility outages and restoration times can be significantly reduced.

II. Commission Notification During Emergency Events

Electric service providers are required to notify the Commission, pursuant to P.U.C. SUBST. R. 25.53(f), by email of any significant outage. During major emergency events and natural disasters such as hurricanes and ice storms, the Commission's Emergency Management Response Team (EMRT) becomes involved. The EMRT helps coordinate power restoration while communicating frequently with any affected electric service provider before, during, and after an event. When the State Operations Center (SOC) is activated, the PUCT's EMRT calls on all affected utilities to work alongside the EMRT at the SOC to begin the power restoration process. Department of Energy (DOE) representatives are also present at the SOC and work closely with the EMRT and utilities to facilitate any FERC waivers for emergency interconnection that may be needed to get power restored as quickly as possible.

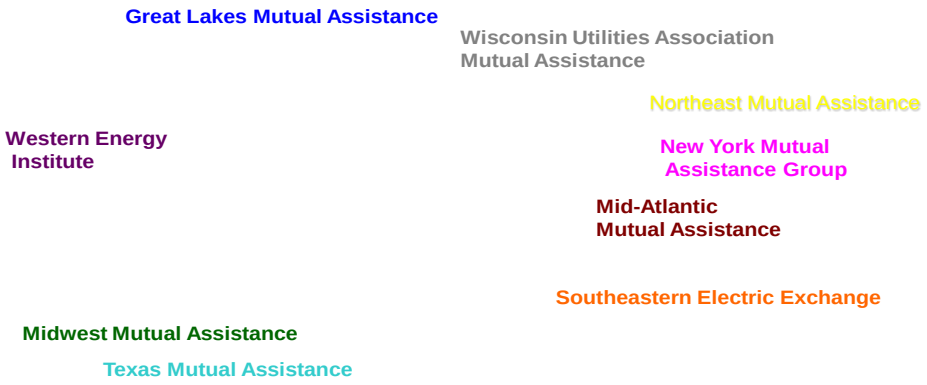
III. Mutual Assistance Groups

Electric service providers have a long history of providing mutual assistance during emergency events and natural disasters. Utilities and electric cooperatives across the state belong to mutual assistance organizations. Both formal and informal arrangements exist to provide assistance during major disasters. There are nine regional mutual assistance groups in the United States. The three regional groups covering Texas and adjacent states are Texas Mutual Assistance Group, Southeastern Electric Exchange Group, and Midwest Mutual Assistance Group.

During major events electric service providers who experienced significant outages have called on unaffected industry entities for assistance and resources to cope with major outages. In the aftermath of Hurricane Ike, 2.87 million Texans were without electric power. The various

utilities responded with 15,235 line crew personnel, which included utility personnel and mutual assistance personnel from over 25 states.

Regional Mutual Assistance Groups in the United States

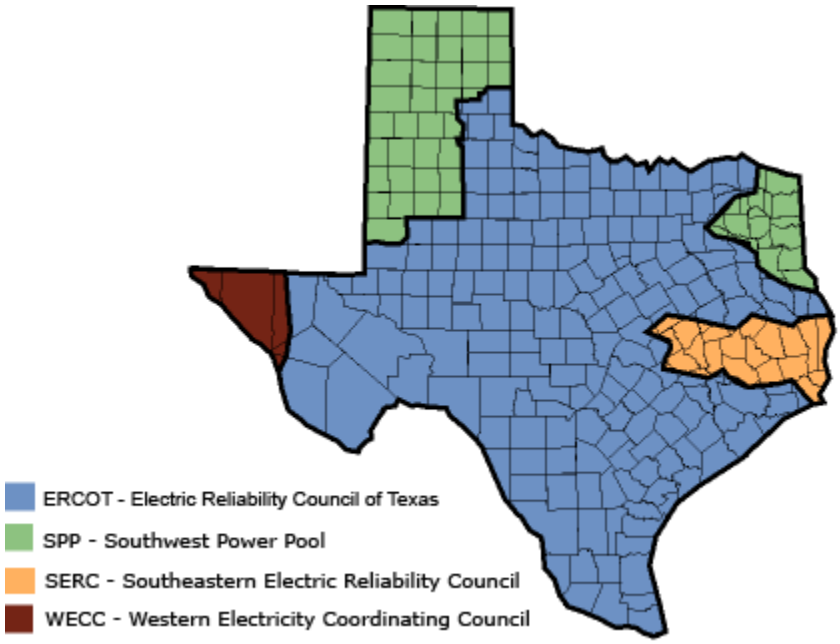


IV. Texas Transmission Grid

The State of Texas contains four different electrical transmission grids, each of which is part of a separate electric reliability region under the North American Electric Reliability Corporation (NERC). By far the largest grid in the state is the Electric Reliability Council of Texas (ERCOT), which covers about 85% of the electric load in Texas and about 75% of the geographic area (see map below). Within ERCOT, there are a large number of companies that own and operate transmission and/or distribution systems.[2] Each of these systems are directly connected to one or more of the other systems, and they are all interconnected with each other as part of the larger ERCOT grid.

[2] The terms "transmission" and "distribution" are distinguished by voltage level. In ERCOT, "transmission" refers to lines and equipment operated at or above 60 thousand volts (60 kV) phase-to-phase and "distribution" refers to facilities operated below 60 kV.

TEXAS RELIABILITY COUNCIL BOUNDARIES



The Southwest Power Pool (SPP) grid serves northeast Texas and the Texas panhandle. It extends outside Texas to all or portions of seven other states in the central United States. The Southeastern Electric Reliability Council (SERC) grid covers southeast Texas, and it extends to 15 other central and southeastern states. In far west Texas, the El Paso area is served by the Western Electric Coordinating Council (WECC) grid, which also serves 13 other western states, as well as parts of Canada and Baja, California in Mexico.[3]

Unlike WECC, SERC and SPP grids, the ERCOT grid lies entirely within Texas. These grids have limited interconnections through DC Ties.[4] The transfer capacity of the DC Ties means that there are limited physical pathways for electricity to flow into or out of ERCOT. It also means that ERCOT and the other grids are not "synchronized" electrically, so establishing a direct

[3] The entire continental U.S. electrical grid is incorporated into the Eastern Interconnect, the Western Interconnect, and ERCOT. SERC and SPP are part of Eastern Interconnect and WECC is part of the Western Interconnect.

[4] The DC Ties are expensive transmission facilities that convert electricity from alternating current (AC) to direct current (DC) and then back to AC. Present DC Ties provide 1,100 MW of interchange capability which is less than two percent of the ERCOT peak demand.

electrical connection between the grids, even for purposes of temporary restoration of service, requires substantial coordination.

ERCOT is also unique with regard to regulatory authority. Whereas, the other grids in Texas are regulated by the Federal Energy Regulatory Commission (FERC), ERCOT is regulated primarily[5] by the PUCT. Entities within ERCOT have long been reluctant to participate in any transmission facility project or power transaction that would flow power between ERCOT and any of the other regions for fear that the project or transaction would result in the extension of FERC jurisdiction into ERCOT. Before undertaking such projects or transactions, it is common practice for entities to seek a written opinion from FERC that it would not claim jurisdiction in ERCOT as a result.

V. Wholesale Market Entities

PURA § 38.073 required the PUCT to study the provision of electricity during a natural disaster or emergency. PURA § 38.073(a) directed the Commission to study the following types of entities: electric utilities, MOUs, electric cooperatives, qualifying facilities, PGCs, exempt wholesale generators, and power marketers. Each of these entities participates in wholesale electricity markets in Texas, but they may differ in terms of their ability to buy and sell electricity with other entities in the market. These differences result from statutory provisions, Commission rules, or existing purchase power contracts between entities. To understand the potential ability of these entities to sell electricity during emergency conditions, it is important to understand their respective characteristics. The following provides a brief description:

- Electric Utility – Although "electric utility" is commonly used as a generic term, the term is defined in PURA as a person or river authority that owns or operates for compensation in this state equipment or facilities to produce, generate, transmit, distribute, sell, or furnish electricity in this state.[6] Inside ERCOT, the term refers to the "wires only" companies, CenterPoint Energy (CenterPoint), Oncor, American Electric Power (AEP), Texas Central Company (TCC) and Texas North Company (TNC), Texas New Mexico Power (TNMP), and Sharyland Electric (Sharyland).[7] As wires only companies, these entities do not own generating facilities and they do not buy and sell power. Their wires carry power for end-users, but they do not sell power to end-users. Outside

[5]The ERCOT Independent System Operator (ISO) and certain market participants that own, operate or use the bulk power system within Texas are required to register with the North American Electric Reliability Corporation (NERC), and must meet federal NERC reliability standards pursuant to the Energy Policy Act of 2005.

[6] P.U.C. SUBST. R. 25.5(41).

[7] These entities can also be referred to as "Transmission and Distribution Utilities" (TDUs).

ERCOT, the term refers to vertically integrated, investor-owned utilities: Xcel Energy (Xcel), Southwestern Public Service (SPS), AEP Southwestern Electric Power Company (SWEPCO), El Paso Electric (EPE), and Entergy Texas, Incorporated (Entergy). These entities own generating facilities and transmission and distribution facilities, and they may buy and sell power in the wholesale market; and they sell power to end-use customers in their respective certificated service areas.

- Municipally Owned Utility (MOU) – This term refers to any utility owned, operated, and controlled by a municipality or by a nonprofit corporation whose directors are appointed by one or more municipalities.[8] These entities own distribution facilities, and they may own generation and transmission facilities. MOUs can buy and sell power. Those that do not own generation obtain all their electricity through purchase power contracts with one or more power suppliers. These contracts may limit the MOU's ability to buy power from other power suppliers.

- Electric Cooperative – This term refers to a corporation organized and operating under the Texas Utilities Code, Chapter 161.[9] Electric cooperatives are either "G&T" cooperatives, meaning they own generation and transmission facilities, or "distribution" cooperatives, which have only distribution facilities. Brazos Electric Cooperative, East Texas Electric Cooperative, and Golden Spread Electric Cooperative are examples of G&T cooperatives. G&T cooperatives have contracted to provide all or a specific portion of the power requirements of their member cooperatives , and the contract between G&T cooperatives and their member cooperatives may limit the member cooperatives ' ability to buy power from alternative sources.

- Qualifying Facility (QF) – "Qualifying Facility" is a federal category of electricity generators that was created by the Public Utilities Regulatory Policies Act of 1978 (PURPA). QFs include cogenerators, who typically provide both electricity and steam to a host entity, such as a manufacturing company. Cogenerators sell excess power not needed by the host into the wholesale electricity market. QFs also include Small Power Producers, who generate power from renewable resource facilities (less than 80 MW) and sell it into the wholesale market.[10]

[8] P.U.C. SUBST. R. 25.5 (71).

[9] P.U.C. SUBST. R. 25.5 (35).

[10] Although PURPA provided that a QF had the right to sell electricity to the local utility, FERC has recently determined that the obligation to buy from a QF does not apply in areas where there is a sufficiently competitive wholesale market. Thus, the QF "put" no longer applies in ERCOT, but it may still apply in areas outside of ERCOT as determined by the FERC.

- Power Generation Company (PGC) – A person that generates electricity intended to be sold at wholesale and does not own transmission or distribution facilities in this state, and does not have a certificated service area.[11] The majority of the power in ERCOT is produced and sold by PGCs. A complete list off all PGCs in Texas can be found on the PUC website at: www.puc.state.tx.us.

- Exempt Wholesale Generator (EWG) – EWG is another federal category of generators that allows affiliates of regulated utilities to generate power and sell it in the competitive wholesale market.[12] For purposes of this report, EWGs will be considered the same as PGCs.

- Power Marketer – A person that becomes an owner of electricity for the purpose of selling electric energy at wholesale and does not own generation, transmission, or distribution in this state and does not have a certificated service area.[13]

VI. Ability to Buy or Sell Electricity During an Emergency Event

The ability of a utility or electric cooperative to buy electricity or various entities in the wholesale market to sell electricity to an electric utility, an MOU, or an electric cooperative will be a function of: (1) the availability of the seller's generating capability; and (2) the availability and capacity of a transmission and distribution pathway to the buyer's end-use customers, generally referred to as the "load."

Electric generating facilities are built in discrete locations, and therefore may be less likely to be damaged in an emergency situation unless the event, such as a tornado, occurs at the plant's specific location. Nuclear plants and coal plants are generally not subject to short-term disruption of fuel supplies, but experience in Texas has shown that natural gas plants may be curtailed or taken off line when pipeline supplies and operations are reduced during freezing weather conditions. Some natural gas plants can substitute fuel oil if its normal supplies are disrupted. However, many natural gas plants cannot operate on fuel oil, and those that do may not maintain significant inventories of fuel oil. However, even if a generating plant is fully operable and has adequate fuel supplies during an emergency event, in most cases it cannot even be started up if it is not connected to a fully operational transmission grid.[14] Electricity is generated and consumed only in real time because there is no effective storage capability.

[11] P.U.C. SUBST. R. 25.5(82).
[12] P.U.C. SUBST. R. 25.5(49).
[13] P.U.C. SUBST. R. 25.5(83).
[14] As described later in this report, distributed generation does not require access to the transmission system.

Therefore, restoration of the transmission and distribution system is usually the most immediate concern in an emergency situation.

Within ERCOT, more than 90% of the electricity is sold through bilateral contracts between buyers and sellers. The remaining power requirements are met by ERCOT, who purchases electricity through its ancillary service markets. Through the ERCOT market, buyers and sellers of electricity have the ability to make transactions, whether long term or short term, and ERCOT has enough installed capacity to meet requirements plus maintain a reserve margin. CPS Energy, an MOU in San Antonio, described the options it would have to produce and/or purchase electricity in ERCOT during an emergency event:

> There are several key sources of replacement power depending on the length and widespread nature of any emergency. Assuming an emergency that affects CPS Energy's ability to generate power from a given power plant, we could start up other units owned by CPS Energy – including our quick start combustion turbine units. We also could purchase power from ERCOT on the balancing energy market. Typically we would purchase from the balancing energy market to meet a short term (intraday) shortfall. If the emergency remained localized but [was] longer in duration than one day, CPS Energy would most likely purchase power (again through the ERCOT market) on a bilateral basis with one of the many counterparties with which we have contracts to buy and sell power. CPS Energy has contracts in place with numerous parties that either own or have access to power generation. Should the emergency not be localized to the San Antonio region and power supply through ERCOT [was] in jeopardy, then CPS Energy would follow the protocols dictated by ERCOT, which manages the stability of the power generation market. CPS Energy is connected to other portions of the ERCOT grid by multiple transmission lines and paths such that a natural disaster would be extremely unlikely to simultaneously damage all of the paths needed to transport emergency power into the San Antonio area. CPS Energy, moreover, has adequate power generation to cover its own load in the case of most emergency situations.

VII. Ability to Establish Interconnections During an Emergency Event

Transmission and distribution systems are vulnerable to disruption from natural disasters or other emergencies because they are located everywhere that electricity is needed, and damage to only one component of the system may impact a much wider part of the system than just the location where the damage occurred. This is particularly true of damage to transmission lines, but distribution system outages can also affect customers outside the immediate area of the outage. By design, transmission and distribution systems are "looped" so that most points in the system can receive power flows from more than one direction. This allows power to be "rerouted" when there is an outage in the system, thereby reducing the outage impact on customers. Nonetheless, outages may be unavoidable in wide-spread emergencies, and

restoration time will be a function of the type and extent of damage. Power cannot be fed into a transmission or distribution system until the system can be operated in accordance with required specifications to prevent further damage to the system, generating equipment, or customers' property.

Early restoration of service during an emergency is usually accomplished in one form or another through a process known as "load transfer." Simply put, if the wires that normally provide power to a load are out of service, it may be possible to serve the load by connecting it to a different set of wires, thereby "transferring" the load from one system to another. The concept may sound simple, but in practice it can only be done in limited circumstances where the other system is close by, the proper electrical interconnection can be made, and the load to be transferred can be fully isolated from its temporarily non-operating system so that there are no unintended power flows that could damage one or both systems. Load transfers can occur at the transmission level or the distribution level within a grid, or they can occur between grids.

An emergency power transaction that takes place between the ERCOT power grid region and one of the adjacent power grid regions requires significant coordination.[15] As described below, the ERCOT staff must take a series of steps to facilitate the flow of emergency power across ERCOT and non-ERCOT areas when a natural disaster or other emergency occurs.

ERCOT Systems Operations Staff must take the following steps:

- Get ERCOT and the non-ERCOT transmission service providers (TSPs) that are involved in the transfer to obtain data and information and perform studies to ensure that the non-ERCOT load can be reliably integrated into the ERCOT system;
- Ensure that ERCOT obtains real-time Supervisory Control and Data Acquisition (SCADA) data from the ERCOT TSP at the transfer point;
- Incorporate the transfer into ERCOT's computer systems, including the network model, state estimator, and real-time contingency analysis;
- Determine if the appropriate DOE/FERC exemptions or approvals are in place (the exemptions must be obtained by the TSPs, not ERCOT);
- Ensure that ERCOT's Market Operations and Client Services Staff make the necessary metering changes and QSE assignments to appropriately settle the transfer. Upon completion of the above listed steps, the TSPs are then allowed to conduct the transfer.

[15] ERCOT is not involved in distribution level transfers because all actions on lower voltage lines are taken by the Distribution Service Provider without a need for ERCOT involvement. ERCOT Systems Operations Staff is only notified of a distribution level transfer.

In addition, ERCOT's Client Services Staff would take following steps:

- Coordinate planning, communication, and execution of the transfer through ERCOT's Legal, System Operations, and Market Operations Staff and all involved Market Participants;
- Make necessary entries and/or modifications in the registration system for settlement and record keeping purposes based on the approved transfer plan; and
- Communicate internally with ERCOT staff and externally with Market Participants during the transfer.

ERCOT's Market Operations Staff would take following steps:

- Set up an ESI ID for the TSPs involved in the transfer in the ERCOT Lodestar computer system based on the information in the TSP's block load transfer registration form submitted to ERCOT; and
- Remove the ESI ID from ERCOT's Siebel computer system to prevent inadvertent switches.

Utilities recognize the importance of interconnection and many have interconnection projects underway. For example, Tex-La Electric Cooperative of Texas, Inc. (Tex-La) and Deep East Texas Cooperative (DETC) are currently working on an interconnection project to upgrade the transmission interconnection capability between the northern and southern portions of their respective systems. This interconnection project will allow more reliable system operational capabilities not only during normal system operations, but also during emergency events. With full implementation of the proposed interconnected system, there will be the capability to provide service restoration from the Entergy service area in southeast Texas into the AEP service area of northeast Texas, as well as similar backfeed from northeast Texas into southeast Texas. The East Texas Cooperatives (ETCs) regularly schedule planning meetings with other area utilities to discuss system planning issues, as well as emergency restoration efforts. The ETCs are also active in similar planning efforts with SPP, SERC and ERCOT.

VIII. Interconnection Steps Taken in Previous Events

Some of the respondents to the staff questions provided examples of the steps that had been taken in previous emergency events to provide interconnection. In particular, during Hurricane Ike, when Entergy lost significant amounts of its power supply, and the City of Houston water system could have been potentially compromised because of the lack of power, CenterPoint

was able to support the city's water pumping stations by connecting to the Crosby-Dayton Tie, located near Crosby, Texas. CenterPoint described the steps it took to provide power from the ERCOT grid to Entergy, an electric utility operating in the SERC grid, through the Crosby-Dayton Tie. Some of these steps were required legally, while other steps were implemented as a courtesy to the various entities. These steps included:

- Obtain from Entergy a request to provide emergency service;
- Notify DOE of the emergency and the need to interconnect ERCOT to the SERC grid using the Crosby-Dayton Tie;
- Notify the FERC, the PUCT, and ERCOT of the emergency and intent to provide the emergency interconnection;
- Provide a draft order to the DOE for execution;
- Send a letter to the DOE providing notice of the date and time of the emergency interconnection. A copy of the letter to the DOE is also provided to FERC, the PUCT, and ERCOT; and
- Once the interconnection has been opened, send a letter to DOE providing notice of the date and time of the cessation of the emergency interconnection. A copy is also sent to the same entities that were provided notice.

When CenterPoint interconnected using the Crosby-Dayton Tie, the following technical steps were taken:

- Establish metering and settlement arrangements. CenterPoint now has a meter at the Crosby-Dayton Tie; therefore, no further action is necessary to address metering. Likewise, an ESI ID has been established for the location, so no further action is required for this site. Entergy is responsible for selecting an ERCOT retail electric provider to provide the electric service to the meter;
- Provide repairs to the necessary transmission and substation facilities to interconnect service from the Crosby-DaytonTie to the customers to be provided service;
- Implement necessary switching to execute an open transition block load transfer, in which the Eastern Interconnect (to which Entergy's network is connected) is not synchronously connected to the ERCOT grid to which CenterPoint's network is connected;
- Operate the transmission and substation facilities through CenterPoint's Real Time Operation up to a demarcation point;

- Reset protective relays to protect electrical facilities in the revised configurations that are used for the emergency connection;
- Perform motor starting calculations to ensure that large electrical motors can be reliability restarted in the revised configurations that are used for the emergency connection; and
- Implement necessary switching to remove the transmission and substation facilities from the ERCOT system and return the facilities to the Entergy system.

Brazos Electric also described the steps it took when Hurricane Ike caused major damage and subsequent outages to the Entergy transmission grid where several Mid-South Synergy (Mid-South) substations are located. Due to the extended time for restoration and the short supply of generation in the affected region, Brazos Electric required and received permission from ERCOT to transfer part of the Mid-South load that was interrupted due to the storm. Mid-South has developed the capability to connect distribution feeders and transfer load on a limited basis between ERCOT and SERC facilities.

Also during Hurricane Ike, a fallen tree damaged a distribution circuit served from the SERC power region, which was also weakened by the storm. Mid-South requested the load be transferred onto a distribution circuit served from the ERCOT region to permit repairs. Both Entergy and ERCOT were notified and permission was obtained.

In the aftermath of Hurricane Rita, Oncor received a request from Deep East Texas Electric Cooperative (DETEC) to provide transmission service to one of their substations. Upon guidance from the PUCT, a multitude of resource crews including vegetation management, engineering, and construction, were deployed to provide transmission service to the substation. These crews rehabilitated several miles of an existing but un-energized 69 kV circuit. This interconnection allowed the flow of power to several communities that would have otherwise experienced extreme extended outages.

Also during Hurricane Rita, Tex-La was able to coordinate the interconnection of transmission facilities between DETEC and the AEP/SWEPCO at an existing emergency 69 kV Point of Interconnection (POI) at DETEC's Pineland substation, including service to the City of Pineland, and the Horton Hill and Weirgate Substations.

During both Hurricanes Rita and Ike, Houston County Electric Cooperative (HCEC) was able to coordinate with Oncor for distribution back-feed service from Lufkin into their Groveton distribution service system normally served by Entergy. This emergency service enabled HCEC to re-energize service to the Centerville School on Highway 94 between Groveton and Apple Springs.

IX. Preparing to Comply with a Commission Order

The large IOUs in the state have experience dealing with natural disasters and emergencies and have reviewed their options to quickly implement emergency power purchases. The larger cooperatives and MOUs also have experience dealing with natural disasters and emergencies. Their larger size provides more purchase and interconnection options. The smaller cooperatives and MOUs do not have immediate access to multiple interconnection options and in some cases; they are limited in their power purchase options. The smaller cooperatives and MOUs need to evaluate interconnection options that may offer a backup power source. They should also negotiate their power purchase options so they are not restricted in the event of a natural disaster or other emergency. Commission staff did not receive a significant number of responses to its question concerning the steps that an entity should take to prepare to comply with a Commission Order after a natural disaster or other emergency event. Notably, Brazos Electric provided the following response:

> Brazos Electric, Entergy, and ERCOT would make a determination of the power supply situation and condition of the Entergy transmission system that existed after a natural disaster event such as a hurricane. Once a determination was made that recovery efforts would be of an extended nature and that an insufficient amount of power supply resources existed on the Entergy transmission system to serve the magnitude of load that existed, Brazos Electric's operational processes would provide that notification will be made to ERCOT and the PUCT of the emergency situation. Brazos Electric would request that ERCOT seek a PUCT order (or any other required authorizations) for the interconnection of ERCOT facilities with Entergy facilities. Once the PUCT ordered the emergency interconnection, Brazos Electric and other ERCOT transmission providers would work with Entergy and ERCOT to arrange and coordinate the necessary switching to establish the emergency interconnection. Tele-metered load information from the emergency connections could be provided to ERCOT, who could then in turn incorporate the temporary SERC region load into ERCOT's system load calculations and take steps to provide energy to the SERC load pursuant to the ERCOT Protocols and Operating Guides.
>
> The scenario described above would allow not only Brazos Electric and its member cooperatives to receive power from the ERCOT region. It would also likely allow others such as Entergy and other entities to receive power that would not otherwise be available. If Brazos Electric's proposal (as described in its response to Question 3 above) were implemented, the pre-arranged emergency interconnections could thereby provide power to citizens of Texas that would otherwise be without power until restorations efforts to the Entergy transmission system were made.

In addition, Entergy provided the following comments:

For the existing locations and previous use of facilities as described in question 5, ETI has worked with the entities involved to interconnect and purchase the needed power without the need for a Commission order. To the extent new interconnections are identified and deemed necessary to comply with section 38.073 of the Public Utility Regulatory Act, ETI and/or the interconnecting utility may need an order from the Commission indicating such facilities are needed prior to constructing such interconnection(s). Once the new facilities are in place to create the new interconnection(s), ETI does not believe it will need a Commission order to purchase the needed power. However, if at the time of such purchase, ETI is unable to secure the needed power a Commission order may be necessary. It may be necessary for ETI to seek guidance from FERC to create and/or modify emergency interconnections between the ERCOT transmission grid and the Eastern Interconnection.

X. Potential for Distributed Generation

Distributed generation (DG) is any electricity generating technology installed by a customer or independent electricity producer that is connected at the distribution level of the electric grid. This includes all generation installed on sites owned and operated by utility customers; for example, solar photovoltaics serving a house or a cogeneration facility serving an office. Larger systems installed by developers may also be considered distributed generation if they are connected to the distribution system rather than the transmission system. In such cases, a developer would need to engage in discussions with the utility to determine whether the distribution facilities have adequate capacity to carry the new generation.

DG systems may be comprised of one or more primary technologies, such as internal combustion engines, combustion turbines, photovoltaics, and batteries. Innumerable combinations of DG technology/fuel options are possible, to take advantage of synergies between individual technologies, making them as robust or cost-effective as possible. Most DG systems operate on hydrocarbon fuel to produce electricity as needed. Battery systems store electric energy from the grid for use when needed. Distributed renewable generation (DRG) derives power from wind, water, sun, or biomass. Just as DG may use more than one technology in a single installation, DRG may use a hybrid of renewable technologies and up to 25% fossil fuels while retaining the “renewable” classification.

DG offers the potential to forestall or avoid utility investments in distribution, transmission and generation facilities, and improve service to customers. However, some forms of DG, especially DRG, are not cost-effective absent subsidies or strategic requirements of the customer. Coordinating DG’s potential with evolving technologies and using it to strengthen reliability of electric service remains an ongoing challenge, and the potential emergency restoration capabilities of distributed generation resources are still being explored.

Various electric utilities with service areas in Central Texas have reported that DG, including combined heat and power (CHP) systems and renewable generation with battery back-up, could strengthen reliability if grid access was impaired. "The degree of improved reliability would largely be dependent on the quantity of such resources," noted Austin Energy. However, the amount of DG resources is currently very limited. One electric cooperative in the central part of the state presently has four 1.8 kW residential windmill generators on its system, and stated that there has been interest for larger-scale waste and solar generation; however, none of the proposed projects are past the proposal stage.

Oncor and AEP/TNC both have a significant presence in West Texas, and both companies report slightly different opinions on the potential impact of DG to strengthen the reliability of electric service during a natural disaster or other emergency. Customer-owned generation that is properly coordinated with the company's electric system strengthens the grid during an emergency. AEP/TNC suggest that there is significant renewable power, qualifying facilities, and other distributed generation within certain west Texas service areas, and available power production has not been the major problem in the immediate aftermath of a natural disaster. Rather, AEP/TNC stated that from its experience the restoration of the transmission lines was more of a factor in providing power to an impacted geographic area than the restoration of a power source. A much larger problem has been getting the distribution system repaired sufficiently to restore service to those customers that are capable of receiving service.

The additional DG, in Oncor's opinion, helps alleviate the amount of load that would have to be served (or restored) in an emergency condition. This would also apply to customers utilizing combined heating and power where customers are serving their own loads. Oncor believes there is limited potential for distributed generation as defined by P.U.C. SUBST. R.25.211 and 25.212 (generation operated in parallel with the grid) to be utilized to serve utility distribution circuit loads during emergency conditions. "Most of Oncor's customer owned distributed generation is at locations where there is customer load and the customer owned generation is intended to be utilized for back-up power to serve that customer's critical loads. These systems were not designed and were not intended to be used to pick up load on the utility's distribution circuits."

The north Texas area has a small amount of DG interconnection through AEP/TNC, with a few companies and cooperatives investigating potential sites for distributed generation as well as CHP facilities within their systems. One such company reported that the only distributed generation in their service area is back-up generators at dairies. These back-up generators are sized to the load to which they are attached, and are not set up for parallel operation with their distribution system. The only notable electric utility with a DG presence in south Texas is AEP/

TCC although one electric cooperative with a south Texas service area did express that their company had no interconnected DG on their distribution system as this time. DG of adequate capacity does have the potential in the support of loads during and after natural disasters and emergencies caused by storms, extreme heat and drought.

P.U.C. SUBST. R. 25.211(n) requires that by March 30 of each year, every electric utility shall file with the Commission a DG Interconnection Report for the preceding calendar year that identifies each distributed generation facility interconnected with the utility's distribution system. The report lists the new distributed generation facilities interconnected with the system since the previous year's report, any distributed generation facilities no longer interconnected with the utility's system since the previous report, the capacity of each facility, and the feeder or other point on the company's utility system where the facility is connected. The annual distributed generation interconnection reports are on file with the PUCT and are available to the public through the Commission's website (http://www.puc.state.tx.us/).

XI. Conclusion

The Commission acknowledges and supports the need for efficient delivery of power in an emergency situation. As discussed earlier in this report, many utility providers have already experienced this need during recent disasters, and have successfully received power from another entity during an emergency. As a result of recent disasters, several interconnection projects and studies are being implemented and expanded. Similarly, utility mutual assistance programs have also expanded. Since each utility provider has different resources and a unique service area with many complex challenges, a one size fits all approach to interconnection is not possible. Each utility must remain committed to regularly communicating with the Commission, ERCOT, and the other utilities in their area to explore different interconnection options so that it can be prepared to take to steps to obtain power quickly.

Many larger investor owned utilities continue to review and amend their policies regarding interconnection and emergency power purchases as needed. Smaller cooperatives and MOUs who have not been significantly impacted by recent disasters and who do not have access to multiple connections should evaluate interconnection options that may offer a backup power source. In addition, smaller cooperatives and MOUs should negotiate their power purchase options so they are not restricted in the event of a natural disaster or other emergency. As the attached maps indicate, emergencies can occur in any place, at any time, and it is critical for utilities to remain committed to working with one another through formal or informal programs and with ERCOT and DOE to make interconnections occur quickly so that power can be restored in an expeditious manner.