Texas Reliability Entity, Inc.
Protocol Compliance Report
to Public Utility Commission of Texas
For The October 8, 2014, Lower Rio Grande Valley Load Shed Event

January 21, 2015

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I. Summary

Texas Reliability Entity, Inc. (Texas RE) investigated the load shedding event that occurred in the Lower Rio Grande Valley on October 8, 2014, as directed by the Public Utility Commission of Texas (PUCT) in a letter dated October 9, 2014, from Brian H. Lloyd, PUCT Executive Director. Texas RE investigated the conditions leading to the emergency event, as well as actions taken once the event occurred. Texas RE assessed the actions of ERCOT and ERCOT Market Participants to determine whether applicable laws, rules, requirements and processes were followed.

The Lower Rio Grande Valley (Valley) is an area in south Texas that, at times, has greater customer demand for electricity than can be served by local Generation Resources. Transmission facilities currently in place limit the amount of electricity that can be imported into the area from other ERCOT Generation Resources. This creates a situation in which extreme contingencies, such as forced outages of major generation or transmission facilities, can threaten the reliability of the electric grid in the Valley. Improvements to the transmission system that will increase import capabilities for the Valley area are scheduled to be completed in 2016. In the meantime, ERCOT and affected Market Participants have created plans that contain measures to be implemented when unexpected outages occur.

On October 8, 2014,[1] three units at the North Edinburg Generating Station tripped, causing the loss of 651 Megawatts (MW) of generation in the Valley area. These trips, combined with other generation outages in the area, created a situation in which System Operating Limits were exceeded and the Valley area could not be operated in a secure state in accordance with NERC Reliability Standards. ERCOT declared a Transmission Emergency and took a number of actions to alleviate the situation, including directing additional available generation to come on-line, redirecting power flow over transmission lines, and obtaining emergency power from Mexico. Ultimately ERCOT ordered manual load shed to prevent the possibility of uncontrolled loss of load and cascading outages.

Texas RE's review of the event indicates that for the most part ERCOT and Market Participants handled the emergency in accordance with applicable Protocols, Operating Guides, and Operating Procedures, and the Valley was restored to a reliable and secure state within approximately three and one half hours. The only compliance issue identified by Texas RE in connection with the load shed was that in response to ERCOT's load shed instruction, AEP Texas Central (AEPTC), the Transmission and Distribution Provider that serves a large portion of the Valley, shed significantly more load than ERCOT directed. This complicated ERCOT's management of the emergency and resulted in more end-use customers experiencing power outages than might otherwise have been the case. Texas RE will further investigate AEPTC's activities during the October 8 Emergency and forward the matter to PUCT for further action, as appropriate.

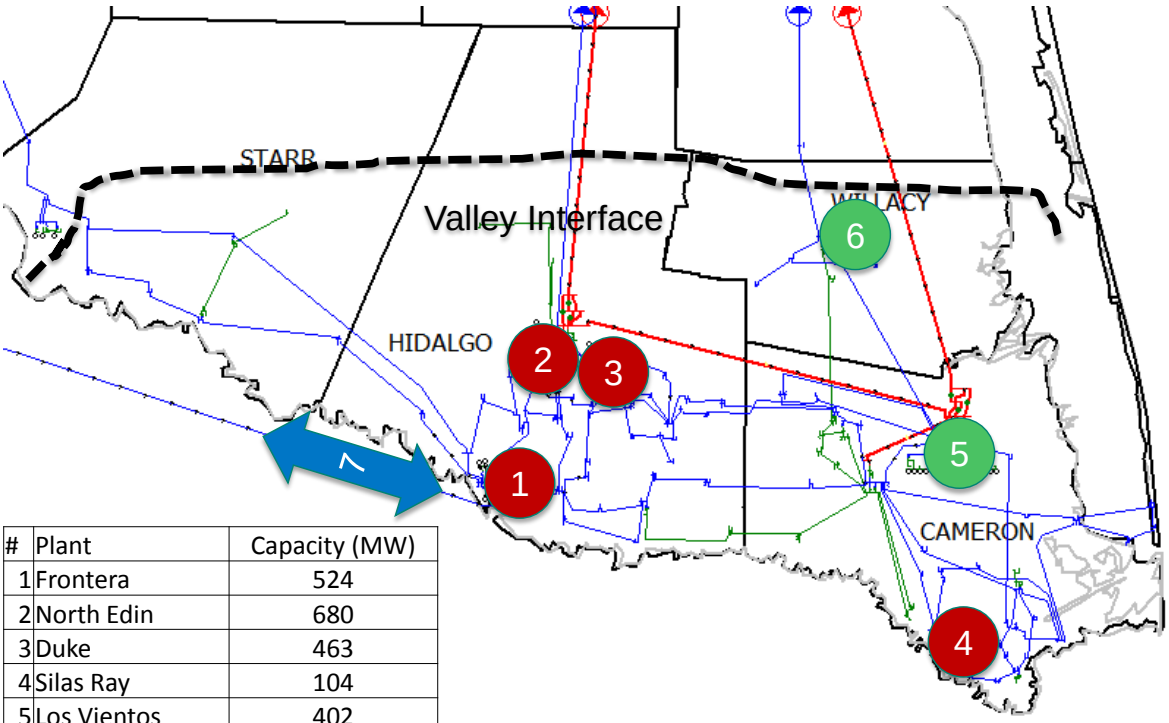
[1] Hereafter all dates are 2014 unless otherwise indicated.

II. Description of Event

A. Background

The Valley is a roughly triangular area in Cameron, Willacy, Hidalgo and Starr Counties. The two largest metropolitan areas are Brownsville and McAllen. Because the Valley is bounded on two sides by the Gulf of Mexico and Mexico, there are limited interconnections between the area and the rest of the ERCOT grid. There are six power plants in the area with a total installed capacity of 2376 MW. Because of planned outages and weather extremes, the amount of local generation is insufficient to serve the load at all times. Additional power is imported into the area on two 345 kV transmission lines and three 138 KV lines. Forced outages of generation or transmission facilities serving the area can create challenges for ERCOT System Operators as they work to maintain system stability and service to end-use customers.

Figure 1 is a map of generation and transmission facilities in the Valley area.



#	Plant	Capacity (MW)
1	Frontera	524
2	North Edin	680
3	Duke	463
4	Silas Ray	104
5	Los Vientos	402
6	Redfish	203
7	Railroad DC Tie	150

Figure 1: Lower Rio Grande Valley Transmission Map

Plans to construct additional transmission into the Valley have been approved and are under construction, but are not scheduled to be completed until 2016. There are also plans to build additional generation facilities in the area.

In order to prepare for potential contingencies involving loss of transmission capacity or loss of generation capacity, ERCOT works with Transmission Service Providers to develop specific plans to respond to such events. Because of the known issues in the Valley area, ERCOT has developed two Mitigation Plans[2] that contain actions to be taken when certain contingencies such as loss of generation or transmission facilities occur. ERCOT also has developed a Temporary Outage Action Plan for the planned outage of the Rio Hondo-La Palma 345 kV line due to possible overloads if 138 kV line forced outages were to occur. This allows for rapid coordinated response when Real Time contingencies are encountered. It also allows for planning studies to be run that are able to accommodate the maximum outages requested while insuring system reliability is maintained.

B. Conditions Leading to Event

1. Weather and Load Forecast

Protocol § 3.12 requires ERCOT to produce Load forecasts that are used for operations and planning objectives, such as power scheduling, outage scheduling and arranging for Ancillary Services. ERCOT uses sophisticated methods to project expected electricity usage, and prepares forecasts based on planning horizons ranging from 1 day to 10 years.

Weather is one of the key inputs for load forecasting. On October 8, temperatures in the Valley were approximately five degrees higher than usual, which contributed to higher than usual electricity usage. However, absent the loss of the North Edinburg facility, local generation in combination with power imported to the Valley from other ERCOT Resources would have been sufficient to serve the load.

2. Outage Scheduling

Protocol § 3.1.1 gives ERCOT broad responsibility for coordinating and approving Outage schedules for maintenance, repair, and construction of Transmission Facilities and Resources within the ERCOT system. ERCOT faces significant challenges in performing outage coordination and management. In addition to the study and review of the Planned and Maintenance Outages, conditions must be evaluated constantly based on changing conditions such as Forced Outages and Unavoidable Outage Extensions. While ERCOT has authority to cancel or require rescheduling of outages, often it is difficult (or even impossible) to stop an in-progress outage and return the equipment to service, particularly within the time frame of an emergency.

Based on ERCOT's studies utilized by their Outage schedulers, sufficient generation and transmission was available (unless multiple additional contingencies occurred) to meet the Valley load on October 8.

[2] Capitalized words are defined terms in the ERCOT Protocols. A glossary of defined terms used in this report is included as Appendix I. The definitions provided are taken from the ERCOT Protocols and Operating Guides.

a. Generation Outages

In the days preceding the October 8 Transmission Emergency several outages of Generation Resources potentially impacting the Valley were in progress. This is not unusual because October is considered the start of the "shoulder months", a time when Loads are ordinarily reduced from their summer peaks and needed maintenance and repairs can be performed to insure readiness for the even higher Winter Load demand in the Valley area.

The following Generation Resources located in the Valley area were in outage at the time of the October 8 Transmission Emergency.

Plant	Owner	Capacity (MW)	Outage Information
Duke (Combined Cycle Plant)	Calpine	463	The plant was in a Level II Maintenance Outage which began 10/7/14 at 23:57
Silas Ray Unit 5	Brownsville PUB	10	Mothballed

b. DC Tie Outage

ERCOT is not synchronously interconnected with other power regions. However, there are five Direct Current Ties (DC-Ties) which connect ERCOT with other power regions and allow limited exchanges of electricity with the Southwest Power Pool (SPP) and Mexico. The "Railroad DC-Tie", which is owned and operated by Sharyland Utilities, is located in the Valley and connects ERCOT and the power grid in Mexico.

Prior to the October 8 emergency, the Railroad DC-Tie was in a forced outage that started October 4. The outage ended October 7, and at the time of the Emergency the DC-Tie was not in use.

c. Transmission Outages

There were 9 transmission line outages (table below) in progress at the time of the October 8 Transmission Emergency in the Valley. As previously discussed, the fall "shoulder months" are also a time of significant transmission maintenance and repair work.

	Equipment Name	Out Time	Description
1	La Palma - Rio Hondo 345kV line	1/22/2014	New equipment energization
2a	La Palma - MV Ranger 138 kV line	9/10/2014	New equipment energization
2b	MV Ranger - Wesmer 138 kV line	9/10/2014	New equipment energization
3a	Garza - MighowTP 138 kV line	10/1/2014	New equipment energization
3b	Bates - MighowTP 138 kV line	10/1/2014	New equipment energization
4	Falfurias 69 kV SVC	8/29/2014	Replace damaged equipment
5	Frontera - Sharyland 138 kV line	10/3/2014	Retirement of old equipment
6	Azteca – S.E. Edinburg 138 kV line	10/6/2014	Line maintenance
7	Laureles MVEC – Port Isabel 138 kV	10/6/2014	Line maintenance
8	North Edinburg 345 kV Bus #2	09/02/2014	Station upgrade
9	Railroad DC Tie	10/3/2014	Planned outage

None of the Transmission Outages were considered to be direct contributing factors to the Transmission Emergency. The Transmission Outages represented increased risk to the Valley Area but without significant additional real time events (such as loss of local generation or transmission elements), sufficient transmission capacity was available to serve the load in the Valley area on October 8.

C. Event Overview

The Transmission Emergency was triggered by the forced outage of North Edinburg Generation Resource (North Edinburg) at 15:50. The total generation lost was 651 MW within one minute, which comprised approximately 38% of the generation capacity in the Valley at that time. As required by Protocol §§ 3.1.4.4 and 6.5.5.1, North Edinburg's QSE notified ERCOT within minutes of the plant tripping off line and updated the plant's telemetered Resource Status Code.

Protocol § 6.5.5.3 provides that ERCOT and Transmission Service Providers shall operate the ERCOT grid pursuant to NERC Reliability Standards, Protocols, and Good Utility Practice. Operating Guide § 2.1 provides that the primary operational duties of ERCOT are to ensure the reliability of the ERCOT system by performing operational planning, operating energy and Ancillary Service Markets, and supervising the ERCOT System to meet NERC Reliability Standards.

During the time leading up to ERCOT's declaration of Transmission Emergency and throughout the emergency itself, ERCOT System Operators managed the situation by giving Dispatch Instructions to Transmission Operators (TO) and Qualified Scheduling Entities (QSE) representing affected Generation Resources. Protocol § 6.5.7.9 requires Market Participants to comply with Dispatch Instructions issued by ERCOT.

In addition to Dispatch Instructions issued orally by ERCOT System Operators, ERCOT automated systems issue electronic instructions in the form of XML (Extensible Markup Language) and ICCP (Inter-Control Center Communications Protocol) messages. These types of instructions fall within the definition of Dispatch Instruction.

Texas RE reviewed operator logs, audio recordings of telephone conversations, telemetry data, outage scheduling information, and extensive information provided by ERCOT to determine the specific instructions that were given and assess whether the instructions had been followed.

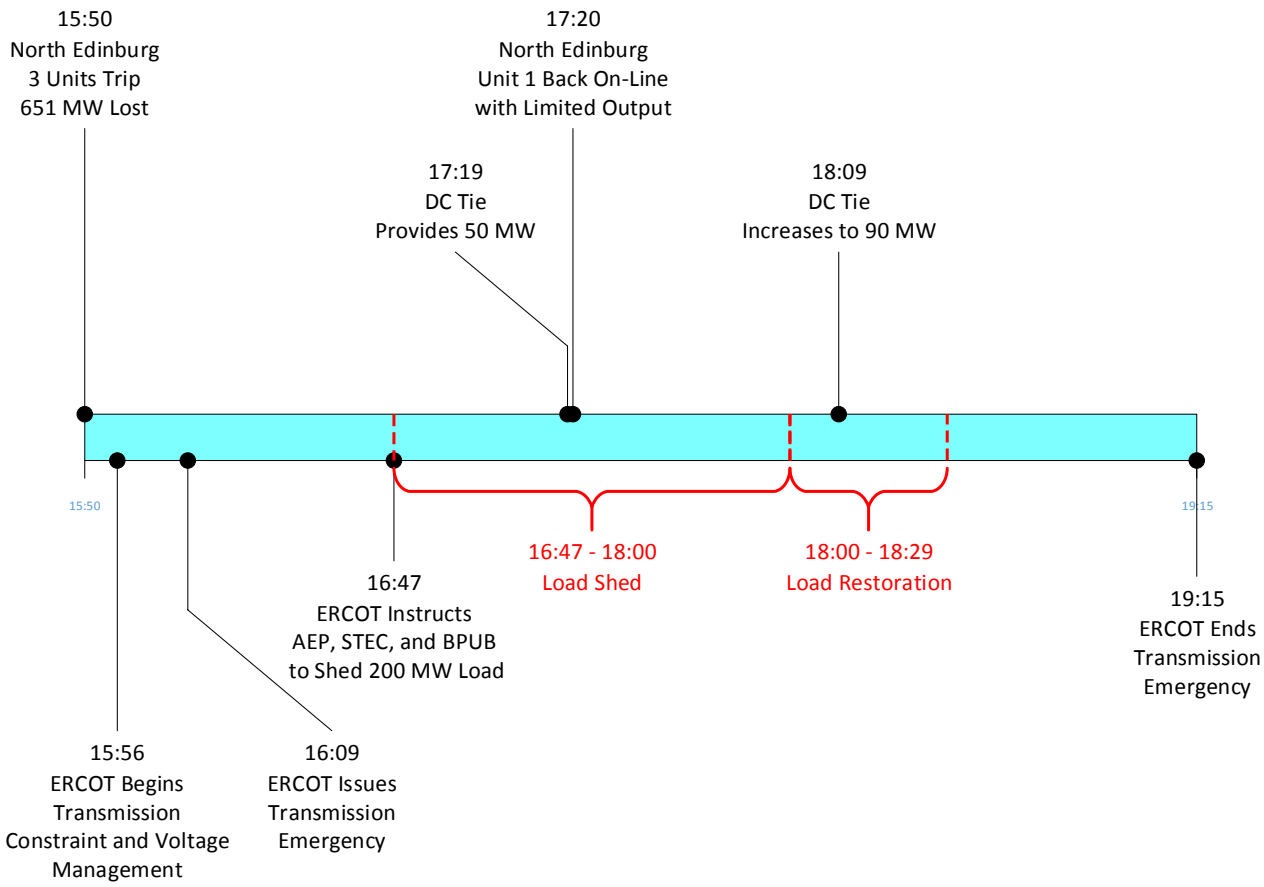


Figure 2: Overview of Emergency

D. Actions During the Event

ERCOT is required to manage the overall grid by insuring that the Transmission System stays within System Operating Limits (SOL). A SOL is defined as the value (such as MW, MVar, Amperes, Frequency or Volts) that satisfies the most limiting of the prescribed operating criteria for a specified system configuration to ensure operation within acceptable reliability criteria. Another key aspect of managing the grid is that the system must be operated such that it is able to withstand the next contingency, that is, loss of additional power plants or transmission lines, without exceeding SOLs.

ERCOT's Energy Management System (EMS) and Real Time Contingency Analysis tool (RTCA) are used to monitor SOLs. These systems continuously analyze the grid and when RTCA indicates that if a contingency were to occur, a facility rating may be exceeded, congestion management techniques are employed per the *ERCOT Operations Transmission and Security Desk Procedure.* These actions may include instructing TOs to shed Load if required to relieve an SOL exceedance as well as possible post-contingency facility ratings exceedances.

1. Voltage Maintenance

The October 8 Emergency was primarily due to low voltage concerns. Most transmission facilities in the ERCOT region are designed to operate at 69 kV, 138 kV or 345 kV. The higher the voltage for a transmission line, the more power (MWs) a line is able to carry. Unlike system frequency, which is essentially the same value across the entire grid, voltage values (even for lines designed to operate at the same nominal voltage such as 69kV, 138 kV, or 345 kV) can vary significantly.

During normal operations, ERCOT assigns each Generation Resource a target Bus Voltage with high and low limits that the Generator must operate within. Protocol § 3.15 requires all generators (greater than 20 MVA) to provide Voltage Support Services (VSS). Generators are the primary means of controlling system voltage and provide voltage support by increasing or decreasing reactive power output.

Transmission Service Providers also contribute to maintaining voltage during periods of high load by switching in capacitor banks to increase system voltage. Reactors are used during light load periods to absorb excessive reactive power and reduce system voltage.

While voltage extremes (both high and low) are a concern, the greater concern is low voltage because it can damage motors and other electrical equipment. Low voltage may cause "brownouts" and system blackout if corrective action is not taken. Generators have protective relays that will trip the generator to protect it from damage due to low voltage.

Transmission Service Providers have Under Voltage Load Shed (UVLS) systems in place that will automatically shed pre-designated loads to maintain system integrity and avoid a blackout. However, when managing an emergency in which voltage instability is a concern, ERCOT System Operators take actions to maintain acceptable voltage levels throughout the system and attempt to avoid activation of the UVLS system. Managing the emergency in this way allows ERCOT to stay in control of the grid and leaves the UVLS system in place in case it is needed.

Throughout the Emergency, ERCOT issued instructions to Resources via their QSEs to assist with voltage support. The Generators responded to ERCOT's instructions and voltage was

maintained at acceptable levels. The UVLS system remained in place as an additional reliability tool had it been needed.

Figure 3 shows the voltage at one of the Generation Resources in the Valley area during the Emergency. The effects of the North Edinburg plant trip and load shed can be seen, but in general voltage is maintained near the target specified by ERCOT.

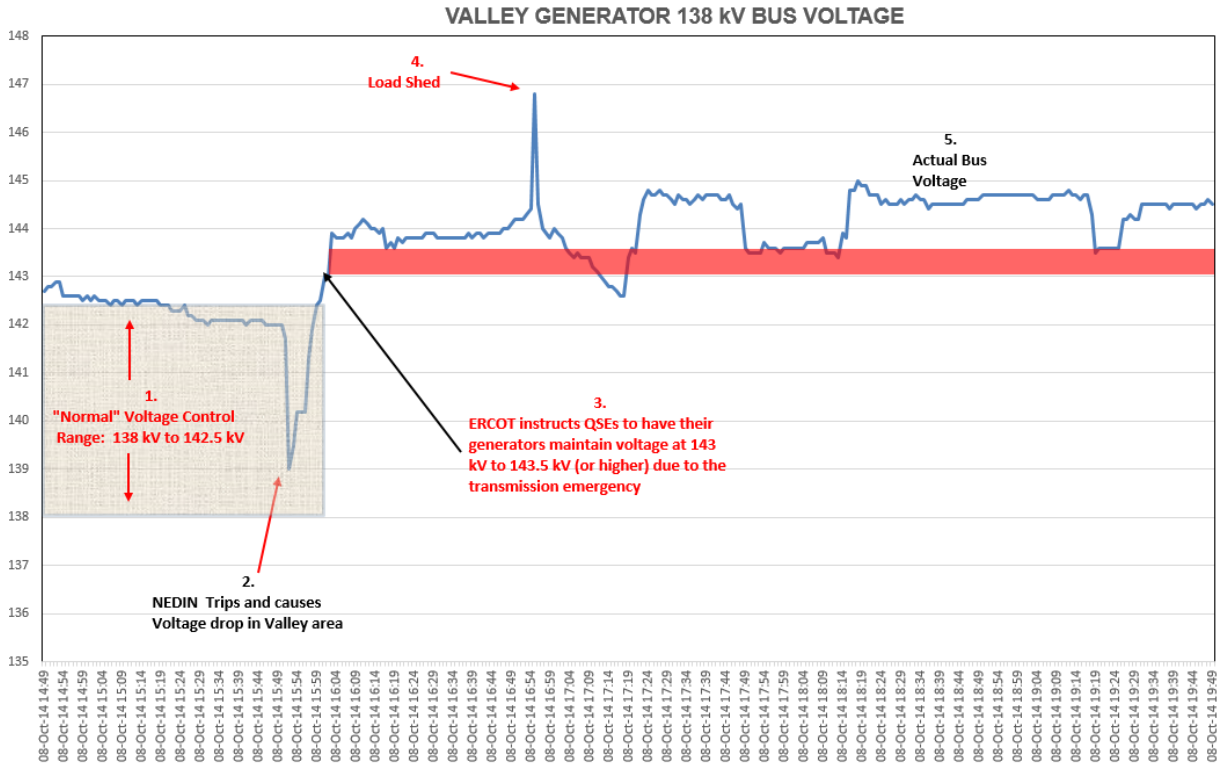


Figure 3: Example of Voltage Impacts

2. System Frequency Impacts

Target frequency for the ERCOT system is 60 Hertz (Hz). Under normal conditions, system frequency is maintained through provision of Primary Frequency Response by Generation Resources, and through ERCOT's deployment of Ancillary Services such as Regulation Up Service, Regulation Down Service, and Responsive Reserve Service. Underfrequency relays located throughout the distribution system that trip load when frequencies reach pre-established levels provide another layer of protection.

The impact of the loss of the North Edinburg units is shown below. System Frequency (ERCOT-wide) dropped when the North Edinburg units tripped but quickly recovered and remained in an acceptable range during the event. ERCOT deployed Responsive Reserve Service (RRS) and Regulation-Up Service (Reg Up) in response to the drop in System Frequency. Generators responded initially and automatically with Primary Frequency Response and then in response to ERCOT's RRS and Reg Up deployments, and System Frequency was recovered in about six minutes.

System Frequency also momentarily spiked (high) to 60.123 Hz when the initial load shed occurred. Overall, the Emergency did not significantly impact system frequency.

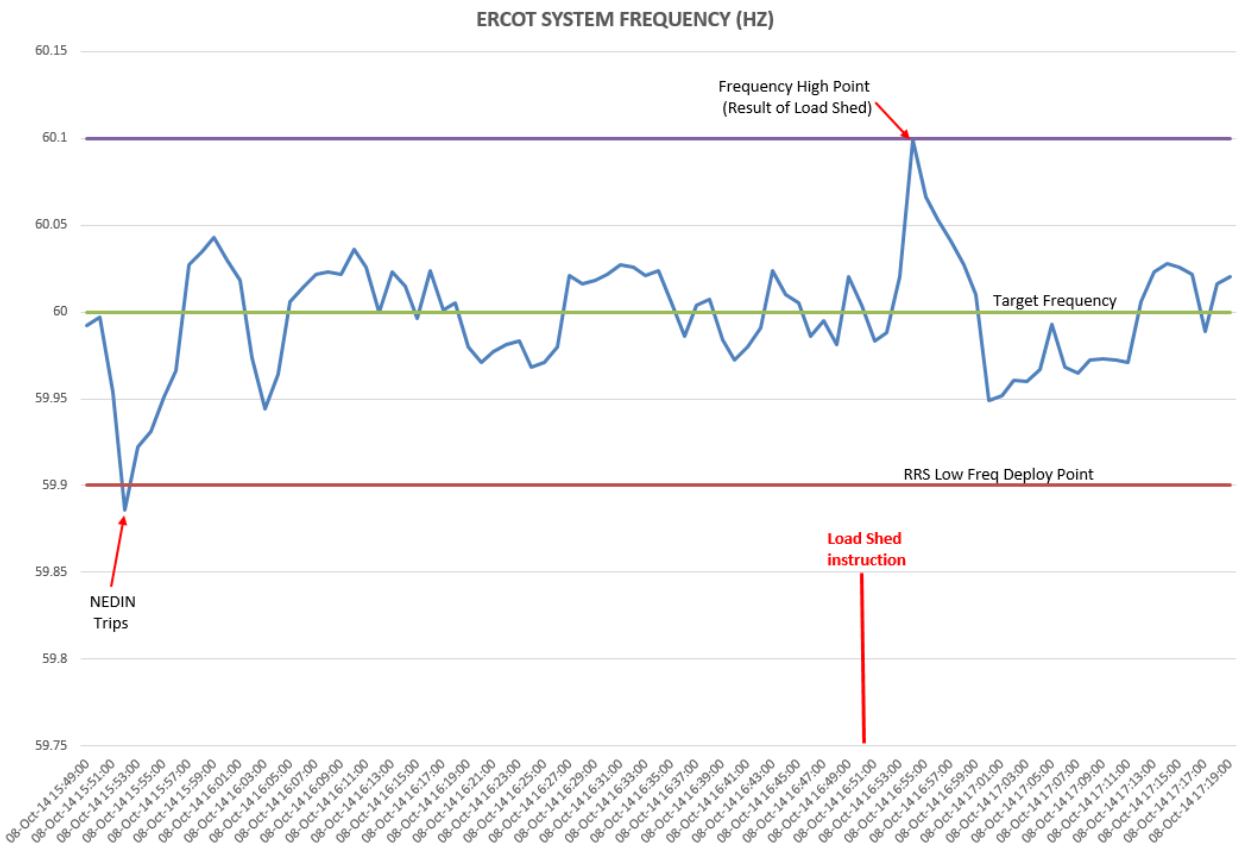


Figure 4: System Frequency Impacts

3. Generation Resources

The overall response of the QSEs and Resource Entities (REs) in the Valley Area to ERCOT's management of the Transmission Emergency was good and consistent with Protocol and Operating Guide requirements. Texas RE reviewed the performance of each Generation Resource in the Valley to determine what instructions were given by ERCOT and whether the Generation Resource complied. The Resources' responses to the requests and instructions from ERCOT appear to be in compliance with Protocol requirements.

a. Thermal Generation

Unit	Owner	Size	Status Pre-Event	Performance During the Event
North Edinburg Combined Cycle Generation Plant (also referred to as the Magic Valley Plant)	Calpine	678 MW	Unit tripped offline at full load which started the chain of events that led to the Transmission Emergency.	Calpine was able to restart one of the Gas Turbines (GT1) and operate it at a reduced capacity and provide 115 MWs to the system during the Event (by approx. 17:20). QSE made proper notifications to ERCOT.
Silas Ray Unit 5	Brownsville PUB	10 MWs	Mothballed – Outage	Mothballed - Outage
Silas Ray Unit 10	Brownsville PUB	46 MWs	On Line at 45 MWs	Unit maintained full output of 45 MWs for the duration of the event to support voltage in the Valley Area, as instructed by ERCOT.
Silas Ray CC1 (a combined cycle plant consisting of Silas Ray Units 6 and 9)	Brownsville PUB	52 MWs	On Line at 47 MWs and performing required testing.	Testing was stopped and the unit ramped to full load for the duration of the event to support voltage in the Valley Area, as instructed by ERCOT.
Duke Combined Cycle Generation Plant (Also referred to as the Hidalgo Plant)	Calpine	463 MWs	Off-line for a Maintenance Outage and unavailable.	Plant did not operate during the Transmission Emergency.
Frontera Combined Cycle Generation Plant	Frontera	524 MW	Unit was operating near its Telemetered High Sustainable Limit (HSL) of 490 MW.	Unit continued to operate near its HSL of 490 MWs until 17:55 when the plant lowered the HSL to 480 MWs where it remained for the rest of the Event.

b. Wind Generation

The two large wind plants in the Valley area, Los Vientos and Redfish, were called on to provide both megawatts (at times nearly 450 MWs) and critical voltage support during the event. Both Los Vientos and Redfish performed well during the course of the event. In accordance with instructions from ERCOT, the plants provided needed generation when called on and curtailed the output when the generation was not needed or helpful. Whether they were in generation mode or curtailment mode, they provided much needed voltage support for the Valley area.

Both wind plants experienced curtailment of their actual generation at times during the Event as ERCOT and the TOs shed and re-established load and as additional generation in the area was dispatched. These periods of curtailment were primarily due to limited ability of the existing Transmission and Distribution System in the Valley area. Further, generation that is physically or electrically "closer" to the actual Load demand is better able to serve the Load. The generation output was curtailed by the actual Load Shed Event (reduced demand), the supply of generation via the RailRoad DC Tie (50 to 90 MWs), and the return to service of one of the North Edinburg Gas Turbines (115 MWs).

The periods of wind plant curtailment were necessary to avoid overloading the transmission lines in the Valley area. The Los Vientos wind plant was actually curtailed off-line prior to and at the time of the North Edinburg trip. The wind plants provided much needed generation and voltage support immediately after the North Edinburg unit trip. Once the Load was shed, the need for the wind generation lessened and they were curtailed. As Load was restored, the Wind plants were allowed to increase output but once other generation was brought back on-line (North Edinburg GT 1) and power was imported thru the Railroad DC Tie (see below) as well as maximizing the import on the 345Kv lines from the Corpus Christi area, it became necessary to again curtail the output of both wind plants.

Unit	Owner	Size	Status Pre-Event	Performance During the Event
Los Vientos LV1A (Los Vientos 1)	Los Vientos Windpower	200 MWs	Curtailed to 0 MWs	Generated at various MW levels as directed by ERCOT Basepoints. Also provided Voltage Support per ERCOT instruction.
Los Vientos LV1B (Los Vientos 2)	Los Vientos Windpower	200 MWs	Curtailed to 0 MWs	Generated at various MW levels as directed by ERCOT Basepoints. Also provided Voltage Support per ERCOT instruction.
Redfish Wind Generation Plant (Also called the Magic Valley Wind Plant) Redfish MV1A	Magic Valley Wind	100 MWs	Online at 33 MWs	Generated at various MW levels as directed by ERCOT Basepoints. Also provided Voltage Support per ERCOT instruction.
Redfish Wind Generation Plant (Also called the Magic Valley Wind Plant) Redfish MV1B	Magic Valley Wind	100 MWs	On Line at 51 MWs	Generated at various MW levels as directed by ERCOT Basepoints. Also provided Voltage Support per ERCOT instruction.

4. Transmission Facilities

ERCOT manages the Valley area transmission system with a Generic Transmission Constraint (GTC) called the Valley Import Limit, which protects the lines in the Rio Grande Valley upon the unexpected loss of one of the 345 kV lines leading into the Valley, or upon unexpected loss of generation in the Valley area. Loss of one of the 345 kV lines or generation during high load conditions can cause overloads, voltage instability, and outages in the Valley area.

The Valley Import GTC was reached but not exceeded during the period of this event. The trips of the North Edinburg generation units caused the Valley import to reach a maximum flow of 1395 MW from 15:53 to 15:56. After the loss of the North Edinburg units and prior to the firm load shed, Real Time Contingency Analysis (RTCA) showed one base case and multiple post-contingency overloads. Several of the post-contingency thermal exceedances were outside allowed limits, which raised concerns of possible cascading outages.

After the load shed, post-contingency SOL exceedances were noted until approximately 17:53, or approximately two hours after the start of the event. RTCA showed multiple post-contingency overloads. These exceedances were within acceptable ranges.

During the period following the loss of the North Edinburg generation at 15:50 until the area was stabilized at approximately 19:15, if either of the 345 kV transmission lines into the Valley had been lost or if another major generation facility in the Valley had tripped, the Under Voltage Load Shed (UVLS) system could possibly have activated to help prevent uncontrolled loss of load and outages in the Valley area.

During the ERCOT Transmission Emergency, two of the line outages (listed below) were withdrawn by ERCOT and placed back in service by the Transmission Entity.

Outage Type	From Station	To Station	Actual Start	Planned End	Time Withdrawn	Time Back In Service
Planned	AZTECA	SE_EDINB	10/6 10:15	10/10 16:00	10/8 17:19	10/8 18:07
Planned	LAURELES MVEC	P_ISABEL	10/6 8:18	10/10 16:00	10/8 17:20	10/8 19:40 (note this line was not placed back in service until after the event)

5. DC Tie

At the time of the North Edinburg unit trip, the Railroad DC-Tie was in outage and being readied for testing. The Railroad DC-Tie had recently been in a Forced Outage (ended at 07:20 on October 7). Anticipating the need for additional local generation after the North Edinburg trip, the DC-Tie Operator Sharyland Utilities contacted ERCOT and then quickly investigated the possibility of placing the Railroad DC-Tie back into service and potentially supplying emergency power from the Mexican Grid working with Comision Federal de Electricidad (CFE). Sharyland was able to place the Railroad DC-Tie back into service and 50 MWs from CFE was imported over the DC-Tie. Later, an additional 40 MWs was obtained from CFE.

6. Load Shed and Restoration

Ultimately, there was no generation or transmission solution available to relieve both the base case and post-contingency overloads, leaving firm load shed as the only option available to relieve the SOL exceedances.

Beginning approximately 30 minutes after the North Edinburg generation units tripped, ERCOT made individual calls to AEPTC, Brownsville PUB, and STEC to advise them that a load shed was likely and to review the Mitigation Plan with them. Then, between 16:47 and 16:49, ERCOT made individual calls to AEPTC, Brownsville PUB, and STEC and issued Dispatch Instructions to each TO to shed its share of 200 MW.[3]

[3] ERCOT did not contact Sharyland Utilities, another TDSP serving the Valley, about the load shed or issue any load shed instructions.

Each of the TOs responded immediately and reported back to ERCOT within approximately 10-15 minutes. Brownsville PUB's and STEC's load shed amounts were reasonably close to the targets. However, AEPTC's initial response to ERCOT's load shed instruction greatly exceeded the target amount.

Figure 5 shows Brownsville PUB's and STEC's load shed performance as compared to their obligations. The left vertical axis shows MWs, and the right vertical axis shows approximate number of affected customers.

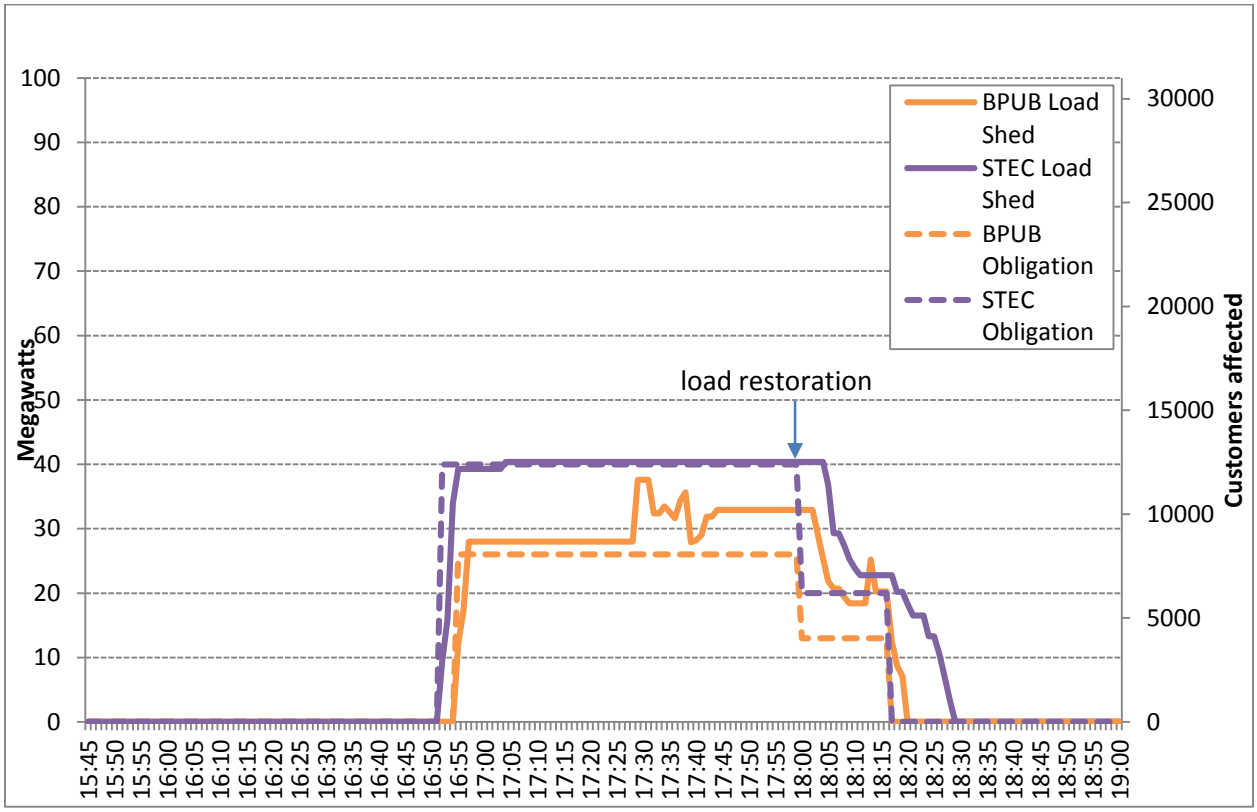


Figure 5: Brownsville PUB and STEC Load Shed Performance

Figure 6 shows AEPTC's load shed performance as compared to its obligation. The left vertical axis shows MWs, and the right vertical axis shows approximate number of affected customers.

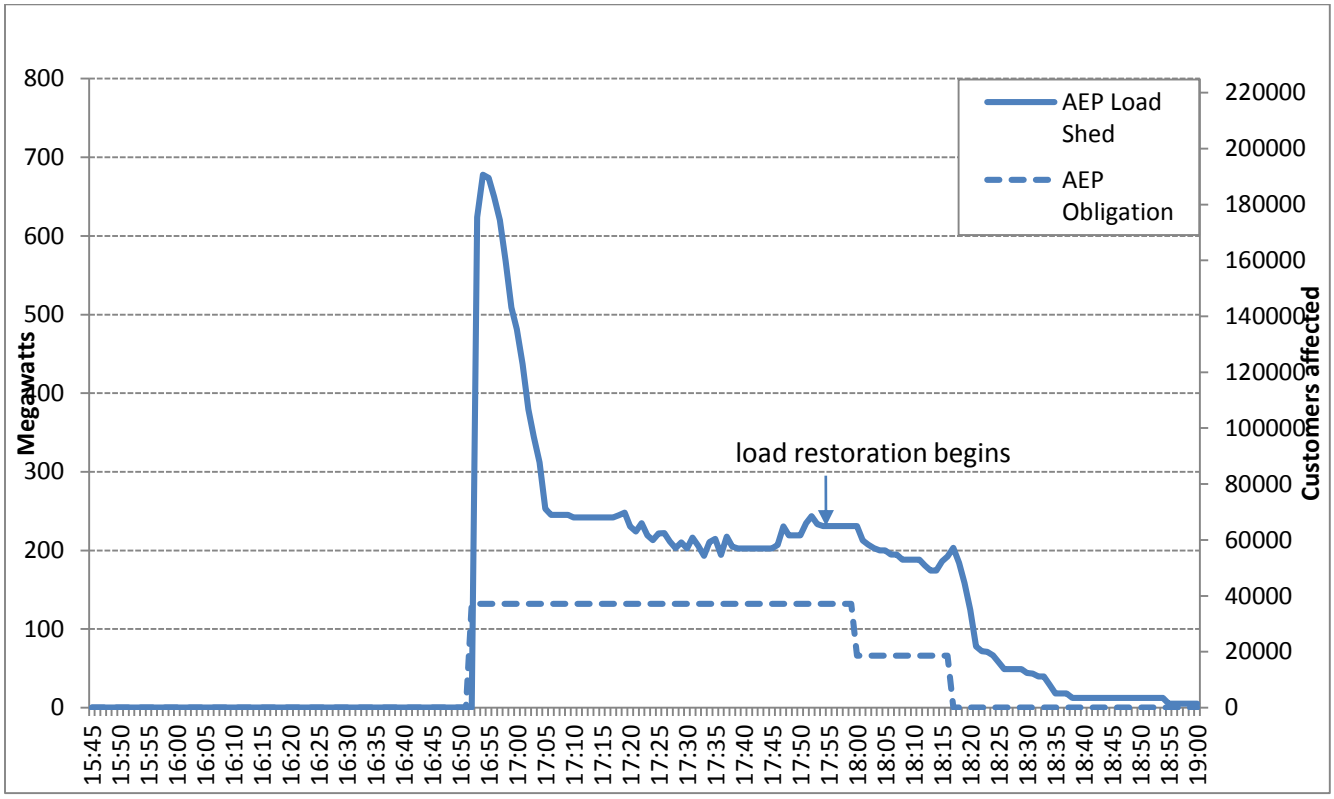


Figure 6: AEPTC Load Shed Performance

The reason for AEPTC's excess load shed appears to have been largely due to operator error. Since the time of the last manual load shed in 2011, AEPTC installed an automated load shed program which had not been used prior to the October 8 Emergency. In response to ERCOT's load shed instruction, the AEPTC operator selected an incorrect program option which resulted in the automated system attempting to interrupt all the feeders for the Valley. AEPTC quickly realized it had exceeded the instructions and promptly took steps to restore the load that was shed in excess of the instructions. Within about ten minutes, AEPTC was able to restore 370 MW of the excess load shed, but 180 MW in excess of the target amount remained interrupted until ERCOT released all load to be restored.

AEPTC's load shed in excess of ERCOT's instruction caused a brief frequency spike, which was corrected through Primary Frequency Response and ERCOT's deployment of Regulation Down Service. AEPTC's actions also caused a much larger number of end-use customers to experience power interruptions than would otherwise have been the case.

At 18:00 ERCOT began issuing instructions to restore load and by 18:29 the entire Valley load was restored.

Texas RE will further investigate AEPTC's actions during the load shed and report to the PUCT for further action, as appropriate.

III. Conclusion

If the North Edinburg power plant had not tripped off-line on the afternoon of October 8, 2014, there would have been sufficient generation, including with imported power, and transmission capacity to serve the load requirements of the Lower Rio Grande Valley. The sudden loss of all three units at North Edinburg resulted in the loss of 651 MW on an unseasonably warm day and caused low voltage conditions that ERCOT System Operators addressed by bringing available generation on line, importing power from Mexico over the DC-Tie, managing transmission constraints, increasing voltage at generation facilities, and ultimately ordering load shed to maintain reliability and system stability. Although interruption of end-use customers is undesirable, a planned and controlled load shed is always preferable to a load shed initiated by automatic relays, which could have occurred if ERCOT System Operators had not acted appropriately.

Overall, with one exception, it appears that Qualified Scheduling Entities, Generators, and Transmission Operators responded appropriately to ERCOT's instructions and acted in accordance with Protocol and Operating Guide requirements. Texas RE will further investigate AEPTC's activities during the October 8 Emergency and forward the matter to PUCT for further action, as appropriate.

APPENDIX
Glossary of Defined Terms[4]

Ancillary Service

A service necessary to support the transmission of energy to Loads while maintaining reliable operation of the Transmission Service Provider's (TSP's) transmission system using Good Utility Practice.

DC Tie

Any non-synchronous transmission interconnections between ERCOT and non-ERCOT electric power systems.

Dispatch Instruction

A specific command issued by ERCOT to a QSE, TSP or DSP in the operation of the ERCOT System.

Emergency or Emergency Condition

An operating condition in which the safety or reliability of the ERCOT System is compromised or threatened, as determined by ERCOT.

ERCOT System

The interconnected power system that is under the jurisdiction of the PUCT and that is not synchronously interconnected with either the Eastern Interconnection or the Western Electricity Coordinating Council.

Forced Outage

An Outage initiated by protective relay, or manually in response to an observation by personnel that the condition of equipment could lead to an event, or potential event, that poses a threat to people, equipment, or public safety.

For a Generation Resource, an Outage that requires immediate removal, either through controlled or uncontrolled actions, of all or a portion of the capacity of the Resource from service through automated or manual means. This type of Outage usually results from immediate mechanical/electrical/hydraulic control system trips and operator-initiated actions in response to a Resource's condition.

Generation Resource

A generator capable of providing energy or Ancillary Service to the ERCOT System and is registered with ERCOT as a Generation Resource. The term "Generation Resource" used by itself in these Protocols does not include a Non-Modeled Generator.

Good Utility Practice

Any of the practices, methods, and acts engaged in, or approved by, a significant portion of the electric utility industry during the relevant time period, or any of the practices, methods, and acts that, in the exercise of reasonable judgment in light of the facts known at the time the decision was made, could have been expected to accomplish the desired result at a reasonable cost

[4] Definitions are taken from ERCOT Protocols and Operating Guides

consistent with good business practices, reliability, safety, and expedition. Good Utility Practice is not intended to be limited to the optimum practice, method, or act, to the exclusion of all others, but rather is intended to include acceptable practices, methods, and acts generally accepted in the region.

Load

The amount of energy in MWh delivered at any specified point or points on a system.

Maintenance Outage

An Outage initiated manually to remove equipment from service to perform work on components that could be postponed briefly but that is required to prevent a potential Forced Outage and that cannot be postponed until the next Planned Outage. Maintenance Outages are classified as follows:

(1) **Level 1 Maintenance Outage** – Equipment that must be removed from service within 24 hours to prevent a potential Forced Outage;

(2) **Level II Maintenance Outage** – Equipment that must be removed from service within seven days to prevent a potential Forced Outage; and

(3) **Level III Maintenance Outage** – Equipment that must be removed from service within 30 days to prevent a potential Forced Outage.

Market Participant

An Entity, other than ERCOT, that engages in any activity that is in whole or in part the subject of these Protocols, regardless of whether that Entity has signed an Agreement with ERCOT. Examples of such an Entity include but are not limited to the following: LSE, QSE, TDSP, CRR Account Holder, Resource Entity, IMRE and REC Account Holder.

Mitigation Plan

A set of pre-defined actions to execute post-contingency to address voltage issues or reduce overloading on one or more given, monitored Transmission Facilities to below their Emergency Rating with restoration of normal operating conditions within two hours. A Mitigation Plan must be implementable and may include transmission switching and Load shedding. Mitigation Plans shall not be used to manage constraints in SCED by either activating them or deactivating them.

Outage

The condition of a Transmission Facility or a portion of a Facility, or Generation Resource that is part of the ERCOT Transmission Grid and defined in the Network Operations Model that has been removed from its normal service, excluding the operations of Transmission Facilities associated with the start-up and shutdown of Generation Resources.

Planned Outage

An Outage that is planned and scheduled in advance with ERCOT, other than a Maintenance Outage or Opportunity Outage.

Primary Frequency Response

The instantaneous proportional increase or decrease in real power output provided by a Resource and the natural real power dampening response provided by Load in response to system frequency deviations. This response is in the direction that stabilizes frequency.

Real Time

The current instant in time.

Regulation Service

An Ancillary Service that consists of either Regulation Down Service (Reg-Down) or Regulation Up Service (Reg-Up).

Responsive Reserve Service

An Ancillary Service that provides operating reserves that is intended to:

(a) Arrest frequency decay within the first few seconds of a significant frequency deviation on the ERCOT Transmission Grid using Primary Frequency Response and interruptible Load;
(b) After the first few seconds of a significant frequency deviation, help restore frequency to its scheduled value to return the system to normal;
(c) Provide energy or continued Load interruption during the implementation of the EEA; and
(d) Provide backup regulation.

Temporary Outage Action Plan

A temporary set of pre-defined actions to execute post-contingency, during a specified Transmission Facility or Resource Outage, in order to address voltage issues or reduce overloading on one or more given, monitored Transmission Facilities to below their Emergency Rating with restoration of normal operating conditions within two hours. A TOAP must be implementable and may include transmission switching and/or Load shedding. TOAPs shall not be used to manage constraints in SCED by either activating them or deactivating them.

Transmission Operator

Entity responsible for the safe and reliable operation of its own portion or designated portion of the ERCOT Transmission System. Every Transmission Service Provider (TSP) or Distribution Service Provider (DSP) in the ERCOT Region shall either register as a TO, or designate a TO as its representative and with the authority to act on its behalf.

Transmission Service Provider

An Entity under the jurisdiction of the PUCT that owns or operates Transmission Facilities used for the transmission of electricity and provides Transmission Service in the ERCOT Transmission Grid.

Verbal Dispatch Instruction

A Dispatch Instruction issued orally.