

BEFORE THE MISSOURI PUBLIC SERVICE COMMISSION

In the Matter of the Joint Application)	
of Entergy Arkansas, Inc., Mid South)	
TransCo LLC, Transmission Company)	
Arkansas, LLC and ITC Midsouth LLC)	File No. EO-2013-0396
for Approval of Transfer of Assets and)	
Certificate of Convenience and Necessity,)	
and Merger and, in connection therewith,)	
Certain Other Related Transactions)	

EXHIBIT JEJ-8

OUTAGE CAUSE ANALYSIS REPORT AND DOCUMENTATION



Root Cause Analysis Report

Outage Date : 03/12/2010

Circuits : Hunters Creek-Wabash

Outage Initiating : 1

Initiating Codes

- 1 = Element-Initiated Outage
- 2 = Other Element-Initiated Outage
- 3 = AC Substation-Initiated Outage
- 4 = AC/DC Terminal-Initiated Outage
- 5 = Other Facility-Initiated Outage

Initiating Cause : 11

Cause Codes

- 1 = Failed AC Station Equipment
- 2 = Failed Protection System Equipment
- 3 = Failed AC Circuit Equipment
- 4 = Weather, excl. Lightning
- 5 = Lightning Only
- 6.1 = Vegetation -- Cat 1 (Grow-in)
- 6.2 = Vegetation -- Cat 2 (Fall-in inside ROW)
- 6.3 = Vegetation -- Cat 3 (Fall-in outside ROW)
- 7 = Foreign Interference
- 8.1 = External -- Distribution Through Fault
- 8.2 = External -- All, excl Dist Through Fault

Written By : ekeeler

Outage Time : 0125

Voltage : 120 kV

Fault Type : 3

Fault Types

- 1 = There was no target because no fault occurred
- 2 = Phase target(s) (i.e., phase-to-phase fault(s))
- 3 = Ground target(s) (i.e., phase-to-ground fault(s))
- 4 = Both phase target(s) and ground target(s)
- 5 = Unknown target(s)

Sustained Cause :

- 9 = Human Error
- 10 = Other
- 11 = Unknown
- 12 = Environmental
- 13 = Contamination
- 14 = Fire
- 15 = Vandalism, Terrorism, Malicious Acts
- 16 = Failed AC/DC Terminal Equipment
- 17 = Failed DC Circuit Equipment
- 18 = Power System Condition

Date : 05/03/2010

Duration : 0

Completed Date : 05/03/2010

Description:

The Hunters Creek-Robin-Wabash line opened and reclosed at 0125 hours on 3/12/10.

Analysis:

Relay data indicated a Z-G fault near Structures 3134. A patrol was requested between Structures 3131-3138. No lightning was detected although this line has had shielding failure outages in the past.

Corrective Action:

ULC Towers patrolled the target area but did not find any indication as to the cause of the fault. The line will have double shield wire peaks and an additional ground wire installed on it by the end of 2010 to alleviate some of the lightning related outages on this line, even though this outage was not caused by lightning.

Hunters Creek-Robin-Wabash

Circuit Characteristics

The Hunters Creek-Robin and Robin-Wabash circuits are paralleled 477 kcmil 26/7 ACSR for the majority of the length. Where there are only 3 conductors it is 954 kcmil 54/7 ACSR. The Imlay Pumping and Otsego tap are tapped off the Robin-Wabash circuit. The Imlay Pumping branch of the circuit is 795 kcmil 26/7 ACSR. A pole top switch with the Otsego Tap is on the Imlay Pumping branch. The Otsego tap is 954 kcmil 54/7 ACSR. There is one shield wire on the line. It varies between 3/8" steel, 7/16" steel, and 3/0 ACSR. There are two transposition towers on the Robin-Wabash section of the line.

The majority of the line was built in 1949, going to Bunce Creek, all on lattice towers. The line was rearranged in 1970 to go to Wabash. This section is comprised of 21 towers that were built at that time. The tap to Imlay Pumping was constructed in 1974 on steel poles. The GOAB switch and wood pole tap to Otsego was built in 2003.

The structures used to build the line in 1949 are still structures we would use today although the design was modified in 1951 using some larger members. Since the tower design was modified in 1951, double ground wire peaks have been designed for this family of towers (AA, AB, AC, AD, and AH.) Any new design would utilize these peaks for improved shielding. The structures used in 1970 are not normally used in new design today except in cases where they would be used to match existing line characteristics. Wood poles are not used for new construction on the ITC *Transmission* system.

Outage History

The Hunters Creek-Robin-Wabash line has had numerous outages on it during the past several years. There have been 36 outages on the line since 1990, not including station caused outages or externally caused outages. The outage breakdown is described below:

1. Galloping: There have been 5 galloping related outages on the line. Three of these outages occurred within an hour of each other in 1991 during the same storm event. The other galloping outages did not occur until 2006 and 2007 during ice storms. Several other lines on the system experienced galloping during these storms as well. It was not isolated to just this line.
2. Lightning: This line has had 10 lightning related outages with 7 of them occurring since 2003. There have been 3 lightning outages in 2008. The line currently has only 1 shield wire. ITC's current standard is to install 2 shield wires for any new construction because of the increased lightning protection. The poor lightning performance on this line is most likely due to the lack of adequate shielding protection.
3. Wind/Weather: There have been 6 wind and weather related outages, 2 of which occurred during the same storm event in 1992. Specifics were not given for these outages but an outage with a wind/weather cause currently is

for storm events that the structures are not designed to handle or for debris that the wind has blown into the line during storms. None of these outages occurred during the winter months so snow/ice did not cause them.

4. Other: This line had 1 outage that is classified as other. Because this occurred in 1995, the records for the outage are not detailed and the exact cause of the outage is not known. Normally an "other" cause is for an unusual event that is not a typical outage that one can predict.
5. Unknown: The most frequent cause of outages on the Hunters Creek-Robin-Wabash line is the unknown cause, occurring 14 times since 1990. After each outage, a line patrol is performed. An aerial patrol is currently performed after the initial ground patrol if nothing is found. A field supervisor leads this aerial patrol and may perform a ground patrol on their own. If nothing is found, the outage is classified as unknown. If the line involved is a 345 kV line, a climbing patrol is done within the target area before the outage can be classified as unknown.

Recent Inspections

The Hunters Creek-Robin line was last climbed in 2005. There were no abnormalities noted for the structures.

An aerial inspection was performed on both the Hunters Creek-Robin line and the Robin-Wabash line in June and November 2007 and May and September 2008. Follow-up ground patrols were performed following the aerial patrols to fix any problems found.

The wood poles on the Otsego tap were inspected in 2005.

Recommendations

Engineering recommends one or both of the following projects for the Hunters Creek-Robin-Wabash circuit:

1. Install double groundwire peaks and a second shield wire. Almost a third of the outages on the line since 1990 have been related to lightning with 70% of those outages occurring in the past 5 years. A single shield wire is not ITCTransmission's standard and we would be improving the lightning performance of this line by increasing the shielding. The shielding angle on the majority of the current towers on the line is 41°. With the addition of a double ground wire peak, the angle can be lowered to 7.85°. The generally accepted industry standard is a shielding angle less than 30°. It is also possible that some of the unknown outages could have been attributable to lightning. The lightning may not have caused damage or a lightning study may not have been performed for some of the older unknown outages.
2. Replace the insulators on the line. This line is almost 60 years old. The insulators are nearing the end of their life. Several unknown outages could be due to flashed insulators where the damage could not be seen from an aerial or ground patrol. If an

insulator is nearing the end of its life, it will no longer provide proper protection and could flash over. Testing could be performed on a random sampling of towers to determine if insulators have gone bad. If a high number of bad insulators is discovered, it would be prudent to replace them all since they are all of the same vintage and are reaching the end of their life.