ERCOT Independent Review

AEPSC Presidio Area Reliability Improvements Study

© 2006 Electric Reliability Council of Texas, Inc. All rights reserved.

Table of Contents

AEPSC Presidio Area Reliability Improvements Study i

AEPSC Presidio Area Reliability Improvements Study 1

1. Introduction to Project submitted 1
2. Model Set Up 2
3. Reliability Study 3
4. Summary 6

© 2006 Electric Reliability Council of Texas, Inc. All rights reserved.

AEPSC Presidio Area Reliability Improvements Study

1. Introduction to Project submitted

The town of Presidio receives electric service via an approximately 60-mile 69-kV line that is radially connected from the Alamito Creek station. This 69-kV line was originally constructed in 1948 and has recently experienced a large number of outages due to lightning strikes and the deteriorating conditions of the line. The pre-contingency and post-contingency voltage at Presidio is expected to fall below criteria in 2009.

American Electric Power Service Corporation (AEPSC) has proposed the following projects to mitigate these problems:

- Install a second 138/69-kV autotransformer at Alamito Creek Substation
- Install a 4.8 MW NaS battery at Presidio Substation
- Construct a new Alamito Creek-Presidio 69-kV line (built for 138-kV service)

AEPSC estimated the cost of these projects to be $67 million. The purpose of this study was to verify the need for these projects. A steady state voltage analysis was performed to determine this need. The project area is shown in figure 1.

© 2008 Electric Reliability Council of Texas, Inc. All rights reserved.

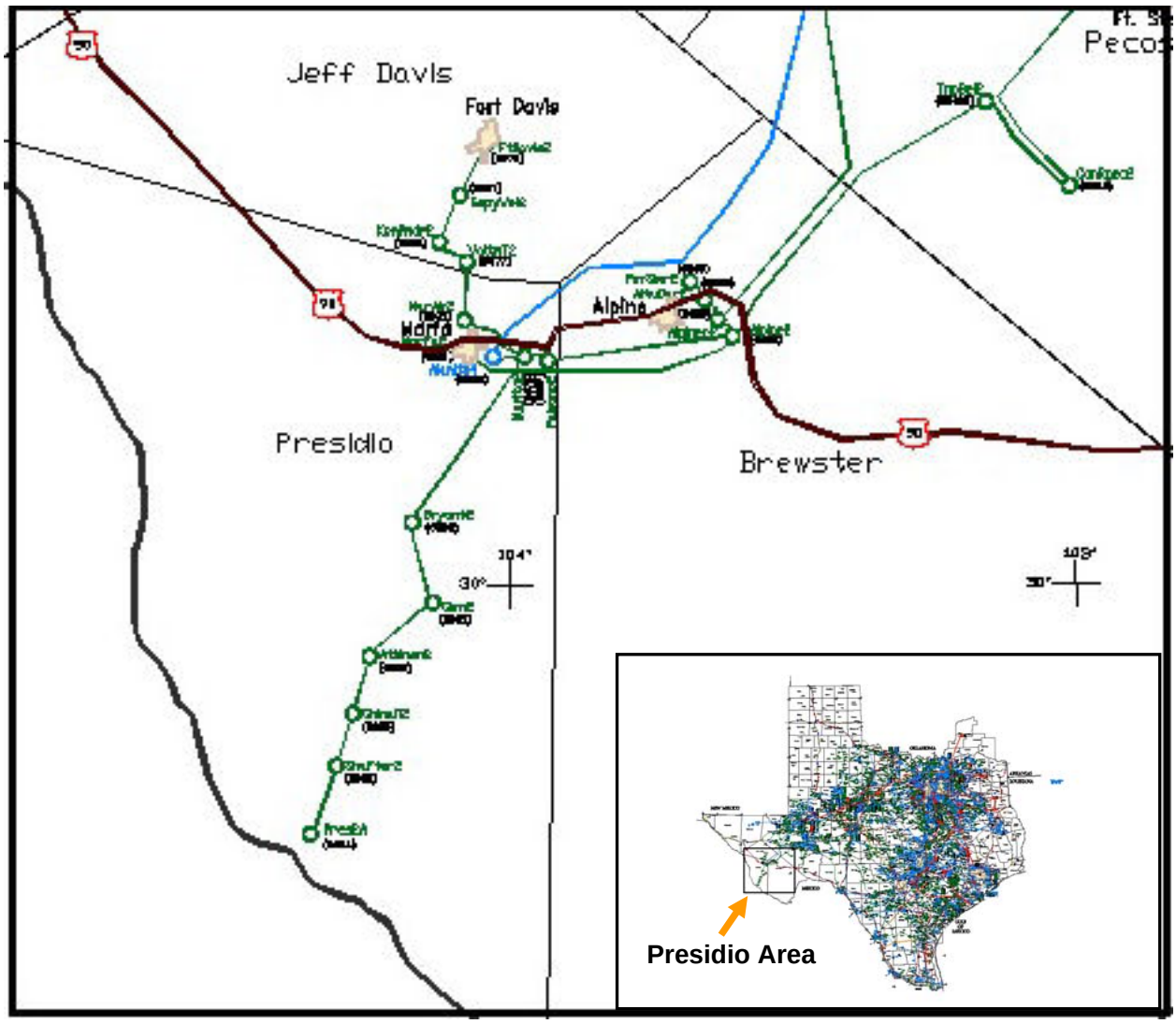

Figure 1: Presidio Area

2. Model Set Up

The Steady State Working Group (SSWG) 2009, 2010, 2011, and 2012 summer peak base cases that were updated in March 2008 (09sum1eco03082008, 10sum1eco03082008, 11sum1eco03082008, and 12sum1eco03082008) were used for this analysis. The 2010 through 2012 summer peak base cases originally had a FACTS device modeled at Presidio. AEP has no firm plans to install this device so it was taken out of service for the duration of the analysis. Also, the 2012 summer peak base case had the Alamito Creek-Presidio 69-kV line as upgraded and a second Alamito Creek 138/69-kV autotransformer added. These upgrades were removed in order to study a non-upgraded case.

For purposes of studying the upgrades the following modeling changes were made to the study cases:

© 2008 Electric Reliability Council of Texas, Inc. All rights reserved.

The autotransformer upgrade was modeled by adding a second 138/69-kV autotransformer at Alamito Creek with the following characteristics:

R = 0.0101 pu; X = 0.1828 pu; Rate A = 33.3 MVA; Rate B = 33.3 MVA

The NaS battery was modeled as a negative load at Presidio with the following characteristics:
P = -4.8 MW; Q = 0 MVAR

The line upgrade was modeled by adding a 33.5 mile Alamito Creek-Chinati 69-kV line and a 26.9 mile Chinati-Presidio 69-kV line with the following characteristics:

Alamito Creek-Chinati:
R = 0.0844 pu; X = 0.4777 pu; B = 0.0101 pu; Rate A = 109 MVA; Rate B = 109 MVA

Chinati-Presidio:
R = 0.0678 pu; X = 0.3836 pu; B = 0.0081 pu; Rate A = 109 MVA; Rate B = 109 MVA

Additionally, the existing Shafter Goldmine-Presidio and Alamito Creek-Bryants Ranch 69-kV lines were taken out of service when the line upgrade was added.

3. Reliability Study

Currently, neither the Alpine-Barilla Junction nor the Alpine-Belding-Conoco Comp Station-Fort Stockton 69-kV lines can be taken out of service for maintenance during even fall peak conditions because the contingency loss of the in-service line causes the Alamito Creek 138/69-kV autotransformer to overload post-contingency. This results in the need for an additional 138/69-kV autotransformer at Alamito Creek.

Steady state voltage analysis was performed on the base case in order to determine the need for the proposed NaS battery and line upgrade. Voltage was measured at Presidio in each of the study cases under base case (n-0) conditions and for the contingency loss of the Barilla Junction-Alamito Creek 138-kV line. Table 1 shows the results of this analysis for each of the cases:

Year:	2009	2010	2011	2012
n-0	0.94 pu	0.87 pu	0.86 pu	0.86 pu
Contingency loss of Barilla Junction-Alamito Creek 138-kV line	0.84 pu	0.76 pu	0.63 pu	0.63 pu

Table 1: Presidio voltage in study case

A second Alamito Creek 138/69-kV autotransformer was added to each of the study cases to determine if this improvement changed the voltage at Presidio. Voltage analysis was rerun for each of the cases with this upgrade and the results are presented in Table 2.

Year:	2009	2010	2011	2012

© 2008 Electric Reliability Council of Texas, Inc. All rights reserved.

n-0	0.94 pu	0.86 pu	0.86 pu	0.85 pu
Contingency loss of Barilla Junction-Alamito Creek 138-kV line	0.84 pu	0.76 pu	0.63 pu	0.63 pu

Table 2: Presidio voltage in study case with second Alamito Creek autotransformer

The results show that pre-contingency voltage is below the ERCOT planning criterion of 0.95 pu in all years. Likewise, the post-contingency voltage is below ERCOT criteria for all years studied.

In order to relieve the voltage criteria violations the line upgrade was added to the study cases and the analysis was rerun. The results are summarized in Table 3.

Year:	2009	2010	2011	2012
n-0	1.02 pu	1.01 pu	1.01 pu	1.01 pu
Contingency loss of Barilla Junction-Alamito Creek 138-kV line	1.04 pu	1.01 pu	0.99 pu	0.98 pu

Table 3: Presidio voltage in study case with the second Alamito Creek autotransformer and the 69-kV line upgrade

The results showed that the voltage at Presidio stayed above 0.95 pu for both pre-contingency and post-contingency conditions. However, AEPSC estimated that the soonest the line upgrade could be in-service would be late 2010 which means that the values shown in Table 3 are not achievable in 2009 and 2010. Thus, without additional upgrades, Presidio voltage would still be below ERCOT planning criteria for summer 2009 and summer 2010. The NaS battery was added to the study case without the line upgrade and voltage analysis was rerun. The results are shown in Table 4.

Year:	2009	2010	2011	2012
n-0	0.99 pu	0.99 pu	1.01 pu	1.01 pu
Contingency loss of Barilla Junction-Alamito Creek 138-kV line	0.97 pu	0.98 pu	0.96 pu	0.94 pu

Table 4: Presidio voltage in study case with the second Alamito Creek autotransformer and NaS battery

The results show that the addition of the NaS battery allows the voltage criteria to be maintained until 2012 when the post-contingency voltage drops below 0.95 pu.

Based strictly on the voltage analysis, the addition of a NaS battery at Presidio prevents the voltage from falling below ERCOT planning criteria until the line can be constructed. Furthermore, the NaS battery provides reliability benefits since it can supply back-up power to loads when the radial line from Alamito Creek is out of service under contingency.

© 2008 Electric Reliability Council of Texas, Inc. All rights reserved.

AEPSC also analyzed operating the line at 138-kV and installing autotransformers at Chinati and Presidio to step the voltage down. This would add approximately $6 million to the cost without providing measurable near-term benefit. Another option presented by AEPSC was to construct the line for 69-kV service instead of 138-kV service. This option would save approximately $3 million. However, if 138-kV service is required later due to potential load growth in the area, it would be expensive to have to later upgrade to 138-kV service. Because of this it is reasonable to construct the line for 138-kV service at this point in case it is needed in the future since the cost is relatively low when compared to the potential future cost of upgrading the line to 138-kV service if it were built for 69-kV service.

In addition to the options presented by AEPSC, several other options where discussed during the comment and response phase of the RPG review as well as during the RPG meeting on May 16, 2008, including:

1. Installation of a small asynchronous tie with CFE – A 10 MW VSC asynchronous tie would have comparable cost but is estimated to take two additional years to install. An asynchronous tie this size can not be scaled up to a size that would be more commercially significant in the future. It would have to be completely replaced. A 100 MW VFT asynchronous tie would be more than twice the cost and still not be in place for an additional two years or longer.
2. Installation of 10 MW Diesel Generation - A regulated transmission provider can not provide generation services, such as merchant generation or an RMR facility. Generation services must be provided by an unregulated market participant. ERCOT has not received any generation interconnection study requests for generation facilities near Presidio.
3. Block load transfer to CFE – This option still requires the load in the area to be subject to outages before and after block load transfer to CFE occurs. At present time, the block load tie to CFE is unable to serve the entire load.
4. Addition of static capacitors – Studies showed that 2 additional 3.6 MVar banks had to be installed at both Presidio and Chinati to get the 2010 post-contingency voltage above 0.9 p.u. at Presidio. However, this caused the line segment from Alamito to Bryant Ranch to overload its 20 MVA rating to 104% at the Alamito end due to the MVar flow from the capacitor banks and the MW flow to the load at Presidio. Installing one less bank at either Presidio or Chinati prevents this line from overloading but does not bring the post-contingency voltage at Presido above 0.9 p.u. This demonstrates that due to the small capacity of the line from Alamito to Presidio, any static or dynamic MVar solution has to be distributed along the line and ultimately does not allow voltage criteria to be met. It also does nothing to improve the power quality at Presidio.

The line was built in 1948 as a 33 kV line using a conductor that are common to those serving an individual home today. The poles and cross-arms are all wooden and are failing at an "unacceptable rate". The line traverses some of the roughest terrain which makes "access for maintenance and repair costly" and lengthy.

AEPSCs project submittal showed that the existing line, which does not have a static wire

© 2008 Electric Reliability Council of Texas, Inc. All rights reserved.

protecting it, has experienced 247 momentary outages from 2001 to 2006. Nine permanent outages have occurred with outage durations as high as 11.2 hours and averaging 6.8 hours. Voltage recorder data recorded 81 poor voltage service quality events from July 8 to September 8, 2007 with eight events recorded in a single day.

In submitting the reviewed project, APESC cites for justification that "The Public Utility Regulatory Act §38.005 relating to Electric Service Reliability Measures states:

> (d) The standards shall ensure that electric utilities do not neglect any local neighborhood or geographic area, including rural areas, communities of less than 1,000 persons, and low-income areas, with regard to system reliability."

In response to comments received that this project has a high cost for the amount of load benefiting from the project, AEPSC states:

> the PUCT has set the threshold for service that does not discriminate based on cost of service. ERCOT has a postage stamp rate, under which all transmission customers pay a system average rate for reliable service even though the cost to serve those customers varies from place to place. The large customers in Texas have enjoyed the benefits of the transmission postage stamp; Presidio should receive the benefit of at least the minimum level of service.

4. Summary

The existing 69-kV line from Alamito Creek to Presidio will not allow the load at Presidio to be reliably served in 2009 and beyond. It should be rebuilt as soon as possible but estimates show it can not be completed before late 2010. In order to meet reliability requirements, ERCOTs studies show that AEPSCs proposed NaS battery installation before summer 2009 will allow reliability requirements to be met until the rebuild of the transmission line is complete. ERCOT staff agrees that the installation of a second 138/69-kV autotransformer at Alamito Creek Substation, the 4.8 MW NaS battery at Presidio Substation and the construct a new Alamito Creek-Presidio 69-kV line (built for 138-kV service) are needed to maintain reliable service in the area.

© 2008 Electric Reliability Council of Texas, Inc. All rights reserved.