GEN-2012-020

Impact Restudy for Generator Modification

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By SPP Generator Interconnections Dept.

REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION
03/08/2019	SPP	Initial report issued.

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SUMMARY

The GEN-2012-020 Interconnection Customer has requested a modification to its 478 MW Interconnection Request. This system impact restudy was performed to determine the effects of changing wind turbine generators from 284 GE 1.68 MW wind turbine generators (for a total of 477.12MW) to 239 Vestas 2.0 MW wind turbine generators (for a total of 478MW). The point of interconnection (POI) for GEN-2012-020 remains at the Southwestern Public Service (SPS) Tuco 230kV Substation.

This study was performed by Aneden Consulting to determine whether the request for modification is considered Material. A short circuit analysis, power factor analysis, a low-wind/no-wind condition analysis, and stability analysis was performed for this modification request. The study report follows this executive summary.

The generating facility will be required to maintain a 95% lagging (providing VARs) and 95% leading (absorbing VArs) power factor at the POI. Additionally, the project will be required to install approximately 41.3 MVArs of reactor shunts on its substation 230 kV bus. This is necessary to offset the capacitive effect on the transmission network caused by the project's transmission line and collector system during low-wind/no-wind conditions.

The restudy showed that no stability problems were found during the summer and the winter peak conditions as a result of changing to the Vestas 2.0MW wind turbine generators. Additionally, the project wind farm was found to stay connected during the contingencies that were studied and, therefore, will meet the Low Voltage Ride Through (LVRT) requirements of FERC Order #661A. The requested modification is not considered Material.

It should be noted that this study analyzed the requested modification to change generator technology and layout. Powerflow analysis was not performed. This study analyzed many of the most probable contingencies, but it is not an all-inclusive list and cannot account for every operational situation. It is likely that the customer may be required to reduce its generation output to 0 MW, also known as curtailment, under certain system conditions to allow system operators to maintain the reliability of the transmission network.

Nothing in this study should be construed as a guarantee of transmission service or delivery rights. If the customer wishes to obtain deliverability to final customers, a separate request for transmission service must be requested on Southwest Power Pool's OASIS by the customer.

A: CONSULTANT'S MATERIAL MODIFICATION STUDY REPORT

See next page for the Consultant's Material Modification Study report

Submitted to
Southwest Power Pool

Report On

GEN-2012-020 Study
Modification Request Impact Study

Revision R1

Date of Submittal
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Executive Summary

Aneden Consulting (Aneden) was retained by the Southwest Power Pool (SPP) to perform a Modification Request Impact Study (Study) for GEN-2012-020, an active generation interconnection request with point of interconnection (POI) at the TUCO 230 kV substation.

GEN-2012-020 has proposed to interconnect in the Southwestern Public Service Company (SPS) control area with a capacity of 477.12 MW including 284 x GE 1.68MW wind turbines as shown in Table ES-1 below. This Study has been requested to evaluate the modification of GEN-2012-020 to change the turbine configuration to a combination of 239 x Vestas 2.0 MW wind turbine generators for a total capacity of 478 MW. The new configuration also has 2 x 68 MVAr capacitor banks at the 230 kV of the collector substation. In addition, the modification request included changes to the generation interconnection line and the main substation transformers. The modification request changes are shown in Table ES-2 below.

Table ES-1: Existing GEN-2012-020 Configuration

Request	Capacity (MW)	Existing Generator Configuration	Point of Interconnection
GEN-2012-020	477.12	284 x GE 1.68MW	Tuco 230kV (525830)

Table ES-2: GEN-2012-020 Modification Request

Facility	Existing		Modification Request
Point of Interconnection	TUCO 230 kV Substation (525830)		TUCO 230 kV Substation (525830)
Configuration/Capacity	284 x GE 1.68 MW = 477.12 MW		239 x Vestas 2.0 MW = 478 MW
Generation Interconnection Line	Length = 18.06 miles R = 0.002590 pu X = 0.020240 pu B = 0.069480 pu		Length = 15.8 miles R = 0.001400 pu X = 0.015830 pu B = 0.048360 pu
Main Substation Transformer	**Two Transformers:** Z = 7.5%, Rating 180 MVA		**Three Transformers:** Z = 11.2%, Rating 126 MVA
Equivalent Collector Line	**Collector Line 1:** R = 0.006300 pu X = 0.007950 pu B = 0.109600 pu	**Collector Line 2:** R = 0.006030 pu X = 0.007660 pu B = 0.113200 pu	R = 0.002683 pu X = 0.003986 pu B = 0.360465 pu
Reactive Power Devices	N/A		2 x 68 MVAR 230 kV Capacitor Banks

GEN-2012-020 was last studied as part of Group 6 in the DISIS-2012-002 ReStudy #2 published on August 2013. Aneden performed reactive power analysis, short circuit analysis and dynamic stability analysis using the modification request data based on the DISIS-2016-001 ReStudy #1 Group 6 study models:

1. 2016 Winter Peak (2016WP),

2. 2017 Summer Peak (2017SP),
3. 2020 Summer Peak (2020SP),
4. 2020 Winter Peak (2020WP), and
5. 2025 Summer Peak (2025SP).

The results of the reactive power analysis, also known as the low-wind/no-wind condition analysis, performed using all five models showed that the GEN-2012-020 project may require a 41.3 MVAr shunt reactor on the 230 kV bus of the project substation. The shunt reactor is needed to reduce the reactive power transfer at the POI to approximately zero during low/no wind conditions while the generation interconnection project remains connected to the grid.

The results from short circuit analysis showed that the maximum change in the fault currents in the immediate systems at or near GEN-2012-020 was 2.05%. All three-phase current levels with the GEN-2012-020 generator online was below 32 kA in both the 2017SP and 2025SP models.

The dynamic stability analysis was performed using the five loading scenarios 2016 Winter Peak, 2017 Summer Peak, 2020 Summer Peak, 2020 Winter Peak and 2025 Summer Peak simulating up to 179 contingencies that included three-phase faults, three phase faults on prior outage cases, and single-line-to-ground faults with stuck breakers faults.

There were no other machine rotor angle damping or transient voltage recovery violations observed in the simulated fault events associated with GEN-2012-020. Additionally, the project wind farm was found to stay connected during the remaining contingencies that were studied and, therefore, will meet the Low Voltage Ride Through (LVRT) requirements of FERC Order #661A.

The results of this Study show that the GEN-2012-020 Modification Request does not constitute a material modification.

1.0 Introduction

Aneden Consulting (Aneden) was retained by the Southwest Power Pool (SPP) to perform a Modification Request Impact Study (Study) for GEN-2012-020, an active generation interconnection request with point of interconnection (POI) at the TUCO 230 kV Substation.

GEN-2012-020 has proposed to interconnect in the Southwestern Public Service Company (SPS) with a capacity of 477.12 including 284 x GE 1.68MW wind turbines as shown in Table 1-1 below. Details of the modification request as provided in Section 2.0 below.

Table 1-1: Existing GEN-2012-020 Configuration

Request	Capacity (MW)	Existing Generator Configuration	Point of Interconnection
GEN-2012-020	477.12	284 x GE 1.68MW	Tuco 230kV (525830)

1.1 Scope

The Study included short circuit, reactive power and dynamic stabilities. The methodology, assumptions and results of the analyses are presented in the following five main sections:

1. Project and Modification Request
2. Reactive Power Analysis
3. Short Circuit Analysis
4. Dynamic Stability Analysis
5. Conclusions

Aneden performed a reactive power analysis, short circuit analysis and dynamic stability analysis using a set of modified study models developed using the modification request data and the five DISIS-2016-001 ReStudy #1 Group 6 study models:

1. 2016 Winter Peak (2016WP),
2. 2017 Summer Peak (2017SP),
3. 2020 Summer Peak (2020SP),
4. 2020 Winter Peak (2020WP), and
5. 2025 Summer Peak (2025SP).

All analyses were performed using the PTI PSS/E version 32.2.4 software. The results of each analysis are presented in the following sections.

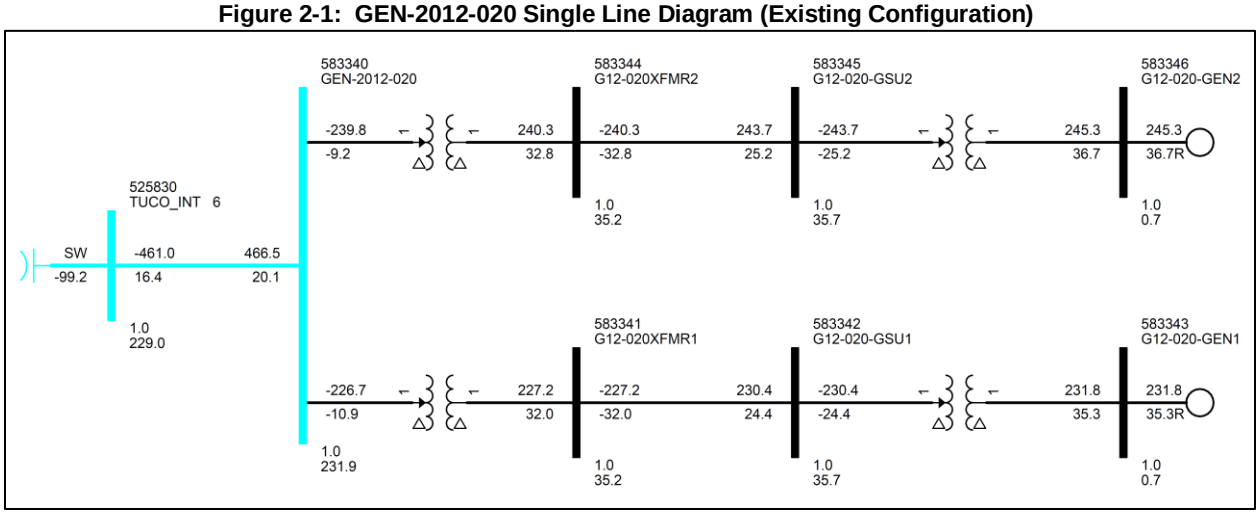
1.2 Study Limitations

The assessments and conclusions provided in this report are based on assumptions and information provided to Aneden by others. While the assumptions and information provided may be appropriate for the purposes of this report, Aneden does not guarantee that those conditions assumed will occur. In addition, Aneden did not independently verify the accuracy or completeness of the information provided. As such, the conclusions and results presented in this report may vary depending on the extent to which actual future conditions differ from the assumptions made or information used herein.

2.0 Project and Modification Request

Figure 2-1 shows the power flow model single line diagram for the existing GEN-2012-020 configuration. GEN-2012-020 was last studied as part of Group 6 in the DISIS-2012-002 ReStudy#2.

Figure 2-1: GEN-2012-020 Single Line Diagram (Existing Configuration)



The GEN-2012-020 Modification Request included a turbine change to 239 x Vestas 2.0 MW for a total project capacity of 478 MW. In addition, the modification request also included changes to the generation interconnection line, the collection system and the main substation transformers. The new configuration also has 2 x 68 MVAr capacitor banks at the 230 kV bus of the collector substation. The major modification request changes are shown in Figure 2-2 and Table 2-1 below.

Figure 2-2: GEN-2012-020 Single Line Diagram (New Configuration)

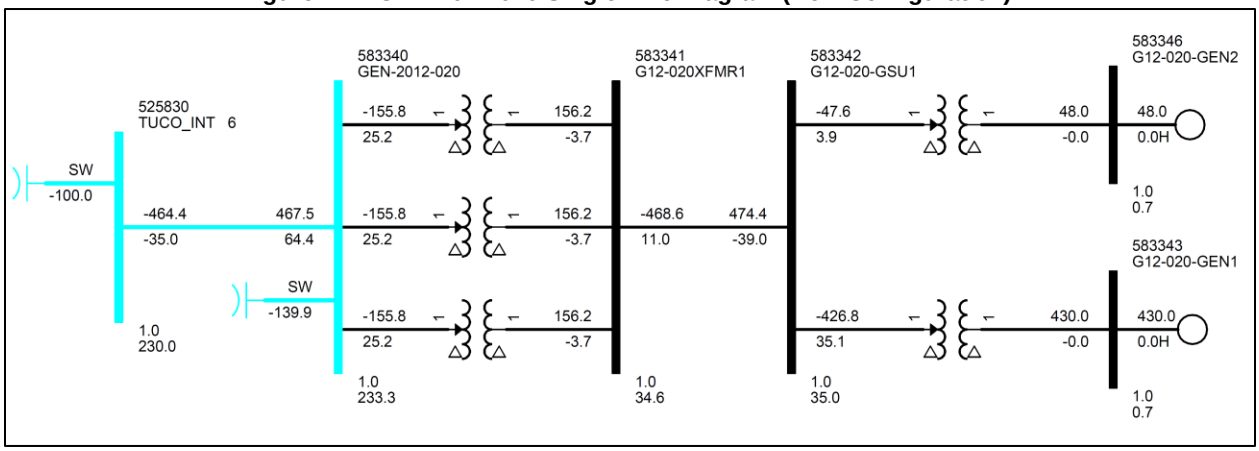


Table 2-1: GEN-2012-020 Modification Request

Facility	Existing		Modification Request
Point of Interconnection	TUCO 230 kV Substation (525830)		TUCO 230 kV Substation (525830)
Configuration/Capacity	284 x GE 1.68 MW = 477.12 MW		239 x Vestas 2.0 MW = 478 MW
Generation Interconnection Line	Length = 18.06 miles R = 0.002590 pu X = 0.020240 pu B = 0.069480 pu		Length = 15.8 miles R = 0.001400 pu X = 0.015830 pu B = 0.048360 pu
Main Substation Transformer	**Two Transformers:** Z = 7.5%, Rating 180 MVA		**Three Transformers:** Z = 11.2%, Rating 126 MVA
Equivalent Collector Line	**Collector Line 1:** R = 0.006300 pu X = 0.007950 pu B = 0.109600 pu	**Collector Line 2:** R = 0.006030 pu X = 0.007660 pu B = 0.113200 pu	R = 0.002683 pu X = 0.003986 pu B = 0.360465 pu
Reactive Power Devices	N/A		2 x 68 MVAR 230 kV Capacitor Banks

3.0 Reactive Power Analysis

The reactive power analysis, also known as the low-wind/no-wind condition analysis, was performed for GEN-2012-020 to determine the reactive power contribution from the project's interconnection line and collector transformer and cables during low/no wind conditions while the project is still connected to the grid and to size shunt reactors that would reduce the project reactive power contribution to the POI to approximately zero.

3.1 Methodology and Criteria

For the GEN-2012-020 project, the generator was switched out of service while other collector system elements remained in-service. A shunt reactor was tested at the study project substation high side bus to bring the MVAr flow into the POI down to approximately zero.

3.2 Results

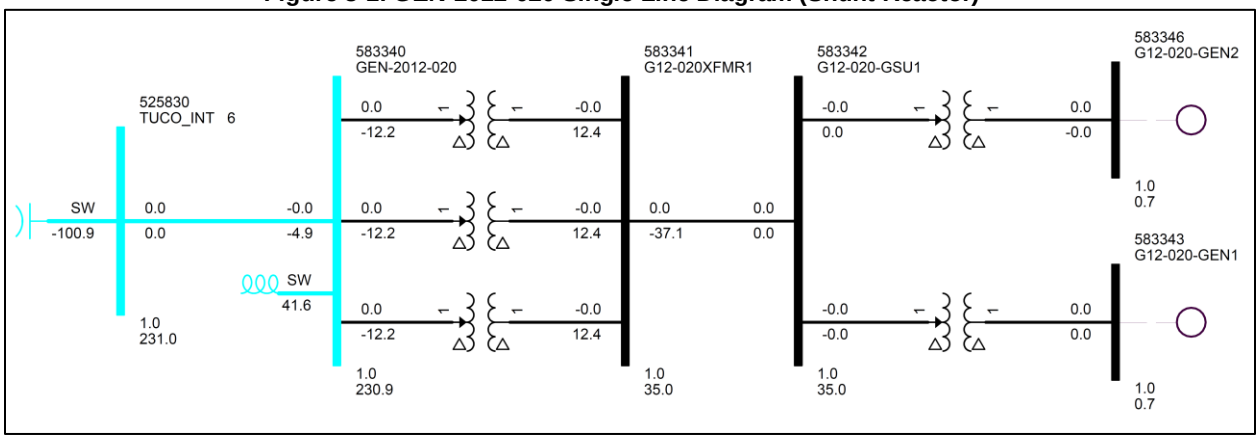
The results from the reactive power analysis showed that the GEN-2012-020 project required approximately 41.3 MVAr shunt reactance at the high side of the project substation to reduce the POI MVAr to zero. This represents the contributions from the project's collection system. Figure 3-1 illustrates the shunt reactor size required to reduce the POI voltage to approximately zero. Reactive compensation can be provided either by discrete reactive devices or by the generator itself if it possesses that capability.

Table 3-1: Shunt Reactor Size for Low Wind Study*

Machine	POI Bus Number	POI Bus Name	Reactor Size (MVAr)				
			16WP	17SP	20SP	20WP	25SP
GEN-2012-020	525830	TUCO_INT 6	41.3	41.3	41.3	41.3	41.3

*Note that the 230 kV Collection System Capacitor Bank was Offline

Figure 3-1: GEN-2012-020 Single Line Diagram (Shunt Reactor)*



*The reactor MVAr contribution shown above depends on the bus voltage. It has a 41.3 MVAr capacity.

The difference in the results can be attributed to the changes to the generation interconnection line and the collector system impedances.

4.0 Short Circuit Analysis

A short-circuit study was performed on the power flow models for the 2017SP and 2025SP models for GEN-2012-020 using the modified study models. The detail results of the short-circuit analysis are provided in Appendix A.

4.1 Methodology

The short-circuit analysis included applying a 3-phase fault on buses up to 5 levels away from the TUCO 230 kV POI bus. The PSS/E "Automatic Sequence Fault Calculation (ASCC)" fault analysis module was used to calculate the fault current levels with and without the project online.

4.2 Results

The results of the short circuit analysis are summarized in Table 4-1 and Table 4-2 for the 2017SP and 2025SP models, respectively. The maximum increase in fault current was about 2.05%, 0.512 kA. The maximum fault current calculated within 5 buses with GEN-2012-020 was less than 32 kA in the 2017SP and 2025SP models respectively.

Table 4-1: 2017SP Short Circuit Results

Voltage (kV)	Max. Current (kA)	Max kA Change	Max %Change
69	30.6	0.01	0.02%
115	31.4	0.08	0.41%
138	23.8	-0.03	-0.13%
230	30.2	0.47	1.90%
345	20.1	0.05	0.34%
Max	**31.4**	**0.47**	**1.90%**

Table 4-2: 2025SP Short Circuit Results

Voltage (kV)	Max. Current (kA)	Max kA Change	Max %Change
69	31.5	0.01	0.09%
115	31.8	0.11	0.53%
138	24.2	-0.03	-0.10%
230	30.4	0.51	2.05%
345	21.0	0.09	0.54%
Max	**31.8**	**0.51**	**2.05%**

5.0 Dynamic Stability Analysis

Aneden performed a dynamic stability analysis to identify the impact of the turbine change and other modifications to the GEN-2012-020 project. The analysis was performed according to SPP's Disturbance Performance Requirements shown in Appendix B. The modification details are described in Section 2.0 above and the dynamic modeling data is provided in Appendix C. The simulation plots can be found in Appendix D.

5.1 Methodology and Criteria

The dynamic stability analysis was performed using models developed with the requested 239 x Vestas 2.0 MW turbine for the GEN-2012-020 generating facility. This stability analysis was performed using PTI's PSS/E version 32.2.4 software.

The stability models were developed using the models from the DISIS-2016-001 ReStudy #1 (DISIS-2016-001-1) for Group 6. The modifications requested to project GEN-2012-020 were used to create modified stability models for this impact study.

The modified power flow models and associated dynamics database were initialized (no-fault test) to confirm that there were no errors in the initial conditions of the system and the dynamic data. The modified dynamics model data for the DISIS-2016-001-1 (Group 6) request and GEN-2012-020 is provided in Appendix C.

During the fault simulations, the active power (PELEC), reactive power (QELEC) and terminal voltage (ETERM) were monitored for GEN-2012-020 and other equally and prior queued projects in Group 6. In addition, voltages of five (5) buses away from the POI of GEN-2012-020 were monitored and plotted. The machine rotor angle for synchronous machines and speed for asynchronous machines within this study area including 520 (AEPW), 524 (OKGE), 525 (WFEC), 526 (SPS), 531 (MIDW), 534 (SUNC), 536 (WERE) were monitored. In addition, the voltages of all 100 kV and above buses within the study area were monitored.

5.2 Fault Definitions

Aneden selected the fault events simulated in the DISIS-2012-002 Group 6 study and included additional faults based on the location of the point of interconnection. The new set of faults were simulated using the modified study models. The fault events include three phase faults with reclosing, stuck breaker, and prior outage events. Single-line-to-ground (SLG) fault impedance values were determined by applying a fault on the base case large enough to produce a 0.6 pu voltage value on the faulted bus. This SLG value was then used for the SLG faults.

The simulated faults are listed and described in Table 5-1 below. These contingencies were applied to the modified 2016 Winter Peak, 2017 Summer Peak, 2020 Summer Peak, 2020 Winter Peak and 2025 Summer Peak models.

Table 5-1: Fault Definitions

Fault ID	Fault Description
FLT01-3PH	3 phase fault on the Jones (526337) to Lubbock_STH (526269) 230kV line ckt1, near Jones.
	a. Apply fault at the Jones 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT03-3PH	3 phase fault on the Jones (526337) to Lubbock_EST (526299) 230kV line, near Jones.
	a. Apply fault at the Jones 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT05-3PH	3 phase fault on the Jones (526337) to Grassland (526677) 230kV line, near Jones.
	a. Apply fault at the Jones 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT07-3PH	3 phase fault on the Lubbock_STH (526269) to Wolfforth (526525) 230kV line, near Lubbock_STH.
	a. Apply fault at the Lubbock_STH 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT09-3PH	3 phase fault on the Wolfforth (526525) to Sundown (526435) 230kV line, near Wolfforth.
	a. Apply fault at the Wolfforth 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT11-3PH	3 phase fault on the Lubbock_EST (526299) to LP-Wadswrth (522888) 230kV line, near Lubbock_ EST.
	a. Apply fault at the Lubbock_ EST 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT13-3PH	3 phase fault on the Jones1 (526337) to Tuco_Int (525830) 230kV line, near Jones.
	a. Apply fault at the Jones 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.

Table 5-1 continued

Fault ID	Fault Description
FLT25-3PH	3 phase fault on the Tolk (525549) to CROSSROADS 7 (527656) 345kV line, near Tolk.
	a. Apply fault at the Tolk 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT39-3PH	3 phase fault on the Yoakum (526935) to G13-027-TAP (562480) 230kV line, near Yoakum.
	a. Apply fault at the Yoakum 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT41-3PH	3 phase fault on the Yoakum (526935) to Amoco_SS (526460) 230kV line, near Yoakum.
	a. Apply fault at the Yoakum 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT43-3PH	3 phase fault on the Yoakum (526935) to G1579&G1580T (560059) 230kV line, near Yoakum.
	a. Apply fault at the Yoakum 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT51-3PH	3 phase fault on the Grassland (526676) to Lynn County (526656) 115kV line, ckt1, near Grassland.
	a. Apply fault at the Grassland 115kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT55-3PH	3 phase fault on the Border (515458) to Woodward (515375) 345kV line, near Border.
	a. Apply fault at the Border 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT57-3PH	3 phase fault on the Tuco_Int (525832) to CRAWFISH_DR (560022) 345kV line, near Tuco.
	a. Apply fault at the Tuco 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT59-3PH	3 phase fault on the Grassland 230kV (526677) to Grassland 115kV (526676) / 13.2kV (526674) transformer, near the 230kV bus.
	a. Apply fault at the Grassland 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer.
	b. Clear fault after 5 cycles by tripping the faulted transformer.

Table 5-1 continued

Fault ID	Fault Description
FLT62-3PH	3 phase fault on the Yoakum 230kV (526935) to Yoakum 115kV (526934) / 13.2kV (526932) transformer, ckt2, near the 230kV bus.
	a. Apply fault at the Yoakum 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer.
FLT64-3PH	3 phase fault on the Tuco 345kV (525832) to Tuco 230kV (525830)/ 13.2kV (525824) transformer, near the 345kV bus.
	a. Apply fault at the Tuco 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer.
FLT65-3PH	3 phase fault on the Tuco 230kV (525830) to Tuco 115kV (525828)/ 13.2kV (525821) transformer, near the 230kV bus.
	a. Apply fault at the Tuco 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer.
FLT66-3PH	3 phase fault on the Swisher 230kV (525213) to Swisher 115kV (525212)/ 13.2kV (525211) transformer, near the 230kV bus.
	a. Apply fault at the Swisher 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer.
FLT67-3PH	3 phase fault on the Carlisle 230kV (526161) to Carlisle 115kV (526160)/ 13.2kV (526157) transformer, near the 230kV bus.
	a. Apply fault at the Carlisle 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer.
FLT68-3PH	3 phase fault on the Tolk 345kV (525549) to Tolk 230kV (525543)/ 13.2kV (525537) transformer, near the 230kV bus.
	a. Apply fault at the Tolk 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer and Tolk 230kV (525543).
FLT68R-3PH	3 phase fault on the Tolk 345kV (525549) to Tolk 230kV (525543)/ 13.2kV (525537) transformer, near the 230kV bus.
	a. Apply fault at the Tolk 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer and Tolk-CROSSROADS 7 345 kV line.
FLT69-3PH	3 phase fault on the Tuco (525830) to Carlisle (526161) 230kV line, ckt1, near Tuco.
	a. Apply fault at the Tuco 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT71-3PH	3 phase fault on the Tuco (525830) to CRAWFISH_DR6 (560021) 230kV line, ckt1, near Tuco.
	a. Apply fault at the Tuco 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT73-3PH	3 phase fault on the Tuco (525830) to Tolk East (525524) 230kV line, ckt1, near Tuco.
	a. Apply fault at the Tuco 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.

Table 5-1 continued

Fault ID	Fault Description
FLT9001-3PH	3 phase fault on the TUCO_INT 6 (525830) to ANTELOPE_1 6 (525840) 230kV line ckt 1, near TUCO_INT 6.
	a. Apply fault at TUCO_INT 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line. Trip ANTELOPE generators
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9002-3PH	3 phase fault on the TUCO_INT 6 (525830) 230kV to TUCO_SVC 1 (525820) 13kV transformer, near TUCO_INT 6 (525830) 230kV.
	a. Apply fault at TUCO_INT 6 (525830) 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer. Trip TUCO SVC
FLT9003-3PH	3 phase fault on the Tuco 345kV (525832) to Tuco 230kV (525830)/ 13.2kV (525824) transformer, near the 230kV bus.
	a. Apply fault at the Tuco 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer.
FLT9004-3PH	3 phase fault on the Tuco_Int (525830) to Jones1 (526337) 230kV line ckt 1, near Tuco_Int.
	a. Apply fault at the Tuco_Int 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9005-3PH	3 phase fault on the TOLK_EAST 6 (525524) 230kV to TOLK_1 1 (525561) 24kV transformer, near TOLK_EAST 6 (525524) 230kV.
	a. Apply fault at TOLK_EAST 6 (525524) 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer. Trip TOLK_1 unit
FLT9006-3PH	3 phase fault on the TOLK_EAST 6 (525524) to ROSEVELT_S 6 (524911) 230kV line ckt 1, near TOLK_EAST 6.
	a. Apply fault at the TOLK_EAST 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9007-3PH	3 phase fault on the TOLK_EAST 6 (525524) to PLANT_X 6 (525481) 230kV line ckt 2, near TOLK_EAST 6.
	a. Apply fault at the TOLK_EAST 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9008-3PH	3 phase fault on the TOLK_WEST 6 (525531) to LAMB_CNTY 6 (525637) 230kV line ckt 1, near TOLK_WEST 6.
	a. Apply fault at the TOLK_WEST 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9009-3PH	3 phase fault on the TOLK_WEST 6 (525531) to G13-027-TAP (562480) 230kV line ckt 1, near TOLK_WEST 6.
	a. Apply fault at the TOLK_WEST 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.

Table 5-1 continued

Fault ID	Fault Description
FLT9010-3PH	3 phase fault on the PLANT_X 6 (525481) to NEWHART 6 (525461) 230kV line ckt 1, near PLANT_X 6.
	a. Apply fault at the PLANT_X 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9011-3PH	3 phase fault on the PLANT_X 6 (525481) to DEAFSMITH 6 (524623) 230kV line ckt 1, near PLANT_X 6.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9012-3PH	3 phase fault on the PLANT_X 6 (525481) to SUNDOWN 6 (526435) 230kV line ckt 1, near PLANT_X 6.
	a. Apply fault at the PLANT_X 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9013-3PH	3 phase fault on the PLANT_X 6 230kV (525481) to PLANT_X 3 115kV (525480)/ 13.2kV (525479) transformer, near the 230kV bus.
	a. Apply fault at the PLANT_X 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer.
FLT9014-3PH	3 phase fault on the PLANT_X 6 230kV (525481) to PLANT_X4 1 20kV (525494) transformer, near the 230kV bus.
	a. Apply fault at the PLANT_X 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer. Trip PLANT_X4 unit
FLT9015-3PH	3 phase fault on the YOAKUM 6 (526935) to MUSTANG 6 (527149) 230kV line ckt 1, near YOAKUM 6.
	a. Apply fault at the YOAKUM 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9016-3PH	3 phase fault on the YOAKUM 6 (526935) to OXYBRU_TP 6 (527010) 230kV line ckt 1, near YOAKUM 6.
	a. Apply fault at the YOAKUM 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9017-3PH	3 phase fault on the YOAKUM 6 230kV (526935) to YOAKUM_345 345kV (526936)/ 13.2kV (526937) transformer, near the 230kV bus.
	a. Apply fault at the YOAKUM 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer.
FLT9018-3PH	3 phase fault on the CROSSROADS 7 (527656) to EDDY_CNTY 7 (527802) 345kV line ckt 1, near CROSSROADS 7.
	a. Apply fault at the CROSSROADS 7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.

Table 5-1 continued

Fault ID	Fault Description
FLT9019-3PH	3 phase fault on the CROSSROADS 7 (527656) to GEN-2008-022 (577103) 345kV line ckt 1, near CROSSROADS 7.
	a. Apply fault at the CROSSROADS 7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line. Trip GEN-2008-022
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9020-3PH	3 phase fault on the CROSSROADS 7 (527656) to GEN-2014-047 (584260) 345kV line ckt 1, near CROSSROADS 7.
	a. Apply fault at the CROSSROADS 7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line. Trip GEN-2014-047
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9021-3PH	3 phase fault on the CROSSROADS 7 (527656) to GEN-2015-056 (584940) 345kV line ckt 1, near CROSSROADS 7.
	a. Apply fault at the CROSSROADS 7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line. Trip GEN-2015-056
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9022-3PH	3 phase fault on the CARLISLE 6 (526161) to GEN-2016-056 (587370) 230kV line ckt 1, near CARLISLE 6.
	a. Apply fault at the CARLISLE 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line. Trip GEN-2016-056
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9023-3PH	3 phase fault on the CARLISLE 6 (526161) to LP-MILWAKEE6 (522823) 230kV line ckt 1, near CARLISLE 6.
	a. Apply fault at the CARLISLE 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9024-3PH	3 phase fault on the CARLISLE 6 (526161) to WOLFFORTH 6 (526525) 230kV line ckt 1, near CARLISLE 6.
	a. Apply fault at the CARLISLE 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9025-3PH	3 phase fault on the WOLFFORTH 6 230kV (526525) to 115kV (526524)/ 13.2kV (526522) transformer, near the 230kV bus.
	a. Apply fault at the WOLFFORTH 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer.
FLT9026-3PH	3 phase fault on the LP-MILWAKEE6 230kV (522823) to 69kV (522828)/ 13.5kV (522827) transformer, near the 230kV bus.
	a. Apply fault at the LP-MILWAKEE6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer.

Table 5-1 continued

Fault ID	Fault Description
FLT9027-3PH	3 phase fault on the LP-MILWAKEE6 (522823) to LP-SOUTHEST6 (522861) 230kV line ckt 1, near LP-MILWAKEE6.
	a. Apply fault at the LP-MILWAKEE6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9028-3PH	3 phase fault on the JONES 6 (526337) to LP-HOLLY 6 (522870) 230kV line ckt 1, near JONES 6.
	a. Apply fault at the JONES 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9029-3PH	3 phase fault on the LP-HOLLY 6 (522870) to LP-SOUTHEST6 (522861) to 230kV line ckt 1, near LP-HOLLY 6.
	a. Apply fault at the LP-HOLLY 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9030-3PH	3 phase fault on the LP-HOLLY 6 230kV (522870) to 69kV (522866)/ 13.5kV (522865) transformer, near the 230kV bus.
	a. Apply fault at the LP-HOLLY 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer.
FLT9031-3PH	3 phase fault on the LUBBCK_STH 6 230kV (526269) to 115kV (526268)/ 13.2kV (526265) transformer, near the 230kV bus.
	a. Apply fault at the LUBBCK_STH 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer.
FLT9032-3PH	3 phase fault on the LUBBCK_STH 6 (526269) to LP-SOUTHEST6 (522861) to 230kV line ckt 1, near LUBBCK_STH 6.
	a. Apply fault at the LUBBCK_STH 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9033-3PH	3 phase fault on the GRASSLAND 6 (526677) to CIRRUS_WND 6 (526679) 230kV line ckt 1, near GRASSLAND 6.
	a. Apply fault at the GRASSLAND 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line. Trip CIRRUS_WND
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9034-3PH	3 phase fault on the CRAWFISH_DR6 (560021) to SWISHER 6 (525213) 230kV line ckt 1, near CRAWFISH_DR6.
	a. Apply fault at the CRAWFISH_DR6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9035-3PH	3 phase fault on the CRAWFISH_DR6 230kV (560021) to 345kV (560022)/ 13.2kV (560023) transformer, near the 230kV bus.
	a. Apply fault at the CRAWFISH_DR6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer.

Table 5-1 continued

Fault ID	Fault Description
FLT9036-3PH	3 phase fault on the SWISHER 6 (525213) to G15-031-TAP (560050) 230kV line ckt 1, near SWISHER 6.
	a. Apply fault at the SWISHER 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9037-3PH	3 phase fault on the SWISHER 6 (525213) to NEWHART 6 (525461) 230kV line ckt 1, near SWISHER 6.
	a. Apply fault at the SWISHER 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9038-3PH	3 phase fault on the CRAWFISH_DR7 345kV (560022) to 230kV (560021)/ 13.2kV (560023) transformer, near the 345kV bus.
	a. Apply fault at the CRAWFISH_DR7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer.
FLT9039-3PH	3 phase fault on the CRAWFISH_DR7 (560022) to BORDER 7 (515458) 345kV line ckt 1, near CRAWFISH_DR7.
	a. Apply fault at the CRAWFISH_DR7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9040-3PH	3 phase fault on the BORDER 7 (515458) to G1149&G1504 (583090) 345kV line ckt 1, near BORDER 7.
	a. Apply fault at the BORDER 7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line. Trip G1149&G1504
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9041-3PH	3 phase fault on the BORDER 7 (515458) to CHISHOLM7 (511553) 345kV line ckt 1, near BORDER 7.
	a. Apply fault at the BORDER 7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9042-3PH	3 phase fault on the BORDER 7 345kV (515458) to 13.2kV (585002) transformer, near the 345kV bus.
	a. Apply fault at the BORDER 7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer. Trip BORDER_SVC
FLT9043-3PH	3 phase fault on the O.K.U.-7 345kV (511456) to 13.2kV (561000) transformer, near the 345kV bus.
	a. Apply fault at the O.K.U.-7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer. Trip OKU_SVC
FLT9044-3PH	3 phase fault on the O.K.U.-7 (511456) to L.E.S.-7 (511468) 345kV line ckt 1, near O.K.U.-7 .
	a. Apply fault at the O.K.U.-7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line, block the HVDC.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.

Table 5-1 continued

Fault ID	Fault Description
FLT9045-3PH	3 phase fault on the TOLK 7 (525549) to POTTER_CO 7 (523961) 345kV line ckt 1, near TOLK 7.
	a. Apply fault at the TOLK 7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9046-3PH	3 phase fault on the POTTER_CO 7 (523961) to HITCHLAND 7 (523097) 345kV line ckt 1, near POTTER_CO 7.
	a. Apply fault at the POTTER_CO 7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9047-3PH	3 phase fault on the POTTER_CO 7 (523961) to SPNSPUR_WND7 (524296) 345kV line ckt 1, near POTTER_CO 7.
	a. Apply fault at the POTTER_CO 7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line. Trip SPNSPUR_WND7 units
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9048-3PH	3 phase fault on the POTTER_CO 7 (523961) to GRAPEVINE (560035) 345kV line ckt 1, near POTTER_CO 7.
	a. Apply fault at the POTTER_CO 7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9049-3PH	3 phase fault on the TUCO_INT 7 (525832) to YOAKUM_345 (526936) 345kV line ckt 1, near TUCO_INT 7.
	a. Apply fault at the TUCO_INT 7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9050-3PH	3 phase fault on the YOAKUM_345 (526936) to HOBBS_INT 7 (527896) 345kV line ckt 1, near YOAKUM_345.
	a. Apply fault at the YOAKUM_345 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9051-3PH	3 phase fault on the CRAWFISH_DR7 (560022) to O.K.U.-7 (511456) 345kV line ckt 1, near CRAWFISH_DR7.
	a. Apply fault at the CRAWFISH_DR7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9052-3PH	3 phase fault on the ROSEVELT_N 6 230kV (524909) to 115kV (524908) / 13.2kV (524907) transformer, near the 230kV bus.
	a. Apply fault at the ROSEVELT_N 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer.

Table 5-1 continued

Fault ID	Fault Description
FLT9053-3PH	3 phase fault on the ROSEVELT_N 6 (524909) to PLSNT_HILL 6 (524770) 230kV line ckt 1, near ROSEVELT_N 6 .
	a. Apply fault at the ROSEVELT_N 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9054-3PH	3 phase fault on the SW_4K33 6 (524915) to OASIS 6 (524875) 230kV line ckt 1, near SW_4K33 6.
	a. Apply fault at the SW_4K33 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9055-3PH	3 phase fault on the ROSEVELT_S 6 (524911) to PNM-DC6 (599955) 230kV line ckt 1, near ROSEVELT_S 6.
	a. Apply fault at the ROSEVELT_S 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9056-3PH	3 phase fault on the TOLK 7 (525549) to CRAWFISH_DR7 (560022) 345kV line ckt 1, near CRAWFISH_DR7.
	a. Apply fault at the CRAWFISH_DR7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9057-3PH	3 phase fault on the TUCO_INT 7 345kV (525832) to ELK_1 1 18kV (525844) transformer, near the 345kV bus.
	a. Apply fault at the TUCO_INT 7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer. Trip ELK_1 unit
FLT9058-3PH	3 phase fault on the TUCO_INT 7 (525832) to GEN-2015-068 (585060) 345kV line ckt 1, near TUCO_INT 7.
	a. Apply fault at the TUCO_INT 7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line. Trip GEN-2015-068
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9059-3PH	3 phase fault on the LUBBCK_EST 6 230kV (526299) to 115kV (526298) / 13.2kV (526294) transformer, near the 230kV bus.
	a. Apply fault at the LUBBCK_EST 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer.
FLT9100-SB	Stuck Breaker on TUCO_INT 3 (525828) 115 / (525830) 230 / (525821) 13.2 kV transformer
	a. Apply single-phase fault at TUCO_INT 3 (525828) 115 kV
	b. After 16 cycles, trip the TUCO_INT 3 (525828) 115 kV Bus and remove the fault
FLT9101-SB	Stuck Breaker on TUCO_INT 7 (525832) 345 / (525830) 230 / (525824) 13.2 kV transformer
	a. Apply single-phase fault at TUCO_INT 7 (525832) 345 kV
	b. After 16 cycles, trip TUCO_INT 7 (525832) to CRAWFISH_DR7 (560022) 345kV line
	c. trip the TUCO_INT 7 (525832) 345 / (525830) 230 / (525824) 13.2 kV transformer and remove the fault

Table 5-1 continued

Fault ID	Fault Description
FLT9102-SB	Stuck Breaker on CRAWFISH_DR6 (560021) to TUCO_INT 6 (525830) 230kV line
	a. Apply single-phase fault at CRAWFISH_DR6 (560021) 230kV
	b. After 16 cycles, trip the CRAWFISH_DR6 (560021) 230kV Bus and remove the fault
FLT9103-SB	Stuck Breaker on TOLK_EAST 6 (525524) to TUCO_INT 6 (525830) 230kV line
	a. Apply single-phase fault at TOLK_EAST 6 (525524) 230kV
	b. After 16 cycles, trip the TOLK_EAST 6 (525524) 230kV Bus and remove the fault, trip
FLT9104-SB	Stuck Breaker on CARLISLE 6 (526161) to TUCO_INT 6 (525830) 230kV line
	a. Apply single-phase fault at CARLISLE 6 (526161) 230kV
	b. After 16 cycles, trip the CARLISLE 6 (526161) 230kV Bus and remove the fault, trip G16-056
FLT9105-SB	Stuck Breaker on JONES 6 (526337) to TUCO_INT 6 (525830) 230kV line
	a. Apply single-phase fault at JONES 6 (526337) 230kV
	b. After 16 cycles, trip the TUCO_INT 6 (525830) to JONES 6 (526337) 230kV line and remove the fault
FLT9006-PO1	Prior outage of ROSEVELT_N 6 (524909) to TOLK_WEST 6 (525531) 230kV line ckt 2, 3 phase fault on the TOLK_EAST 6 (525524) to ROSEVELT_S 6 (524911) 230kV line ckt 1, near TOLK_EAST 6.
	a. Apply fault at the TOLK_EAST 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT68-PO2	Prior outage of Tuco (525830) to Carlisle (526161) 230kV line, ckt1 3 phase fault on the Tolk 345kV (525549) to Tolk 230kV (525543)/ 13.2kV (525537) transformer, near the 230kV bus.
	a. Apply fault at the Tolk 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer and Tolk 230kV (525543).
FLT9005-PO2	Prior outage of Tuco (525830) to Carlisle (526161) 230kV line, ckt1 3 phase fault on the TOLK_EAST 6 (525524) 230kV to TOLK_1 1 (525561) 24kV transformer, near TOLK_EAST 6 (525524) 230kV.
	a. Apply fault at TOLK_EAST 6 (525524) 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer. Trip TOLK_1 unit
FLT9006-PO2	Prior outage of Tuco (525830) to Carlisle (526161) 230kV line, ckt1 3 phase fault on the TOLK_EAST 6 (525524) to ROSEVELT_S 6 (524911) 230kV line ckt 1, near TOLK_EAST 6.
	a. Apply fault at the TOLK_EAST 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9007-PO2	Prior outage of Tuco (525830) to Carlisle (526161) 230kV line, ckt1 3 phase fault on the TOLK_EAST 6 (525524) to PLANT_X 6 (525481) 230kV line ckt 2, near TOLK_EAST 6.
	a. Apply fault at the TOLK_EAST 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.

Table 5-1 continued

Fault ID	Fault Description
FLT9008-PO2	Prior outage of Tuco (525830) to Carlisle (526161) 230kV line, ckt1 3 phase fault on the TOLK_WEST 6 (525531) to LAMB_CNTY 6 (525637) 230kV line ckt 1, near TOLK_WEST 6.
	a. Apply fault at the TOLK_WEST 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9009-PO2	Prior outage of Tuco (525830) to Carlisle (526161) 230kV line, ckt1 3 phase fault on the TOLK_WEST 6 (525531) to G13-027-TAP (562480) 230kV line ckt 1, near TOLK_WEST 6.
	a. Apply fault at the TOLK_WEST 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9034-PO2	Prior outage of Tuco (525830) to Carlisle (526161) 230kV line, ckt1 3 phase fault on the CRAWFISH_DR6 (560021) to SWISHER 6 (525213) 230kV line ckt 1, near CRAWFISH_DR6.
	a. Apply fault at the CRAWFISH_DR6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9035-PO2	Prior outage of Tuco (525830) to Carlisle (526161) 230kV line, ckt1 3 phase fault on the CRAWFISH_DR6 230kV (560021) to 345kV (560022)/ 13.2kV (560023) transformer, near the 230kV bus.
	a. Apply fault at the CRAWFISH_DR6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer.
FLT01-PO2	Prior outage of Tuco (525830) to Carlisle (526161) 230kV line, ckt1 3 phase fault on the Jones (526337) to Lubbock_STH (526269) 230kV line ckt1, near Jones.
	a. Apply fault at the Jones 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT03-PO2	Prior outage of Tuco (525830) to Carlisle (526161) 230kV line, ckt1 3 phase fault on the Jones (526337) to Lubbock_EST (526299) 230kV line, near Jones.
	a. Apply fault at the Jones 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT05-PO2	Prior outage of Tuco (525830) to Tolk East (525524) 230kV line, ckt1 3 phase fault on the Jones (526337) to Grassland (526677) 230kV line, near Jones.
	a. Apply fault at the Jones 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.

Table 5-1 continued

Fault ID	Fault Description
FLT13-PO2	Prior outage of Tuco (525830) to Tolk East (525524) 230kV line, ckt1 3 phase fault on the Jones1 (526337) to Tuco_Int (525830) 230kV line, near Jones.
	a. Apply fault at the Jones 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9028-PO2	Prior outage of Tuco (525830) to Tolk East (525524) 230kV line, ckt1 3 phase fault on the JONES 6 (526337) to LP-HOLLY 6 (522870) 230kV line ckt 1, near JONES 6.
	a. Apply fault at the JONES 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT57-PO2	Prior outage of Tuco (525830) to Tolk East (525524) 230kV line, ckt1 3 phase fault on the Tuco_Int (525832) to CRAWFISH_DR (560022) 345kV line, near Tuco.
	a. Apply fault at the Tuco 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT64-PO2	Prior outage of Tuco (525830) to Tolk East (525524) 230kV line, ckt1 3 phase fault on the Tuco 345kV (525832) to Tuco 230kV (525830)/ 13.2kV (525824) transformer, near the 345kV bus.
	a. Apply fault at the Tuco 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer.
FLT9049-PO2	Prior outage of Tuco (525830) to Tolk East (525524) 230kV line, ckt1 3 phase fault on the TUCO_INT 7 (525832) to YOAKUM_345 (526936) 345kV line ckt 1, near TUCO_INT 7.
	a. Apply fault at the TUCO_INT 7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9057-PO2	Prior outage of Tuco (525830) to Tolk East (525524) 230kV line, ckt1 3 phase fault on the TUCO_INT 7 345kV (525832) to ELK_1 1 18kV (525844) transformer, near the 345kV bus.
	a. Apply fault at the TUCO_INT 7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer. Trip ELK_1 unit
FLT9058-PO2	Prior outage of Tuco (525830) to Tolk East (525524) 230kV line, ckt1 3 phase fault on the TUCO_INT 7 (525832) to GEN-2015-068 (585060) 345kV line ckt 1, near TUCO_INT 7.
	a. Apply fault at the TUCO_INT 7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT67-PO3	Prior outage of Tuco 345kV (525832) to Tuco 230kV (525830)/ 13.2kV (525824) transformer 3 phase fault on the Carlisle 230kV (526161) to Carlisle 115kV (526160)/ 13.2kV (526157) transformer, near the 230kV bus.
	a. Apply fault at the Carlisle 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer.

Table 5-1 continued

Fault ID	Fault Description
FLT9022-PO3	Prior outage of Tuco 345kV (525832) to Tuco 230kV (525830)/ 13.2kV (525824) transformer 3 phase fault on the CARLISLE 6 (526161) to GEN-2016-056 (587370) 230kV line ckt 1, near CARLISLE 6.
	a. Apply fault at the CARLISLE 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line. Trip GEN-2016-056
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9023-PO3	Prior outage of Tuco 345kV (525832) to Tuco 230kV (525830)/ 13.2kV (525824) transformer 3 phase fault on the CARLISLE 6 (526161) to LP-MILWAKEE6 (522823) 230kV line ckt 1, near CARLISLE 6.
	a. Apply fault at the CARLISLE 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9024-PO3	Prior outage of Tuco 345kV (525832) to Tuco 230kV (525830)/ 13.2kV (525824) transformer 3 phase fault on the CARLISLE 6 (526161) to WOLFFORTH 6 (526525) 230kV line ckt 1, near CARLISLE 6.
	a. Apply fault at the CARLISLE 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9034-PO3	Prior outage of Tuco 345kV (525832) to Tuco 230kV (525830)/ 13.2kV (525824) transformer 3 phase fault on the CRAWFISH_DR6 (560021) to SWISHER 6 (525213) 230kV line ckt 1, near CRAWFISH_DR6.
	a. Apply fault at the CRAWFISH_DR6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9035-PO3	Prior outage of Tuco 345kV (525832) to Tuco 230kV (525830)/ 13.2kV (525824) transformer 3 phase fault on the CRAWFISH_DR6 230kV (560021) to 345kV (560022)/ 13.2kV (560023) transformer, near the 230kV bus.
	a. Apply fault at the CRAWFISH_DR6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer.
FLT01-PO3	Prior outage of Tuco 345kV (525832) to Tuco 230kV (525830)/ 13.2kV (525824) transformer 3 phase fault on the Jones (526337) to Lubbock_STH (526269) 230kV line ckt1, near Jones.
	a. Apply fault at the Jones 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT03-PO3	Prior outage of Tuco 345kV (525832) to Tuco 230kV (525830)/ 13.2kV (525824) transformer 3 phase fault on the Jones (526337) to Lubbock_EST (526299) 230kV line, near Jones.
	a. Apply fault at the Jones 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.

Table 5-1 continued

Fault ID	Fault Description
FLT05-PO3	Prior outage of Tuco 345kV (525832) to Tuco 230kV (525830)/ 13.2kV (525824) transformer 3 phase fault on the Jones (526337) to Grassland (526677) 230kV line, near Jones.
	a. Apply fault at the Jones 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT13-PO3	Prior outage of Tuco 345kV (525832) to Tuco 230kV (525830)/ 13.2kV (525824) transformer 3 phase fault on the Jones1 (526337) to Tuco_Int (525830) 230kV line, near Jones.
	a. Apply fault at the Jones 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9028-PO3	Prior outage of Tuco 345kV (525832) to Tuco 230kV (525830)/ 13.2kV (525824) transformer 3 phase fault on the JONES 6 (526337) to LP-HOLLY 6 (522870) 230kV line ckt 1, near JONES 6.
	a. Apply fault at the JONES 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT68-PO3	Prior outage of Tuco 345kV (525832) to Tuco 230kV (525830)/ 13.2kV (525824) transformer 3 phase fault on the Tolk 345kV (525549) to Tolk 230kV (525543)/ 13.2kV (525537) transformer, near the 230kV bus.
	a. Apply fault at the Tolk 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer and Tolk 230kV (525543).
FLT9005-PO3	Prior outage of Tuco 345kV (525832) to Tuco 230kV (525830)/ 13.2kV (525824) transformer 3 phase fault on the TOLK_EAST 6 (525524) 230kV to TOLK_1 1 (525561) 24kV transformer, near TOLK_EAST 6 (525524) 230kV.
	a. Apply fault at TOLK_EAST 6 (525524) 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer. Trip TOLK_1 unit
FLT9006-PO3	Prior outage of Tuco 345kV (525832) to Tuco 230kV (525830)/ 13.2kV (525824) transformer 3 phase fault on the TOLK_EAST 6 (525524) to ROSEVELT_S 6 (524911) 230kV line ckt 1, near TOLK_EAST 6.
	a. Apply fault at the TOLK_EAST 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9007-PO3	Prior outage of Tuco 345kV (525832) to Tuco 230kV (525830)/ 13.2kV (525824) transformer 3 phase fault on the TOLK_EAST 6 (525524) to PLANT_X 6 (525481) 230kV line ckt 2, near TOLK_EAST 6.
	a. Apply fault at the TOLK_EAST 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.

Table 5-1 continued

Fault ID	Fault Description
FLT9008-PO3	Prior outage of Tuco 345kV (525832) to Tuco 230kV (525830)/ 13.2kV (525824) transformer 3 phase fault on the TOLK_WEST 6 (525531) to LAMB_CNTY 6 (525637) 230kV line ckt 1, near TOLK_WEST 6.
	a. Apply fault at the TOLK_WEST 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9009-PO3	Prior outage of Tuco 345kV (525832) to Tuco 230kV (525830)/ 13.2kV (525824) transformer 3 phase fault on the TOLK_WEST 6 (525531) to G13-027-TAP (562480) 230kV line ckt 1, near TOLK_WEST 6.
	a. Apply fault at the TOLK_WEST 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT67-PO4	Prior outage of Tuco (525830) to CRAWFISH_DR6 (560021) 230kV line, ckt1 3 phase fault on the Carlisle 230kV (526161) to Carlisle 115kV (526160)/ 13.2kV (526157) transformer, near the 230kV bus.
	a. Apply fault at the Carlisle 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer.
FLT9022-PO4	Prior outage of Tuco (525830) to CRAWFISH_DR6 (560021) 230kV line, ckt1 3 phase fault on the CARLISLE 6 (526161) to GEN-2016-056 (587370) 230kV line ckt 1, near CARLISLE 6.
	a. Apply fault at the CARLISLE 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line. Trip GEN-2016-056
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9023-PO4	Prior outage of Tuco (525830) to CRAWFISH_DR6 (560021) 230kV line, ckt1 3 phase fault on the CARLISLE 6 (526161) to LP-MILWAKEE6 (522823) 230kV line ckt 1, near CARLISLE 6.
	a. Apply fault at the CARLISLE 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9024-PO4	Prior outage of Tuco (525830) to CRAWFISH_DR6 (560021) 230kV line, ckt1 3 phase fault on the CARLISLE 6 (526161) to WOLFFORTH 6 (526525) 230kV line ckt 1, near CARLISLE 6.
	a. Apply fault at the CARLISLE 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT01-PO4	Prior outage of Tuco (525830) to CRAWFISH_DR6 (560021) 230kV line, ckt1 3 phase fault on the Jones (526337) to Lubbock_STH (526269) 230kV line ckt1, near Jones.
	a. Apply fault at the Jones 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.

Table 5-1 continued

Fault ID	Fault Description
FLT03-PO4	Prior outage of Tuco (525830) to CRAWFISH_DR6 (560021) 230kV line, ckt1 3 phase fault on the Jones (526337) to Lubbock_EST (526299) 230kV line, near Jones.
	a. Apply fault at the Jones 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT05-PO4	Prior outage of Tuco (525830) to CRAWFISH_DR6 (560021) 230kV line, ckt1 3 phase fault on the Jones (526337) to Grassland (526677) 230kV line, near Jones.
	a. Apply fault at the Jones 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT13-PO4	Prior outage of Tuco (525830) to CRAWFISH_DR6 (560021) 230kV line, ckt1 3 phase fault on the Jones1 (526337) to Tuco_Int (525830) 230kV line, near Jones.
	a. Apply fault at the Jones 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9028-PO4	Prior outage of Tuco (525830) to CRAWFISH_DR6 (560021) 230kV line, ckt1 3 phase fault on the JONES 6 (526337) to LP-HOLLY 6 (522870) 230kV line ckt 1, near JONES 6.
	a. Apply fault at the JONES 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT57-PO4	Prior outage of Tuco (525830) to CRAWFISH_DR6 (560021) 230kV line, ckt1 3 phase fault on the Tuco_Int (525832) to CRAWFISH_DR (560022) 345kV line, near Tuco.
	a. Apply fault at the Tuco 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT64-PO4	Prior outage of Tuco (525830) to CRAWFISH_DR6 (560021) 230kV line, ckt1 3 phase fault on the Tuco 345kV (525832) to Tuco 230kV (525830)/ 13.2kV (525824) transformer, near the 345kV bus.
	a. Apply fault at the Tuco 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer.
FLT9049-PO4	Prior outage of Tuco (525830) to CRAWFISH_DR6 (560021) 230kV line, ckt1 3 phase fault on the TUCO_INT 7 (525832) to YOAKUM_345 (526936) 345kV line ckt 1, near TUCO_INT 7.
	a. Apply fault at the TUCO_INT 7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.

Table 5-1 continued

Fault ID	Fault Description
FLT9057-PO4	Prior outage of Tuco (525830) to CRAWFISH_DR6 (560021) 230kV line, ckt1 3 phase fault on the TUCO_INT 7 345kV (525832) to ELK_1 1 18kV (525844) transformer, near the 345kV bus.
	a. Apply fault at the TUCO_INT 7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer. Trip ELK_1 unit
FLT9058-PO4	Prior outage of Tuco (525830) to CRAWFISH_DR6 (560021) 230kV line, ckt1 3 phase fault on the TUCO_INT 7 (525832) to GEN-2015-068 (585060) 345kV line ckt 1, near TUCO_INT 7.
	a. Apply fault at the TUCO_INT 7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT68-PO4	Prior outage of Tuco (525830) to CRAWFISH_DR6 (560021) 230kV line, ckt1 3 phase fault on the Tolk 345kV (525549) to Tolk 230kV (525543)/ 13.2kV (525537) transformer, near the 230kV bus.
	a. Apply fault at the Tolk 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer and Tolk 230kV (525543).
FLT9005-PO4	Prior outage of Tuco (525830) to CRAWFISH_DR6 (560021) 230kV line, ckt1 3 phase fault on the TOLK_EAST 6 (525524) 230kV to TOLK_1 1 (525561) 24kV transformer, near TOLK_EAST 6 (525524) 230kV.
	a. Apply fault at TOLK_EAST 6 (525524) 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer. Trip TOLK_1 unit
FLT9006-PO4	Prior outage of Tuco (525830) to CRAWFISH_DR6 (560021) 230kV line, ckt1 3 phase fault on the TOLK_EAST 6 (525524) to ROSEVELT_S 6 (524911) 230kV line ckt 1, near TOLK_EAST 6.
	a. Apply fault at the TOLK_EAST 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9007-PO4	Prior outage of Tuco (525830) to CRAWFISH_DR6 (560021) 230kV line, ckt1 3 phase fault on the TOLK_EAST 6 (525524) to PLANT_X 6 (525481) 230kV line ckt 2, near TOLK_EAST 6.
	a. Apply fault at the TOLK_EAST 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9008-PO4	Prior outage of Tuco (525830) to CRAWFISH_DR6 (560021) 230kV line, ckt1 3 phase fault on the TOLK_WEST 6 (525531) to LAMB_CNTY 6 (525637) 230kV line ckt 1, near TOLK_WEST 6.
	a. Apply fault at the TOLK_WEST 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.

Table 5-1 continued

Fault ID	Fault Description
FLT9009-PO4	Prior outage of Tuco (525830) to CRAWFISH_DR6 (560021) 230kV line, ckt1 3 phase fault on the TOLK_WEST 6 (525531) to G13-027-TAP (562480) 230kV line ckt 1, near TOLK_WEST 6.
	a. Apply fault at the TOLK_WEST 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT67-PO5	Prior outage of Jones1 (526337) to Tuco_Int (525830) 230kV line 3 phase fault on the Carlisle 230kV (526161) to Carlisle 115kV (526160)/ 13.2kV (526157) transformer, near the 230kV bus.
	a. Apply fault at the Carlisle 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer.
FLT9022-PO5	Prior outage of Jones1 (526337) to Tuco_Int (525830) 230kV line 3 phase fault on the CARLISLE 6 (526161) to GEN-2016-056 (587370) 230kV line ckt 1, near CARLISLE 6.
	a. Apply fault at the CARLISLE 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line. Trip GEN-2016-056
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9023-PO5	Prior outage of Jones1 (526337) to Tuco_Int (525830) 230kV line 3 phase fault on the CARLISLE 6 (526161) to LP-MILWAKEE6 (522823) 230kV line ckt 1, near CARLISLE 6.
	a. Apply fault at the CARLISLE 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9024-PO5	Prior outage of Jones1 (526337) to Tuco_Int (525830) 230kV line 3 phase fault on the CARLISLE 6 (526161) to WOLFFORTH 6 (526525) 230kV line ckt 1, near CARLISLE 6.
	a. Apply fault at the CARLISLE 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9034-PO5	Prior outage of Jones1 (526337) to Tuco_Int (525830) 230kV line 3 phase fault on the CRAWFISH_DR6 (560021) to SWISHER 6 (525213) 230kV line ckt 1, near CRAWFISH_DR6.
	a. Apply fault at the CRAWFISH_DR6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9035-PO5	Prior outage of Jones1 (526337) to Tuco_Int (525830) 230kV line 3 phase fault on the CRAWFISH_DR6 230kV (560021) to 345kV (560022)/ 13.2kV (560023) transformer, near the 230kV bus.
	a. Apply fault at the CRAWFISH_DR6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer.

Table 5-1 continued

Fault ID	Fault Description
FLT57-PO5	Prior outage of Jones1 (526337) to Tuco_Int (525830) 230kV line 3 phase fault on the Tuco_Int (525832) to CRAWFISH_DR (560022) 345kV line, near Tuco.
	a. Apply fault at the Tuco 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT64-PO5	Prior outage of Jones1 (526337) to Tuco_Int (525830) 230kV line 3 phase fault on the Tuco 345kV (525832) to Tuco 230kV (525830)/ 13.2kV (525824) transformer, near the 345kV bus.
	a. Apply fault at the Tuco 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer.
FLT9049-PO5	Prior outage of Jones1 (526337) to Tuco_Int (525830) 230kV line 3 phase fault on the TUCO_INT 7 (525832) to YOAKUM_345 (526936) 345kV line ckt 1, near TUCO_INT 7.
	a. Apply fault at the TUCO_INT 7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9057-PO5	Prior outage of Jones1 (526337) to Tuco_Int (525830) 230kV line 3 phase fault on the TUCO_INT 7 345kV (525832) to ELK_1 1 18kV (525844) transformer, near the 345kV bus.
	a. Apply fault at the TUCO_INT 7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer. Trip ELK_1 unit
FLT9058-PO5	Prior outage of Jones1 (526337) to Tuco_Int (525830) 230kV line 3 phase fault on the TUCO_INT 7 (525832) to GEN-2015-068 (585060) 345kV line ckt 1, near TUCO_INT 7.
	a. Apply fault at the TUCO_INT 7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT68-PO5	Prior outage of Jones1 (526337) to Tuco_Int (525830) 230kV line 3 phase fault on the Tolk 345kV (525549) to Tolk 230kV (525543)/ 13.2kV (525537) transformer, near the 230kV bus.
	a. Apply fault at the Tolk 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer and Tolk 230kV (525543).
FLT9005-PO5	Prior outage of Jones1 (526337) to Tuco_Int (525830) 230kV line 3 phase fault on the TOLK_EAST 6 (525524) 230kV to TOLK_1 1 (525561) 24kV transformer, near TOLK_EAST 6 (525524) 230kV.
	a. Apply fault at TOLK_EAST 6 (525524) 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer. Trip TOLK_1 unit
FLT9006-PO5	Prior outage of Jones1 (526337) to Tuco_Int (525830) 230kV line 3 phase fault on the TOLK_EAST 6 (525524) to ROSEVELT_S 6 (524911) 230kV line ckt 1, near TOLK_EAST 6.
	a. Apply fault at the TOLK_EAST 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.

Table 5-1 continued

Fault ID	Fault Description
FLT9007-PO5	Prior outage of Jones1 (526337) to Tuco_Int (525830) 230kV line 3 phase fault on the TOLK_EAST 6 (525524) to PLANT_X 6 (525481) 230kV line ckt 2, near TOLK_EAST 6.
	a. Apply fault at the TOLK_EAST 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9008-PO5	Prior outage of Jones1 (526337) to Tuco_Int (525830) 230kV line 3 phase fault on the TOLK_WEST 6 (525531) to LAMB_CNTY 6 (525637) 230kV line ckt 1, near TOLK_WEST 6.
	a. Apply fault at the TOLK_WEST 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9009-PO5	Prior outage of Jones1 (526337) to Tuco_Int (525830) 230kV line 3 phase fault on the TOLK_WEST 6 (525531) to G13-027-TAP (562480) 230kV line ckt 1, near TOLK_WEST 6.
	a. Apply fault at the TOLK_WEST 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT67-PO6	Prior outage of Tuco (525830) to Tolk East (525524) 230kV line, ckt1 3 phase fault on the Carlisle 230kV (526161) to Carlisle 115kV (526160)/ 13.2kV (526157) transformer, near the 230kV bus.
	a. Apply fault at the Carlisle 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer.
FLT9022-PO6	Prior outage of Tuco (525830) to Tolk East (525524) 230kV line, ckt1 3 phase fault on the CARLISLE 6 (526161) to GEN-2016-056 (587370) 230kV line ckt 1, near CARLISLE 6.
	a. Apply fault at the CARLISLE 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line. Trip GEN-2016-056
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9023-PO6	Prior outage of Tuco (525830) to Tolk East (525524) 230kV line, ckt1 3 phase fault on the CARLISLE 6 (526161) to LP-MILWAKEE6 (522823) 230kV line ckt 1, near CARLISLE 6.
	a. Apply fault at the CARLISLE 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9024-PO6	Prior outage of Tuco (525830) to Tolk East (525524) 230kV line, ckt1 3 phase fault on the CARLISLE 6 (526161) to WOLFFORTH 6 (526525) 230kV line ckt 1, near CARLISLE 6.
	a. Apply fault at the CARLISLE 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.

Table 5-1 continued

Fault ID	Fault Description
FLT9034-PO6	Prior outage of Tuco (525830) to Tolk East (525524) 230kV line, ckt1 3 phase fault on the CRAWFISH_DR6 (560021) to SWISHER 6 (525213) 230kV line ckt 1, near CRAWFISH_DR6.
	a. Apply fault at the CRAWFISH_DR6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9035-PO6	Prior outage of Tuco (525830) to Tolk East (525524) 230kV line, ckt1 3 phase fault on the CRAWFISH_DR6 230kV (560021) to 345kV (560022)/ 13.2kV (560023) transformer, near the 230kV bus.
	a. Apply fault at the CRAWFISH_DR6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer.
FLT01-PO6	Prior outage of Tuco (525830) to Tolk East (525524) 230kV line, ckt1 3 phase fault on the Jones (526337) to Lubbock_STH (526269) 230kV line ckt1, near Jones.
	a. Apply fault at the Jones 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT03-PO6	Prior outage of Tuco (525830) to Tolk East (525524) 230kV line, ckt1 3 phase fault on the Jones (526337) to Lubbock_EST (526299) 230kV line, near Jones.
	a. Apply fault at the Jones 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT05-PO6	Prior outage of Tuco (525830) to Tolk East (525524) 230kV line, ckt1 3 phase fault on the Jones (526337) to Grassland (526677) 230kV line, near Jones.
	a. Apply fault at the Jones 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT13-PO6	Prior outage of Tuco (525830) to Tolk East (525524) 230kV line, ckt1 3 phase fault on the Jones1 (526337) to Tuco_Int (525830) 230kV line, near Jones.
	a. Apply fault at the Jones 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9028-PO6	Prior outage of Tuco (525830) to Tolk East (525524) 230kV line, ckt1 3 phase fault on the JONES 6 (526337) to LP-HOLLY 6 (522870) 230kV line ckt 1, near JONES 6.
	a. Apply fault at the JONES 6 230kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.

Table 5-1 continued

Fault ID	Fault Description
FLT57-PO6	Prior outage of Tuco (525830) to Tolk East (525524) 230kV line, ckt1 3 phase fault on the Tuco_Int (525832) to CRAWFISH_DR (560022) 345kV line, near Tuco.
	a. Apply fault at the Tuco 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT64-PO6	Prior outage of Tuco (525830) to Tolk East (525524) 230kV line, ckt1 3 phase fault on the Tuco 345kV (525832) to Tuco 230kV (525830)/ 13.2kV (525824) transformer, near the 345kV bus.
	a. Apply fault at the Tuco 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer.
FLT9049-PO6	Prior outage of Tuco (525830) to Tolk East (525524) 230kV line, ckt1 3 phase fault on the TUCO_INT 7 (525832) to YOAKUM_345 (526936) 345kV line ckt 1, near TUCO_INT 7.
	a. Apply fault at the TUCO_INT 7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9057-PO6	Prior outage of Tuco (525830) to Tolk East (525524) 230kV line, ckt1 3 phase fault on the TUCO_INT 7 345kV (525832) to ELK_1 1 18kV (525844) transformer, near the 345kV bus.
	a. Apply fault at the TUCO_INT 7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted transformer. Trip ELK_1 unit
FLT9058-PO6	Prior outage of Tuco (525830) to Tolk East (525524) 230kV line, ckt1 3 phase fault on the TUCO_INT 7 (525832) to GEN-2015-068 (585060) 345kV line ckt 1, near TUCO_INT 7.
	a. Apply fault at the TUCO_INT 7 345kV bus.
	b. Clear fault after 5 cycles by tripping the faulted line.
	c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
	d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.

5.3 Results

There were no damping or voltage recovery violations observed during the simulations and the system returned to stable conditions.

Table 5-2 shows the results of the fault events simulated for each of the models.

Table 5-2: GEN-2012-020 Dynamic Stability Results

Fault ID	16WP	17SP	20SP	20WP	25SP
FLT01-3PH	Stable	Stable	Stable	Stable	Stable
FLT03-3PH	Stable	Stable	Stable	Stable	Stable
FLT05-3PH	Stable	Stable	Stable	Stable	Stable
FLT07-3PH	Stable	Stable	Stable	Stable	Stable
FLT09-3PH	Stable	Stable	Stable	Stable	Stable
FLT11-3PH	Stable	Stable	Stable	Stable	Stable
FLT13-3PH	Stable	Stable	Stable	Stable	Stable
FLT25-3PH	Stable	Stable	Stable	Stable	Stable
FLT39-3PH	Stable	Stable	Stable	Stable	Stable
FLT41-3PH	Stable	Stable	Stable	Stable	Stable
FLT43-3PH	Stable	Stable	Stable	Stable	Stable
FLT51-3PH	Stable	Stable	Stable	Stable	Stable
FLT55-3PH	Stable	Stable	Stable	Stable	Stable
FLT57-3PH	Stable	Stable	Stable	Stable	Stable
FLT59-3PH	Stable	Stable	Stable	Stable	Stable
FLT62-3PH	Stable	Stable	Stable	Stable	Stable
FLT64-3PH	Stable	Stable	Stable	Stable	Stable
FLT65-3PH	Stable	Stable	Stable	Stable	Stable
FLT66-3PH	Stable	Stable	Stable	Stable	Stable
FLT67-3PH	Stable	Stable	Stable	Stable	Stable
FLT68-3PH	Stable	Stable	Stable	Stable	Stable
FLT68R-3PH	Stable	Stable	Stable	Stable	Stable
FLT69-3PH	Stable	Stable	Stable	Stable	Stable
FLT71-3PH	Stable	Stable	Stable	Stable	Stable
FLT73-3PH	Stable	Stable	Stable	Stable	Stable
FLT9001-3PH	Stable	Stable	Stable	Stable	Stable
FLT9002-3PH	Stable	Stable	Stable	Stable	Stable
FLT9003-3PH	Stable	Stable	Stable	Stable	Stable
FLT9004-3PH	Stable	Stable	Stable	Stable	Stable
FLT9005-3PH	Stable	Stable	Stable	Stable	Stable
FLT9006-3PH	Stable	Stable	Stable	Stable	Stable
FLT9007-3PH	Stable	Stable	Stable	Stable	Stable
FLT9008-3PH	Stable	Stable	Stable	Stable	Stable
FLT9009-3PH	Stable	Stable	Stable	Stable	Stable
FLT9010-3PH	Stable	Stable	Stable	Stable	Stable
FLT9011-3PH	Stable	Stable	Stable	Stable	Stable
FLT9012-3PH	Stable	Stable	Stable	Stable	Stable
FLT9013-3PH	Stable	Stable	Stable	Stable	Stable
FLT9014-3PH	Stable	Stable	Stable	Stable	Stable
FLT9015-3PH	Stable	Stable	Stable	Stable	Stable
FLT9016-3PH	Stable	Stable	Stable	Stable	Stable
FLT9017-3PH	Stable	Stable	Stable	Stable	Stable
FLT9018-3PH	Stable	Stable	Stable	Stable	Stable
FLT9019-3PH	Stable	Stable	Stable	Stable	Stable
FLT9020-3PH	Stable	Stable	Stable	Stable	Stable
FLT9021-3PH	Stable	Stable	Stable	Stable	Stable
FLT9022-3PH	Stable	Stable	Stable	Stable	Stable
FLT9023-3PH	Stable	Stable	Stable	Stable	Stable
FLT9024-3PH	N/A	Stable	Stable	Stable	Stable
FLT9025-3PH	Stable	Stable	Stable	Stable	Stable
FLT9026-3PH	Stable	Stable	Stable	Stable	Stable
FLT9027-3PH	N/A	N/A	Stable	Stable	Stable
FLT9028-3PH	Stable	Stable	Stable	Stable	Stable
FLT9029-3PH	N/A	N/A	Stable	Stable	Stable

Table 5-2 continued

Fault ID	16WP	17SP	20SP	20WP	25SP
FLT9030-3PH	Stable	Stable	Stable	Stable	Stable
FLT9031-3PH	Stable	Stable	Stable	Stable	Stable
FLT9032-3PH	Stable	Stable	Stable	Stable	Stable
FLT9033-3PH	Stable	Stable	Stable	Stable	Stable
FLT9034-3PH	Stable	Stable	Stable	Stable	Stable
FLT9035-3PH	Stable	Stable	Stable	Stable	Stable
FLT9036-3PH	Stable	Stable	Stable	Stable	Stable
FLT9037-3PH	Stable	Stable	Stable	Stable	Stable
FLT9038-3PH	Stable	Stable	Stable	Stable	Stable
FLT9039-3PH	Stable	Stable	Stable	Stable	Stable
FLT9040-3PH	Stable	Stable	Stable	Stable	Stable
FLT9041-3PH	Stable	Stable	Stable	Stable	Stable
FLT9042-3PH	Stable	Stable	Stable	Stable	Stable
FLT9043-3PH	Stable	Stable	Stable	Stable	Stable
FLT9044-3PH	Stable	Stable	Stable	Stable	Stable
FLT9045-3PH	Stable	Stable	Stable	Stable	Stable
FLT9046-3PH	Stable	Stable	Stable	Stable	Stable
FLT9047-3PH	Stable	Stable	Stable	Stable	Stable
FLT9048-3PH	Stable	Stable	Stable	Stable	Stable
FLT9049-3PH	Stable	Stable	Stable	Stable	Stable
FLT9050-3PH	Stable	Stable	Stable	Stable	Stable
FLT9051-3PH	Stable	Stable	Stable	Stable	Stable
FLT9052-3PH	Stable	Stable	Stable	Stable	Stable
FLT9053-3PH	Stable	Stable	Stable	Stable	Stable
FLT9054-3PH	Stable	Stable	Stable	Stable	Stable
FLT9055-3PH	Stable	Stable	Stable	Stable	Stable
FLT9056-3PH	Stable	Stable	Stable	Stable	Stable
FLT9057-3PH	Stable	Stable	Stable	Stable	Stable
FLT9058-3PH	Stable	Stable	Stable	Stable	Stable
FLT9059-3PH	Stable	Stable	Stable	Stable	Stable
FLT9100-SB	Stable	Stable	Stable	Stable	Stable
FLT9101-SB	Stable	Stable	Stable	Stable	Stable
FLT9102-SB	Stable	Stable	Stable	Stable	Stable
FLT9103-SB	Stable	Stable	Stable	Stable	Stable
FLT9104-SB	Stable	Stable	Stable	Stable	Stable
FLT9105-SB	Stable	Stable	Stable	Stable	Stable
FLT9006-PO1	Stable	Stable	Stable	Stable	Stable
FLT01-PO2	Stable	Stable	Stable	Stable	Stable
FLT03-PO2	Stable	Stable	Stable	Stable	Stable
FLT05-PO2	Stable	Stable	Stable	Stable	Stable
FLT13-PO2	Stable	Stable	Stable	Stable	Stable
FLT57-PO2	Stable	Stable	Stable	Stable	Stable
FLT64-PO2	Stable	Stable	Stable	Stable	Stable
FLT68-PO2	Stable	Stable	Stable	Stable	Stable
FLT9005-PO2	Stable	Stable	Stable	Stable	Stable
FLT9006-PO2	Stable	Stable	Stable	Stable	Stable
FLT9007-PO2	Stable	Stable	Stable	Stable	Stable
FLT9008-PO2	Stable	Stable	Stable	Stable	Stable
FLT9009-PO2	Stable	Stable	Stable	Stable	Stable
FLT9028-PO2	Stable	Stable	Stable	Stable	Stable
FLT9034-PO2	Stable	Stable	Stable	Stable	Stable
FLT9035-PO2	Stable	Stable	Stable	Stable	Stable
FLT9049-PO2	Stable	Stable	Stable	Stable	Stable
FLT9057-PO2	Stable	Stable	Stable	Stable	Stable
FLT9058-PO2	Stable	Stable	Stable	Stable	Stable

Table 5-2 continued

Fault ID	16WP	17SP	20SP	20WP	25SP
FLT9059-3PH	Stable	Stable	Stable	Stable	Stable
FLT9100-SB	Stable	Stable	Stable	Stable	Stable
FLT9101-SB	Stable	Stable	Stable	Stable	Stable
FLT9102-SB	Stable	Stable	Stable	Stable	Stable
FLT9103-SB	Stable	Stable	Stable	Stable	Stable
FLT9104-SB	Stable	Stable	Stable	Stable	Stable
FLT9105-SB	Stable	Stable	Stable	Stable	Stable
FLT9006-PO1	Stable	Stable	Stable	Stable	Stable
FLT01-PO2	Stable	Stable	Stable	Stable	Stable
FLT03-PO2	Stable	Stable	Stable	Stable	Stable
FLT05-PO2	Stable	Stable	Stable	Stable	Stable
FLT13-PO2	Stable	Stable	Stable	Stable	Stable
FLT57-PO2	Stable	Stable	Stable	Stable	Stable
FLT64-PO2	Stable	Stable	Stable	Stable	Stable
FLT68-PO2	Stable	Stable	Stable	Stable	Stable
FLT9005-PO2	Stable	Stable	Stable	Stable	Stable
FLT9006-PO2	Stable	Stable	Stable	Stable	Stable
FLT9007-PO2	Stable	Stable	Stable	Stable	Stable
FLT9008-PO2	Stable	Stable	Stable	Stable	Stable
FLT9009-PO2	Stable	Stable	Stable	Stable	Stable
FLT9028-PO2	Stable	Stable	Stable	Stable	Stable
FLT9034-PO2	Stable	Stable	Stable	Stable	Stable
FLT9035-PO2	Stable	Stable	Stable	Stable	Stable
FLT9049-PO2	Stable	Stable	Stable	Stable	Stable
FLT9057-PO2	Stable	Stable	Stable	Stable	Stable
FLT9058-PO2	Stable	Stable	Stable	Stable	Stable
FLT01-PO3	Stable	Stable	Stable	Stable	Stable
FLT03-PO3	Stable	Stable	Stable	Stable	Stable
FLT05-PO3	Stable	Stable	Stable	Stable	Stable
FLT13-PO3	Stable	Stable	Stable	Stable	Stable
FLT67-PO3	Stable	Stable	Stable	Stable	Stable
FLT68-PO3	Stable	Stable	Stable	Stable	Stable
FLT9005-PO3	Stable	Stable	Stable	Stable	Stable
FLT9006-PO3	Stable	Stable	Stable	Stable	Stable
FLT9007-PO3	Stable	Stable	Stable	Stable	Stable
FLT9008-PO3	Stable	Stable	Stable	Stable	Stable
FLT9009-PO3	Stable	Stable	Stable	Stable	Stable
FLT9022-PO3	Stable	Stable	Stable	Stable	Stable
FLT9023-PO3	Stable	Stable	Stable	Stable	Stable
FLT9024-PO3	N/A	Stable	Stable	Stable	Stable
FLT9028-PO3	Stable	Stable	Stable	Stable	Stable
FLT9034-PO3	Stable	Stable	Stable	Stable	Stable
FLT9035-PO3	Stable	Stable	Stable	Stable	Stable
FLT01-PO4	Stable	Stable	Stable	Stable	Stable
FLT03-PO4	Stable	Stable	Stable	Stable	Stable
FLT05-PO4	Stable	Stable	Stable	Stable	Stable
FLT13-PO4	Stable	Stable	Stable	Stable	Stable
FLT57-PO4	Stable	Stable	Stable	Stable	Stable
FLT64-PO4	Stable	Stable	Stable	Stable	Stable
FLT67-PO4	Stable	Stable	Stable	Stable	Stable
FLT68-PO4	Stable	Stable	Stable	Stable	Stable
FLT9005-PO4	Stable	Stable	Stable	Stable	Stable
FLT9006-PO4	Stable	Stable	Stable	Stable	Stable
FLT9007-PO4	Stable	Stable	Stable	Stable	Stable
FLT9008-PO4	Stable	Stable	Stable	Stable	Stable
FLT9009-PO4	Stable	Stable	Stable	Stable	Stable
FLT9022-PO4	Stable	Stable	Stable	Stable	Stable
FLT9023-PO4	Stable	Stable	Stable	Stable	Stable
FLT9024-PO4	N/A	Stable	Stable	Stable	Stable

Table 5-2 continued

Fault ID	16WP	17SP	20SP	20WP	25SP
FLT9049-PO4	Stable	Stable	Stable	Stable	Stable
FLT9057-PO4	Stable	Stable	Stable	Stable	Stable
FLT9058-PO4	Stable	Stable	Stable	Stable	Stable
FLT57-PO5	Stable	Stable	Stable	Stable	Stable
FLT64-PO5	Stable	Stable	Stable	Stable	Stable
FLT67-PO5	Stable	Stable	Stable	Stable	Stable
FLT68-PO5	Stable	Stable	Stable	Stable	Stable
FLT9005-PO5	Stable	Stable	Stable	Stable	Stable
FLT9006-PO5	Stable	Stable	Stable	Stable	Stable
FLT9007-PO5	Stable	Stable	Stable	Stable	Stable
FLT9008-PO5	Stable	Stable	Stable	Stable	Stable
FLT9009-PO5	Stable	Stable	Stable	Stable	Stable
FLT9022-PO5	Stable	Stable	Stable	Stable	Stable
FLT9023-PO5	Stable	Stable	Stable	Stable	Stable
FLT9024-PO5	N/A	Stable	Stable	Stable	Stable
FLT9034-PO5	Stable	Stable	Stable	Stable	Stable
FLT9035-PO5	Stable	Stable	Stable	Stable	Stable
FLT9049-PO5	Stable	Stable	Stable	Stable	Stable
FLT9057-PO5	Stable	Stable	Stable	Stable	Stable
FLT9058-PO5	Stable	Stable	Stable	Stable	Stable
FLT01-PO6	Stable	Stable	Stable	Stable	Stable
FLT03-PO6	Stable	Stable	Stable	Stable	Stable
FLT05-PO6	Stable	Stable	Stable	Stable	Stable
FLT13-PO6	Stable	Stable	Stable	Stable	Stable
FLT57-PO6	Stable	Stable	Stable	Stable	Stable
FLT64-PO6	Stable	Stable	Stable	Stable	Stable
FLT67-PO6	Stable	Stable	Stable	Stable	Stable
FLT9022-PO6	Stable	Stable	Stable	Stable	Stable
FLT9023-PO6	Stable	Stable	Stable	Stable	Stable
FLT9024-PO6	N/A	Stable	Stable	Stable	Stable
FLT9028-PO6	Stable	Stable	Stable	Stable	Stable
FLT9034-PO6	Stable	Stable	Stable	Stable	Stable
FLT9035-PO6	Stable	Stable	Stable	Stable	Stable
FLT9049-PO6	Stable	Stable	Stable	Stable	Stable
FLT9057-PO6	Stable	Stable	Stable	Stable	Stable
FLT9058-PO6	Stable	Stable	Stable	Stable	Stable

The associated stability plots are provided in Appendix D. Additionally, the project wind farm was found to stay connected during the contingencies that were studied and, therefore, will meet the Low Voltage Ride Through (LVRT) requirements of FERC Order #661A.

6.0 Conclusions

The Interconnection Customer for GEN-2012-020 requested a Modification Request Impact Study to assess the impact of the turbine and facility changes presented in Table 6-1 below.

Table 6-1: Modification Request

Facility	Existing		Modification Request
Point of Interconnection	TUCO 230 kV Substation (525830)		TUCO 230 kV Substation (525830)
Configuration/Capacity	284 x GE 1.68 MW = 477.12 MW		239 x Vestas 2.0 MW = 478 MW
Generation Interconnection Line	Length = 18.06 miles R = 0.002590 pu X = 0.020240 pu B = 0.069480 pu		Length = 15.8 miles R = 0.001400 pu X = 0.015830 pu B = 0.048360 pu
Main Substation Transformer	**Two Transformers:** Z = 7.5%, Rating 180 MVA		**Three Transformers:** Z = 11.2%, Rating 126 MVA
Equivalent Collector Line	**Collector Line 1:** R = 0.006300 pu X = 0.007950 pu B = 0.109600 pu	**Collector Line 2:** R = 0.006030 pu X = 0.007660 pu B = 0.113200 pu	R = 0.002683 pu X = 0.003986 pu B = 0.360465 pu
Reactive Power Devices	N/A		2 x 68 MVAR 230 kV Capacitor Banks

The reactive power analysis, low-wind/no-wind condition analysis, performed to determine the size of a reactor required at the GEN-2012-020 main substation during low wind conditions showed that a 41.3 MVAr reactor would be needed to maintain the project's reactive power contribution to the POI at zero.

The short circuit analysis showed that the maximum increase in fault current caused by GEN-2012-020 did not exceed 2.05%. The largest fault current calculated was below 32 kA for both the 2017SP and 2025SP models.

The results of the dynamic stability analysis showed there were no machine rotor angle damping or transient voltage recovery violations observed in the simulated fault events associated with GEN-2012-020 and the system achieved stable operation after each fault event. Additionally, the project wind farm was found to stay connected during the simulated contingencies that were studied and will meet the Low Voltage Ride Through (LVRT) requirements of FERC Order #661A.

In conclusion, the results of this Study showed that the Modification Request shown in Table 6-1 do not constitute a material modification.