ANEDEN CONSULTING

Report on

# GEN-2022-GR1
# Modification Request Impact Study

**Revision R1 October 16, 2024**

Submitted to

SPP Southwest Power Pool

anedenconsulting.com

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# Revision History

| DATE OR VERSION NUMBER | AUTHOR | CHANGE DESCRIPTION |
|---|---|---|
| 10/16/2024 | Aneden Consulting | Initial Report Issued |
| | | |
| | | |

# Executive Summary

Aneden Consulting (Aneden) was retained by the Southwest Power Pool (SPP) to perform a Modification Request Impact Study (Study) for GEN-2022-GR1, an active Generation Interconnection Request (GIR) with a Point of Interconnection (POI) at the Pirkey 138 kV Substation.

The GEN-2022-GR1 project, a solar generating facility, interconnects in the American Electric Power (AEP) control area with a current Generator Interconnection Agreement (GIA) Interconnection Service amount of 580 MW. This Study has been requested to evaluate the modification of GEN-2022-GR1 to change the fuel type and the configuration to 2 x GE 285 MVA synchronous gas-fired units operating at 255/256.5 MW Summer/Winter for a total assumed dispatch of 510/513 MW Summer/Winter.

In addition, the modification request included changes to the generator step-up transformers, generation interconnection line, auxiliary loads, and reactive power devices, and removed the collector system and main substation transformers. The previously accepted and modified configurations for GEN-2022-GR1 are shown in Table ES-1 below.

**Table ES-1: GEN-2022-GR1 Modification Request**

| Facility | Previous Configuration[1] | | | Modification Configuration | |
|---|---|---|---|---|---|
| Point of Interconnection | Pirkey 138kV Substation (508562) | | | Pirkey 138kV Substation (508562) | |
| Configuration/Capacity | 201 x Power Electronics FS3190M (solar) = 582.9 MW [dispatch]<br>PPC to limit injection to 580 MW | | | 2 x GE 255/256.5 MW (Summer/Winter) Units (combustion) = 510/513 MW (Summer/Winter) [dispatch] | |
| Generation Interconnection Line | Length = 0.189 miles<br>R = 0.00001 pu<br>X = 0.00006 pu<br>B = 0.00002 pu<br>Rating MVA = 0 MVA | | | Length = 0.4 miles<br>R = 0.000010 pu<br>X = 0.000130 pu<br>B = 0.000040 pu<br>Rating A/B MVA = 777/1046 MVA | |
| Main Substation Transformer[2] | X = 9.496%, R = 0.271%, Winding MVA = 138 MVA, Rating MVA = 230 MVA | X = 9.496%, R = 0.271%, Winding MVA = 138 MVA, Rating MVA = 230 MVA | X = 9.496%, R = 0.271%, Winding MVA = 138 MVA, Rating MVA = 230 MVA | N/A | |
| Equivalent GSU Transformer[2] | Gen 1 Equivalent Qty: 68<br>X = 7.222%, R = 0.634%, Winding MVA = 224.4 MVA, Rating MVA = 224.4 MVA | Gen 2 Equivalent Qty: 68<br>X = 7.222%, R = 0.634%, Winding MVA = 224.4 MVA, Rating MVA = 224.4 MVA | Gen 3 Equivalent Qty: 65<br>X = 7.222%, R = 0.634%, Winding MVA = 214.5 MVA, Rating MVA = 214.5 MVA | Gen 1 Equivalent Qty: 1<br>X = 8.998%, R = 0.188%, Winding MVA = 184 MVA, Rating MVA = 305 MVA | Gen 2 Equivalent Qty: 1<br>X = 8.998%, R = 0.188%, Winding MVA = 184 MVA, Rating MVA = 305 MVA |
| Equivalent Collector Line[3] | R = 0.001443859 pu<br>X = 0.001807229 pu<br>B = 0.027800492 pu | R = 0.001134021 pu<br>X = 0.001254025 pu<br>B = 0.013168945 pu | R = 0.001414462 pu<br>X = 0.001800776 pu<br>B = 0.025558115 pu | N/A | |
| Auxiliary Load | N/A | | | 2.0 MW + 1.0 MVAr on 18 kV bus (Summer)<br>1.67 MW + 0.8 MVAr on 18 kV bus (Winter) | 2.0 MW + 1.0 MVAr on 18 kV bus (Summer)<br>1.67 MW + 0.8 MVAr on 18 kV bus (Winter) |
| Generator Dynamic Model[4] & Power Factor | 68 x Power Electronics FS3190M (REGCAU1)[4]<br>Leading: 0.879<br>Lagging: 0.879 | 68 x Power Electronics FS3190M (REGCAU1)[4]<br>Leading: 0.879<br>Lagging: 0.879 | 65 x Power Electronics FS3190M (REGCAU1)[4]<br>Leading: 0.879<br>Lagging: 0.879 | 1 x GE 255/256.5 MW (Summer/Winter) (GENTPJ1)[4]<br>Leading: 0.9389<br>Lagging: 0.9 | 1 x GE 255/256.5 MW (Summer/Winter) (GENTPJ1)[4]<br>Leading: 0.9389<br>Lagging: 0.9 |
| Reactive Power Devices | 2 x 14 MVAR 34.5 kV Capacitor Bank | 2 x 14 MVAR 34.5 kV Capacitor Bank | 2 x 14 MVAR 34.5 kV Capacitor Bank | N/A | N/A |

1) Previous accepted replacement configuration, 2) X and R based on Winding MVA, 3) All pu are on 100 MVA Base, 4) DYR stability model name

SPP determined that steady-state analysis was not required because the original Existing Generating Facility (EGF) that GEN-2022-GR1 replaced is a Legacy unit and as such it was not subject to a DISIS steady-state analysis. However, SPP determined that the change in fuel type from solar to synchronous gas-fired required short circuit and dynamic stability analyses.

The scope of this study included short circuit analysis and dynamic stability analyses.

Aneden performed the analyses using the modification request data and the DISIS-2018-002/2019-001 study models:

- 2025 Summer Peak (25SP),
- 2025 Winter Peak (25WP)

All analyses were performed using the Siemens PTI PSS/E[1] version 34 software and the results are summarized below.

The short circuit analysis was performed using the 25SP stability model modified for short circuit analysis. The results from the short circuit analysis with the updated topology showed that the maximum GEN-2022-GR1 contribution to three-phase fault currents in the immediate transmission systems at or near the GEN-2022-GR1 POI was 7.33 kA. The maximum three-phase fault current level within 5 buses of the POI was 37.77 kA for the 25SP model.

The dynamic stability analysis was performed using Siemens PTI PSS/E version 34.8.0 software for the two modified study models: 25SP and 25WP. 145 fault events were simulated, which included three-phase faults and single-line-to-ground stuck breaker faults. The results of the dynamic stability analysis showed several existing base case issues that were found in both the original DISIS-2018-002/2019-001 models and in the models with the GEN-2022-GR1 modification included. These issues were not attributed to the GEN-2022-GR1 modification request and are detailed in Appendix C.

There were no damping or voltage recovery violations attributed to the GEN-2022-GR1 modification request observed during the simulated faults.

Based on the results of the study, SPP determined that the requested modification is **not a Material Modification**. The requested modification does not have a material adverse impact on the Transmission System when compared to the impacts of the generating facility prior to the modification**.**

It is likely that the customer may be required to reduce its generation output to 0 MW in real-time, 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.

[1] Power System Simulator for Engineering

# 1.0 Scope of Study

Aneden Consulting (Aneden) was retained by the Southwest Power Pool (SPP) to perform a Modification Request Impact Study (Study) for GEN-2022-GR1. This Modification Request Impact Study is a generation interconnection study performed to evaluate the impacts of modifying the existing GEN-2022-GR1 configuration captured in its Generation Interconnection Agreement (GIA). The determination of the required scope of the study is dependent upon the specific modification requested and how it may impact the Transmission System when compared to the impacts of the generating facility prior to the modification. If the modified configuration has a material adverse impact on the Transmission system compared to the impacts of the generating facility prior to the modification, the requested modification will be deemed a Material Modification. The criteria sections below include reasoning as to why an analysis was either included or excluded from the scope of study.

All analyses were performed using the Siemens PTI PSS/E version 34 software. The results of each analysis are presented in the following sections.

## 1.1 Reactive Power Analysis

SPP requires that a reactive power analysis be performed on the requested configuration if it is a non-synchronous resource. The reactive power analysis determines the capacitive effect at the POI caused by the project's collection system and transmission line's capacitance. A shunt reactor size was determined to offset the capacitive effect and maintain zero (0) MVAr injection at the POI while the plant's generators and capacitors were offline. A reactive power analysis was not performed on the requested modified configuration as it is a synchronous generator resource.

## 1.2 Short Circuit Analysis & Stability Analysis

To determine whether stability and short circuit analyses are required, SPP evaluates the difference between the stability models, the stability model parameters and, if needed, the equivalent collector system impedance between the existing configuration and the requested modification. Dynamic stability analysis and short circuit analysis would be required if the differences listed above were determined to potentially have an impact on the Transmission System when compared to the impacts of the generating facility prior to the modification.

## 1.3 Steady-State Analysis

Steady-state analysis is performed if SPP deems it necessary based on the nature of the requested change. SPP determined that steady-state analysis was not required because the original Existing Generating Facility (EGF) that GEN-2022-GR1 replaced is a Legacy unit and as such it was not subject to a DISIS steady-state analysis.

## 1.4 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.

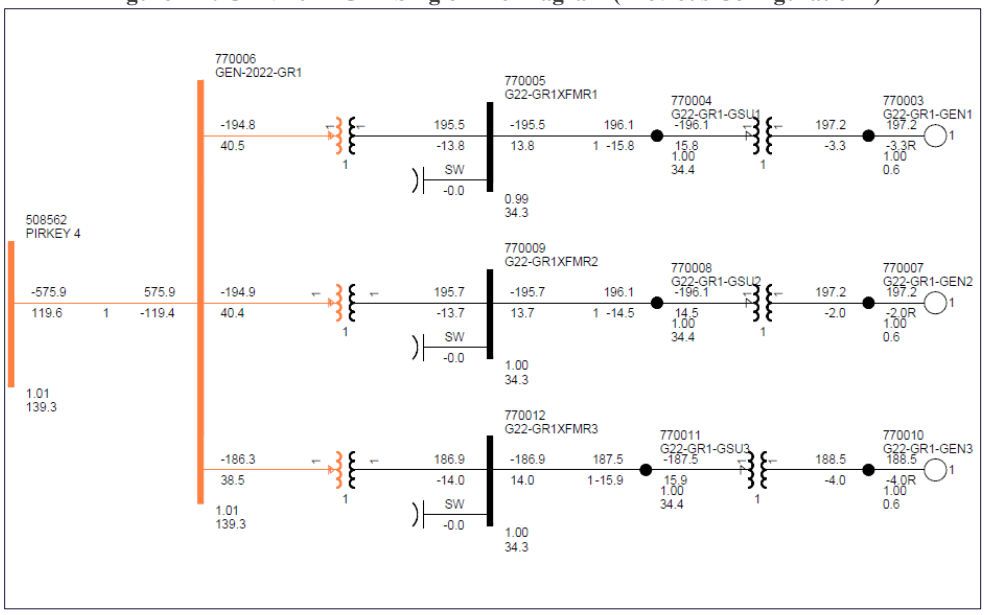
# 2.0 Project and Modification Request

The GEN-2022-GR1 Interconnection Customer requested a modification to its Generation Interconnection Request (GIR) with a Point of Interconnection (POI) at the Pirkey 138 kV Substation in the American Electric Power (AEP) control area.

At the time of report posting, GEN-2022-GR1 is an active Interconnection Request with a queue status of "IA FULLY EXECUTED/ON SCHEDULE." GEN-2022-GR1 is a solar facility with a maximum summer and winter queue capacity of 580 MW with Energy Resource Interconnection Service (ERIS).

The GEN-2022-GR1 project was originally studied as a replacement request for a legacy unit and was performed outside of the Definitive Interconnection System Impact Study (DISIS) process. Figure 2-1 shows the power flow model single line diagram for the previously accepted GEN-2022-GR1 replacement configuration using the DISIS-2018-002/2019-001 25SP stability model and modeling information provided by SPP. GEN-2022-GR1, a solar generating facility, has a current GIA Interconnection Service amount of 580 MW.

**Figure 2-1: GEN-2022-GR1 Single Line Diagram (Previous Configuration*)**




*based on the DISIS-2018-002/2019-001 25SP stability models with modeling information from SPP

This Study has been requested to evaluate the modification of GEN-2022-GR1 to change the fuel type and the configuration to 2 x GE 285 MVA synchronous gas-fired units operating at 255/256.5 MW Summer/Winter for a total assumed dispatch of 510/513 MW Summer/Winter.

In addition, the modification request included changes to the generator step-up transformers, generation interconnection line, auxiliary loads, and reactive power devices, and removed the collector system and main substation transformers. Figure 2-2 shows the power flow model single line diagram for the GEN-2022-GR1 modification. The previously accepted and modified configurations for GEN-2022-GR1 are shown in Table 2-1 below.

**Figure 2-2: GEN-2022-GR1 Single Line Diagram (Modification Configuration)**

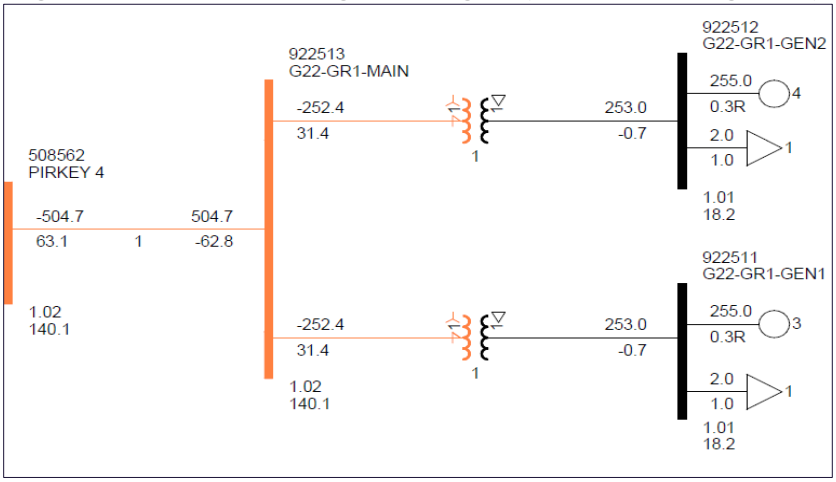



**Table 2-1: GEN-2022-GR1 Modification Request**

| Facility | Previous Configuration[1] | | | Modification Configuration | |
|---|---|---|---|---|---|
| Point of Interconnection | Pirkey 138kV Substation (508562) | | | Pirkey 138kV Substation (508562) | |
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| Generation Interconnection Line | Length = 0.189 miles<br>R = 0.00001 pu<br>X = 0.00006 pu<br>B = 0.00002 pu<br>Rating MVA = 0 MVA | | | Length = 0.4 miles<br>R = 0.000010 pu<br>X = 0.000130 pu<br>B = 0.000040 pu<br>Rating A/B MVA = 777/1046 MVA | |
| Main Substation Transformer[2] | X = 9.496%,<br>R = 0.271%,<br>Winding MVA = 138 MVA,<br>Rating MVA = 230 MVA | X = 9.496%,<br>R = 0.271%,<br>Winding MVA = 138 MVA,<br>Rating MVA = 230 MVA | X = 9.496%,<br>R = 0.271%,<br>Winding MVA = 138 MVA,<br>Rating MVA = 230 MVA | N/A | |
| Equivalent GSU Transformer[2] | Gen 1 Equivalent Qty: 68<br>X = 7.222%, R = 0.634%,<br>Winding MVA = 224.4 MVA,<br>Rating MVA = 224.4 MVA | Gen 2 Equivalent Qty: 68<br>X = 7.222%,<br>R = 0.634%,<br>Winding MVA = 224.4 MVA,<br>Rating MVA = 224.4 MVA | Gen 3 Equivalent Qty: 65<br>X = 7.222%,<br>R = 0.634%,<br>Winding MVA = 214.5 MVA,<br>Rating MVA = 214.5 MVA | Gen 1 Equivalent Qty: 1<br><br>X = 8.998%, R = 0.188%,<br>Winding MVA = 184 MVA,<br>Rating MVA = 305 MVA | Gen 2 Equivalent Qty: 1<br><br>X = 8.998%, R = 0.188%,<br>Winding MVA = 184 MVA,<br>Rating MVA = 305 MVA |
| Equivalent Collector Line[3] | R = 0.001443859 pu<br>X = 0.001807229 pu<br>B = 0.027800492 pu | R = 0.001134021 pu<br>X = 0.001254025 pu<br>B = 0.013168945 pu | R = 0.001414462 pu<br>X = 0.001800776 pu<br>B = 0.025558115 pu | N/A | |
| Auxiliary Load | N/A | | | 2.0 MW + 1.0 MVAr on 18 kV bus (Summer)<br>1.67 MW + 0.8 MVAr on 18 kV bus (Winter) | 2.0 MW + 1.0 MVAr on 18 kV bus (Summer)<br>1.67 MW + 0.8 MVAr on 18 kV bus (Winter) |
| Generator Dynamic Model[4] & Power Factor | 68 x Power Electronics FS3190M (REGCAU1)[4]<br>Leading: 0.879<br>Lagging: 0.879 | 68 x Power Electronics FS3190M (REGCAU1)[4]<br>Leading: 0.879<br>Lagging: 0.879 | 65 x Power Electronics FS3190M (REGCAU1)[4]<br>Leading: 0.879<br>Lagging: 0.879 | 1 x GE 255/256.5 MW (Summer/Winter) (GENTPJ1)[4]<br>Leading: 0.9389<br>Lagging: 0.9 | 1 x GE 255/256.5 MW (Summer/Winter) (GENTPJ1)[4]<br>Leading: 0.9389<br>Lagging: 0.9 |
| Reactive Power Devices | 2 x 14 MVAR 34.5 kV Capacitor Bank | 2 x 14 MVAR 34.5 kV Capacitor Bank | 2 x 14 MVAR 34.5 kV Capacitor Bank | N/A | N/A |

1) Previous accepted replacement configuration, 2) X and R based on Winding MVA, 3) All pu are on 100 MVA Base, 4) DYR stability model name

# 3.0 Existing vs Modification Comparison

To determine which analyses are required for the Study, the differences between the previously accepted configuration and the requested modification were evaluated. Aneden performed this comparison and the resulting analyses using a set of modified study models developed based on the modification request data, the previously accepted replacement configuration, and the DISIS-2018-002/2019-001 study models. The analysis was completed using PSS/E version 34 software.

The methodology and results of the comparisons are described below.

## 3.1 Stability Model Parameters Comparison

SPP determined that short circuit and dynamic stability analyses were required because of the fuel type change from solar to synchronous gas-fired. This is because the short circuit contribution and stability responses of the previous configuration and the requested modification's configuration may differ. The generator dynamic model for the modification can be found in Appendix A.

As short circuit and dynamic stability analyses were already deemed required, a stability model parameters comparison was not needed for the determination of the scope of the study.

## 3.2 Equivalent Impedance Comparison Calculation

As the fuel type change determined that short circuit and dynamic stability analyses were required, an equivalent impedance comparison was not needed for the determination of the scope of the study.

# 4.0 Short Circuit Analysis

Aneden performed a short circuit study using the 25SP model for GEN-2022-GR1 to determine the maximum fault current requiring interruption by protective equipment for each bus in the relevant subsystem. The detailed results of the short circuit analysis are provided in Appendix B.

## 4.1 Methodology

The short circuit analysis included applying a 3-phase fault on buses up to 5 levels away from the 138 kV POI bus. The PSS/E "Automatic Sequence Fault Calculation (ASCC)" fault analysis module was used to calculate the fault current levels in the transmission system with and without GEN-2022-GR1 online.

Aneden created a short circuit model using the 25SP DISIS-2018-002/2019-001 stability study model by adjusting the GEN-2022-GR1 short circuit parameters consistent with the submitted data. The adjusted parameters used in the short circuit analysis are shown in Table 4-1 below. No other changes were made to the model.

**Table 4-1: Short Circuit Model Parameters***

| Parameter | Value by Generator Bus# | |
|---|---|---|
| | 922511 | 922512 |
| Machine MVA Base | 285 | 285 |
| R (pu) | 0 | 0 |
| X'' (pu) | 0.185 | 0.185 |

*pu values based on Machine MVA Base

## 4.2 Results

The results of the short circuit analysis for the 25SP model are summarized in Table 4-2 and Table 4-3. The GEN-2022-GR1 POI bus (Pirkey 138 kV) fault current magnitudes for the comparison cases are provided in Table 4-2 showing a fault current of 37.77 kA with the GEN-2022-GR1 project online. Table 4-3 shows the maximum fault current magnitudes and fault current increases with the GEN-2022-GR1 project online.

The maximum fault current calculated within 5 buses of the POI was 37.77 kA for the 25SP model. The maximum GEN-2022-GR1 contribution to three-phase fault currents was about 24.1% and 7.33 kA.

**Table 4-2: POI Short Circuit Comparison Results**

| Case | GEN-OFF Current (kA) | GEN-ON Current (kA) | kA Change | %Change |
|---|---|---|---|---|
| 25SP | 30.45 | 37.77 | 7.33 | 24.1% |

**Table 4-3: 25SP Short Circuit Comparison Results**

| Voltage (kV) | Max. Current (GEN-ON) (kA) | Max kA Change | Max %Change |
|---|---|---|---|
| 69 | 22.62 | 0.52 | 2.9% |
| 138 | 37.77 | 7.33 | 24.1% |
| 230 | 14.99 | 0.03 | 0.2% |
| 345 | 21.11 | 1.70 | 11.8% |
| **Max** | **37.77** | **7.33** | **24.1%** |

# 5.0 Dynamic Stability Analysis

Aneden performed a dynamic stability analysis to identify the impact of the modifications to GEN-2022-GR1. The analysis was performed according to SPP's Disturbance Performance Requirements[2]. The modification details are described in Section 2.0 above and the dynamic modeling data is provided in Appendix A. The existing base case issues and simulation plots can be found in Appendix C.

## 5.1 Methodology and Criteria

The dynamic stability analysis was performed using models developed with the requested GEN-2022-GR1 configuration of 2 x GE 285 MVA operating at 255/256.5 MW Summer/Winter (GENTPJ1). This stability analysis was performed using Siemens PTI's PSS/E version 34.8.0 software.

The modifications requested for the GEN-2022-GR1 project were used to create modified stability models for this impact study based on the DISIS-2018-002/2019-001 stability study models:

- 2025 Summer Peak (25SP),
- 2025 Winter Peak (25WP)

The dynamic model data for the GEN-2022-GR1 project is provided in Appendix A. The power flow models and associated dynamic 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 following system adjustments were made to address existing base case issues that are not attributed to the modification request:

- The PSSE dynamic simulation iterations and acceleration factor were adjusted as needed to resolve PSSE dynamic simulation crashes.

During the fault simulations, the active power (PELEC), reactive power (QELEC), and terminal voltage (ETERM) were monitored for GEN-2022-GR1 and other projects in Group 4. In addition, voltages of five (5) buses away from the POI of the GEN-2022-GR1 were monitored and plotted. The machine rotor angle for synchronous machines and speed for asynchronous machines within the study areas including 327 (EES-EAI), 330 (AECI), 351 (EES), 356 (AMMO), 502 (CLEC), 515 (SWPA), 520 (AEPW), 523 (GRDA), 524 (OKGE), 525 (WFEC), 526 (SPS), 527 (OMPA), 534 (SUNC), 536 (WERE), 544 (EMDE), and 546 (SPRM) were monitored. The voltages of all 100 kV and above buses within the study area were monitored as well.

## 5.2 Fault Definitions

Aneden developed fault events as required to study the modification. The new set of faults was simulated using the modified study models. The fault events included three-phase faults and single-line-to-ground stuck breaker faults. Single-line-to-ground faults are approximated by applying a fault impedance to bring the faulted bus positive sequence voltage to 0.6 pu. The simulated faults are listed and described in Table 5-1 below. These contingencies were applied to the modified 25SP and 25WP models.

[2] SPP Disturbance Performance Requirements: https://www.spp.org/documents/28859/spp%20disturbance%20performance%20requirements%20(twg%20approved).pdf

**Table 5-1: Fault Definitions**

| Fault ID | Planning Event | Fault Descriptions |
|---|---|---|
| FLT1000-SB | P4 | Stuck Breaker on PIRKEY 4 (508562) 138 kV Bus<br>a. Apply single phase fault at the PIRKEY 4 (508562) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the PIRKEY 4 (508562) 138 kV / PIRKEY 7 (508563) 345 kV / PIRKY1-1 (508587) 13.8 kV XFMR CKT 1.<br>b.2.Trip the PIRKEY 4 (508562) 138 kV to HALLSVLS4 (508595) 138 kV line CKT 1. |
| FLT1001-SB | P4 | Stuck Breaker on PIRKEY 4 (508562) 138 kV Bus<br>a. Apply single phase fault at the PIRKEY 4 (508562) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the PIRKEY 4 (508562) 138 kV / PIRKEY 7 (508563) 345 kV / PIRKY1-1 (508587) 13.8 kV XFMR CKT 1.<br>b.2.Trip the PIRKEY 4 (508562) 138 kV to MARSHL-4 (508557) 138 kV line CKT 1. |
| FLT1002-SB | P4 | Stuck Breaker on PIRKEY 4 (508562) 138 kV Bus<br>a. Apply single phase fault at the PIRKEY 4 (508562) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the PIRKEY 4 (508562) 138 kV to HALLSVLS4 (508595) 138 kV line CKT 1.<br>b.2.Trip the PIRKEY 4 (508562) 138 kV to G22-GR1-MAIN (922513) 138 kV line CKT 1.<br>Trip generator(s) on the Bus G22-GR1-GEN1 (922511) 18 kV<br>Trip generator(s) on the Bus G22-GR1-GEN2 (922512) 18 kV |
| FLT1003-SB | P4 | Stuck Breaker on PIRKEY 4 (508562) 138 kV Bus<br>a. Apply single phase fault at the PIRKEY 4 (508562) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the PIRKEY 4 (508562) 138 kV to SABMINT4 (508566) 138 kV line CKT 1.<br>b.2.Trip the PIRKEY 4 (508562) 138 kV to EASTON 4 (509092) 138 kV line CKT 1. |
| FLT1004-SB | P4 | Stuck Breaker on PIRKEY 4 (508562) 138 kV Bus<br>a. Apply single phase fault at the PIRKEY 4 (508562) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the PIRKEY 4 (508562) 138 kV to G22-GR1-MAIN (922513) 138 kV line CKT 1.<br>b.1.Trip the PIRKEY 4 (508562) 138 kV / PIRKEY 7 (508563) 345 kV / PIRKY2-1 (508588) 13.8 kV XFMR CKT 2.<br>Trip generator(s) on the Bus G22-GR1-GEN1 (922511) 18 kV<br>Trip generator(s) on the Bus G22-GR1-GEN2 (922512) 18 kV |
| FLT1005-SB | P4 | Stuck Breaker on PIRKEY 4 (508562) 138 kV Bus<br>a. Apply single phase fault at the PIRKEY 4 (508562) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the PIRKEY 4 (508562) 138 kV to EASTON 4 (509092) 138 kV line CKT 1.<br>b.1.Trip the PIRKEY 4 (508562) 138 kV / PIRKEY 7 (508563) 345 kV / PIRKY2-1 (508588) 13.8 kV XFMR CKT 2. |
| FLT1006-SB | P4 | Stuck Breaker on PIRKEY 7 (508563) 345 kV Bus<br>a. Apply single phase fault at the PIRKEY 7 (508563) 345 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the PIRKEY 7 (508563) 345 kV to LEBROCK7 (508572) 345 kV line CKT 1.<br>b.2.Trip the PIRKEY 7 (508563) 345 kV to DIANA 7 (508832) 345 kV line CKT 1. |
| FLT1007-SB | P4 | Stuck Breaker on PIRKEY 7 (508563) 345 kV Bus<br>a. Apply single phase fault at the PIRKEY 7 (508563) 345 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the PIRKEY 7 (508563) 345 kV to LEBROCK7 (508572) 345 kV line CKT 1.<br>b.2.Trip the PIRKEY 7 (508563) 345 kV / PIRKEY 4 (508562) 138 kV / PIRKY1-1 (508587) 13.8 kV XFMR CKT 1. |
| FLT1008-SB | P4 | Stuck Breaker on PIRKEY 7 (508563) 345 kV Bus<br>a. Apply single phase fault at the PIRKEY 7 (508563) 345 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.2.Trip the PIRKEY 7 (508563) 345 kV / PIRKEY 4 (508562) 138 kV / PIRKY1-1 (508587) 13.8 kV XFMR CKT 1.<br>b.2.Trip the PIRKEY 7 (508563) 345 kV to LEBROCK7 (508572) 345 kV line CKT 2. |
| FLT1009-SB | P4 | Stuck Breaker on PIRKEY 7 (508563) 345 kV Bus<br>a. Apply single phase fault at the PIRKEY 7 (508563) 345 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the PIRKEY 7 (508563) 345 kV to DIANA 7 (508832) 345 kV line CKT 1.<br>b.2.Trip the PIRKEY 7 (508563) 345 kV / PIRKEY 4 (508562) 138 kV / PIRKY2-1 (508588) 13.8 kV XFMR CKT 2. |

**Table 5-1 Continued**

| Fault ID | Planning Event | Fault Descriptions |
|---|---|---|
| FLT1010-SB | P4 | Stuck Breaker on PIRKEY 7 (508563) 345 kV Bus<br>a. Apply single phase fault at the PIRKEY 7 (508563) 345 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.2.Trip the PIRKEY 7 (508563) 345 kV / PIRKEY 4 (508562) 138 kV / PIRKY2-1 (508588) 13.8 kV XFMR CKT 2.<br>b.2.Trip the PIRKEY 7 (508563) 345 kV to LEBROCK7 (508572) 345 kV line CKT 2. |
| FLT1011-SB | P4 | Stuck Breaker on DIANA 7 (508832) 345 kV Bus<br>a. Apply single phase fault at the DIANA 7 (508832) 345 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the DIANA 7 (508832) 345 kV to SW SHV 7 (507760) 345 kV line CKT 1.<br>b.2.Trip the DIANA 7 (508832) 345 kV to PIRKEY 7 (508563) 345 kV line CKT 1. |
| FLT1012-SB | P4 | Stuck Breaker on DIANA 7 (508832) 345 kV Bus<br>a. Apply single phase fault at the DIANA 7 (508832) 345 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the DIANA 7 (508832) 345 kV to WELSH 7 (508359) 345 kV line CKT 1.<br>b.2.Trip the DIANA 7 (508832) 345 kV to SW SHV 7 (507760) 345 kV line CKT 1. |
| FLT1013-SB | P4 | Stuck Breaker on DIANA 7 (508832) 345 kV Bus<br>a. Apply single phase fault at the DIANA 7 (508832) 345 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the DIANA 7 (508832) 345 kV to WELSH 7 (508359) 345 kV line CKT 1.<br>b.2.Trip the DIANA 7 (508832) 345 kV / DIANA 4 (508831) 138 kV / DIANA-N1 (508845) 13.8 kV XFMR CKT 3. |
| FLT1014-SB | P4 | Stuck Breaker on DIANA 7 (508832) 345 kV Bus<br>a. Apply single phase fault at the DIANA 7 (508832) 345 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.2.Trip the DIANA 7 (508832) 345 kV / DIANA 4 (508831) 138 kV / DIANA-N1 (508845) 13.8 kV XFMR CKT 3.<br>b.2.Trip the DIANA 7 (508832) 345 kV to WELSH 7 (508359) 345 kV line CKT 2. |
| FLT1015-SB | P4 | Stuck Breaker on DIANA 7 (508832) 345 kV Bus<br>a. Apply single phase fault at the DIANA 7 (508832) 345 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the DIANA 7 (508832) 345 kV to WELSH 7 (508359) 345 kV line CKT 2.<br>b.2.Trip the DIANA 7 (508832) 345 kV / DIANA 4 (508831) 138 kV / DIANA-S1 (508844) 13.8 kV XFMR CKT 1. |
| FLT1016-SB | P4 | Stuck Breaker on DIANA 7 (508832) 345 kV Bus<br>a. Apply single phase fault at the DIANA 7 (508832) 345 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.2.Trip the DIANA 7 (508832) 345 kV / DIANA 4 (508831) 138 kV / DIANA-S1 (508844) 13.8 kV XFMR CKT 1.<br>b.2.Trip the DIANA 7 (508832) 345 kV / DIANA 4 (508831) 138 kV / DIANA-M1 (508843) 13.8 kV XFMR CKT 2. |
| FLT1017-SB | P4 | Stuck Breaker on DIANA 7 (508832) 345 kV Bus<br>a. Apply single phase fault at the DIANA 7 (508832) 345 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.2.Trip the DIANA 7 (508832) 345 kV / DIANA 4 (508831) 138 kV / DIANA-M1 (508843) 13.8 kV XFMR CKT 2.<br>b.2.Trip the DIANA 7 (508832) 345 kV to PIRKEY 7 (508563) 345 kV line CKT 1. |
| FLT1018-SB | P4 | Stuck Breaker on DIANA 4 (508831) 138 kV Bus<br>a. Apply single phase fault at the DIANA 4 (508831) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the DIANA 4 (508831) 138 kV / DIANA 7 (508832) 345 kV / DIANA-N1 (508845) 13.8 kV XFMR CKT 3.<br>b.2.Trip the DIANA 4 (508831) 138 kV to LSSOUTH4 (508297) 138 kV line CKT 1. |
| FLT1019-SB | P4 | Stuck Breaker on DIANA 4 (508831) 138 kV Bus<br>a. Apply single phase fault at the DIANA 4 (508831) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the DIANA 4 (508831) 138 kV to LSSOUTH4 (508297) 138 kV line CKT 1.<br>b.2.Trip the DIANA 4 (508831) 138 kV to PERDUE 4 (508351) 138 kV line CKT 1. |
| FLT1020-SB | P4 | Stuck Breaker on DIANA 4 (508831) 138 kV Bus<br>a. Apply single phase fault at the DIANA 4 (508831) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the DIANA 4 (508831) 138 kV to PERDUE 4 (508351) 138 kV line CKT 1.<br>b.2.Trip the DIANA 4 (508831) 138 kV to SPRHILL4 (508571) 138 kV line CKT 1. |

**Table 5-1 Continued**

| Fault ID | Planning Event | Fault Descriptions |
|---|---|---|
| FLT1021-SB | P4 | Stuck Breaker on DIANA 4 (508831) 138 kV Bus<br>a. Apply single phase fault at the DIANA 4 (508831) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the DIANA 4 (508831) 138 kV to SPRHILL4 (508571) 138 kV line CKT 1.<br>b.2.Trip the DIANA 4 (508831) 138 kV to DIANASW4 (509639) 138 kV line CKT 1. |
| FLT1022-SB | P4 | Stuck Breaker on DIANA 4 (508831) 138 kV Bus<br>a. Apply single phase fault at the DIANA 4 (508831) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the DIANA 4 (508831) 138 kV to DIANASW4 (509639) 138 kV line CKT 1.<br>b.1.Trip the DIANA 4 (508831) 138 kV / DIANA 7 (508832) 345 kV / DIANA-M1 (508843) 13.8 kV XFMR CKT 2. |
| FLT1023-SB | P4 | Stuck Breaker on DIANA 4 (508831) 138 kV Bus<br>a. Apply single phase fault at the DIANA 4 (508831) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the DIANA 4 (508831) 138 kV / DIANA 7 (508832) 345 kV / DIANA-M1 (508843) 13.8 kV XFMR CKT 2.<br>b.1.Trip the DIANA 4 (508831) 138 kV / DIANA 7 (508832) 345 kV / DIANA-S1 (508844) 13.8 kV XFMR CKT 1. |
| FLT1024-SB | P4 | Stuck Breaker on DIANA 4 (508831) 138 kV Bus<br>a. Apply single phase fault at the DIANA 4 (508831) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the DIANA 4 (508831) 138 kV / DIANA 7 (508832) 345 kV / DIANA-S1 (508844) 13.8 kV XFMR CKT 1.<br>b.2.Trip the DIANA 4 (508831) 138 kV to NGPLTAP4 (508837) 138 kV line CKT 1. |
| FLT1025-SB | P4 | Stuck Breaker on DIANA 4 (508831) 138 kV Bus<br>a. Apply single phase fault at the DIANA 4 (508831) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the DIANA 4 (508831) 138 kV to NGPLTAP4 (508837) 138 kV line CKT 1.<br>b.1.Trip the DIANA 4 (508831) 138 kV / DIANA 7 (508832) 345 kV / DIANA-N1 (508845) 13.8 kV XFMR CKT 3. |
| FLT1026-SB | P4 | Stuck Breaker on LEBROCK7 (508572) 345 kV Bus<br>a. Apply single phase fault at the LEBROCK7 (508572) 345 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the LEBROCK7 (508572) 345 kV / LEBROCG1 (506752) 18 kV XFMR CKT 1.<br>b.2.Trip the LEBROCK7 (508572) 345 kV to TENRUSK7 (508585) 345 kV line CKT 1.<br>Trip generator(s) on the Bus LEBROCG1 (506752) 18 kV |
| FLT1027-SB | P4 | Stuck Breaker on LEBROCK7 (508572) 345 kV Bus<br>a. Apply single phase fault at the LEBROCK7 (508572) 345 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the LEBROCK7 (508572) 345 kV to TENRUSK7 (508585) 345 kV line CKT 1.<br>b.2.Trip the LEBROCK7 (508572) 345 kV / LEBROCG2 (506753) 18 kV XFMR CKT 1.<br>Trip generator(s) on the Bus LEBROCG2 (506753) 18 kV |
| FLT1028-SB | P4 | Stuck Breaker on LEBROCK7 (508572) 345 kV Bus<br>a. Apply single phase fault at the LEBROCK7 (508572) 345 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.2.Trip the LEBROCK7 (508572) 345 kV / LEBROCG2 (506753) 18 kV XFMR CKT 1.<br>b.2.Trip the LEBROCK7 (508572) 345 kV to PIRKEY 7 (508563) 345 kV line CKT 2.<br>Trip generator(s) on the Bus LEBROCG2 (506753) 18 kV |
| FLT1029-SB | P4 | Stuck Breaker on LEBROCK7 (508572) 345 kV Bus<br>a. Apply single phase fault at the LEBROCK7 (508572) 345 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the LEBROCK7 (508572) 345 kV to PIRKEY 7 (508563) 345 kV line CKT 2.<br>b.2.Trip the LEBROCK7 (508572) 345 kV / LEBROCS1 (506754) 18 kV XFMR CKT 1.<br>Trip generator(s) on the Bus LEBROCS1 (506754) 18 kV |
| FLT1030-SB | P4 | Stuck Breaker on LEBROCK7 (508572) 345 kV Bus<br>a. Apply single phase fault at the LEBROCK7 (508572) 345 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.2.Trip the LEBROCK7 (508572) 345 kV / LEBROCS1 (506754) 18 kV XFMR CKT 1.<br>b.2.Trip the LEBROCK7 (508572) 345 kV to PIRKEY 7 (508563) 345 kV line CKT 1.<br>Trip generator(s) on the Bus LEBROCS1 (506754) 18 kV |

**Table 5-1 Continued**

| Fault ID | Planning Event | Fault Descriptions |
|---|---|---|
| FLT1031-SB | P4 | Stuck Breaker on LEBROCK7 (508572) 345 kV Bus<br>a. Apply single phase fault at the LEBROCK7 (508572) 345 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the LEBROCK7 (508572) 345 kV to PIRKEY 7 (508563) 345 kV line CKT 1.<br>b.1.Trip the LEBROCK7 (508572) 345 kV / LEBROCG1 (506752) 18 kV XFMR CKT 1.<br>Trip generator(s) on the Bus LEBROCG1 (506752) 18 kV |
| FLT1032-SB | P4 | Stuck Breaker on SABMINT4 (508566) 138 kV Bus<br>a. Apply single phase fault at the SABMINT4 (508566) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the SABMINT4 (508566) 138 kV to PIRKEY 4 (508562) 138 kV line CKT 1.<br>b.2.Trip the SABMINT4 (508566) 138 kV to SEMRSHL4 (508569) 138 kV line CKT 1. |
| FLT1033-SB | P4 | Stuck Breaker on EASTON 4 (509092) 138 kV Bus<br>a. Apply single phase fault at the EASTON 4 (509092) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the EASTON 4 (509092) 138 kV to PIRKEY 4 (508562) 138 kV line CKT 1.<br>b.2.Trip the EASTON 4 (509092) 138 kV to BRANDYBR (508596) 138 kV line CKT 1. |
| FLT1034-SB | P4 | Stuck Breaker on HALLSVLS4 (508595) 138 kV Bus<br>a. Apply single phase fault at the HALLSVLS4 (508595) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the HALLSVLS4 (508595) 138 kV to PIRKEY 4 (508562) 138 kV line CKT 1.<br>b.2.Trip the HALLSVLS4 (508595) 138 kV to WHITNEY4 (508575) 138 kV line CKT 1. |
| FLT1035-SB | P4 | Stuck Breaker on MARSHL-4 (508557) 138 kV Bus<br>a. Apply single phase fault at the MARSHL-4 (508557) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the MARSHL-4 (508557) 138 kV to PIRKEY 4 (508562) 138 kV line CKT 1.<br>b.2.Trip the MARSHL-4 (508557) 138 kV to JEFFRSN4 (508835) 138 kV line CKT 1. |
| FLT1036-SB | P4 | Stuck Breaker on MARSHAL2 (508556) 69 kV Bus<br>a. Apply single phase fault at the MARSHAL2 (508556) 69 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip bus MARSHAL2 (508556) 69 kV.<br>b.2.Trip bus MARAUTO2 (508576) 69 kV. |
| FLT9000-3PH | P1 | 3 Phase fault on PIRKEY 4 (508562) 138 kV to G22-GR1-MAIN (922513) 138 kV line CKT 1, near PIRKEY 4 (508562) 138 kV.<br>a. Apply fault at the PIRKEY 4 (508562) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>Trip generator(s) on the Bus G22-GR1-GEN1 (922511) 18 kV<br>Trip generator(s) on the Bus G22-GR1-GEN2 (922512) 18 kV<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9001-3PH | P1 | 3 Phase fault on PIRKEY 4 (508562) 138 kV to MARSHL-4 (508557) 138 kV line CKT 1, near PIRKEY 4 (508562) 138 kV.<br>a. Apply fault at the PIRKEY 4 (508562) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9002-3PH | P1 | 3 Phase fault on PIRKEY 4 (508562) 138 kV to HALLSVLS4 (508595) 138 kV line CKT 1, near PIRKEY 4 (508562) 138 kV.<br>a. Apply fault at the PIRKEY 4 (508562) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9003-3PH | P1 | 3 Phase fault on PIRKEY 4 (508562) 138 kV to EASTON 4 (509092) 138 kV line CKT 1, near PIRKEY 4 (508562) 138 kV.<br>a. Apply fault at the PIRKEY 4 (508562) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9004-3PH | P1 | 3 Phase fault on PIRKEY 4 (508562) 138 kV to SABMINT4 (508566) 138 kV line CKT 1, near PIRKEY 4 (508562) 138 kV.<br>a. Apply fault at the PIRKEY 4 (508562) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |

**Table 5-1 Continued**

| Fault ID | Planning Event | Fault Descriptions |
|---|---|---|
| FLT9005-3PH | P1 | 3 Phase fault on PIRKEY 4 (508562) 138 kV / PIRKEY 7 (508563) 345 kV / PIRKY2-1 (508588) 13.8 kV XFMR CKT 2, near PIRKEY 4 (508562) 138 kV.<br>a. Apply fault at the PIRKEY 4 (508562) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted transformer. |
| FLT9006-3PH | P1 | 3 Phase fault on MARSHL-4 (508557) 138 kV to PIRKEY 4 (508562) 138 kV line CKT 1, near MARSHL-4 (508557) 138 kV.<br>a. Apply fault at the MARSHL-4 (508557) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9007-3PH | P1 | 3 Phase fault on MARSHL-4 (508557) 138 kV / MARAUTO2 (508576) 69 kV / MRSH4#11 (508591) 12.47 kV XFMR CKT 1, near MARSHL-4 (508557) 138 kV.<br>a. Apply fault at the MARSHL-4 (508557) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted transformer. |
| FLT9008-3PH | P1 | 3 Phase fault on MARSHL-4 (508557) 138 kV to JEFFRSN4 (508835) 138 kV line CKT 1, near MARSHL-4 (508557) 138 kV.<br>a. Apply fault at the MARSHL-4 (508557) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9009-3PH | P1 | 3 Phase fault on JEFFRSN4 (508835) 138 kV to MARSHL-4 (508557) 138 kV line CKT 1, near JEFFRSN4 (508835) 138 kV.<br>a. Apply fault at the JEFFRSN4 (508835) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9010-3PH | P1 | 3 Phase fault on JEFFRSN4 (508835) 138 kV to LAKEPIN4 (509624) 138 kV line CKT 1, near JEFFRSN4 (508835) 138 kV.<br>a. Apply fault at the JEFFRSN4 (508835) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9011-3PH | P1 | 3 Phase fault on JEFFRSN4 (508835) 138 kV to IPCJEFF4 (508833) 138 kV line CKT 1, near JEFFRSN4 (508835) 138 kV.<br>a. Apply fault at the JEFFRSN4 (508835) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9012-3PH | P1 | 3 Phase fault on JEFFRSN4 (508835) 138 kV to WILKES 4 (508840) 138 kV line CKT 1, near JEFFRSN4 (508835) 138 kV.<br>a. Apply fault at the JEFFRSN4 (508835) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9013-3PH | P1 | 3 Phase fault on MARAUTO2 (508576) 69 kV / MARSHL-4 (508557) 138 kV / MRSH4#21 (508592) 12.47 kV XFMR CKT 1, near MARAUTO2 (508576) 69 kV.<br>a. Apply fault at the MARAUTO2 (508576) 69 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted transformer. |
| FLT9014-3PH | P1 | 3 Phase fault on MARAUTO2 (508576) 69 kV to MARSHAL2 (508556) 69 kV line CKT 1, near MARAUTO2 (508576) 69 kV.<br>a. Apply fault at the MARAUTO2 (508576) 69 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9015-3PH | P1 | 3 Phase fault on MARSHAL2 (508556) 69 kV to MARAUTO2 (508576) 69 kV line CKT 1, near MARSHAL2 (508556) 69 kV.<br>a. Apply fault at the MARSHAL2 (508556) 69 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |

**Table 5-1 Continued**

| Fault ID | Planning Event | Fault Descriptions |
|---|---|---|
| FLT9016-3PH | P1 | 3 Phase fault on MARSHAL2 (508556) 69 kV to HALLSVL2 (508543) 69 kV line CKT 1, near MARSHAL2 (508556) 69 kV.<br>a. Apply fault at the MARSHAL2 (508556) 69 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9017-3PH | P1 | 3 Phase fault on MARSHAL2 (508556) 69 kV to BLOCKRT2 (509055) 69 kV line CKT 1, near MARSHAL2 (508556) 69 kV.<br>a. Apply fault at the MARSHAL2 (508556) 69 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9018-3PH | P1 | 3 Phase fault on MARSHAL2 (508556) 69 kV to NMARSHL2 (508838) 69 kV line CKT 1, near MARSHAL2 (508556) 69 kV.<br>a. Apply fault at the MARSHAL2 (508556) 69 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9019-3PH | P1 | 3 Phase fault on HALLSVL2 (508543) 69 kV to MARSHAL2 (508556) 69 kV line CKT 1, near HALLSVL2 (508543) 69 kV.<br>a. Apply fault at the HALLSVL2 (508543) 69 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9020-3PH | P1 | 3 Phase fault on HALLSVL2 (508543) 69 kV to LONGVHT2 (508553) 69 kV line CKT 1, near HALLSVL2 (508543) 69 kV.<br>a. Apply fault at the HALLSVL2 (508543) 69 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9021-3PH | P1 | 3 Phase fault on BLOCKRT2 (509055) 69 kV to MARSHAL2 (508556) 69 kV line CKT 1, near BLOCKRT2 (509055) 69 kV.<br>a. Apply fault at the BLOCKRT2 (509055) 69 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9022-3PH | P1 | 3 Phase fault on BLOCKRT2 (509055) 69 kV to ROSBORO2 (509085) 69 kV line CKT 1, near BLOCKRT2 (509055) 69 kV.<br>a. Apply fault at the BLOCKRT2 (509055) 69 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9023-3PH | P1 | 3 Phase fault on BLOCKRT2 (509055) 69 kV to BLOCKER2 (509053) 69 kV line CKT 1, near BLOCKRT2 (509055) 69 kV.<br>a. Apply fault at the BLOCKRT2 (509055) 69 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9024-3PH | P1 | 3 Phase fault on NMARSHL2 (508838) 69 kV to MARSHAL2 (508556) 69 kV line CKT 1, near NMARSHL2 (508838) 69 kV.<br>a. Apply fault at the NMARSHL2 (508838) 69 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9025-3PH | P1 | 3 Phase fault on NMARSHL2 (508838) 69 kV to WOODLWN2 (508842) 69 kV line CKT 1, near NMARSHL2 (508838) 69 kV.<br>a. Apply fault at the NMARSHL2 (508838) 69 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |

**Table 5-1 Continued**

| Fault ID | Planning Event | Fault Descriptions |
|---|---|---|
| FLT9026-3PH | P1 | 3 Phase fault on HALLSVLS4 (508595) 138 kV to PIRKEY 4 (508562) 138 kV line CKT 1, near HALLSVLS4 (508595) 138 kV.<br>a. Apply fault at the HALLSVLS4 (508595) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9027-3PH | P1 | 3 Phase fault on HALLSVLS4 (508595) 138 kV to WHITNEY4 (508575) 138 kV line CKT 1, near HALLSVLS4 (508595) 138 kV.<br>a. Apply fault at the HALLSVLS4 (508595) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9028-3PH | P1 | 3 Phase fault on WHITNEY4 (508575) 138 kV to HALLSVLS4 (508595) 138 kV line CKT 1, near WHITNEY4 (508575) 138 kV.<br>a. Apply fault at the WHITNEY4 (508575) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9029-3PH | P1 | 3 Phase fault on WHITNEY4 (508575) 138 kV to LONGVHT4 (508554) 138 kV line CKT 1, near WHITNEY4 (508575) 138 kV.<br>a. Apply fault at the WHITNEY4 (508575) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9030-3PH | P1 | 3 Phase fault on WHITNEY4 (508575) 138 kV to EASTEX 4 (508582) 138 kV line CKT 1, near WHITNEY4 (508575) 138 kV.<br>a. Apply fault at the WHITNEY4 (508575) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9031-3PH | P1 | 3 Phase fault on WHITNEY4 (508575) 138 kV / WHITNEY2 (508574) 69 kV / WHIT1-1 (508589) 12.47 kV XFMR CKT 1, near WHITNEY4 (508575) 138 kV.<br>a. Apply fault at the WHITNEY4 (508575) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted transformer. |
| FLT9032-3PH | P1 | 3 Phase fault on WHITNEY2 (508574) 69 kV / WHITNEY4 (508575) 138 kV / WHIT1-1 (508589) 12.47 kV XFMR CKT 1, near WHITNEY2 (508574) 69 kV.<br>a. Apply fault at the WHITNEY2 (508574) 69 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted transformer. |
| FLT9033-3PH | P1 | 3 Phase fault on WHITNEY2 (508574) 69 kV to LETOURT2 (508549) 69 kV line CKT 1, near WHITNEY2 (508574) 69 kV.<br>a. Apply fault at the WHITNEY2 (508574) 69 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9034-3PH | P1 | 3 Phase fault on WHITNEY2 (508574) 69 kV to MONROCR2 (508558) 69 kV line CKT 1, near WHITNEY2 (508574) 69 kV.<br>a. Apply fault at the WHITNEY2 (508574) 69 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9035-3PH | P1 | 3 Phase fault on WHITNEY2 (508574) 69 kV to LONGVUE2 (508555) 69 kV line CKT 1, near WHITNEY2 (508574) 69 kV.<br>a. Apply fault at the WHITNEY2 (508574) 69 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9036-3PH | P1 | 3 Phase fault on WHITNEY2 (508574) 69 kV to LONGVHT2 (508553) 69 kV line CKT 1, near WHITNEY2 (508574) 69 kV.<br>a. Apply fault at the WHITNEY2 (508574) 69 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |

**Table 5-1 Continued**

| Fault ID | Planning Event | Fault Descriptions |
|---|---|---|
| FLT9037-3PH | P1 | 3 Phase fault on EASTON 4 (509092) 138 kV to PIRKEY 4 (508562) 138 kV line CKT 1, near EASTON 4 (509092) 138 kV.<br>a. Apply fault at the EASTON 4 (509092) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9038-3PH | P1 | 3 Phase fault on EASTON 4 (509092) 138 kV to BRANDYBR (508596) 138 kV line CKT 1, near EASTON 4 (509092) 138 kV.<br>a. Apply fault at the EASTON 4 (509092) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9039-3PH | P1 | 3 Phase fault on BRANDYBR (508596) 138 kV to EASTON 4 (509092) 138 kV line CKT 1, near BRANDYBR (508596) 138 kV.<br>a. Apply fault at the BRANDYBR (508596) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9040-3PH | P1 | 3 Phase fault on BRANDYBR (508596) 138 kV to KNOXLEE4 (508548) 138 kV line CKT 1, near BRANDYBR (508596) 138 kV.<br>a. Apply fault at the BRANDYBR (508596) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9041-3PH | P1 | 3 Phase fault on SABMINT4 (508566) 138 kV to PIRKEY 4 (508562) 138 kV line CKT 1, near SABMINT4 (508566) 138 kV.<br>a. Apply fault at the SABMINT4 (508566) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9042-3PH | P1 | 3 Phase fault on SABMINT4 (508566) 138 kV to SABINEM4 (508577) 138 kV line CKT 1, near SABMINT4 (508566) 138 kV.<br>a. Apply fault at the SABMINT4 (508566) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9043-3PH | P1 | 3 Phase fault on SABMINT4 (508566) 138 kV to SEMRSHL4 (508569) 138 kV line CKT 1, near SABMINT4 (508566) 138 kV.<br>a. Apply fault at the SABMINT4 (508566) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9044-3PH | P1 | 3 Phase fault on SEMRSHL4 (508569) 138 kV to SABMINT4 (508566) 138 kV line CKT 1, near SEMRSHL4 (508569) 138 kV.<br>a. Apply fault at the SEMRSHL4 (508569) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9045-3PH | P1 | 3 Phase fault on SEMRSHL4 (508569) 138 kV to SCOTTSV4 (508567) 138 kV line CKT 1, near SEMRSHL4 (508569) 138 kV.<br>a. Apply fault at the SEMRSHL4 (508569) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9046-3PH | P1 | 3 Phase fault on PIRKEY 7 (508563) 345 kV / PIRKEY 4 (508562) 138 kV / PIRKY2-1 (508588) 13.8 kV XFMR CKT 2, near PIRKEY 7 (508563) 345 kV.<br>a. Apply fault at the PIRKEY 7 (508563) 345 kV Bus.<br>b. Clear fault after 6 cycles by tripping the faulted transformer. |
| FLT9047-3PH | P1 | 3 Phase fault on PIRKEY 7 (508563) 345 kV to LEBROCK7 (508572) 345 kV line CKT 2, near PIRKEY 7 (508563) 345 kV.<br>a. Apply fault at the PIRKEY 7 (508563) 345 kV Bus.<br>b. Clear fault after 6 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 6 cycles, then trip the line in (b) and remove fault. |

**Table 5-1 Continued**

| Fault ID | Planning Event | Fault Descriptions |
|---|---|---|
| FLT9048-3PH | P1 | 3 Phase fault on PIRKEY 7 (508563) 345 kV to DIANA 7 (508832) 345 kV line CKT 1, near PIRKEY 7 (508563) 345 kV.<br>a. Apply fault at the PIRKEY 7 (508563) 345 kV Bus.<br>b. Clear fault after 6 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 6 cycles, then trip the line in (b) and remove fault. |
| FLT9049-3PH | P1 | 3 Phase fault on LEBROCK7 (508572) 345 kV to PIRKEY 7 (508563) 345 kV line CKT 1, near LEBROCK7 (508572) 345 kV.<br>a. Apply fault at the LEBROCK7 (508572) 345 kV Bus.<br>b. Clear fault after 6 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 6 cycles, then trip the line in (b) and remove fault. |
| FLT9050-3PH | P1 | 3 Phase fault on LEBROCK7 (508572) 345 kV to LEBROCS1 (506754) 18 kV XFMR CKT 1, near LEBROCK7 (508572) 345 kV.<br>a. Apply fault at the LEBROCK7 (508572) 345 kV Bus.<br>b. Clear fault after 6 cycles by tripping the faulted transformer.<br>Trip generator(s) on the Bus LEBROCS1 (506754) 18 kV |
| FLT9051-3PH | P1 | 3 Phase fault on LEBROCK7 (508572) 345 kV to LEBROCG2 (506753) 18 kV XFMR CKT 1, near LEBROCK7 (508572) 345 kV.<br>a. Apply fault at the LEBROCK7 (508572) 345 kV Bus.<br>b. Clear fault after 6 cycles by tripping the faulted transformer.<br>Trip generator(s) on the Bus LEBROCG2 (506753) 18 kV |
| FLT9052-3PH | P1 | 3 Phase fault on LEBROCK7 (508572) 345 kV to LEBROCG1 (506752) 18 kV XFMR CKT 1, near LEBROCK7 (508572) 345 kV.<br>a. Apply fault at the LEBROCK7 (508572) 345 kV Bus.<br>b. Clear fault after 6 cycles by tripping the faulted transformer.<br>Trip generator(s) on the Bus LEBROCG1 (506752) 18 kV |
| FLT9053-3PH | P1 | 3 Phase fault on LEBROCK7 (508572) 345 kV to TENRUSK7 (508585) 345 kV line CKT 1, near LEBROCK7 (508572) 345 kV.<br>a. Apply fault at the LEBROCK7 (508572) 345 kV Bus.<br>b. Clear fault after 6 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 6 cycles, then trip the line in (b) and remove fault. |
| FLT9054-3PH | P1 | 3 Phase fault on TENRUSK7 (508585) 345 kV to LEBROCK7 (508572) 345 kV line CKT 1, near TENRUSK7 (508585) 345 kV.<br>a. Apply fault at the TENRUSK7 (508585) 345 kV Bus.<br>b. Clear fault after 6 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 6 cycles, then trip the line in (b) and remove fault. |
| FLT9055-3PH | P1 | 3 Phase fault on TENRUSK7 (508585) 345 kV to CROCKET7 (509241) 345 kV line CKT 1, near TENRUSK7 (508585) 345 kV.<br>a. Apply fault at the TENRUSK7 (508585) 345 kV Bus.<br>b. Clear fault after 6 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 6 cycles, then trip the line in (b) and remove fault. |
| FLT9056-3PH | P1 | 3 Phase fault on TENRUSK7 (508585) 345 kV to TENGEN 7 (508586) 345 kV line CKT 1, near TENRUSK7 (508585) 345 kV.<br>a. Apply fault at the TENRUSK7 (508585) 345 kV Bus.<br>b. Clear fault after 6 cycles by tripping the faulted line.<br>Trip generator(s) on the Bus TENGAS 1 (506745) 18 kV<br>Trip generator(s) on the Bus TENGAS 2 (506746) 18 kV<br>Trip generator(s) on the Bus TENGAS 3 (506747) 18 kV<br>Trip generator(s) on the Bus TENSTM 1 (506748) 23 kV<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 6 cycles, then trip the line in (b) and remove fault. |
| FLT9057-3PH | P1 | 3 Phase fault on DIANA 7 (508832) 345 kV to PIRKEY 7 (508563) 345 kV line CKT 1, near DIANA 7 (508832) 345 kV.<br>a. Apply fault at the DIANA 7 (508832) 345 kV Bus.<br>b. Clear fault after 6 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 6 cycles, then trip the line in (b) and remove fault. |

**Table 5-1 Continued**

| Fault ID | Planning Event | Fault Descriptions |
|---|---|---|
| FLT9058-3PH | P1 | 3 Phase fault on DIANA 7 (508832) 345 kV to SW SHV 7 (507760) 345 kV line CKT 1, near DIANA 7 (508832) 345 kV.<br>a. Apply fault at the DIANA 7 (508832) 345 kV Bus.<br>b. Clear fault after 6 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 6 cycles, then trip the line in (b) and remove fault. |
| FLT9059-3PH | P1 | 3 Phase fault on DIANA 7 (508832) 345 kV to WELSH 7 (508359) 345 kV line CKT 1, near DIANA 7 (508832) 345 kV.<br>a. Apply fault at the DIANA 7 (508832) 345 kV Bus.<br>b. Clear fault after 6 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 6 cycles, then trip the line in (b) and remove fault. |
| FLT9060-3PH | P1 | 3 Phase fault on DIANA 7 (508832) 345 kV / DIANA 4 (508831) 138 kV / DIANA-N1 (508845) 13.8 kV XFMR CKT 3, near DIANA 7 (508832) 345 kV.<br>a. Apply fault at the DIANA 7 (508832) 345 kV Bus.<br>b. Clear fault after 6 cycles by tripping the faulted transformer. |
| FLT9061-3PH | P1 | 3 Phase fault on SW SHV 7 (507760) 345 kV to DIANA 7 (508832) 345 kV line CKT 1, near SW SHV 7 (507760) 345 kV.<br>a. Apply fault at the SW SHV 7 (507760) 345 kV Bus.<br>b. Clear fault after 6 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 6 cycles, then trip the line in (b) and remove fault. |
| FLT9062-3PH | P1 | 3 Phase fault on SW SHV 7 (507760) 345 kV to LONGWD 7 (508809) 345 kV line CKT 1, near SW SHV 7 (507760) 345 kV.<br>a. Apply fault at the SW SHV 7 (507760) 345 kV Bus.<br>b. Clear fault after 6 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 6 cycles, then trip the line in (b) and remove fault. |
| FLT9063-3PH | P1 | 3 Phase fault on SW SHV 7 (507760) 345 kV to DOLHILL7 (500250) 345 kV line CKT 1, near SW SHV 7 (507760) 345 kV.<br>a. Apply fault at the SW SHV 7 (507760) 345 kV Bus.<br>b. Clear fault after 6 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 6 cycles, then trip the line in (b) and remove fault. |
| FLT9064-3PH | P1 | 3 Phase fault on SW SHV 7 (507760) 345 kV / SW SHV 4 (507759) 138 kV / SWSHV2-1 (507777) 13.8 kV XFMR CKT 2, near SW SHV 7 (507760) 345 kV.<br>a. Apply fault at the SW SHV 7 (507760) 345 kV Bus.<br>b. Clear fault after 6 cycles by tripping the faulted transformer. |
| FLT9065-3PH | P1 | 3 Phase fault on SW SHV 4 (507759) 138 kV / SW SHV 7 (507760) 345 kV / SWSHV2-1 (507777) 13.8 kV XFMR CKT 2, near SW SHV 4 (507759) 138 kV.<br>a. Apply fault at the SW SHV 4 (507759) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted transformer. |
| FLT9066-3PH | P1 | 3 Phase fault on SW SHV 4 (507759) 138 kV to S SHV 4 (507755) 138 kV line CKT 1, near SW SHV 4 (507759) 138 kV.<br>a. Apply fault at the SW SHV 4 (507759) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9067-3PH | P1 | 3 Phase fault on SW SHV 4 (507759) 138 kV to SPRIDGE4 (507757) 138 kV line CKT 1, near SW SHV 4 (507759) 138 kV.<br>a. Apply fault at the SW SHV 4 (507759) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9068-3PH | P1 | 3 Phase fault on SW SHV 4 (507759) 138 kV to LEASIDE 4 (507793) 138 kV line CKT 1, near SW SHV 4 (507759) 138 kV.<br>a. Apply fault at the SW SHV 4 (507759) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |

**Table 5-1 Continued**

| Fault ID | Planning Event | Fault Descriptions |
|---|---|---|
| FLT9069-3PH | P1 | 3 Phase fault on SW SHV 4 (507759) 138 kV to POWELL 4 (507748) 138 kV line CKT 1, near SW SHV 4 (507759) 138 kV.<br>a. Apply fault at the SW SHV 4 (507759) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9070-3PH | P1 | 3 Phase fault on SW SHV 4 (507759) 138 kV to GENMOTR4 (507732) 138 kV line CKT 1, near SW SHV 4 (507759) 138 kV.<br>a. Apply fault at the SW SHV 4 (507759) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9071-3PH | P1 | 3 Phase fault on WELSH 7 (508359) 345 kV to DIANA 7 (508832) 345 kV line CKT 1, near WELSH 7 (508359) 345 kV.<br>a. Apply fault at the WELSH 7 (508359) 345 kV Bus.<br>b. Clear fault after 6 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 6 cycles, then trip the line in (b) and remove fault. |
| FLT9072-3PH | P1 | 3 Phase fault on WELSH 7 (508359) 345 kV to WELSH3-1 (509406) 18 kV XFMR CKT 1, near WELSH 7 (508359) 345 kV.<br>a. Apply fault at the WELSH 7 (508359) 345 kV Bus.<br>b. Clear fault after 6 cycles by tripping the faulted transformer.<br>Trip generator(s) on the Bus WELSH3-1 (509406) 18 kV |
| FLT9073-3PH | P1 | 3 Phase fault on WELSH 7 (508359) 345 kV to WELSH1-1 (509404) 18 kV XFMR CKT 1, near WELSH 7 (508359) 345 kV.<br>a. Apply fault at the WELSH 7 (508359) 345 kV Bus.<br>b. Clear fault after 6 cycles by tripping the faulted transformer.<br>Trip generator(s) on the Bus WELSH1-1 (509404) 18 kV |
| FLT9074-3PH | P1 | 3 Phase fault on WELSH 7 (508359) 345 kV to WILKES 7 (508841) 345 kV line CKT 1, near WELSH 7 (508359) 345 kV.<br>a. Apply fault at the WELSH 7 (508359) 345 kV Bus.<br>b. Clear fault after 6 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 6 cycles, then trip the line in (b) and remove fault. |
| FLT9075-3PH | P1 | 3 Phase fault on WELSH 7 (508359) 345 kV to NWTXARK7 (508072) 345 kV line CKT 1, near WELSH 7 (508359) 345 kV.<br>a. Apply fault at the WELSH 7 (508359) 345 kV Bus.<br>b. Clear fault after 6 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 6 cycles, then trip the line in (b) and remove fault. |
| FLT9076-3PH | P1 | 3 Phase fault on WELSH 7 (508359) 345 kV to LYDIA 7 (508298) 345 kV line CKT 1, near WELSH 7 (508359) 345 kV.<br>a. Apply fault at the WELSH 7 (508359) 345 kV Bus.<br>b. Clear fault after 6 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 6 cycles, then trip the line in (b) and remove fault. |
| FLT9077-3PH | P1 | 3 Phase fault on WELSH 7 (508359) 345 kV to SPPMAINBUS (5917) 345 kV line CKT 1, near WELSH 7 (508359) 345 kV.<br>a. Apply fault at the WELSH 7 (508359) 345 kV Bus.<br>b. Clear fault after 6 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 6 cycles, then trip the line in (b) and remove fault. |
| FLT9078-3PH | P1 | 3 Phase fault on DIANA 4 (508831) 138 kV / DIANA 7 (508832) 345 kV / DIANA-N1 (508845) 13.8 kV XFMR CKT 3, near DIANA 4 (508831) 138 kV.<br>a. Apply fault at the DIANA 4 (508831) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted transformer. |
| FLT9079-3PH | P1 | 3 Phase fault on DIANA 4 (508831) 138 kV to NGPLTAP4 (508837) 138 kV line CKT 1, near DIANA 4 (508831) 138 kV.<br>a. Apply fault at the DIANA 4 (508831) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |

**Table 5-1 Continued**

| Fault ID | Planning Event | Fault Descriptions |
|---|---|---|
| FLT9080-3PH | P1 | 3 Phase fault on DIANA 4 (508831) 138 kV to SPRHILL4 (508571) 138 kV line CKT 1, near DIANA 4 (508831) 138 kV.<br>a. Apply fault at the DIANA 4 (508831) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9081-3PH | P1 | 3 Phase fault on DIANA 4 (508831) 138 kV to DIANASW4 (509639) 138 kV line CKT 1, near DIANA 4 (508831) 138 kV.<br>a. Apply fault at the DIANA 4 (508831) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9082-3PH | P1 | 3 Phase fault on DIANA 4 (508831) 138 kV to PERDUE 4 (508351) 138 kV line CKT 1, near DIANA 4 (508831) 138 kV.<br>a. Apply fault at the DIANA 4 (508831) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9083-3PH | P1 | 3 Phase fault on DIANA 4 (508831) 138 kV to LSSOUTH4 (508297) 138 kV line CKT 1, near DIANA 4 (508831) 138 kV.<br>a. Apply fault at the DIANA 4 (508831) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9084-3PH | P1 | 3 Phase fault on NGPLTAP4 (508837) 138 kV to DIANA 4 (508831) 138 kV line CKT 1, near NGPLTAP4 (508837) 138 kV.<br>a. Apply fault at the NGPLTAP4 (508837) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9085-3PH | P1 | 3 Phase fault on NGPLTAP4 (508837) 138 kV to PLILER 4 (508564) 138 kV line CKT 1, near NGPLTAP4 (508837) 138 kV.<br>a. Apply fault at the NGPLTAP4 (508837) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9086-3PH | P1 | 3 Phase fault on NGPLTAP4 (508837) 138 kV to NGPL 4 (508827) 138 kV line CKT 1, near NGPLTAP4 (508837) 138 kV.<br>a. Apply fault at the NGPLTAP4 (508837) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9087-3PH | P1 | 3 Phase fault on SPRHILL4 (508571) 138 kV to DIANA 4 (508831) 138 kV line CKT 1, near SPRHILL4 (508571) 138 kV.<br>a. Apply fault at the SPRHILL4 (508571) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9088-3PH | P1 | 3 Phase fault on SPRHILL4 (508571) 138 kV to LLAMOND4 (508552) 138 kV line CKT 1, near SPRHILL4 (508571) 138 kV.<br>a. Apply fault at the SPRHILL4 (508571) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9089-3PH | P1 | 3 Phase fault on DIANASW4 (509639) 138 kV to DIANA 4 (508831) 138 kV line CKT 1, near DIANASW4 (509639) 138 kV.<br>a. Apply fault at the DIANASW4 (509639) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |

**Table 5-1 Continued**

| Fault ID | Planning Event | Fault Descriptions |
|---|---|---|
| FLT9090-3PH | P1 | 3 Phase fault on DIANASW4 (509639) 138 kV to NOONDAY4 (509628) 138 kV line CKT 1, near DIANASW4 (509639) 138 kV.<br>a. Apply fault at the DIANASW4 (509639) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9091-3PH | P1 | 3 Phase fault on DIANASW4 (509639) 138 kV to DIAN 4 (509607) 138 kV line CKT 1, near DIANASW4 (509639) 138 kV.<br>a. Apply fault at the DIANASW4 (509639) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9092-3PH | P1 | 3 Phase fault on PERDUE 4 (508351) 138 kV to DIANA 4 (508831) 138 kV line CKT 1, near PERDUE 4 (508351) 138 kV.<br>a. Apply fault at the PERDUE 4 (508351) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9093-3PH | P1 | 3 Phase fault on PERDUE 4 (508351) 138 kV to BIGSAND4 (509603) 138 kV line CKT 1, near PERDUE 4 (508351) 138 kV.<br>a. Apply fault at the PERDUE 4 (508351) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9094-3PH | P1 | 3 Phase fault on PERDUE 4 (508351) 138 kV to EXXONM 4 (508369) 138 kV line CKT 1, near PERDUE 4 (508351) 138 kV.<br>a. Apply fault at the PERDUE 4 (508351) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9095-3PH | P1 | 3 Phase fault on PERDUE 4 (508351) 138 kV to NEWGLAD4 (508560) 138 kV line CKT 1, near PERDUE 4 (508351) 138 kV.<br>a. Apply fault at the PERDUE 4 (508351) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9096-3PH | P1 | 3 Phase fault on PERDUE 4 (508351) 138 kV / PERDUE 2 (508350) 69 kV / PERDUE 1 (508356) 13.8 kV XFMR CKT 1, near PERDUE 4 (508351) 138 kV.<br>a. Apply fault at the PERDUE 4 (508351) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted transformer. |
| FLT9097-3PH | P1 | 3 Phase fault on PERDUE 2 (508350) 69 kV / PERDUE 4 (508351) 138 kV / PERDUE 1 (508356) 13.8 kV XFMR CKT 1, near PERDUE 2 (508350) 69 kV.<br>a. Apply fault at the PERDUE 2 (508350) 69 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted transformer. |
| FLT9098-3PH | P1 | 3 Phase fault on PERDUE 2 (508350) 69 kV to BIGSNDY2 (508335) 69 kV line CKT 1, near PERDUE 2 (508350) 69 kV.<br>a. Apply fault at the PERDUE 2 (508350) 69 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9099-3PH | P1 | 3 Phase fault on PERDUE 2 (508350) 69 kV to GILMER 2 (508341) 69 kV line CKT 1, near PERDUE 2 (508350) 69 kV.<br>a. Apply fault at the PERDUE 2 (508350) 69 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9100-3PH | P1 | 3 Phase fault on PERDUE 2 (508350) 69 kV to CLARKSV2 (508540) 69 kV line CKT 1, near PERDUE 2 (508350) 69 kV.<br>a. Apply fault at the PERDUE 2 (508350) 69 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |

Table 5-1 Continued

| Fault ID | Planning Event | Fault Descriptions |
|---|---|---|
| FLT9101-3PH | P1 | 3 Phase fault on LSSOUTH4 (508297) 138 kV to DIANA 4 (508831) 138 kV line CKT 1, near LSSOUTH4 (508297) 138 kV.<br>a. Apply fault at the LSSOUTH4 (508297) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9102-3PH | P1 | 3 Phase fault on LSSOUTH4 (508297) 138 kV to PITTSB_4 (508313) 138 kV line CKT 1, near LSSOUTH4 (508297) 138 kV.<br>a. Apply fault at the LSSOUTH4 (508297) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9103-3PH | P1 | 3 Phase fault on LSSOUTH4 (508297) 138 kV to WILKES 4 (508840) 138 kV line CKT 1, near LSSOUTH4 (508297) 138 kV.<br>a. Apply fault at the LSSOUTH4 (508297) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9104-3PH | P1 | 3 Phase fault on LSSOUTH4 (508297) 138 kV / LSSOUTH2 (508296) 69 kV / LSS-1 (508325) 12.47 kV XFMR CKT 1, near LSSOUTH4 (508297) 138 kV.<br>a. Apply fault at the LSSOUTH4 (508297) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted transformer. |
| FLT9105-3PH | P1 | 3 Phase fault on LSSOUTH2 (508296) 69 kV / LSSOUTH4 (508297) 138 kV / LSS-1 (508325) 12.47 kV XFMR CKT 1, near LSSOUTH2 (508296) 69 kV.<br>a. Apply fault at the LSSOUTH2 (508296) 69 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted transformer. |
| FLT9106-3PH | P1 | 3 Phase fault on LSSOUTH2 (508296) 69 kV to LSREC 2 (508295) 69 kV line CKT 1, near LSSOUTH2 (508296) 69 kV.<br>a. Apply fault at the LSSOUTH2 (508296) 69 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |
| FLT9107-3PH | P1 | 3 Phase fault on LSSOUTH2 (508296) 69 kV to LONSTAR2 (508320) 69 kV line CKT 1, near LSSOUTH2 (508296) 69 kV.<br>a. Apply fault at the LSSOUTH2 (508296) 69 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>c. Wait 20 cycles, and then re-close the line in (b) back into the fault.<br>d. Leave Fault on for 7 cycles, then trip the line in (b) and remove fault. |

## 5.3 Results

Table 5-2 shows the relevant results of the fault events simulated for each of the modified models. Existing DISIS base case issues are documented separately in Appendix C. The associated stability plots are also provided in Appendix C.

Table 5-2: GEN-2022-GR1 Dynamic Stability Results

| Fault ID | 25SP | | | 25WP | | |
|---|---|---|---|---|---|---|
| | Voltage Violation | Voltage Recovery | Stable | Voltage Violation | Voltage Recovery | Stable |
| FLT1000-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1001-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1002-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1003-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1004-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1005-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1006-SB | Pass | Pass | Stable | Pass | Pass | Stable |

**Table 5-2 continued**

| Fault ID | 25SP | | | 25WP | | |
|---|---|---|---|---|---|---|
| | Voltage Violation | Voltage Recovery | Stable | Voltage Violation | Voltage Recovery | Stable |
| FLT1007-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1008-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1009-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1010-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1011-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1012-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1013-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1014-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1015-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1016-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1017-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1018-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1019-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1020-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1021-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1022-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1023-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1024-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1025-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1026-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1027-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1028-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1029-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1030-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1031-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1032-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1033-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1034-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1035-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT1036-SB | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9000-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9001-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9002-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9003-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9004-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9005-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9006-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9007-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9008-3PH | Pass | Pass | Stable | Pass | Pass | Stable |

**Table 5-2 continued**

| Fault ID | 25SP | | | 25WP | | |
|---|---|---|---|---|---|---|
| | Voltage Violation | Voltage Recovery | Stable | Voltage Violation | Voltage Recovery | Stable |
| FLT9009-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9010-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9011-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9012-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9013-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9014-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9015-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9016-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9017-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9018-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9019-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9020-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9021-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9022-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9023-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9024-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9025-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9026-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9027-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9028-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9029-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9030-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9031-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9032-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9033-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9034-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9035-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9036-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9037-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9038-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9039-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9040-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9041-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9042-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9043-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9044-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9045-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9046-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9047-3PH | Pass | Pass | Stable | Pass | Pass | Stable |

**Table 5-2 continued**

| Fault ID | 25SP | | | 25WP | | |
|---|---|---|---|---|---|---|
| | Voltage Violation | Voltage Recovery | Stable | Voltage Violation | Voltage Recovery | Stable |
| FLT9048-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9049-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9050-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9051-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9052-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9053-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9054-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9055-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9056-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9057-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9058-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9059-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9060-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9061-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9062-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9063-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9064-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9065-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9066-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9067-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9068-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9069-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9070-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9071-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9072-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9073-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9074-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9075-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9076-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9077-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9078-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9079-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9080-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9081-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9082-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9083-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9084-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9085-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9086-3PH | Pass | Pass | Stable | Pass | Pass | Stable |

**Table 5-2 continued**

| Fault ID | 25SP | | | 25WP | | |
|---|---|---|---|---|---|---|
| | Voltage Violation | Voltage Recovery | Stable | Voltage Violation | Voltage Recovery | Stable |
| FLT9087-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9088-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9089-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9090-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9091-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9092-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9093-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9094-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9095-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9096-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9097-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9098-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9099-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9100-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9101-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9102-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9103-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9104-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9105-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9106-3PH | Pass | Pass | Stable | Pass | Pass | Stable |
| FLT9107-3PH | Pass | Pass | Stable | Pass | Pass | Stable |

The results of the dynamic stability showed several existing base case issues that were found in both the original DISIS-2018-002/2019-001 models and the models with the GEN-2022-GR1 modification included. These issues were not attributed to the GEN-2022-GR1 modification request and detailed in Appendix C.

There were no damping or voltage recovery violations attributed to the GEN-2022-GR1 modification request observed during the simulated faults.

# 6.0 Material Modification Determination

In accordance with Attachment V of SPP's Open Access Transmission Tariff, for modifications other than those specifically permitted by Attachment V, SPP shall evaluate the proposed modifications prior to making them and inform the Interconnection Customer in writing of whether the modifications would constitute a Material Modification. Material Modification shall mean (1) modification to an Interconnection Request in the queue that has a material adverse impact on the cost or timing of any other Interconnection Request with a later Queue priority date; or (2) planned modification to an Existing Generating Facility that is undergoing evaluation for a Generating Facility Modification or Generating Facility Replacement, and has a material adverse impact on the Transmission System with respect to: i) steady-state thermal or voltage limits, ii) dynamic system stability and response, or iii) short-circuit capability limit; compared to the impacts of the Existing Generating Facility prior to the modification or replacement.

## 6.1 Results

SPP determined the requested modification is not a Material Modification based on the results of this Modification Request Impact Study performed by Aneden. Aneden evaluated the impact of the requested modification and determined that the requested modification did not negatively impact the Transmission System when the dynamic stability and short circuit results were compared to the impacts of the generating facility prior to the modification.

This determination implies that any network upgrades already required by GEN-2022-GR1 would not be negatively impacted and that no new upgrades are required due to the requested modification, thus not resulting in a material adverse impact on the Transmission System when compared to the impacts of the generating facility prior to the modification.