# GEN-2024-GR1

## GENERATOR REPLACEMENT STUDY

By Aneden Consulting and SPP Generator Interconnection
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# REVISION HISTORY

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# EXECUTIVE SUMMARY

Pursuant to the Southwest Power Pool (SPP) Open Access Transmission Tariff (SPP tariff) Attachment V section 3.9 and SPP Business Practice 7800, Interconnection Customers can submit replacement requests for its Existing Generating Facilities. The Interconnection Customer of an Existing Generating Facility (EGF) with a Point of Interconnection (POI) at the Horseshoe Lake 138 kV Substation requested to be studied in the SPP Generator Replacement process.

GEN-2024-GR1, the Replacement Generating Facility (RGF), will connect to the existing POI, the Horseshoe Lake 138 kV Substation in the Oklahoma Gas & Electric (OG&E) transmission system. The EGF has 492 MW of available replacement capacity as confirmed by SPP based on the nameplate of the generating facility. This study has been requested to evaluate the impact of the RGF, consisting of 2 x GE 279 MVA synchronous gas-fired units with a total assumed dispatch of 492 MW. The injection amount of the RGF must be limited to 492 MW at the POI. As a result, the customer must install monitoring and control equipment as needed to ensure that the amount of power injected at the POI does not exceed the Interconnection Service amount.

The Generator Replacement Process consists of two parts: a Reliability Assessment Study and a Replacement Impact Study. The Reliability Assessment Study identifies any system impacts after the removal of the EGF from service and before the commission date of the RGF with proposed system adjustments to mitigate any issues. The Replacement Impact Study evaluates whether the RGF is a Material Modification.

## Reliability Assessment Study

Because the EGF was considered retired prior to the Generating Facility Replacement, the performance of the Transmission System with the EGF ceasing commercial operations is the status quo. SPP determined that for the Reliability Assessment Study, no further analysis for the time between removing the EGF from service and the commission of the RGF is necessary, and no mitigations are applicable.

## Replacement Impact Study

Aneden Consulting (Aneden) was retained by SPP to perform the Replacement Impact Study (Impact Study) for GEN-2024-GR1.

SPP determined that steady-state analysis was not required as the EGF is a Legacy unit and as such was not subject to a DISIS steady-state analysis. Since the RGF is a synchronous generator, a reactive power analysis was not required. However, SPP determined that short circuit and dynamic stability analyses were required as the dynamic model for the EGF and RGF are different (GENROU and GENTPJ1, respectively). The scope of this Impact Study included short circuit analysis and dynamic stability analysis.

The results of the Impact Study showed that the requested replacement did not have a material adverse impact on the SPP transmission system. The requested generator replacement of the EGF with GEN-2024-GR1 was determined **not a Material Modification**.

As the requested replacement generating capacity is higher than its Interconnection Service, the customer must install monitoring and control equipment as needed to ensure that the amount of power injected at the POI does not exceed the requested Interconnection Service amount. The monitoring and control scheme may be reviewed by the Transmission Owner (TO) and documented in Appendix C of the RGF GIA.

It is likely that the customer may be required to reduce its generation output 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. Transfer of an existing resource designation from the EGF to the RGF can be achieved by submitting a transfer of designation request pursuant to Section 30.2.1 of the SPP tariff. If the customer would like to obtain new deliverability to final customers, a separate request for transmission service must be requested on SPP's OASIS by the customer.

# SCOPE OF STUDY

Pursuant to SPP tariff Attachment V section 3.9 and SPP Business Practice 7800, Interconnection Customers can submit replacement requests for its Existing Generating Facilities. A Generator Replacement Impact Study is an interconnection study performed to evaluate the impacts of replacing existing generation with new generation. Two analyses covering different time frames are evaluated:

- Reliability Assessment Study – study performed to evaluate the performance of the Transmission System for the period between the date that the Existing Generating Facility (EGF) ceases commercial operations and the Commercial Operation Date (COD) of the Replacement Generating Facility (RGF).
- Replacement Impact Study – study performed to evaluate if the RGF has a material adverse impact on the SPP Transmission System.

For any impacts to the system identified in the Reliability Assessment Study, non-transmission solutions such as redispatch, remedial action schemes, or reactive setting adjustments will be identified to mitigate issues originating after the removal of the EGF from service and before the commission of the RGF.

If the Replacement Impact Study identifies any materially adverse impact from operating the RGF when compared to the EGF, such impacts shall be deemed a Material Modification.

## RELIABILITY ASSESSMENT STUDY

The Reliability Assessment Study evaluates the performance of the Transmission System for the time period between the date that the EGF ceases commercial operations and the Commercial Operation Date of the RGF.

This study compares the conditions on the Transmission System that would exist if the EGF is taken offline to the conditions on the Transmission System as they exist when the EGF is online. The EGF would be responsible for mitigating any reliability violations identified in the study and may not cease operations until all mitigations are implemented or are in service.

Because the EGF was considered retired prior to the Generating Facility Replacement and was out-of-service in the latest planning assessment models, the performance of the Transmission System with the EGF ceasing commercial operations is the status quo. SPP determined that for the Reliability Assessment Study, no further analysis for the time between removing the EGF from service and the commission of the RGF is necessary, and no mitigations are applicable.

# REPLACEMENT IMPACT STUDY

Aneden Consulting (Aneden) was retained by SPP to perform the Replacement Impact Study (Impact Study) for GEN-2024-GR1. All analyses were performed using Siemens PTI PSS/E version 34 software.

## STEADY STATE ANALYSIS

To determine whether steady state analysis is required, SPP evaluates the reliability conditions that were previously studied. This is done by comparing the current DISIS steady-state requirements versus the steady-state analysis previously performed on the EGF. SPP determined that since the EGF was a Legacy unit and was not subject to a DISIS steady-state analysis, no steady-state analysis for the RGF is required.

## STABILITY AND SHORT CIRCUIT ANALYSES

To determine whether stability and short circuit analyses are required, SPP evaluates the difference between the stability models and corresponding parameters and, if needed, the collector system impedance between the existing configuration and the requested replacement. Dynamic stability analysis and short circuit analysis shall be performed if the differences listed above may result in a significant impact on the most recently performed DISIS stability analysis.

## REACTIVE POWER ANALYSIS

The reactive power analysis determines the capacitive effect at the POI caused by the project's collector system and transmission line's capacitance. A shunt reactor size is determined to offset the capacitive effect and maintain zero (0) MVAr injection at the POI while the project's generators and capacitors (if any) are offline. A reactive power analysis was not performed on the requested replacement configuration as it is a synchronous generator resource.

## STUDY LIMITATIONS

The assessments and conclusions provided in this report are based on assumptions and information provided to SPP/Aneden by others. While the assumptions and information provided may be appropriate for the purposes of this report, SPP/Aneden does not guarantee that those conditions assumed will occur. In addition, SPP/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.

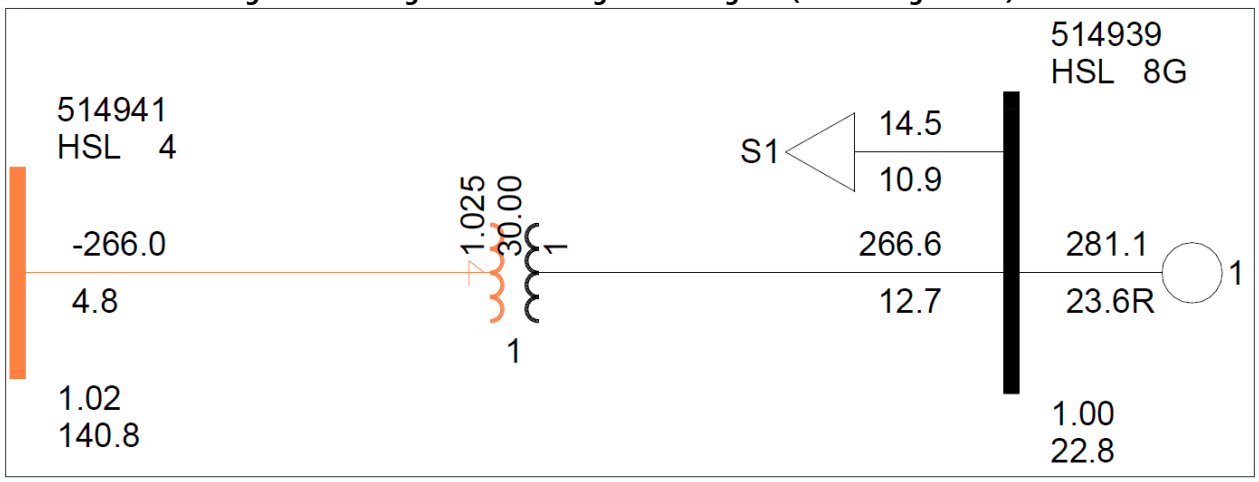
# PROJECT AND REPLACEMENT REQUEST

The GEN-2024-GR1 Interconnection Customer has requested a replacement to its EGF, a synchronous gas steam generating facility with a POI at the Horseshoe Lake 138 kV Substation and a requested retirement date of December 31, 2026. The Interconnection Service available for replacement is 492 MW as confirmed by SPP based on the nameplate of the generating facility. Of the Interconnection Service available, the RGF Interconnection Customer has requested 492 MW of Energy Resource Interconnection Service (ERIS). The requested RGF is a synchronous gas-fired generation plant consisting of 2 x GE 279 MVA synchronous gas-fired units with a total assumed dispatch of 492 MW. The injection amount of the RGF must be limited to 492 MW at the POI. As a result, the customer must install monitoring and control equipment as needed to ensure that the amount of power injected at the POI does not exceed the Interconnection Service amount.

The RGF has a planned commercial operation date of December 31, 2026. The EGF predated the SPP GI queue and does not have an SPP Generation Interconnection Agreement (GIA).

The POI of the EGF and RGF is at the Horseshoe Lake 138 kV Substation in the Oklahoma Gas & Electric (OG&E) transmission system, and the EGF and RGF are not expected to be operational simultaneously. Figure 1 and Figure 2 show the steady state model single-line diagram for the EGF and RGF configurations, respectively. Table 1 details the existing and replacement configurations for GEN-2024-GR1.

**Figure 1: Existing Generation Single Line Diagram (EGF Configuration)***




*based on the DISIS-2018-002/2019-001 25SP stability models

**Figure 2: GEN-2024-GR1 Single Line Diagram (RGF Configuration)**

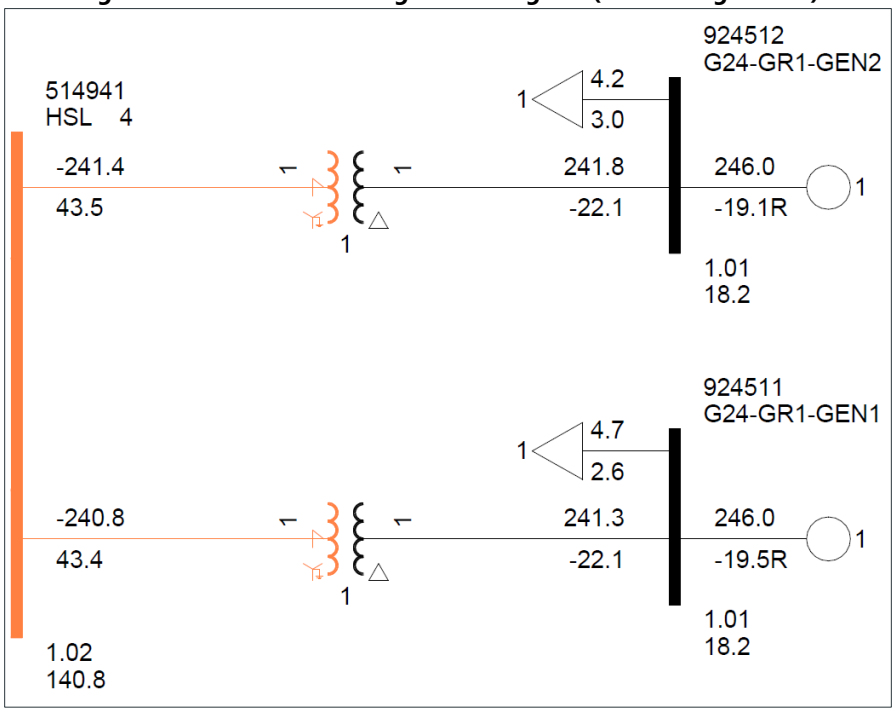



**Table 1: EGF and RGF Configuration Details**

| Facility | Existing Generator Facility Configuration | Replacement Generator Facility Configuration | |
|---|---|---|---|
| Point of Interconnection | Horseshoe Lake 138 kV (514941) | Horseshoe Lake 138 kV (514941) | |
| Configuration/Capacity | 1 Synchronous Gas-Fired Unit with 492 MVA Capacity [414 MW dispatch] | 2 x GE 279 MVA Gas Turbine (Gas Combustion) = 558 MVA [492 MW dispatch]<br>Units are rated at 558 MVA, POI limited to 492 MW | |
| GSU Transformer[1] | Gen 1 Equivalent Qty: 1<br><br>X = 11.026%, R = 0.296%,<br>Winding MVA = 475 MVA,<br>Rating MVA = 532 MVA | Gen 1 Equivalent Qty: 1<br>X = 5.999%, R = 0.133%,<br>Voltage = 17.8/138 kV (Delta/Wye Grounded),<br>Taps Available = 5 Taps, ±5%<br>Winding MVA = 162 MVA,<br>Rating MVA = 270 MVA | Gen 2 Equivalent Qty: 1<br>X = 5.999%, R = 0.133%,<br>Voltage = 17.8/138 kV (Delta/Wye Grounded),<br>Taps Available = 5 Taps, ±5%<br>Winding MVA = 162 MVA,<br>Rating MVA = 270 MVA |
| Generator Dynamic Model[3] & Power Factor | GENROU[3]<br>Leading: 0.92<br>Lagging: 0.88 | 1 x GE 279 MVA Gas Turbine (GENTPJ1)[3]<br>Leading: 0.95<br>Lagging: 0.88172 | 1 x GE 279 MVA Gas Turbine (GENTPJ1)[3]<br>Leading: 0.95<br>Lagging: 0.88172 |
| Auxiliary Load | 14.5 MW + 10.8 MVAr on 22.8 kV bus | 4.706 MW + 2.604 MVAr on 18 kV bus | 4.155 MW + 2.986 MVAr on 18 kV bus |
| 1) X and R based on Winding MVA, 2) All pu are on 100 MVA Base, 3) DYR stability model name | | | |

# RELIABILITY ASSESSMENT STUDY

The Reliability Assessment Study evaluates the performance of the Transmission System for the time period between the date that the EGF ceases commercial operations and the Commercial Operation Date of the RGF.

This study compares the conditions on the Transmission System that would exist if the EGF is taken offline to the conditions on the Transmission System as they exist when the EGF is online. The EGF would be responsible for mitigating any reliability violations identified in the study and may not cease operations until all mitigations are implemented or are in service.

Because the EGF was considered retired prior to the Generating Facility Replacement, the performance of the Transmission System with the EGF ceasing commercial operations is the status quo. SPP determined that for the Reliability Assessment Study, no further analysis for the time between removing the EGF from service and the commission of the RGF is necessary, and no mitigations are applicable.

# REPLACEMENT IMPACT STUDY

Aneden was retained by SPP to perform the Replacement Impact Study (Impact Study) for GEN-2024-GR1.

## EXISTING VS. REPLACEMENT COMPARISON

To determine which analyses are required for the Impact Study, the differences between the existing configuration and the requested replacement were evaluated. This comparison and the resulting analyses used a set of modified study models developed based on the replacement request data and the DISIS-2018-002/2019-001 study models.

### STABILITY MODEL PARAMETERS COMPARISION

Because the dynamic model for the EGF and RGF are different (GENROU and GENTPJ1, respectively), SPP determined short-circuit and dynamic stability analyses were required. This is because the short-circuit contribution and stability responses of the existing configuration and the requested replacement's configuration may differ. The generator dynamic model for the RGF can be found in Appendix A.

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

### EQUIVALENT IMPEDANCE COMPARISON CALCULATION

As the stability model 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.

# SHORT-CIRCUIT ANALYSIS

Aneden performed a short circuit study using the 25SP model to determine the maximum fault current requiring interruption by protective equipment with the RGF online for each bus in the relevant subsystem, and the amount of increase in maximum fault current due to the addition of the RGF. The detailed results of the short circuit analysis are provided in Appendix B.

## METHODOLOGY

The short-circuit analysis included applying a three-phase fault on buses up to five 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 the GEN-2024-GR1 RGF online.

SPP created a short circuit model using the 25SP stability study model by adjusting the GEN-2024-GR1 short-circuit parameters consistent with the replacement data. The adjusted parameters are shown in Table 2 below.

**Table 2: GEN-2024-GR1 Short-Circuit Parameters***

| Parameter | Value by Generator Bus# | |
|---|---|---|
| | 924511 | 924512 |
| Machine MVA Base | 279 | 279 |
| R (pu) | 0 | 0 |
| X'' (pu) | 0.18 | 0.18 |

*pu values based on Machine MVA Base

## RESULTS

The results of the short circuit analysis for the 25SP model are summarized in Table 3 and Table 4. The GEN-2024-GR1 POI bus (Horseshoe Lake 138 kV) fault current magnitude is provided in Table 3 showing a fault current of 44.88 kA with the RGF online. The addition of the RGF increased the POI bus fault current by 8.19 kA. Table 4 shows the maximum fault current magnitudes and fault current increases with the RGF project online.

The maximum fault current calculated within 5 buses of the POI was 47.36 kA for the 25SP model. There were several buses with a maximum three-phase fault current over 40 kA. These buses are highlighted in Appendix B. The maximum contribution to three-phase fault currents due to the addition of the RGF was about 22.3% and 8.19 kA.

**Table 3: POI Short-Circuit Results**

| Case | GEN-OFF Current (kA) | GEN-ON Current (kA) | kA Change | %Change |
|---|---|---|---|---|
| 25SP | 36.69 | 44.88 | 8.19 | 22.3% |

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

| Voltage (kV) | Max. Current (kA) | Max kA Change | Max %Change |
|---|---|---|---|
| 69 | 13.96 | 0.24 | 2.1% |
| 138 | 47.36 | 8.19 | 22.3% |
| 345 | 34.15 | 0.37 | 1.3% |
| **Max** | **47.36** | **8.19** | **22.3%** |

# DYNAMIC STABILITY ANALYSIS

Aneden performed a dynamic stability analysis to identify the impact of the GEN-2024-GR1 project. The analysis was performed according to SPP's Disturbance Performance Requirements[1]. The replacement details are described in the Project and Replacement Request section and the dynamic modeling data is provided in Appendix A. The existing base case issues and simulation plots can be found in Appendix C.

## METHODOLOGY AND CRITERIA

The dynamic stability analysis was performed using models developed with the requested RGF configuration of 2 x GE 279 MVA (GENTPJ1). This stability analysis was performed using PTI's PSS/E version 34.8.0 software.

The RGF project details 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-2024-GR1 project is provided in Appendix A. The modified power flow models and associated dynamics database were initialized (no-fault test) to confirm that there were no errors in the initial conditions of the system and the dynamic data.

The following system adjustments were made to address existing base case issues that are not attributed to the replacement request:

- The frequency protective relays at bus 762650 were disabled after observing the generator tripping during initial three phase fault simulations. This frequency tripping issue is a known PSS/E limitation when calculating bus frequency as it relates to non-conventional type devices.
- The fault simulation file acceleration factor was reduced, and the iteration limit was increased as needed to resolve stability simulation crashes.

During the fault simulations, the active power (PELEC), reactive power (QELEC), and terminal voltage (ETERM) were monitored for the EGF and SGF and other current and prior queued projects in Group 4. In addition, voltages of five (5) buses away from the POI of the RGF 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),

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

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.

## FAULT DEFINITIONS

Aneden developed fault events as required to study the RGF. 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. These contingencies were applied to the modified 25SP and 25WP models.

**Table 5: Fault Definitions**

| Fault ID | Planning Event | Fault Descriptions |
|---|---|---|
| FLT1000-SB | P4 | Stuck Breaker on JNSKAMO4 (514906) 138 kV Bus<br>a. Apply single phase fault at the JNSKAMO4 (514906) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the JNSKAMO4 (514906) 138 kV to 4MEMORALT (300136) 138 kV line CKT 1.<br>b.2.Trip the JNSKAMO4 (514906) 138 kV to ARCADIA4 (514907) 138 kV line CKT 1. |
| FLT1001-SB | P4 | Stuck Breaker on JNSKAMO4 (514906) 138 kV Bus<br>a. Apply single phase fault at the JNSKAMO4 (514906) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the JNSKAMO4 (514906) 138 kV to 4MEMORALT (300136) 138 kV line CKT 1.<br>b.2.Trip the JNSKAMO4 (514906) 138 kV to HSL 4 (514941) 138 kV line CKT 1. |
| FLT1002-SB | P4 | Stuck Breaker on JNSKAMO4 (514906) 138 kV Bus<br>a. Apply single phase fault at the JNSKAMO4 (514906) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the JNSKAMO4 (514906) 138 kV to HSL 4 (514941) 138 kV line CKT 1.<br>b.2.Trip the JNSKAMO4 (514906) 138 kV to ARCADIA4 (514907) 138 kV line CKT 1. |
| FLT1003-SB | P4 | Stuck Breaker on HSL 4 (514941) 138 kV Bus<br>a. Apply single phase fault at the HSL 4 (514941) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the HSL 4 (514941) 138 kV to JONESSB4 (515480) 138 kV line CKT 1.<br>b.2.Trip the HSL 4 (514941) 138 kV / HSLWEST2 (514937) 69 kV / HSL 1 (515731) 13.8 kV XFMR CKT 1. |
| FLT1004-SB | P4 | Stuck Breaker on HSL 4 (514941) 138 kV Bus<br>a. Apply single phase fault at the HSL 4 (514941) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the HSL 4 (514941) 138 kV to SE15TH 4 (514993) 138 kV line CKT 1.<br>b.2.Trip the HSL 4 (514941) 138 kV / G24-GR1-GEN1 (924511) 18 kV XFMR CKT 1.<br>b.3.Trip the HSL 4 (514941) 138 kV / G24-GR1-GEN2 (924512) 18 kV XFMR CKT 1.<br>Trip generator(s) on the Bus G24-GR1-GEN1 (924511) 18 kV<br>Trip generator(s) on the Bus G24-GR1-GEN2 (924512) 18 kV |
| FLT1005-SB | P4 | Stuck Breaker on HSL 4 (514941) 138 kV Bus<br>a. Apply single phase fault at the HSL 4 (514941) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the HSL 4 (514941) 138 kV to HAMMTAP4 (515046) 138 kV line CKT 1.<br>b.2.Trip the HSL 4 (514941) 138 kV / HSL 7S (514936) 20.9 kV XFMR CKT 1.<br>Trip generator(s) on the Bus HSL 7S (514936) 20.9 kV |
| FLT1006-SB | P4 | Stuck Breaker on HSL 4 (514941) 138 kV Bus<br>a. Apply single phase fault at the HSL 4 (514941) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the HSL 4 (514941) 138 kV to JNSKAMO4 (514906) 138 kV line CKT 1.<br>b.2.Trip the HSL 4 (514941) 138 kV to DALE 4 (514987) 138 kV line CKT 1. |
| FLT1007-SB | P4 | Stuck Breaker on HSL 4 (514941) 138 kV Bus<br>a. Apply single phase fault at the HSL 4 (514941) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the HSL 4 (514941) 138 kV to DUNJEE 4 (514884) 138 kV line CKT 1.<br>b.2.Trip the HSL 4 (514941) 138 kV to MIDWAY 4 (514966) 138 kV line CKT 1. |

**Table 5 Continued**

| Fault ID | Planning Event | Fault Descriptions |
|---|---|---|
| FLT1008-SB | P4 | Stuck Breaker on HSL 4 (514941) 138 kV Bus<br>a. Apply single phase fault at the HSL 4 (514941) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip the HSL 4 (514941) 138 kV / HSL 9G (514944) 13.8 kV XFMR CKT 1.<br>b.2.Trip the HSL 4 (514941) 138 kV / HSL 10G (514945) 13.8 kV XFMR CKT 1.<br>b.3.Trip the HSL 4 (514941) 138 kV to GEN-2018-029 (762647) 138 kV line CKT 1.<br>Trip generator(s) on the Bus HSL 9G (514944) 13.8 kV<br>Trip generator(s) on the Bus HSL 10G (514945) 13.8 kV<br>Trip generator(s) on the Bus G18-029GEN1 (762650) 0.7 kV |
| FLT1009-SB | P4 | Stuck Breaker on DUNJEE 4 (514884) 138 kV Bus<br>a. Apply single phase fault at the DUNJEE 4 (514884) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip bus DUNJEE 4 (514884) 138 kV. |
| FLT1010-SB | P4 | Stuck Breaker on MIDWAY 4 (514966) 138 kV Bus<br>a. Apply single phase fault at the MIDWAY 4 (514966) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip bus MIDWAY 4 (514966) 138 kV. |
| FLT1011-SB | P4 | Stuck Breaker on SE15TH 4 (514993) 138 kV Bus<br>a. Apply single phase fault at the SE15TH 4 (514993) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip bus SE15TH 4 (514993) 138 kV. |
| FLT1012-SB | P4 | Stuck Breaker on GRNPAST2 (514971) 69 kV Bus<br>a. Apply single phase fault at the GRNPAST2 (514971) 69 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip bus GRNPAST2 (514971) 69 kV. |
| FLT1013-SB | P4 | Stuck Breaker on HSLWEST2 (514937) 69 kV Bus<br>a. Apply single phase fault at the HSLWEST2 (514937) 69 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip bus HSLWEST2 (514937) 69 kV. |
| FLT1014-SB | P4 | Stuck Breaker on HSLEAST2 (514927) 69 kV Bus<br>a. Apply single phase fault at the HSLEAST2 (514927) 69 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip bus HSLEAST2 (514927) 69 kV. |
| FLT1015-SB | P4 | Stuck Breaker on HAMMTAP4 (515046) 138 kV Bus<br>a. Apply single phase fault at the HAMMTAP4 (515046) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip bus HAMMTAP4 (515046) 138 kV. |
| FLT1016-SB | P4 | Stuck Breaker on DALE 4 (514987) 138 kV Bus<br>a. Apply single phase fault at the DALE 4 (514987) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip bus DALE 4 (514987) 138 kV. |
| FLT1017-SB | P4 | Stuck Breaker on JONESSB4 (515480) 138 kV Bus<br>a. Apply single phase fault at the JONESSB4 (515480) 138 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip bus JONESSB4 (515480) 138 kV. |
| FLT1018-SB | P4 | Stuck Breaker on TXSTELA2 (514985) 69 kV Bus<br>a. Apply single phase fault at the TXSTELA2 (514985) 69 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip bus TXSTELA2 (514985) 69 kV. |
| FLT1019-SB | P4 | Stuck Breaker on MCLOUDT2 (515504) 69 kV Bus<br>a. Apply single phase fault at the MCLOUDT2 (515504) 69 kV Bus<br>b. Clear fault after 16 cycles and trip the following elements:<br>b.1.Trip bus MCLOUDT2 (515504) 69 kV. |
| FLT9000-3PH | P1 | 3 Phase fault on HSL 4 (514941) 138 kV to G24-GR1-GEN1 (924511) 18 kV XFMR CKT 1, near HSL 4 (514941) 138 kV.<br>a. Apply fault at the HSL 4 (514941) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted transformer.<br>Trip generator(s) on the Bus G24-GR1-GEN1 (924511) 18 kV |

**Table 5 Continued**

| Fault ID | Planning Event | Fault Descriptions |
|---|---|---|
| FLT9001-3PH | P1 | 3 Phase fault on HSL 4 (514941) 138 kV to G24-GR1-GEN2 (924512) 18 kV XFMR CKT 1, near HSL 4 (514941) 138 kV.<br>a. Apply fault at the HSL 4 (514941) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted transformer.<br>Trip generator(s) on the Bus G24-GR1-GEN2 (924512) 18 kV |
| FLT9002-3PH | P1 | 3 Phase fault on HSL 4 (514941) 138 kV to HSL 9G (514944) 13.8 kV XFMR CKT 1, near HSL 4 (514941) 138 kV.<br>a. Apply fault at the HSL 4 (514941) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted transformer.<br>Trip generator(s) on the Bus HSL 9G (514944) 13.8 kV |
| FLT9003-3PH | P1 | 3 Phase fault on HSL 4 (514941) 138 kV to HSL 10G (514945) 13.8 kV XFMR CKT 1, near HSL 4 (514941) 138 kV.<br>a. Apply fault at the HSL 4 (514941) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted transformer.<br>Trip generator(s) on the Bus HSL 10G (514945) 13.8 kV |
| FLT9004-3PH | P1 | 3 Phase fault on HSL 4 (514941) 138 kV to HSL 7S (514936) 20.9 kV XFMR CKT 1, near HSL 4 (514941) 138 kV.<br>a. Apply fault at the HSL 4 (514941) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted transformer.<br>Trip generator(s) on the Bus HSL 7S (514936) 20.9 kV |
| FLT9005-3PH | P1 | 3 Phase fault on HSL 4 (514941) 138 kV to GEN-2018-029 (762647) 138 kV line CKT 1, near HSL 4 (514941) 138 kV.<br>a. Apply fault at the HSL 4 (514941) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted line.<br>Trip generator(s) on the Bus G18-029GEN1 (762650) 0.7 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. |
| FLT9006-3PH | P1 | 3 Phase fault on HSL 4 (514941) 138 kV to JONESSB4 (515480) 138 kV line CKT 1, near HSL 4 (514941) 138 kV.<br>a. Apply fault at the HSL 4 (514941) 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 JONESSB4 (515480) 138 kV to HSL 4 (514941) 138 kV line CKT 1, near JONESSB4 (515480) 138 kV.<br>a. Apply fault at the JONESSB4 (515480) 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. |
| FLT9008-3PH | P1 | 3 Phase fault on HSL 4 (514941) 138 kV to DALE 4 (514987) 138 kV line CKT 1, near HSL 4 (514941) 138 kV.<br>a. Apply fault at the HSL 4 (514941) 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 DALE 4 (514987) 138 kV to HSL 4 (514941) 138 kV line CKT 1, near DALE 4 (514987) 138 kV.<br>a. Apply fault at the DALE 4 (514987) 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 HSL 4 (514941) 138 kV to HAMMTAP4 (515046) 138 kV line CKT 1, near HSL 4 (514941) 138 kV.<br>a. Apply fault at the HSL 4 (514941) 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 HAMMTAP4 (515046) 138 kV to HSL 4 (514941) 138 kV line CKT 1, near HAMMTAP4 (515046) 138 kV.<br>a. Apply fault at the HAMMTAP4 (515046) 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 Continued**

| Fault ID | Planning Event | Fault Descriptions |
|---|---|---|
| FLT9012-3PH | P1 | 3 Phase fault on HSL 4 (514941) 138 kV / HSLWEST2 (514937) 69 kV / HSL 1 (515731) 13.8 kV XFMR CKT 1, near HSL 4 (514941) 138 kV.<br>a. Apply fault at the HSL 4 (514941) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted transformer. |
| FLT9013-3PH | P1 | 3 Phase fault on HSLWEST2 (514937) 69 kV / HSL 4 (514941) 138 kV / HSL 1 (515731) 13.8 kV XFMR CKT 1, near HSLWEST2 (514937) 69 kV.<br>a. Apply fault at the HSLWEST2 (514937) 69 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted transformer. |
| FLT9014-3PH | P1 | 3 Phase fault on HSL 4 (514941) 138 kV to JNSKAMO4 (514906) 138 kV line CKT 1, near HSL 4 (514941) 138 kV.<br>a. Apply fault at the HSL 4 (514941) 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. |
| FLT9015-3PH | P1 | 3 Phase fault on JNSKAMO4 (514906) 138 kV to HSL 4 (514941) 138 kV line CKT 1, near JNSKAMO4 (514906) 138 kV.<br>a. Apply fault at the JNSKAMO4 (514906) 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. |
| FLT9016-3PH | P1 | 3 Phase fault on HSL 4 (514941) 138 kV to SE15TH 4 (514993) 138 kV line CKT 1, near HSL 4 (514941) 138 kV.<br>a. Apply fault at the HSL 4 (514941) 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. |
| FLT9017-3PH | P1 | 3 Phase fault on SE15TH 4 (514993) 138 kV to HSL 4 (514941) 138 kV line CKT 1, near SE15TH 4 (514993) 138 kV.<br>a. Apply fault at the SE15TH 4 (514993) 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. |
| FLT9018-3PH | P1 | 3 Phase fault on HSL 4 (514941) 138 kV to MIDWAY 4 (514966) 138 kV line CKT 1, near HSL 4 (514941) 138 kV.<br>a. Apply fault at the HSL 4 (514941) 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. |
| FLT9019-3PH | P1 | 3 Phase fault on MIDWAY 4 (514966) 138 kV to HSL 4 (514941) 138 kV line CKT 1, near MIDWAY 4 (514966) 138 kV.<br>a. Apply fault at the MIDWAY 4 (514966) 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. |
| FLT9020-3PH | P1 | 3 Phase fault on HSL 4 (514941) 138 kV to DUNJEE 4 (514884) 138 kV line CKT 1, near HSL 4 (514941) 138 kV.<br>a. Apply fault at the HSL 4 (514941) 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. |
| FLT9021-3PH | P1 | 3 Phase fault on DUNJEE 4 (514884) 138 kV to HSL 4 (514941) 138 kV line CKT 1, near DUNJEE 4 (514884) 138 kV.<br>a. Apply fault at the DUNJEE 4 (514884) 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. |
| FLT9022-3PH | P1 | 3 Phase fault on MIDWAY 4 (514966) 138 kV to NE10TH 4 (514964) 138 kV line CKT 1, near MIDWAY 4 (514966) 138 kV.<br>a. Apply fault at the MIDWAY 4 (514966) 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 Continued**

| Fault ID | Planning Event | Fault Descriptions |
|---|---|---|
| FLT9023-3PH | P1 | 3 Phase fault on NE10TH 4 (514964) 138 kV to MIDWAY 4 (514966) 138 kV line CKT 1, near NE10TH 4 (514964) 138 kV.<br>a. Apply fault at the NE10TH 4 (514964) 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. |
| FLT9024-3PH | P1 | 3 Phase fault on DUNJEE 4 (514884) 138 kV to RENO 4 (514973) 138 kV line CKT 1, near DUNJEE 4 (514884) 138 kV.<br>a. Apply fault at the DUNJEE 4 (514884) 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. |
| FLT9025-3PH | P1 | 3 Phase fault on RENO 4 (514973) 138 kV to DUNJEE 4 (514884) 138 kV line CKT 1, near RENO 4 (514973) 138 kV.<br>a. Apply fault at the RENO 4 (514973) 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. |
| FLT9026-3PH | P1 | 3 Phase fault on SE15TH 4 (514993) 138 kV to BARNES 4 (515003) 138 kV line CKT 1, near SE15TH 4 (514993) 138 kV.<br>a. Apply fault at the SE15TH 4 (514993) 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 BARNES 4 (515003) 138 kV to SE15TH 4 (514993) 138 kV line CKT 1, near BARNES 4 (515003) 138 kV.<br>a. Apply fault at the BARNES 4 (515003) 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 SE15TH 4 (514993) 138 kV to GLENDAL4 (514986) 138 kV line CKT 1, near SE15TH 4 (514993) 138 kV.<br>a. Apply fault at the SE15TH 4 (514993) 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 GLENDAL4 (514986) 138 kV to SE15TH 4 (514993) 138 kV line CKT 1, near GLENDAL4 (514986) 138 kV.<br>a. Apply fault at the GLENDAL4 (514986) 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 JNSKAMO4 (514906) 138 kV to 4MEMORALT (300136) 138 kV line CKT 1, near JNSKAMO4 (514906) 138 kV.<br>a. Apply fault at the JNSKAMO4 (514906) 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 4MEMORALT (300136) 138 kV to JNSKAMO4 (514906) 138 kV line CKT 1, near 4MEMORALT (300136) 138 kV.<br>a. Apply fault at the 4MEMORALT (300136) 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. |
| FLT9032-3PH | P1 | 3 Phase fault on JNSKAMO4 (514906) 138 kV to ARCADIA4 (514907) 138 kV line CKT 1, near JNSKAMO4 (514906) 138 kV.<br>a. Apply fault at the JNSKAMO4 (514906) 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 Continued**

| Fault ID | Planning Event | Fault Descriptions |
|---|---|---|
| FLT9033-3PH | P1 | 3 Phase fault on ARCADIA4 (514907) 138 kV to JNSKAMO4 (514906) 138 kV line CKT 1, near ARCADIA4 (514907) 138 kV.<br>a. Apply fault at the ARCADIA4 (514907) 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. |
| FLT9034-3PH | P1 | 3 Phase fault on HSLWEST2 (514937) 69 kV to HSLEAST2 (514927) 69 kV line CKT 1, near HSLWEST2 (514937) 69 kV.<br>a. Apply fault at the HSLWEST2 (514937) 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 HSLEAST2 (514927) 69 kV to HSLWEST2 (514937) 69 kV line CKT 1, near HSLEAST2 (514927) 69 kV.<br>a. Apply fault at the HSLEAST2 (514927) 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 HAMMTAP4 (515046) 138 kV to LINCOLN4 (515442) 138 kV line CKT 1, near HAMMTAP4 (515046) 138 kV.<br>a. Apply fault at the HAMMTAP4 (515046) 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. |
| FLT9037-3PH | P1 | 3 Phase fault on LINCOLN4 (515442) 138 kV to HAMMTAP4 (515046) 138 kV line CKT 1, near LINCOLN4 (515442) 138 kV.<br>a. Apply fault at the LINCOLN4 (515442) 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 HAMMTAP4 (515046) 138 kV to HAMMETT4 (520951) 138 kV line CKT 1, near HAMMTAP4 (515046) 138 kV.<br>a. Apply fault at the HAMMTAP4 (515046) 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 HAMMETT4 (520951) 138 kV to HAMMTAP4 (515046) 138 kV line CKT 1, near HAMMETT4 (520951) 138 kV.<br>a. Apply fault at the HAMMETT4 (520951) 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 DALE 4 (514987) 138 kV to SQUIRCK4 (515059) 138 kV line CKT 1, near DALE 4 (514987) 138 kV.<br>a. Apply fault at the DALE 4 (514987) 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 SQUIRCK4 (515059) 138 kV to DALE 4 (514987) 138 kV line CKT 1, near SQUIRCK4 (515059) 138 kV.<br>a. Apply fault at the SQUIRCK4 (515059) 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 JONESSB4 (515480) 138 kV to ACORN 4 (515459) 138 kV line CKT 1, near JONESSB4 (515480) 138 kV.<br>a. Apply fault at the JONESSB4 (515480) 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 Continued**

| Fault ID | Planning Event | Fault Descriptions |
|---|---|---|
| FLT9043-3PH | P1 | 3 Phase fault on ACORN 4 (515459) 138 kV to JONESSB4 (515480) 138 kV line CKT 1, near ACORN 4 (515459) 138 kV.<br>a. Apply fault at the ACORN 4 (515459) 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 JONESSB4 (515480) 138 kV to CHTWOOD4 (514842) 138 kV line CKT 1, near JONESSB4 (515480) 138 kV.<br>a. Apply fault at the JONESSB4 (515480) 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 CHTWOOD4 (514842) 138 kV to JONESSB4 (515480) 138 kV line CKT 1, near CHTWOOD4 (514842) 138 kV.<br>a. Apply fault at the CHTWOOD4 (514842) 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 CHTWOOD4 (514842) 138 kV to LGARBER4 (515465) 138 kV line CKT 1, near CHTWOOD4 (514842) 138 kV.<br>a. Apply fault at the CHTWOOD4 (514842) 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. |
| FLT9047-3PH | P1 | 3 Phase fault on ACORN 4 (515459) 138 kV to BRYANT 4 (514839) 138 kV line CKT 1, near ACORN 4 (515459) 138 kV.<br>a. Apply fault at the ACORN 4 (515459) 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. |
| FLT9048-3PH | P1 | 3 Phase fault on SQUIRCK4 (515059) 138 kV to STRLGTP4 (515286) 138 kV line CKT 1, near SQUIRCK4 (515059) 138 kV.<br>a. Apply fault at the SQUIRCK4 (515059) 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. |
| FLT9049-3PH | P1 | 3 Phase fault on SQUIRCK4 (515059) 138 kV to INGLEWD4 (515060) 138 kV line CKT 1, near SQUIRCK4 (515059) 138 kV.<br>a. Apply fault at the SQUIRCK4 (515059) 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. |
| FLT9050-3PH | P1 | 3 Phase fault on LINCOLN4 (515442) 138 kV to MEEKER 4 (520464) 138 kV line CKT 1, near LINCOLN4 (515442) 138 kV.<br>a. Apply fault at the LINCOLN4 (515442) 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. |
| FLT9051-3PH | P1 | 3 Phase fault on LINCOLN4 (515442) 138 kV to WFROSST4 (515366) 138 kV line CKT 1, near LINCOLN4 (515442) 138 kV.<br>a. Apply fault at the LINCOLN4 (515442) 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. |
| FLT9052-3PH | P1 | 3 Phase fault on LINCOLN4 (515442) 138 kV to JACKTWN4 (515051) 138 kV line CKT 1, near LINCOLN4 (515442) 138 kV.<br>a. Apply fault at the LINCOLN4 (515442) 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 Continued**

| Fault ID | Planning Event | Fault Descriptions |
|---|---|---|
| FLT9053-3PH | P1 | 3 Phase fault on HSLEAST2 (514927) 69 kV to TXSTELA2 (514985) 69 kV line CKT 1, near HSLEAST2 (514927) 69 kV.<br>a. Apply fault at the HSLEAST2 (514927) 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. |
| FLT9054-3PH | P1 | 3 Phase fault on TXSTELA2 (514985) 69 kV to HSLEAST2 (514927) 69 kV line CKT 1, near TXSTELA2 (514985) 69 kV.<br>a. Apply fault at the TXSTELA2 (514985) 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. |
| FLT9055-3PH | P1 | 3 Phase fault on HSLEAST2 (514927) 69 kV to MCLOUDT2 (515504) 69 kV line CKT 1, near HSLEAST2 (514927) 69 kV.<br>a. Apply fault at the HSLEAST2 (514927) 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. |
| FLT9056-3PH | P1 | 3 Phase fault on MCLOUDT2 (515504) 69 kV to HSLEAST2 (514927) 69 kV line CKT 1, near MCLOUDT2 (515504) 69 kV.<br>a. Apply fault at the MCLOUDT2 (515504) 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. |
| FLT9057-3PH | P1 | 3 Phase fault on HSLEAST2 (514927) 69 kV to GRNPAST2 (514971) 69 kV line CKT 1, near HSLEAST2 (514927) 69 kV.<br>a. Apply fault at the HSLEAST2 (514927) 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. |
| FLT9058-3PH | P1 | 3 Phase fault on GRNPAST2 (514971) 69 kV to HSLEAST2 (514927) 69 kV line CKT 1, near GRNPAST2 (514971) 69 kV.<br>a. Apply fault at the GRNPAST2 (514971) 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. |
| FLT9059-3PH | P1 | 3 Phase fault on GRNPAST2 (514971) 69 kV to DEEPFKT2 (514970) 69 kV line CKT 1, near GRNPAST2 (514971) 69 kV.<br>a. Apply fault at the GRNPAST2 (514971) 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. |
| FLT9060-3PH | P1 | 3 Phase fault on TXSTELA2 (514985) 69 kV to LITLAXT2 (515502) 69 kV line CKT 1, near TXSTELA2 (514985) 69 kV.<br>a. Apply fault at the TXSTELA2 (514985) 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. |
| FLT9061-3PH | P1 | 3 Phase fault on TXSTELA2 (514985) 69 kV to TXPLSTP2 (515516) 69 kV line CKT 1, near TXSTELA2 (514985) 69 kV.<br>a. Apply fault at the TXSTELA2 (514985) 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. |
| FLT9062-3PH | P1 | 3 Phase fault on MCLOUDT2 (515504) 69 kV to MCLOUD 2 (515065) 69 kV line CKT 1, near MCLOUDT2 (515504) 69 kV.<br>a. Apply fault at the MCLOUDT2 (515504) 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 Continued**

| Fault ID | Planning Event | Fault Descriptions |
|---|---|---|
| FLT9063-3PH | P1 | 3 Phase fault on MCLOUDT2 (515504) 69 kV to SINCPNT2 (515642) 69 kV line CKT 1, near MCLOUDT2 (515504) 69 kV.<br>a. Apply fault at the MCLOUDT2 (515504) 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. |
| FLT9064-3PH | P1 | 3 Phase fault on ARCADIA4 (514907) 138 kV to LGARBER4 (515465) 138 kV line CKT 1, near ARCADIA4 (514907) 138 kV.<br>a. Apply fault at the ARCADIA4 (514907) 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. |
| FLT9065-3PH | P1 | 3 Phase fault on ARCADIA4 (514907) 138 kV / ARCADIA7 (514908) 345 kV / ARC_TERT (999997) 13.8 kV XFMR CKT 1, near ARCADIA4 (514907) 138 kV.<br>a. Apply fault at the ARCADIA4 (514907) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted transformer. |
| FLT9066-3PH | P1 | 3 Phase fault on ARCADIA7 (514908) 345 kV / ARCADIA4 (514907) 138 kV / ARC_TERT (999997) 13.8 kV XFMR CKT 1, near ARCADIA7 (514908) 345 kV.<br>a. Apply fault at the ARCADIA7 (514908) 345 kV Bus.<br>b. Clear fault after 6 cycles by tripping the faulted transformer. |
| FLT9067-3PH | P1 | 3 Phase fault on ARCADIA4 (514907) 138 kV / ARCADIA7 (514908) 345 kV / ARCADI21 (515703) 13.8 kV XFMR CKT 1, near ARCADIA4 (514907) 138 kV.<br>a. Apply fault at the ARCADIA4 (514907) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted transformer. |
| FLT9068-3PH | P1 | 3 Phase fault on ARCADIA7 (514908) 345 kV / ARCADIA4 (514907) 138 kV / ARCADI21 (515703) 13.8 kV XFMR CKT 1, near ARCADIA7 (514908) 345 kV.<br>a. Apply fault at the ARCADIA7 (514908) 345 kV Bus.<br>b. Clear fault after 6 cycles by tripping the faulted transformer. |
| FLT9069-3PH | P1 | 3 Phase fault on ARCADIA4 (514907) 138 kV to CTNWOOD4 (514827) 138 kV line CKT 1, near ARCADIA4 (514907) 138 kV.<br>a. Apply fault at the ARCADIA4 (514907) 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 ARCADIA4 (514907) 138 kV to RNDBARN4 (515461) 138 kV line CKT 1, near ARCADIA4 (514907) 138 kV.<br>a. Apply fault at the ARCADIA4 (514907) 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 ARCADIA7 (514908) 345 kV to SEMINOL7 (515045) 345 kV line CKT 1, near ARCADIA7 (514908) 345 kV.<br>a. Apply fault at the ARCADIA7 (514908) 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 ARCADIA7 (514908) 345 kV to GEN-2017-132 (760032) 345 kV line CKT 1, near ARCADIA7 (514908) 345 kV.<br>a. Apply fault at the ARCADIA7 (514908) 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. |
| FLT9073-3PH | P1 | 3 Phase fault on ARCADIA7 (514908) 345 kV to REDBUD 7 (514909) 345 kV line CKT 1, near ARCADIA7 (514908) 345 kV.<br>a. Apply fault at the ARCADIA7 (514908) 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 Continued**

| Fault ID | Planning Event | Fault Descriptions |
|---|---|---|
| FLT9074-3PH | P1 | 3 Phase fault on ARCADIA7 (514908) 345 kV to NORTWST7 (514880) 345 kV line CKT 1, near ARCADIA7 (514908) 345 kV.<br>a. Apply fault at the ARCADIA7 (514908) 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 BARNES 4 (515003) 138 kV to DRAPER 4 (514933) 138 kV line CKT 1, near BARNES 4 (515003) 138 kV.<br>a. Apply fault at the BARNES 4 (515003) 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. |
| FLT9076-3PH | P1 | 3 Phase fault on BARNES 4 (515003) 138 kV to TINKER54 (514994) 138 kV line CKT 1, near BARNES 4 (515003) 138 kV.<br>a. Apply fault at the BARNES 4 (515003) 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. |
| FLT9077-3PH | P1 | 3 Phase fault on GLENDAL4 (514986) 138 kV to TINKER74 (515959) 138 kV line CKT 1, near GLENDAL4 (514986) 138 kV.<br>a. Apply fault at the GLENDAL4 (514986) 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. |
| FLT9078-3PH | P1 | 3 Phase fault on NE10TH 4 (514964) 138 kV to RENO 4 (514973) 138 kV line CKT 1, near NE10TH 4 (514964) 138 kV.<br>a. Apply fault at the NE10TH 4 (514964) 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. |
| FLT9079-3PH | P1 | 3 Phase fault on RENO 4 (514973) 138 kV to NE10TH 4 (514964) 138 kV line CKT 1, near RENO 4 (514973) 138 kV.<br>a. Apply fault at the RENO 4 (514973) 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. |
| FLT9080-3PH | P1 | 3 Phase fault on RENO 4 (514973) 138 kV / RENO 2 (514972) 69 kV / RENO 1 (515753) 13.8 kV XFMR CKT 1, near RENO 4 (514973) 138 kV.<br>a. Apply fault at the RENO 4 (514973) 138 kV Bus.<br>b. Clear fault after 7 cycles by tripping the faulted transformer. |
| FLT9081-3PH | P1 | 3 Phase fault on RENO 4 (514973) 138 kV to WASHPRK4 (515156) 138 kV line CKT 1, near RENO 4 (514973) 138 kV.<br>a. Apply fault at the RENO 4 (514973) 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 RENO 4 (514973) 138 kV to TROSPER4 (514963) 138 kV line CKT 1, near RENO 4 (514973) 138 kV.<br>a. Apply fault at the RENO 4 (514973) 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 LITLAXT2 (515502) 69 kV to TXSTELA2 (514985) 69 kV line CKT 1, near LITLAXT2 (515502) 69 kV.<br>a. Apply fault at the LITLAXT2 (515502) 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. |
| FLT9084-3PH | P1 | 3 Phase fault on LITLAXT2 (515502) 69 kV to MACOCTP2 (514956) 69 kV line CKT 1, near LITLAXT2 (515502) 69 kV.<br>a. Apply fault at the LITLAXT2 (515502) 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 Continued**

| Fault ID | Planning Event | Fault Descriptions |
|---|---|---|
| FLT9085-3PH | P1 | 3 Phase fault on TXPLSTP2 (515516) 69 kV to TXSTELA2 (514985) 69 kV line CKT 1, near TXPLSTP2 (515516) 69 kV.<br>a. Apply fault at the TXPLSTP2 (515516) 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. |
| FLT9086-3PH | P1 | 3 Phase fault on TXPLSTP2 (515516) 69 kV to TXPLSTE2 (514989) 69 kV line CKT 1, near TXPLSTP2 (515516) 69 kV.<br>a. Apply fault at the TXPLSTP2 (515516) 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. |
| FLT9087-3PH | P1 | 3 Phase fault on TXPLSTP2 (515516) 69 kV to LTLRLKT2 (514983) 69 kV line CKT 1, near TXPLSTP2 (515516) 69 kV.<br>a. Apply fault at the TXPLSTP2 (515516) 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. |
| FLT9088-3PH | P1 | 3 Phase fault on SINCPNT2 (515642) 69 kV to MCLOUDT2 (515504) 69 kV line CKT 1, near SINCPNT2 (515642) 69 kV.<br>a. Apply fault at the SINCPNT2 (515642) 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. |
| FLT9089-3PH | P1 | 3 Phase fault on SINCPNT2 (515642) 69 kV to SHAWNEE2 (515068) 69 kV line CKT 1, near SINCPNT2 (515642) 69 kV.<br>a. Apply fault at the SINCPNT2 (515642) 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. |
| FLT9090-3PH | P1 | 3 Phase fault on SINCPNT2 (515642) 69 kV to SINCPAN2 (515072) 69 kV line CKT 1, near SINCPNT2 (515642) 69 kV.<br>a. Apply fault at the SINCPNT2 (515642) 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. |
| FLT9091-3PH | P1 | 3 Phase fault on DEEPFKT2 (514970) 69 kV to GRNPAST2 (514971) 69 kV line CKT 1, near DEEPFKT2 (514970) 69 kV.<br>a. Apply fault at the DEEPFKT2 (514970) 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. |
| FLT9092-3PH | P1 | 3 Phase fault on DEEPFKT2 (514970) 69 kV to DEEPFRK2 (514974) 69 kV line CKT 1, near DEEPFKT2 (514970) 69 kV.<br>a. Apply fault at the DEEPFKT2 (514970) 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. |
| FLT9093-3PH | P1 | 3 Phase fault on DEEPFKT2 (514970) 69 kV to NE30TH 2 (514969) 69 kV line CKT 1, near DEEPFKT2 (514970) 69 kV.<br>a. Apply fault at the DEEPFKT2 (514970) 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. |
| FLT9094-3PH | P1 | 3 Phase fault on 4MEMORALT (300136) 138 kV to 4LUTHER (300135) 138 kV line CKT 1, near 4MEMORALT (300136) 138 kV.<br>a. Apply fault at the 4MEMORALT (300136) 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. |

# RESULTS

Table 6 shows the relevant results of the fault events simulated for each of the modified cases. Existing DISIS base case issues are documented separately in Appendix C. The associated stability plots are also provided in Appendix C.

**Table 6: Stability Analysis 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 |
| 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 |
| 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 6 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 |

**Table 6 Continued**

| Fault ID | 25SP | | | 25WP | | |
|---|---|---|---|---|---|---|
| | Voltage Violation | Voltage Recovery | Stable | Voltage Violation | Voltage Recovery | 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 |
| 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 |

**Table 6 Continued**

| Fault ID | 25SP | | | 25WP | | |
|---|---|---|---|---|---|---|
| | Voltage Violation | Voltage Recovery | Stable | Voltage Violation | Voltage Recovery | 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 |
| 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 |

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 the models with GEN-2024-GR1 included. These issues were not attributed to the GEN-2024-GR1 replacement request and are detailed in Appendix C.

There were no damping or voltage recovery violations attributed to the GEN-2024-GR1 replacement request observed during the simulated faults.

# INSTALLED CAPACITY EXCEEDS GIA CAPACITY

Under FERC Order 845, Interconnection Customers are allowed to request Interconnection Service that is lower than the full generating capacity of their planned generating facilities. The Interconnection Customers must install acceptable control and protection devices that prevent the injection above their requested Interconnection Service amount measured at the POI.

# NECESSARY INTERCONNECTION FACILITIES

This study identified necessary Interconnection Facilities to accommodate GEN-2024-GR1 as shown in Table 7.

**Table 7: Necessary Interconnection Facilities**

| Upgrade Name | Upgrade Description |
|---|---|
| Horseshoe Lake 138 kV GEN-2024-GR1 Interconnection (TOIF) (OG&E) | Interconnection upgrades and cost estimates needed to interconnect the following Interconnection Customer facility, GEN-2024-GR1, into the POI at Horseshoe Lake 138 kV. |
| Horseshoe Lake 138 kV GEN-2024-GR1 Interconnection (Non-Shared NU) (OG&E) | Interconnection upgrades and cost estimates needed to interconnect the following Interconnection Customer facility, GEN-2024-GR1, into the POI at Horseshoe Lake 138 kV. |

SPP will work with the TO(s) indicated for the Interconnection Facilities Study, if required.

# RESULTS

## RELIABILITY ASSESSMENT STUDY

Because the EGF was considered retired prior to the Generating Facility Replacement, the performance of the Transmission System with the EGF ceasing commercial operations is the status quo. SPP determined that for the Reliability Assessment Study, no further analysis for the time between removing the EGF from service and the commission of the RGF is necessary, and no mitigations are applicable.

## REPLACEMENT IMPACT STUDY

In accordance with SPP tariff Attachment V, any material adverse impact from operating the RGF when compared to the EGF would be identified as a Material Modification. In the case that the Interconnection Customer chooses to move forward with the RGF, it must submit the RGF as a new Interconnection Request.

Because no material adverse impacts to the SPP Transmission System were identified, SPP determined the requested replacement is **not a Material Modification**. SPP determined that the requested replacement did not cause a materially adverse impact to the dynamic stability and short-circuit characteristics of the SPP system.

This determination implies that no new upgrades beyond those required for interconnection of the RGF are required, thus not resulting in a material adverse impact on the cost or timing of any other Interconnection Request with a later Queue priority date.

## NEXT STEPS

As the requested replacement is determined to not be a Material Modification, pursuant to SPP tariff Attachment V section 3.9.3, the Interconnection Customer shall inform SPP within 30 Calendar Days after having received these study results of its election to proceed.

If the Interconnection Customer chooses to proceed with the studied replacement, SPP will initiate an Interconnection Facilities Study and subsequently tender a draft GIA. The Interconnection Customer shall withdraw any associated Attachment AB retirement requests of the EGF, if applicable, and complete the Attachment AE requirements for de-registration of the EGF and registration of the RGF, including transfer or termination of applicable existing transmission service. If the Interconnection Customer would like to obtain new deliverability to final customers, a separate request for transmission service must be requested on SPP's OASIS.

Failure by the Interconnection Customer to provide an election to proceed within 30 Calendar Days will result in withdrawal of the Interconnection Request pursuant to section 3.7 of SPP tariff Attachment V.