GEN-2023-GR4

GENERATOR REPLACEMENT STUDY

By Aneden Consulting and SPP Generator Interconnection

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

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 Cunningham 115 kV Substation requested to be studied in the SPP Generator Replacement process.

GEN-2023-GR4, the Replacement Generating Facility (RGF), will connect to the existing POI, the Cunningham 115 kV Substation in the Southwestern Public Service (SPS) area.

The EGF has 72 MW of available replacement capacity, based on the nameplate of the generating facility and the EGF's Network Integration Transmission Service Agreement (NITSA) provided by the Interconnection Customer. This Study has been requested to evaluate the replacement configuration of 20 x PE FS4200M solar inverters operating at 3.655 MW with a reduced dispatch of 72.85 MW as specified by the Interconnection Customer. The inverters are rated at 4.2 MW, thus the generating capability of the RGF (84 MW), exceeds its requested Interconnection Service amount of 72 MW. The injection amount of the RGF must be limited to 72 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 between the removal of the EGF from service and the commission date of the RGF and system adjustments to mitigate those issues. The Replacement Impact Study identifies whether the RGF is a Material Modification.

SPP determined that a Reliability Assessment study was not required for the time period between the date that the Existing Generating Facility ceases commercial operations and the Commercial Operation Date of the Replacement Generating Facility. This determination was made using the criteria for evaluating Resource Retirement submissions in the SPP OATT Business Practice 7800. The planning screening assessment found that the resource has not been modeled as online and dispatched in the latest set of the approved Base Reliability power flow or MDWG dynamics models that are being utilized in the current Integrated Transmission Planning assessment or annual TPL-001-4 assessment. The Operational screening assessment found that the EGF had periodic use in late 2021 and early 2022, however has been on outage since late 2022. The EGF has not been called on for voltage support or committed for reliability related issues during the two year period. There are two permanent flowgates at the Hobbs substation, however, based on the EGF being on forced outage since late 2022, there are other units in the area to provide counter-flow to the constraints. Based on this screening, SPP determined that no additional analysis is needed.

Aneden Consulting (Aneden) was retained by SPP to perform the Replacement Impact Study (Impact Study) for GEN-2023-GR4.

SPP determined that steady-state analysis was not required as the EGF is a Legacy unit and was not subject to a DISIS steady-state analysis. In addition, the requested capacity of the RGF does not exceed the EGF output of 72 MW. However, SPP determined that short circuit and dynamic stability analyses were required as the fuel type changed from synchronous gas-fired to solar. The scope of this Impact Study included reactive power analysis, 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-2023-GR4 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.

In accordance with FERC Order No. 827, the generating facility will be required to provide dynamic reactive power within the range of 0.95 leading to 0.95 lagging at the high-side of the generator substation.

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 Southwest Power Pool’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 time 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

SPP determined that a Reliability Assessment study was not required for the time period between the date that the Existing Generating Facility ceases commercial operations and the Commercial Operation Date of the Replacement Generating Facility. This determination was made using the criteria for evaluating Resource Retirement submissions in the SPP OATT Business Practice 7800. The planning screening assessment found that the resource has not been modeled as online and dispatched in the latest set of the approved Base Reliability power flow or MDWG dynamics models that are being utilized in the current Integrated Transmission Planning assessment or annual TPL-001-4 assessment. The Operational screening assessment found that the EGF had periodic use in late 2021 and early 2022, however has been on outage since late 2022. The EGF has not been called on for voltage support or committed for reliability related issues during the two year period. There are two permanent flowgates at the Hobbs substation, however, based on the EGF being on forced outage since late 2022, there are other units in the area to provide counter-flow to the constraints. Based on this screening, SPP determined that no additional analysis is needed.

REPLACEMENT IMPACT STUDY

Aneden Consulting (Aneden) was retained by SPP to perform the Replacement Impact Study (Impact Study) for GEN-2023-GR4. 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 if all required reliability conditions 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 would be required if the differences listed above may result in a significant impact on the most recently performed DISIS stability analysis.

REACTIVE POWER ANALYSIS

A reactive power analysis was performed on the requested replacement configuration as it is a non-synchronous resource. 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 in order to offset the capacitive effect and maintain zero (0) MVAr flow at the POI while the project's generators and capacitors (if any) are offline.

STUDY LIMITATIONS

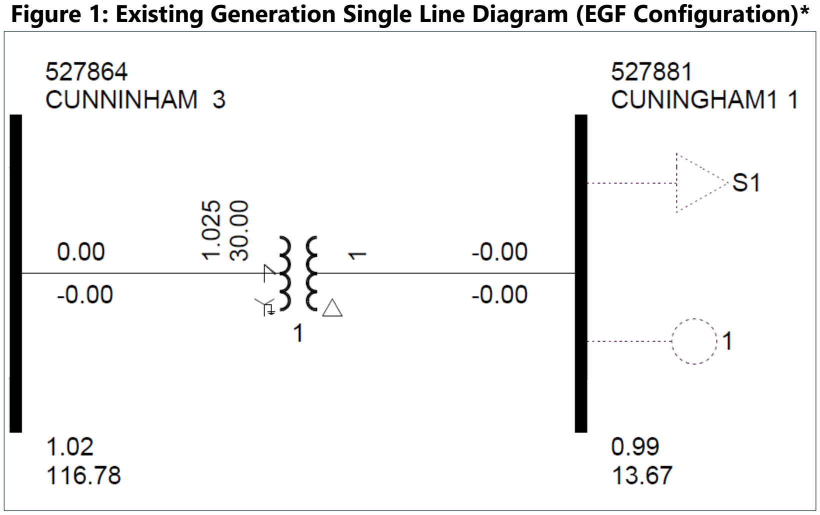
The assessments and conclusions provided in this report are based on assumptions and information provided to SPP/Aneden by others. While the assumptions and information provided may be appropriate for the purposes of this report, SPP/Aneden does not guarantee that those conditions assumed will occur. 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-2023-GR4 Interconnection Customer has requested a replacement to its EGF, a synchronous gas-fired generating facility with a POI at the Cunningham 115 kV Substation and a retirement date of July 13, 2022. The Interconnection Service available for replacement is 72 MW, based on the nameplate of the generating facility and the EGF's Network Integration Transmission Service Agreement (NITSA) provided by the Interconnection Customer. Of the Interconnection Service available, the RGF Interconnection Customer has requested 72 MW of Energy Resource Interconnection Service (ERIS). The requested RGF is a solar farm consisting of 20 x PE FS4200M solar inverters operating at 3.655 MW with a reduced dispatch of 72.85 MW as specified by the Interconnection Customer. The inverters are rated at 4.2 MW, thus the generating capability of the Replacement Generating Facility (RGF) also known as GEN-2023-GR4 (84 MW), exceeds its requested Interconnection Service amount of 72 MW. The injection amount of the RGF must be limited to 72 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 May 1, 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 Cunningham 115 kV Substation in the Southwestern Public Service (SPS) area. Since the EGF has been retired, the EGF and RGF will not be operated 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-2023-GR4.

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



*based on the DISIS-2017-002-1 25SP stability models

Figure 2: GEN-2023-GR4 Single Line Diagram (RGF Configuration)

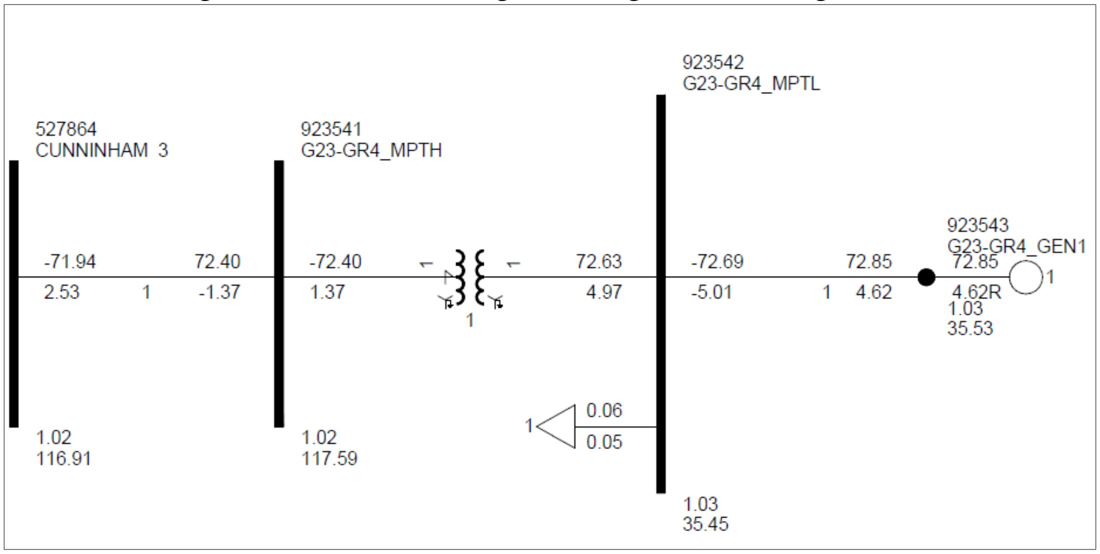


Table 1: EGF and RGF Configuration Details

Facility	Existing Generator Facility Configuration	Replacement Generator Facility Configuration
Point of Interconnection	Cunningham 115 kV (527864)	Cunningham 115 kV (527864)
Configuration/Capacity	1 Gas Turbine Unit with a capacity of 72 MW	20 x PE FS4200M 3.655 MW (solar) = 73.1 MW [72.85 MW dispatch] Units are rated at 4.2 MW, PPC to limit GEN-2023-GR4 to 72 MW at the POI
Generation Interconnection Line	N/A	Length = 5.2 miles R = 0.009117 pu X = 0.030840 pu B = 0.003706 pu Rating MVA = 117 MVA
Main Substation Transformer[1]	N/A	X = 6.996%, R = 0.228%, Voltage = 34.5/115 kV (Wye Grounded/Wye Grounded), Taps Available = 33 Taps, ±10% Winding MVA = 57 MVA, Rating MVA = 95 MVA
Generator Step Up Transformer[2]	X = 12.711%, R = 0.461%, Voltage = 13.8/115 kV, Fixed Taps Available = 5 Winding MVA = 100 MVA, Rating MVA = 90 MVA	N/A
Equivalent Collector Line[3]	N/A	R = 0.003156 pu X = 0.003843 pu B = 0.005521 pu
Auxiliary Load	2.1 MW + 0 MVAr on 13.8 kV bus	0.06 MW + 0.045 MVAr on 34.5 kV bus
Generator Dynamic Model[4] & Power Factor	GENROU[4] Leading: 0.86 Lagging: 0.94	20 x PE FS4200M 4.2 MVA (REGCA1)[4] Leading: 0.87 Lagging: 0.87
1) X and R based on Winding MVA, 2) X and R based on System MVA, 3) All pu are on 100 MVA Base, 4) DYR stability model name		

RELIABILITY ASSESSMENT STUDY

SPP determined that a Reliability Assessment study was not required for the time period between the date that the Existing Generating Facility ceases commercial operations and the Commercial Operation Date of the Replacement Generating Facility. This determination was made using the criteria for evaluating Resource Retirement submissions in the SPP OATT Business Practice 7800. The planning screening assessment found that the resource has not been modeled as online and dispatched in the latest set of the approved Base Reliability power flow or MDWG dynamics models that are being utilized in the current Integrated Transmission Planning assessment or annual TPL-001-4 assessment. The Operational screening assessment found that the EGF had periodic use in late 2021 and early 2022, however has been on outage since late 2022. The EGF has not been called on for voltage support or committed for reliability related issues during the two year period. There are two permanent flowgates at the Hobbs substation, however, based on the EGF being on forced outage since late 2022, there are other units in the area to provide counter-flow to the constraints. Based on this screening, SPP determined that no additional analysis is needed.

REPLACEMENT IMPACT STUDY

Aneden was retained by SPP to perform the Replacement Impact Study (Impact Study) for GEN-2023-GR4.

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. SPP performed this comparison and the resulting analyses using a set of modified study models developed based on the replacement request data and the DISIS-2017-002-1 study models.

STABILITY MODEL PARAMETERS COMPARISION

Because of the change in fuel type from synchronous gas-fired to solar, SPP determined that 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 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.

REACTIVE POWER ANALYSIS

Aneden performed a reactive power analysis for GEN-2023-GR4 to determine the capacitive charging effects under reduced generation conditions (unsuitable wind speeds, unsuitable solar irradiance, insufficient state of charge, idle conditions, curtailment, etc.) at the generation site and to size shunt reactors that would reduce the project reactive power contribution to the POI to approximately zero.

METHODOLOGY AND CRITERIA

The GEN-2023-GR4 generators and auxiliary/station service loads were switched out of service while other system elements remained in-service. A shunt reactor was tested at the project's collection substation 34.5 kV bus to set the MVAr flow into the POI to approximately zero. The size of the shunt reactor is equivalent to the charging current value at unity voltage and the compensation provided is proportional to the voltage effects on the charging current (i.e., for voltages above unity, reactive compensation is greater than the size of the reactor).

Aneden performed the reactive power analysis using the replacement request data based on the DISIS-2017-002-1 stability study 2025 Summer Peak (25SP) model.

RESULTS

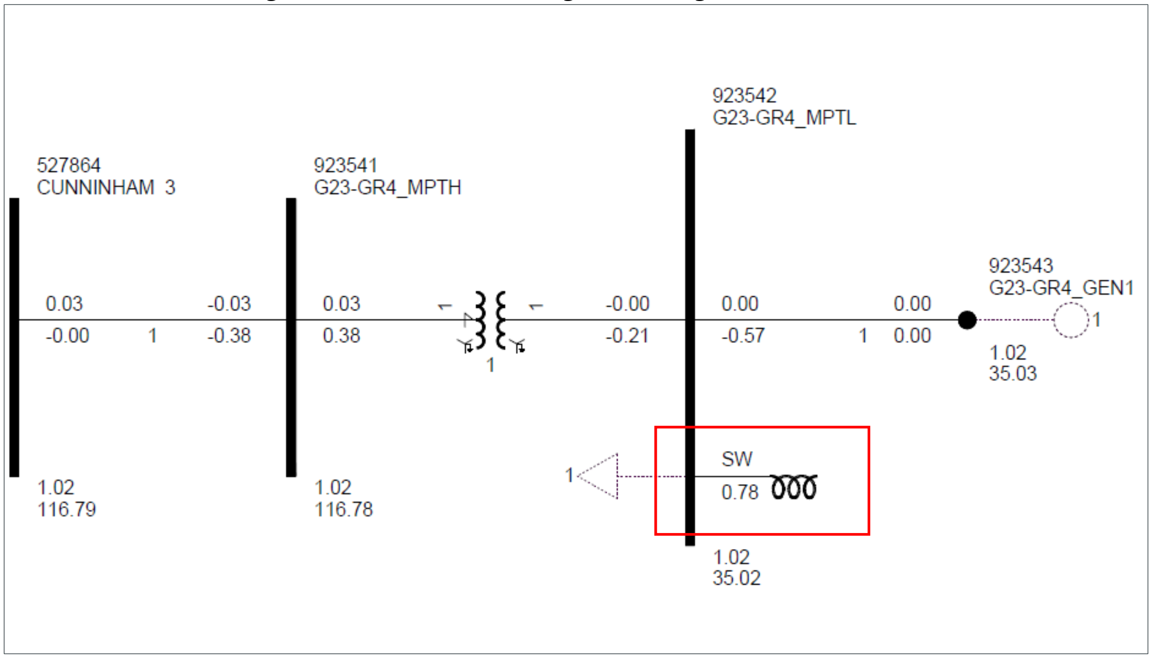
The results from the analysis showed that the GEN-2023-GR4 project needed approximately 0.7527 MVAr of compensation at its collector substation, to reduce the POI MVAr to zero. Figure 3 illustrates the shunt reactor size needed to reduce the POI MVAr to approximately zero with the replacement configuration. The final shunt reactor requirements for GEN-2023-GR4 are shown in Table 2.

The information gathered from the reactive power analysis is provided as information to the Interconnection Customer and Transmission Owner (TO) and/or Transmission Operator (TOP). The applicable reactive power requirements will be further reviewed by the TO and/or TOP.

Table 2: Shunt Reactor Size for Reactive Power Analysis

Machine	POI Bus Number	POI Bus Name	Reactor Size (MVAr)
			25SP
GEN-2023-GR4	527864	CUNNINHAM 3	0.7527

Figure 3: GEN-2023-GR4 Single Line Diagram (Shunt Sizes)



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 115 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-2023-GR4 RGF online.

SPP created a short circuit model using the 25SP stability study model by adjusting the GEN-2023-GR4 short-circuit parameters consistent with the replacement data. The adjusted parameters are shown in Table 3 below.

Table 3: GEN-2023-GR4 Short-Circuit Parameters*

Parameter	Value by Generator Bus#
	923543
Machine MVA Base	84
R (pu)	0
X'' (pu)	0.921

*pu values based on Machine MVA Base

RESULTS

The results of the short circuit analysis for the 25SP model are summarized in Table 4 and Table 5. The GEN-2023-GR4 POI bus (Cunningham 115 kV) fault current magnitude is provided in Table 4 showing a fault current of 27.6 kA with the RGF online. The addition of the RGF increased the POI bus fault current by 0.4 kA. Table 5 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 31.26 kA for the 25SP model. The maximum contribution to three-phase fault currents due to the addition of the RGF was about 1.5% and 0.4 kA.

Table 4: POI Short-Circuit Results

Case	GEN-OFF Current (kA)	GEN-ON Current (kA)	kA Change	%Change
25SP	27.20	27.60	0.40	1.5%

Table 5: 25SP Short-Circuit Results

Voltage (kV)	Max. Current (kA)	Max kA Change	Max %Change
69	9.80	0.01	0.1%
115	31.26	0.40	1.5%
230	18.97	0.07	0.4%
345	12.63	0.02	0.2%
Max	**31.26**	**0.40**	**1.5%**

DYNAMIC STABILITY ANALYSIS

Aneden performed a dynamic stability analysis to identify the impact of the GEN-2023-GR4 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 20 x PE FS4200M operating at 3.655 MW (REGCA1). 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-2017-002-1 stability study models:

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

The dynamic model data for the GEN-2023-GR4 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 buses 761442, 761445, 761447, and 761449 were disabled after observing the generators 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 voltage protective relays at buses 761442, 761445, 761447, and 761449 were disabled to avoid generator tripping due to an instantaneous over voltage spike after fault clearing.
- 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

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

in Group 5[2]. 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 520 (AEPW), 524 (OKGE), 526 (SPS), and 652 (WAPA) 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 were 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 6. These contingencies were applied to the modified 25SP and 25WP models.

Table 6: Fault Definitions

Fault ID	Planning Event	Fault Descriptions
FLT9001-3PH	P1	3 phase fault on the CUNNINHAM 3 (527864) to MADDOX 3 (528355) 115 kV line CKT 1, near CUNNINHAM 3. a. Apply fault at the CUNNINHAM 3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9002-3PH	P1	3 phase fault on the CUNNINHAM 3 (527864) to QUAHADA 3 (528394) 115 kV line CKT 1, near CUNNINHAM 3. a. Apply fault at the CUNNINHAM 3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9003-3PH	P1	3 phase fault on the CUNNINHAM 3 (527864) to MONUMNT_TP 3 (528568) 115 kV line CKT 1, near CUNNINHAM 3. a. Apply fault at the CUNNINHAM 3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9004-3PH	P1	3 phase fault on the CUNNINHAM 3 (527864) to BUCKEYE_TP 3 (528348) 115 kV line CKT 1, near CUNNINHAM 3. a. Apply fault at the CUNNINHAM 3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9005-3PH	P1	3 phase fault on the CUNNINHAM 3 (527864) to HOBBS_INT 3 (527891) 115 kV line CKT 1, near CUNNINHAM 3. a. Apply fault at the CUNNINHAM 3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.

[2] Based on the DISIS-2017-002 Cluster Groups

Table 6 Continued

Fault ID	Planning Event	Fault Descriptions
FLT9006-3PH	P1	3 phase fault on the CUNNINHAM 115 kV (527864) /230 kV (527867) /13.2 kV (527863) XFMR CKT 1, near CUNNINHAM 3 115 kV. a. Apply fault at the CUNNINHAM 3 115 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer.
FLT9007-3PH	P1	3 phase fault on the QUAHADA 3 (528394) to LEA_NATIONL3 (528399) 115 kV line CKT 1, near QUAHADA 3. a. Apply fault at the QUAHADA 3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9008-3PH	P1	3 phase fault on the QUAHADA 3 (528394) to XTO_BIGEDDY3 (528396) 115 kV line CKT 1, near QUAHADA 3. a. Apply fault at the QUAHADA 3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9009-3PH	P1	3 phase fault on the QUAHADA 3 (528394) to DCP_ZIA TP 3 (528422) 115 kV line CKT 1, near QUAHADA 3. a. Apply fault at the QUAHADA 3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9010-3PH	P1	3 phase fault on the BUCKEYE_TP 3 (528348) to BUCKEYE 3 (528385) 115 kV line CKT 1, near BUCKEYE_TP 3. a. Apply fault at the BUCKEYE_TP 3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9011-3PH	P1	3 phase fault on the BUCKEYE_TP 3 (528348) to LE-TXACO_TP3 (528627) 115 kV line CKT 1, near BUCKEYE_TP 3. a. Apply fault at the BUCKEYE_TP 3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9012-3PH	P1	3 phase fault on the LE-TXACO_TP3 (528627) to LE-SANANDRS3 (528341) 115 kV line CKT 1, near LE-TXACO_TP3. a. Apply fault at the LE-TXACO_TP3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9013-3PH	P1	3 phase fault on the LE-TXACO_TP3 (528627) to LE-TEXACO 3 (528792) 115 kV line CKT 1, near LE-TXACO_TP3. a. Apply fault at the LE-TXACO_TP3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9014-3PH	P1	3 phase fault on the XTO_BIGEDDY3 (528396) to PCA 3 (527930) 115 kV line CKT 1, near XTO_BIGEDDY3. a. Apply fault at the XTO_BIGEDDY3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9015-3PH	P1	3 phase fault on the DCP_ZIA TP 3 (528422) to DCP_ZIA 3 (528423) 115 kV line CKT 1, near DCP_ZIA TP 3. a. Apply fault at the DCP_ZIA TP 3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.

Table 6 Continued

Fault ID	Planning Event	Fault Descriptions
FLT9016-3PH	P1	3 phase fault on the DCP_ZIA TP 3 (528422) to ZIA 3 (528420) 115 kV line CKT 1, near DCP_ZIA TP 3. a. Apply fault at the DCP_ZIA TP 3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9017-3PH	P1	3 phase fault on the LEA_NATIONL3 (528399) to ENRON_TP 3 (528317) 115 kV line CKT 1, near LEA_NATIONL3. a. Apply fault at the LEA_NATIONL3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9018-3PH	P1	3 phase fault on the MADDOX 3 (528355) to PEARLE 3 (528392) 115 kV line CKT 1, near MADDOX 3. a. Apply fault at the MADDOX 3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9019-3PH	P1	3 phase fault on the MADDOX 3 (528355) to SANGER_SW 3 (528463) 115 kV line CKT 1, near MADDOX 3. a. Apply fault at the MADDOX 3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9020-3PH	P1	3 phase fault on the MADDOX 115 kV (528355) /13.8 kV (528361) XFMR CKT 1, near MADDOX 3 115 kV. a. Apply fault at the MADDOX 3 115 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer. **Trip generator on bus MADDOX_1 (528361)**
FLT9021-3PH	P1	3 phase fault on the MADDOX 3 (528355) to MONUMENT 3 (528491) 115 kV line CKT 1, near MADDOX 3. a. Apply fault at the MADDOX 3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9022-3PH	P1	3 phase fault on the MADDOX 3 (528355) to HOBBS_INT 3 (527891) 115 kV line CKT 1, near MADDOX 3. a. Apply fault at the MADDOX 3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9023-3PH	P1	3 phase fault on the PEARLE 3 (528392) to ENRON_TP 3 (528317) 115 kV line CKT 1, near PEARLE 3. a. Apply fault at the PEARLE 3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9024-3PH	P1	3 phase fault on the SANGER_SW 3 (528463) to OXYPERMIAN 3 (528575) 115 kV line CKT 1, near SANGER_SW 3. a. Apply fault at the SANGER_SW 3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9025-3PH	P1	3 phase fault on the MONUMNT_TP 3 (528568) to BYRD_TP 3 (528581) 115 kV line CKT 1, near MONUMNT_TP 3. a. Apply fault at the MONUMNT_TP 3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.

Table 6 Continued

Fault ID	Planning Event	Fault Descriptions
FLT9026-3PH	P1	3 phase fault on the BYRD_TP 3 (528581) to COOPER_RNCH3 (528554) 115 kV line CKT 1, near BYRD_TP 3. a. Apply fault at the BYRD_TP 3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9027-3PH	P1	3 phase fault on the BYRD_TP 3 (528581) to BYRD 3 (528582) 115 kV line CKT 1, near BYRD_TP 3. a. Apply fault at the BYRD_TP 3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9028-3PH	P1	3 phase fault on the MONUMENT 3 (528491) to W_HOBBS 3 (528498) 115 kV line CKT 1, near MONUMENT 3. a. Apply fault at the MONUMENT 3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9029-3PH	P1	3 phase fault on the MONUMENT 115 kV (528491) /13.8 kV (528490) XFMR CKT 1, near MONUMENT 3 115 kV. a. Apply fault at the MONUMENT 3 115 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer. **Trip generator on bus MONUMENT 1 (528490)**
FLT9030-3PH	P1	3 phase fault on the HOBBS_INT 3 (527891) to LE-WEST_SUB3 (528333) 115 kV line CKT 1, near HOBBS_INT 3. a. Apply fault at the HOBBS_INT 3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9031-3PH	P1	3 phase fault on the HOBBS_INT 3 (527891) to MILLEN_TPW 3 (528434) 115 kV line CKT 1, near HOBBS_INT 3. a. Apply fault at the HOBBS_INT 3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9032-3PH	P1	3 phase fault on the HOBBS_INT 3 (527891) to BENSING 3 (528433) 115 kV line CKT 1, near HOBBS_INT 3. a. Apply fault at the HOBBS_INT 3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9033-3PH	P1	3 phase fault on the CUNNINHAM 3 115 kV (527864) /13.8 kV (527884) XFMR CKT 1, near CUNNINHAM 3 115 kV. a. Apply fault at the CUNNINHAM 3 115 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer. **Trip generator on bus CUNINGHAM4 (527884)**
FLT9034-3PH	P1	3 phase fault on the HOBBS_INT 115 kV (527891) /18 kV (527901) XFMR CKT 1, near HOBBS_INT 3 115 kV. a. Apply fault at the HOBBS_INT 3 115 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer. **Trip generator on bus HOBBS_PLT1 1 (527901)**
FLT9035-3PH	P1	3 phase fault on the LE-WEST 115 kV (528333) /34.5 kV (528337) /13.8 kV (528336) XFMR CKT 1, near LE-WEST_SUB3 115 kV. a. Apply fault at the LE-WEST_SUB3 115 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer.
FLT9036-3PH	P1	3 phase fault on the LE-WEST_SUB 115 kV (528333) /13.8 kV (528331) XFMR CKT 1, near LE-WEST_SUB3 115 kV. a. Apply fault at the LE-WEST_SUB 115 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer. **Trip generator on bus ASGI10 (528331)**

Table 6 Continued

Fault ID	Planning Event	Fault Descriptions
FLT9037-3PH	P1	3 phase fault on the LE-WEST_SUB3 (528333) to LE-NRTH_INT3 (528334) 115 kV line CKT 1, near LE-WEST_SUB3. a. Apply fault at the LE-WEST_SUB3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9038-3PH	P1	3 phase fault on the MILLEN_TPW 3 (528434) to MILLEN 3 (528435) 115 kV line CKT 1, near MILLEN_TPW 3. a. Apply fault at the MILLEN_TPW 3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9039-3PH	P1	3 phase fault on the BENSING 3 (528433) to HIGG 3 (527363) 115 kV line CKT 1, near BENSING 3. a. Apply fault at the BENSING 3 115 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9040-3PH	P1	3 phase fault on the CUNNIGHM_S 6 (527867) to HOBBS_INT 6 (527894) 230 kV line CKT 1, near CUNNIGHM_S 6. a. Apply fault at the CUNNIGHM_S 6 230 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9041-3PH	P1	3 phase fault on the CUNNIGHM 230 kV (527867) /13.8 kV (527882) XFMR CKT 1, near CUNNIGHM_S 6 230 kV. a. Apply fault at the CUNNIGHM_S 6 230 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer. **Trip generator on bus CUNINGHAM 2 1 (527882)**
FLT9042-3PH	P1	3 phase fault on the CUNNIGHM_N 6 (527865) to POTASH_JCT 6 (527963) 230 kV line CKT 1, near CUNNIGHM_N 6. a. Apply fault at the CUNNIGHM_N 6 230 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9043-3PH	P1	3 phase fault on the CUNNIGHM_N 6 (527865) to EDDY_NORTH 6 (527799) 230 kV line CKT 1, near CUNNIGHM_N 6. a. Apply fault at the CUNNIGHM_N 6 230 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9044-3PH	P1	3 phase fault on the CUNNIGHM 230 kV (527865) /13.8 kV (527883) XFMR CKT 1, near CUNNIGHM_S 6 230 kV. a. Apply fault at the CUNNIGHM_S 6 230 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer. **Trip generator on bus CUNINGHAM3 1 (527883)**
FLT9045-3PH	P1	3 phase fault on the POTASH_JCT 6 230 kV (527963) /115 kV (527962) /13.2 kV (527958) XFMR CKT 1, near POTASH_JCT 6 230 kV. a. Apply fault at the POTASH_JCT 6 230 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer.
FLT9046-3PH	P1	3 phase fault on the POTASH_JCT 6 (527963) to PECOS 6 (528179) 230 kV line CKT 1, near POTASH_JCT 6. a. Apply fault at the POTASH_JCT 6 230 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9047-3PH	P1	3 phase fault on the EDDY_NORTH 6 (527799) to 7-RIVERS 6 (528095) 230 kV line CKT 1, near EDDY_NORTH 6. a. Apply fault at the EDDY_NORTH 6 230 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.

Table 6 Continued

Fault ID	Planning Event	Fault Descriptions
FLT9048-3PH	P1	3 phase fault on the EDDY 230 kV (527799) /8.5 kV (527790) XFMR CKT 1, near EDDY_NORTH 6 230 kV. a. Apply fault at the EDDY_NORTH 6 230 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer.
FLT9049-3PH	P1	3 phase fault on the EDDY_NORTH 6 (527799) to CHAVES_CNTY6 (527483) 230 kV line CKT 1, near EDDY_NORTH 6. a. Apply fault at the EDDY_NORTH 6 230 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9050-3PH	P1	3 phase fault on the EDDY_TR2 230 kV (527799) /115 kV (527798) /13.2 kV (527797) XFMR CKT 1, near EDDY_NORTH 6 230 kV. a. Apply fault at the EDDY_NORTH 6 230 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer.
FLT9051-3PH	P1	3 phase fault on the PECOS 6 (528179) to 7-RIVERS 6 (528095) 230 kV line CKT 1, near PECOS 6. a. Apply fault at the PECOS 6 230 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9052-3PH	P1	3 phase fault on the EDDY_TR 230 kV (527799) /345 kV (527802) /13.2 kV (527796) XFMR CKT 1, near EDDY_NORTH 6 230 kV. a. Apply fault at the EDDY_NORTH 6 230 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer.
FLT9053-3PH	P1	3 phase fault on the HOBBS_INT 230 kV (527894) /115 kV (527891) /13.2 kV (527890) XFMR CKT 1, near HOBBS_INT 6 230 kV. a. Apply fault at the HOBBS_INT 6 230 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer.
FLT9054-3PH	P1	3 phase fault on the HOBBS_INT 6 (527894) to ANDREWS (528604) 230 kV line CKT 1, near HOBBS_INT 6. a. Apply fault at the HOBBS_INT 6 230 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9055-3PH	P1	3 phase fault on the HOBBS_INT 6 (527894) to INK_BASIN 6 (527028) 230 kV line CKT 1, near HOBBS_INT 6. a. Apply fault at the HOBBS_INT 6 230 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT9056-3PH	P1	3 phase fault on the HOBBS_TR 230 kV (527894) /345 kV (527896) /13.2 kV (527895) XFMR CKT 1, near HOBBS_INT 6 230 kV. a. Apply fault at the HOBBS_INT 6 230 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer.
FLT9057-3PH	P1	3 phase fault on the HOBBS_TR 230 kV (527894) /18 kV (527903) XFMR CKT 1, near HOBBS_INT 6 230 kV. a. Apply fault at the HOBBS_INT 6 230 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer. Trip generator on bus HOBBS_PLT3 1 (527903)
FLT9058-3PH	P1	3 phase fault on the HOBBS_INT 7 (527896) to RDRUNNER 7 (528027) 345 kV line CKT UC, near HOBBS_INT 7. a. Apply fault at the HOBBS_INT 7 345 kV bus. b. Clear fault after 6 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 6 cycles, then trip the line in (b) and remove fault.
FLT9059-3PH	P1	3 phase fault on the HOBBS_INT 7 (527896) to KIOWA 7 (527965) 345 kV line CKT 1, near HOBBS_INT 7. a. Apply fault at the HOBBS_INT 7 345 kV bus. b. Clear fault after 6 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 6 cycles, then trip the line in (b) and remove fault.

Table 6 Continued

Fault ID	Planning Event	Fault Descriptions
FLT9060-3PH	P1	3 phase fault on the HOBBS_INT 7 (527896) to CROSSROADS 7 (527656) 345 kV line CKT LX, near HOBBS_INT 7. a. Apply fault at the HOBBS_INT 7 230 kV bus. b. Clear fault after 6 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 6 cycles, then trip the line in (b) and remove fault.
FLT9061-3PH	P1	3 phase fault on the YOAKUM_345 345 kV (526936) /230 kV (526935) /13.2 kV (526937) XFMR CKT 1, near YOAKUM_345 345 kV. a. Apply fault at the YOAKUM_345 345 kV bus. b. Clear fault after 6 cycles and trip the faulted transformer.
FLT9062-3PH	P1	3 phase fault on the YOAKUM_345 (526936) to TUCO_INT 7 (525832) 345 kV line CKT 1, near YOAKUM_345. a. Apply fault at the YOAKUM_345 345 kV bus. b. Clear fault after 6 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 6 cycles, then trip the line in (b) and remove fault.
FLT9063-3PH	P1	3 phase fault on the RDRUNNER 7 (528027) to PHANTOM 7 (528015) 345 kV line CKT 1, near RDRUNNER 7. a. Apply fault at the RDRUNNER 7 345 kV bus. b. Clear fault after 6 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 6 cycles, then trip the line in (b) and remove fault.
FLT9064-3PH	P1	3 phase fault on the RDRUNNER 345 kV (528027) /115 kV (528025) /13.2 kV (528023) XFMR CKT 1, near RDRUNNER 7 345 kV. a. Apply fault at the RDRUNNER 7 345 kV bus. b. Clear fault after 6 cycles and trip the faulted transformer.
FLT9065-3PH	P1	3 phase fault on the RDRUNNER 7 (528027) to KIOWA 7 (527965) 345 kV line CKT 1, near RDRUNNER 7. a. Apply fault at the RDRUNNER 7 345 kV bus. b. Clear fault after 6 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 6 cycles, then trip the line in (b) and remove fault.
FLT9066-3PH	P1	3 phase fault on the KIOWA 7 (527965) to N_LOVING 7 (528185) 345 kV line CKT 1, near KIOWA 7. a. Apply fault at the KIOWA 7 345 kV bus. b. Clear fault after 6 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 6 cycles, then trip the line in (b) and remove fault.
FLT9067-3PH	P1	3 phase fault on the KIOWA 345 kV (527965) /115 kV (527966) /13.2 kV (527964) XFMR CKT 1, near KIOWA 345 kV. a. Apply fault at the KIOWA 345 kV bus. b. Clear fault after 6 cycles and trip the faulted transformer.
FLT9068-3PH	P1	3 phase fault on the KIOWA 7 (527965) to EDDY_CNTY 7 (527802) 345 kV line CKT 1, near KIOWA 7. a. Apply fault at the KIOWA 7 345 kV bus. b. Clear fault after 6 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 6 cycles, then trip the line in (b) and remove fault.
FLT9069-3PH	P1	3 phase fault on the CROSSROADS 7 (527656) to SAGA_SCOL 7 (527610) 345 kV line CKT 1, near CROSSROADS 7. a. Apply fault at the CROSSROADS 7 345 kV bus. b. Clear fault after 6 cycles by tripping the faulted line. **Trip generators on bus SAGSFT3 (527605), SAGSFT4 (527607), SAGSFT2 1 (527617), SAGSFT2 (527618), SAGSFT1 1 (527614), SAGSFT1 (527615)** c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 6 cycles, then trip the line in (b) and remove fault.

Table 6 Continued

Fault ID	Planning Event	Fault Descriptions
FLT9070-3PH	P1	3 phase fault on the CROSSROADS 7 (527656) to RSVLT_CC_E 7 (527655) 345 kV line CKT 1, near CROSSROADS 7. a. Apply fault at the CROSSROADS 7 345 kV bus. b. Clear fault after 6 cycles by tripping the faulted line. **Trip generators on bus MILP_WIND 1 (527653), RSVLT_GEN1 1 (527651), RSVLT_GEN2 1 (527652)** c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 6 cycles, then trip the line in (b) and remove fault.
FLT9071-3PH	P1	3 phase fault on the CROSSROADS 7 (527656) to TOLK 7 (525549) 345 kV line CKT 1, near CROSSROADS 7. a. Apply fault at the CROSSROADS 7 345 kV bus. b. Clear fault after 6 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 6 cycles, then trip the line in (b) and remove fault.
FLT9072-3PH	P1	3 phase fault on the TOLK 345 kV (525549) /230 kV (525531) /13.2 kV (525537) XFMR CKT 1, near TOLK 7 345 kV. a. Apply fault at the TOLK 7 345 kV bus. b. Clear fault after 6 cycles and trip the faulted transformer.
FLT9073-3PH	P1	3 phase fault on the HOBBS_INT 7 (527896) to YOAKUM_345 (526936) 345 kV line CKT 1, near HOBBS_INT 7. a. Apply fault at the HOBBS_INT 7 345 kV bus. b. Clear fault after 6 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 6 cycles, then trip the line in (b) and remove fault.
FLT1001-SB	P4	**Stuck Breaker at CUNNINHAM 3 (527864) 115 kV bus** a. Apply single phase fault at CUNNINHAM 3 bus. b. Clear fault after 16 cycles and trip the following elements c. Trip the CUNNINHAM 3 (527864) to MADDOX 3 (528355) 115 kV line CKT 1. d. Trip the CUNNINHAM 3 (527864) to BUCKEYE_TP 3 (528348) 115 kV line CKT 1.
FLT1002-SB	P4	**Stuck Breaker at CUNNINHAM 3 (527864) 115 kV bus** a. Apply single phase fault at CUNNINHAM 3 bus. b. Clear fault after 16 cycles and trip the following elements c. Trip the CUNNINHAM 3 (527864) to MONUMNT_TP 3 (528568) 115 kV line CKT 1. d. Trip the CUNNINHAM 3 (527864) to QUAHADA 3 (528394) 115 kV line CKT 1.
FLT1003-SB	P4	**Stuck Breaker at CUNNINHAM 3 (527864) 115 kV bus** a. Apply single phase fault at CUNNINHAM 3 bus. b. Clear fault after 16 cycles and trip the following elements c. Trip the CUNNINHAM 3 (527864) to MONUMNT_TP 3 (528568) 115 kV line CKT 1. d. Trip the CUNNINHAM 3 (527864) to HOBBS_INT 3 (527891) 115 kV line CKT 1.
FLT1004-SB	P4	**Stuck Breaker at CUNNINHAM 3 (527864) 115 kV bus** a. Apply single phase fault at CUNNINHAM 3 bus. b. Clear fault after 16 cycles and trip the following elements c. Trip the CUNNINHAM 3 (527864) to HOBBS_INT 3 (527891) 115 kV line CKT 1. d. Trip the CUNNINHAM 3 (527864) to HOBBS_INT 3 (527891) 115 kV line CKT 2.
FLT1005-SB	P4	**Stuck Breaker at CUNNINHAM 3 (527864) 115 kV bus** a. Apply single phase fault at CUNNINHAM 3 bus. b. Clear fault after 16 cycles and trip the following elements c. Trip the CUNNINHAM 115 kV (527864) /230 kV (527867) /13.2 kV (527863) XFMR CKT 1. d. Trip the CUNNINHAM 3 (527864) to HOBBS_INT 3 (527891) 115 kV line CKT 2.
FLT1006-SB	P4	**Stuck Breaker at CUNNIGHM_S 6 (527867) 230 kV bus** a. Apply single phase fault at CUNNIGHM_S 6 bus. b. Clear fault after 16 cycles and trip the following elements c. Trip the Bus CUNNIGHM_S 6 (527867).
FLT1007-SB	P4	**Stuck Breaker at HOBBS_INT 6 (527894) 230 kV bus** a. Apply single phase fault at HOBBS_INT 6 bus. b. Clear fault after 16 cycles and trip the following elements c. Trip the HOBBS_INT 6 (527894) to CUNNIGHM_S 6 (527867) 230 kV line CKT 1. d. Trip the HOBBS_TR 230 kV (527894) /18 kV (527903) XFMR CKT 1. Trip generator on bus HOBBS_PLT3 1 (527903)

Table 6 Continued

Fault ID	Planning Event	Fault Descriptions
FLT1008-SB	P4	**Stuck Breaker at HOBBS_INT 6 (527894) 230 kV bus** a. Apply single phase fault at HOBBS_INT 6 bus. b. Clear fault after 16 cycles and trip the following elements c. Trip the HOBBS_INT 6 (527894) to ANDREWS (528604) 230 kV line CKT 1. d. Trip the HOBBS_INT 230 kV (527894) /115 kV (527891) /13.2 kV (527890) XFMR CKT 1.
FLT1009-SB	P4	**Stuck Breaker at HOBBS_INT 6 (527894) 230 kV bus** a. Apply single phase fault at HOBBS_INT 6 bus. b. Clear fault after 16 cycles and trip the following elements c. Trip the HOBBS_INT 6 (527894) to INK_BASIN 6 (527028) 230 kV line CKT 1. d. Trip the HOBBS_INT 230 kV (527894) /115 kV (527891) /13.2 kV (527889) XFMR CKT 2.
FLT1010-SB	P4	**Stuck Breaker at HOBBS_INT 3 (527891) 115 kV bus** a. Apply single phase fault at HOBBS_INT 3 bus. b. Clear fault after 16 cycles and trip the following elements c. Trip the HOBBS_INT 3 (527891) to MADDOX 3 (528355) 115 kV line CKT 1. d. Trip the HOBBS_INT 230 kV (527894) /115 kV (527891) /13.2 kV (527889) XFMR CKT 2.
FLT1011-SB	P4	**Stuck Breaker at HOBBS_INT 3 (527891) 115 kV bus** a. Apply single phase fault at HOBBS_INT 3 bus. b. Clear fault after 16 cycles and trip the following elements c. Trip the HOBBS_INT 3 (527891) to LE-WEST_SUB3 (528333) 115 kV line CKT 1. d. Trip the HOBBS_INT 3 (527891) to HOBBS_PLT1 (527901) 115 kV line CKT 1. Trip generator on bus HOBBS_PLT1 1 (527901)
FLT1012-SB	P4	**Stuck Breaker at HOBBS_INT 3 (527891) 115 kV bus** a. Apply single phase fault at HOBBS_INT 3 bus. b. Clear fault after 16 cycles and trip the following elements c. Trip the HOBBS_INT 3 (527891) to CUNNINHAM 3 (527864) 115 kV line CKT 1. d. Trip the HOBBS_INT 3 (527891) to HOBBS_PLT2 (527902) 115 kV line CKT 1. Trip generator on bus HOBBS_PLT2 1 (527902)
FLT1013-SB	P4	**Stuck Breaker at HOBBS_INT 3 (527891) 115 kV bus** a. Apply single phase fault at HOBBS_INT 3 bus. b. Clear fault after 16 cycles and trip the following elements c. Trip the HOBBS_INT 3 (527891) to CUNNINHAM 3 (527864) 115 kV line CKT 2. d. Trip the HOBBS_INT 3 (527891) to BENSING 3 (528433) 115 kV line CKT 1.
FLT1014-SB	P4	**Stuck Breaker at HOBBS_INT 7 (527896) 345 kV bus** a. Apply single phase fault at HOBBS_INT 7 bus. b. Clear fault after 16 cycles and trip the following elements c. Trip the HOBBS_TR 230 kV (527894) /345 kV (527896) /13.2 kV (527895) XFMR CKT 1. d. Trip the HOBBS_INT 7 (527896) to KIOWA 7 (527965) 345 kV line CKT 1.

RESULTS

Table 7 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 7: Stability Analysis Results

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

Table 7 Continued

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

Table 7 Continued

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

Table 7 Continued

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

The results of the dynamic stability analysis showed several existing base case issues that were found in both the original DISIS-2017-002-1 model and the model with GEN-2023-GR4 included. These issues were not attributed to the GEN-2023-GR4 replacement request and are detailed in Appendix C.

There were no damping or voltage recovery violations attributed to the GEN-2023-GR4 replacement request observed during the simulated faults. Additionally, the project was found to stay connected during the contingencies that were studied and, therefore, will meet the Low Voltage Ride Through (LVRT) requirements of FERC Order #661A.

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-2023-GR4 as shown in Table 8.

Table 8: Necessary Interconnection Facilities

Upgrade Name	Upgrade Description
Cunningham 115 kV GEN-2023-GR4 Interconnection (TOIF) (SPS)	Interconnection upgrades and cost estimates needed to interconnect the following Interconnection Customer facility, GEN-2023-GR4, into the POI at Cunningham 115 kV.
Cunningham 115 kV GEN-2023-GR4 Interconnection (Non-Shared NU) (SPS)	Interconnection upgrades and cost estimates needed to interconnect the following Interconnection Customer facility, GEN-2023-GR4, into the POI at Cunningham 115 kV.

Should the Interconnection Customer choose to move forward with this request, an Interconnection Facilities Study will be necessary to determine the full scope, cost, and time required to interconnect these upgrades. SPP will work with the TO(s) indicated for the Interconnection Facilities Study.

RESULTS

RELIABILITY ASSESSMENT STUDY

SPP determined that a Reliability Assessment study was not required for the time period between the date that the Existing Generating Facility ceases commercial operations and the Commercial Operation Date of the Replacement Generating Facility. This determination was made using the criteria for evaluating Resource Retirement submissions in the SPP OATT Business Practice 7800. The planning screening assessment found that the resource has not been modeled as online and dispatched in the latest set of the approved Base Reliability power flow or MDWG dynamics models that are being utilized in the current Integrated Transmission Planning assessment or annual TPL-001-4 assessment. The Operational screening assessment found that the EGF had periodic use in late 2021 and early 2022, however has been on outage since late 2022. The EGF has not been called on for voltage support or committed for reliability related issues during the two year period. There are two permanent flowgates at the Hobbs substation, however, based on the EGF being on forced outage since late 2022, there are other units in the area to provide counter-flow to the constraints. Based on this screening, SPP determined that no additional analysis is needed.

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 Southwest Power Pool'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.