



# GEN-2023-GR5

## GENERATOR REPLACEMENT STUDY

By Aneden Consulting and SPP Generator Interconnection

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# REVISION HISTORY

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# EXECUTIVE SUMMARY

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

GEN-2023-GR5, the Replacement Generating Facility (RGF), will connect to the existing POI, the Plant X 115 kV Substation in the Southwestern Public Service (SPS) area.

The EGF, a synchronous gas-fired facility, has 150 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 42 x PE FS4200M solar inverters operating at 3.619 MW for a total assumed dispatch of 151.3 MW. The inverters are rated at 4.2 MW, thus the generating capability of the RGF (176.4 MW), exceeds its requested Interconnection Service amount of 150 MW. The injection amount of the RGF must be limited to 150 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.

## **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 from service of the EGF 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-2023-GR5.

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. In addition, the requested capacity of the RGF does not exceed the EGF output of 150 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-GR5 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 SPP's OASIS by the customer.

# SCOPE OF STUDY

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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

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

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 violation 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 from service of the EGF 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-2023-GR5. 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 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

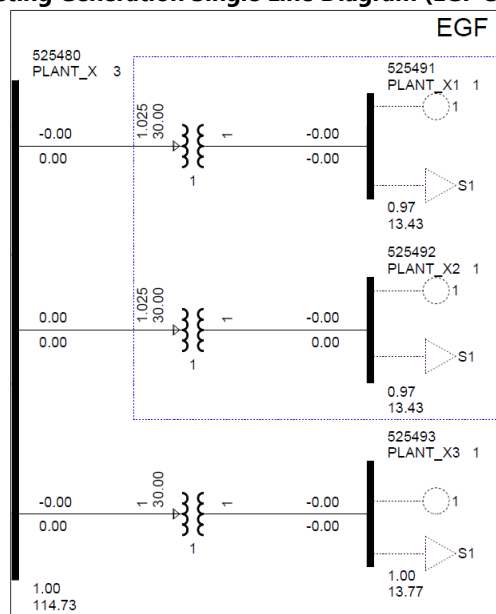
The assessments and conclusions provided in this report are based on assumptions and information provided to SPP/Aneden by others. While the assumptions and information provided may be appropriate for the purposes of this report, SPP/Aneden does not guarantee that those conditions assumed will occur. 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-GR5 Interconnection Customer has requested a replacement to its EGF, a synchronous gas-fired generating facility with a POI at the Plant X 115 kV Substation and a requested retirement date of August 11, 2022. The Interconnection Service available for replacement is 150 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 150 MW of Energy Resource Interconnection Service (ERIS). The requested RGF is a solar farm consisting of 42 x PE FS4200M solar inverters operating at 3.619 MW for a total assumed dispatch of 151.3 MW. The inverters are rated at 4.2 MW, thus the generating capability of the Replacement Generating Facility (RGF) also known as GEN-2023-GR5 (176.4 MW), exceeds its requested Interconnection Service amount of 150 MW. The injection amount of the RGF must be limited to 150 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).

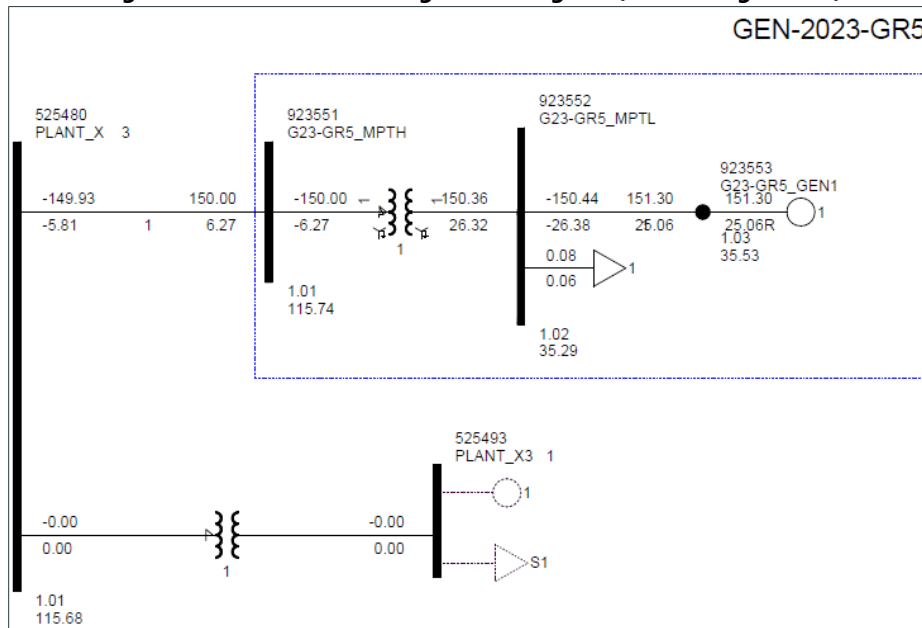
The POI of the EGF and RGF is at the Plant X 115 kV Substation in the Southwestern Public Service (SPS) area, and the EGF and RGF are not expected to be operational simultaneously. Figure 1 and Figure 2 show the steady state model single-line diagram for the EGF and RGF configurations, respectively. Table 1 details the existing and replacement configurations for GEN-2023-GR5.

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



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

**Figure 2: GEN-2023-GR5 Single Line Diagram (RGF Configuration)**



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

Facility	Existing Generator Facility Configuration		Replacement Generator Facility Configuration
Point of Interconnection	Plant X 115 kV (525480)		Plant X 115 kV (525480)
Configuration/Capacity	2 Gas Turbine Units totaling 150 MW		42 x PE FS4200M 3.619 MW (solar) = 151.998 MW [151.3 MW dispatch] Units are rated at 4.2 MW, PPC to limit GEN-2023-GR5 to 150 MW at the POI
Generation Interconnection Line	N/A		Length = 0.4 miles R = 0.000301 pu X = 0.002218 pu B = 0.000306 pu Rating MVA = 198 MVA
Main Substation Transformer <sup>1</sup>	N/A		X = 9.999%, R = 0.155%, Voltage = 34.5/115 kV (Wye Grounded/Wye Grounded), Taps Available = 33 Taps, $\pm 10\%$ Winding MVA = 113 MVA, Rating MVA = 187 MVA
Generator Step Up Transformer <sup>2</sup>	<b>Plant_X1:</b> X = 16.42%, R = 0.649%, Voltage = 13.8/115 kV, Fixed Taps Available = 5 Winding MVA = 100 MVA, Rating MVA = 65 MVA	<b>Plant_X2:</b> X = 9.88%, R = 0.325%, Voltage = 13.8/115 kV, Fixed Taps Available = 5 Winding MVA = 100 MVA, Rating MVA = 125 MVA	N/A
Equivalent Collector Line <sup>3</sup>	N/A		R = 0.003888 pu X = 0.005706 pu B = 0.024542 pu
Auxiliary Load	2.1 MW + 0 MVar on 13.8 kV bus	4.8 MW + 0 MVar on 13.8 kV bus	0.08 MW + 0.06 MVar on 34.5 kV bus
Generator Dynamic Model <sup>4</sup> & Power Factor	GENROU <sup>4</sup> Leading: 1.0 Lagging: 1.0	GENROU <sup>4</sup> Leading: 0.79 Lagging: 0.93	42 x PE FS4200M 4.2 MVA (REGCA1) <sup>4</sup> Leading: 0.862 Lagging: 0.862
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

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

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 violation 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 from service of the EGF and the commission of the RGF is necessary, and no mitigations are applicable.

# REPLACEMENT IMPACT STUDY

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Aneden was retained by SPP to perform the Replacement Impact Study (Impact Study) for GEN-2023-GR5.

## 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 COMPARISON

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-GR5 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-GR5 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

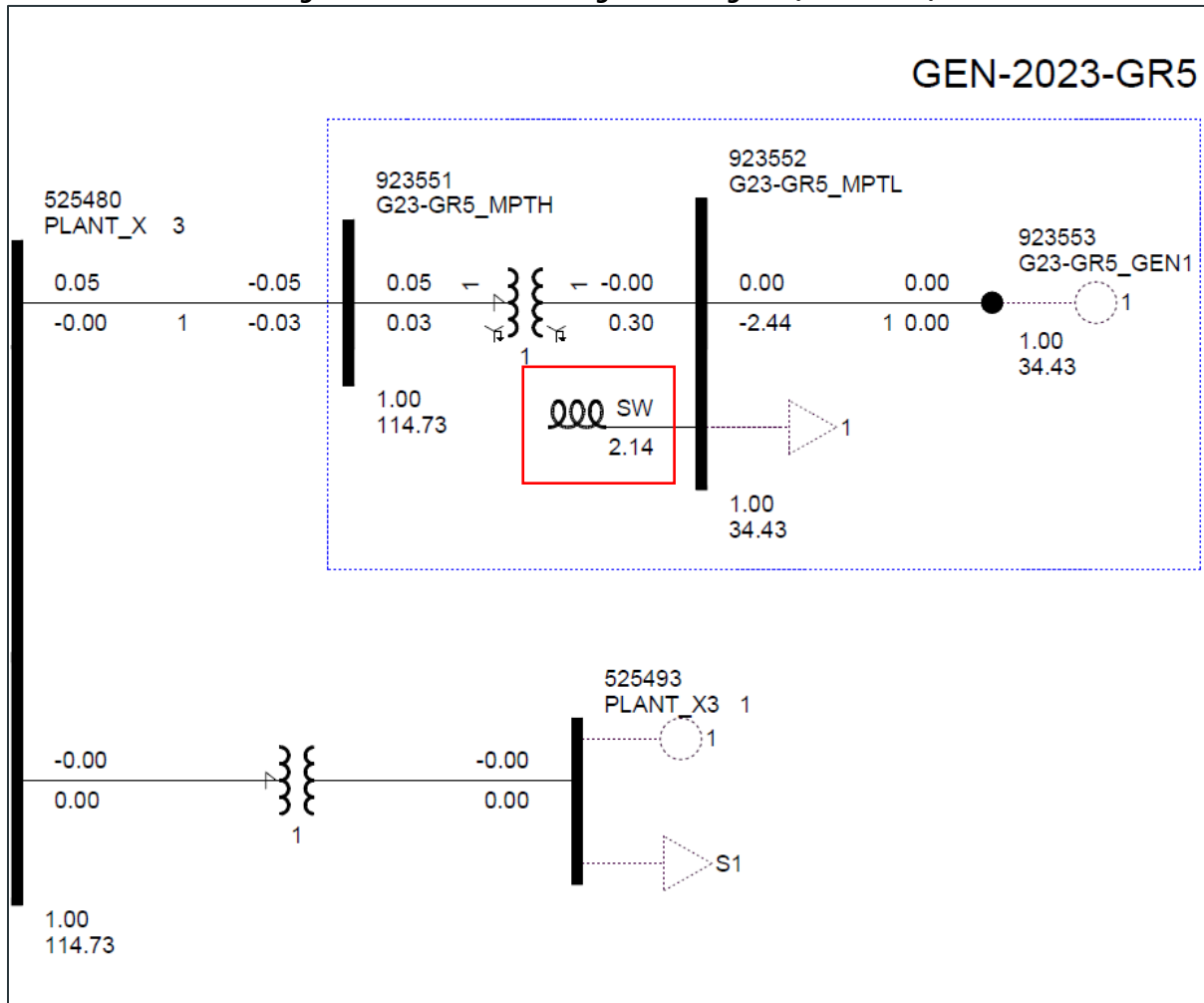
The results from the analysis showed that the GEN-2023-GR5 project needed approximately 2.15 MVar of compensation at its collector substation, to reduce the POI MVar to zero. Figure 3 illustrates the shunt reactor size needed to reduce the POI MVar to approximately zero with the replacement configuration. The final shunt reactor requirements for GEN-2023-GR5 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-GR5	525480	PLANT_X 3	2.15

Figure 3: GEN-2023-GR5 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-GR5 RGF online.

SPP created a short circuit model using the 25SP stability study model by adjusting the GEN-2023-GR5 short-circuit parameters consistent with the replacement data. The adjusted parameters are shown in Table 3 below.

**Table 3: GEN-2023-GR5 Short-Circuit Parameters\***

Parameter	Value by Generator Bus#
	923553
Machine MVA Base	176.4
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-GR5 POI bus (Plant X 115 kV) fault current magnitude is provided in Table 4 showing a fault current of 15.37 kA with the RGF online. The addition of the RGF increased the POI bus fault current by 0.81 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 27.56 kA for the 25SP model. The maximum contribution to three-phase fault currents due to the addition of the RGF was about 5.5% and 0.81 kA.



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

Case	GEN-OFF Current (kA)	GEN-ON Current (kA)	kA Change	%Change
25SP	14.56	15.37	0.81	5.5%

**Table 5: 25SP Short-Circuit Results**

Voltage (kV)	Max. Current (kA)	Max kA Change	Max %Change
69	9.03	0.03	0.6%
115	19.61	0.81	5.5%
230	27.56	0.19	0.8%
345	14.40	0.03	0.2%
<b>Max</b>	<b>27.56</b>	<b>0.81</b>	<b>5.5%</b>

## DYNAMIC STABILITY ANALYSIS

Aneden performed a dynamic stability analysis to identify the impact of the GEN-2023-GR5 project. The analysis was performed according to SPP's Disturbance Performance Requirements<sup>1</sup>. 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 42 x PE FS4200M operating at 3.619 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-GR5 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, 761449, and 523812 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

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

[https://www.spp.org/documents/28859/spp%20disturbance%20performance%20requirements%20\(twg%20approved\).pdf](https://www.spp.org/documents/28859/spp%20disturbance%20performance%20requirements%20(twg%20approved).pdf)

in Group 5<sup>2</sup>. 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 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 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 PLANT_X 3 (525480) to RKYFORD_TP 3 (525446) 115 kV line CKT 1, near PLANT_X 3. a. Apply fault at the PLANT_X 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 PLANT_X 3 (525480) to HALE_CNTY 3 (525454) 115 kV line CKT 1, near PLANT_X 3. a. Apply fault at the PLANT_X 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 PLANT_X 3 (525480) to MULSHVLY_TP3 (525019) 115 kV line CKT 1, near PLANT_X 3. a. Apply fault at the PLANT_X 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 PLANT_X 3 (525480) to LAMB_CNTY 3 (525636) 115 kV line CKT 1, near PLANT_X 3. a. Apply fault at the PLANT_X 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 PLANT_X 3 (525480) to BC-EARTH 3 (525056) 115 kV line CKT 1, near PLANT_X 3. a. Apply fault at the PLANT_X 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.
FLT9006-3PH	P1	3 phase fault on the PLANT_X 115 kV (525480) /230 kV (525481) /13.2 kV (525479) XFMR CKT 1, near PLANT_X 3 115 kV. a. Apply fault at the PLANT_X 3 115 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer.
FLT9007-3PH	P1	3 phase fault on the MULSHVLY_TP3 (525019) to MULSHVALLY3 (525018) 115 kV line CKT 1, near MULSHVLY_TP3. a. Apply fault at the MULSHVLY_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.

<sup>2</sup> Based on the DISIS-2017-002 Cluster Groups

**Table 6 Continued**

Fault ID	Planning Event	Fault Descriptions
FLT9008-3PH	P1	3 phase fault on the MULSHVLY_TP3 (525019) to BAILEYCO 3 (525028) 115 kV line CKT 1, near MULSHVLY_TP3. a. Apply fault at the MULSHVLY_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.
FLT9009-3PH	P1	3 phase fault on the BAILEYCO 3 (525028) to CURRY 3 (524822) 115 kV line CKT 1, near BAILEYCO 3. a. Apply fault at the BAILEYCO 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 BAILEYCO 3 115 kV (525028) /69 kV (525027) /13.2 kV (525025) XFMR CKT 1, near BAILEYCO 3 115 kV. a. Apply fault at the BAILEYCO 3 115 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer.
FLT9011-3PH	P1	3 phase fault on the RKYFORD_TP 3 (525446) to ROCKYFORD 3 (525393) 115 kV line CKT 1, near RKYFORD_TP 3. a. Apply fault at the RKYFORD_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 RKYFORD_TP 3 (525446) to LC-S_OLTON 3 (525440) 115 kV line CKT 1, near RKYFORD_TP 3. a. Apply fault at the RKYFORD_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.
FLT9013-3PH	P1	3 phase fault on the HALE_CNTY 3 (525454) to LAMTON 3 (525414) 115 kV line CKT 1, near HALE_CNTY 3. a. Apply fault at the HALE_CNTY 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.
FLT9014-3PH	P1	3 phase fault on the HALE_CNTY 3 (525454) to COX (525326) 115 kV line CKT 1, near HALE_CNTY 3. a. Apply fault at the HALE_CNTY 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.
FLT9015-3PH	P1	3 phase fault on the HALE_TR1 1 115 kV (525454) /69 kV (525453) /13.2 kV (525451) XFMR CKT 1, near HALE_CNTY 3 115 kV. a. Apply fault at the HALE_CNTY 3 115 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer.
FLT9016-3PH	P1	3 phase fault on the HALE_CNTY 3 (525454) to TUCO_INT 3 (525828) 115 kV line CKT 1, near HALE_CNTY 3. a. Apply fault at the HALE_CNTY 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 HALE_CNTY 3 (525454) to KRESS_INT 3 (525192) 115 kV line CKT 1, near HALE_CNTY 3. a. Apply fault at the HALE_CNTY 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.
FLT9018-3PH	P1	3 phase fault on the KRESS_INT 3 (525192) to NEWHART 3 (525460) 115 kV line CKT 1, near KRESS_INT 3. a. Apply fault at the KRESS_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.
FLT9019-3PH	P1	3 phase fault on the COX 115 kV (525326) /69 kV (525325) /13.2 kV (525324) XFMR CKT 1, near COX 3 115 kV. a. Apply fault at the COX 3 115 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer.

**Table 6 Continued**

Fault ID	Planning Event	Fault Descriptions
FLT9020-3PH	P1	3 phase fault on the COX 3 (525326) to KISER 3 (525272) 115 kV line CKT 1, near COX 3. a. Apply fault at the COX 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.
FLT9021-3PH	P1	3 phase fault on the COX 3 (525326) to CALLAHAN 3 (525763) 115 kV line CKT 1, near COX 3. a. Apply fault at the COX 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 TUCO_INT 3 (525828) to FLOYD_CNTY 3 (525780) 115 kV line CKT 1, near TUCO_INT 3. a. Apply fault at the TUCO_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.
FLT9023-3PH	P1	3 phase fault on the TUCO_INT 3 115 kV (525828) /69 kV (525826) /13.2 kV (525823) XFMR CKT 1, near TUCO_INT 3 115 kV. a. Apply fault at the TUCO_INT 3 115 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer.
FLT9024-3PH	P1	3 phase fault on the LAMB_TR 115 kV (525636) /69 kV (525635) /13.2 kV (525631) XFMR CKT 1, near LAMB_CNTY 3 115 kV. a. Apply fault at the LAMB_CNTY 3 115 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer.
FLT9025-3PH	P1	3 phase fault on the LAMB_CNTY 3 (525636) to HOCKLEY 3 (526020) 115 kV line CKT 1, near LAMB_CNTY 3. a. Apply fault at the LAMB_CNTY 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.
FLT9026-3PH	P1	3 phase fault on the TUCO_INT 3 (525828) to STANTON_W 3 (526076) 115 kV line CKT 1, near TUCO_INT 3. a. Apply fault at the TUCO_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.
FLT9027-3PH	P1	3 phase fault on the TUCO_INT 3 (525828) to LUBBCK_EST 3 (526298) 115 kV line CKT 1, near TUCO_INT 3. a. Apply fault at the TUCO_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.
FLT9028-3PH	P1	3 phase fault on the BC-EARTH 3 (525056) to BC-KELLEY 3 (525050) 115 kV line CKT 1, near BC-EARTH 3. a. Apply fault at the BC-EARTH 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 BC-KELLEY 3 (525050) to CASTRO_CNTY3 (524746) 115 kV line CKT 1, near BC-KELLEY 3. a. Apply fault at the BC-KELLEY 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.
FLT9030-3PH	P1	3 phase fault on the PLANT_X 6 (525481) to NEWHART 6 (525461) 230 kV line CKT 1, near PLANT_X 6. a. Apply fault at the PLANT_X 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.
FLT9031-3PH	P1	3 phase fault on the PLANT_X 6 (525481) to G17-146-TAP (760498) 230 kV line CKT 1, near PLANT_X 6. a. Apply fault at the PLANT_X 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
FLT9032-3PH	P1	3 phase fault on the PLANT_X 6 (525481) to SUNDOWN 6 (526435) 230 kV line CKT 1, near PLANT_X 6. a. Apply fault at the PLANT_X 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.
FLT9033-3PH	P1	3 phase fault on the PLANT_X 6 (525481) to G17-218TAP (762174) 230 kV line CKT 1, near PLANT_X 6. a. Apply fault at the PLANT_X 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.
FLT9034-3PH	P1	3 phase fault on the PLANT_X 6 (525481) to GEN-2017-217 (761523) 230 kV line CKT 1, near PLANT_X 6. a. Apply fault at the PLANT_X 6 230 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. Trip generators on bus G17-217-GEN1 (761526), G17-217-GEN2 (761529) 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.
FLT9035-3PH	P1	3 phase fault on the NEWHART 6 (525461) to GEN-2017-176 (761439) 230 kV line CKT 1, near NEWHART 6. a. Apply fault at the NEWHART 6 230 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. Trip generators on bus G17-176-GEN1 (761442), G17-176-GEN2 (761445), G17-176-GEN3 (761447), G17-176-GEN4 (761449) 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.
FLT9036-3PH	P1	3 phase fault on the NEWHART 6 230 kV (525461) /115 kV (525460) /13.2 kV (525459) XFMR CKT 1, near NEWHART 6 230 kV. a. Apply fault at the NEWHART 6 230 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer.
FLT9037-3PH	P1	3 phase fault on the NEWHART 6 (525461) to POTTER_CO 6 (523959) 230 kV line CKT 1, near NEWHART 6. a. Apply fault at the NEWHART 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.
FLT9038-3PH	P1	3 phase fault on the NEWHART 6 (525461) to SWISHER 6 (525213) 230 kV line CKT 1, near NEWHART 6. a. Apply fault at the NEWHART 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.
FLT9039-3PH	P1	3 phase fault on the SWISHER 6 (525213) to TUCO_INT 6 (525830) 230 kV line CKT 1, near SWISHER 6. a. Apply fault at the SWISHER 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.
FLT9040-3PH	P1	3 phase fault on the TUCO_INT 6 (525830) to CARLISLE 6 (526161) 230 kV line CKT 1, near TUCO_INT 6. a. Apply fault at the TUCO_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.
FLT9041-3PH	P1	3 phase fault on the LAMB_TR 230 kV (525637) /115 kV (525636) /13.2 kV (525633) XFMR CKT 1, near LAMB_CNTY 6 230 kV. a. Apply fault at the LAMB_CNTY 6 230 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer.
FLT9042-3PH	P1	3 phase fault on the TOLK 6 (525531) to TUCO_INT 6 (525830) 230 kV line CKT 1, near TOLK 6. a. Apply fault at the TOLK 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 CARLISLE 6 (526161) to WOLFFORTH 6 (526525) 230 kV line CKT 1, near CARLISLE 6. a. Apply fault at the CARLISLE 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
FLT9044-3PH	P1	3 phase fault on the G17-146-TAP (760498) to DEAFSMITH 6 (524623) 230 kV line CKT 1, near G17-146-TAP. a. Apply fault at the G17-146-TAP 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.
FLT9045-3PH	P1	3 phase fault on the DEAFSMITH 6 (524623) to BUSHLAND 6 (524267) 230 kV line CKT 1, near DEAFSMITH 6. a. Apply fault at the DEAFSMITH 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.
FLT9046-3PH	P1	3 phase fault on the DEAFSMITH 230 kV (524623) /115 kV (524622) /13.2 kV (524620) XFMR CKT 1, near DEAFSMITH 6 230 kV. a. Apply fault at the DEAFSMITH 6 230 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer.
FLT9047-3PH	P1	3 phase fault on the SUNDOWN 6 (526435) to AMOCO_SS 6 (526460) 230 kV line CKT 1, near SUNDOWN 6. a. Apply fault at the SUNDOWN 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.
FLT9048-3PH	P1	3 phase fault on the SUNDOWN 230 kV (526435) /115 kV (526434) /13.2 kV (526432) XFMR CKT 1, near SUNDOWN 6 230 kV. a. Apply fault at the SUNDOWN 6 230 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer.
FLT9049-3PH	P1	3 phase fault on the SUNDOWN 6 (526435) to WOLFFORTH 6 (526525) 230 kV line CKT 1, near SUNDOWN 6. a. Apply fault at the SUNDOWN 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 AMOCO_SS 6 (526460) to YOAKUM 6 (526935) 230 kV line CKT 1, near AMOCO_SS 6. a. Apply fault at the AMOCO_SS 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.
FLT9051-3PH	P1	3 phase fault on the WOLFFORTH 230 kV (526525) /115 kV (526524) /13.2 kV (526522) XFMR CKT 1, near WOLFFORTH 6 230 kV. a. Apply fault at the WOLFFORTH 6 230 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer.
FLT9052-3PH	P1	3 phase fault on the WOLFFORTH 6 (526525) to LUBBCK_STH 6 (526269) 230 kV line CKT 1, near WOLFFORTH 6. a. Apply fault at the WOLFFORTH 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.
FLT9053-3PH	P1	3 phase fault on the POTTER 230 kV (523959) /345 kV (523961) /13.2 kV (523957) XFMR CKT 1, near POTTER_CO 6 230 kV. a. Apply fault at the POTTER_CO 6 230 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer.
FLT9054-3PH	P1	3 phase fault on the POTTER_CO 6 (523959) to HARRNG_EST 6 (523979) 230 kV line CKT 1, near POTTER_CO 6. a. Apply fault at the POTTER_CO 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 POTTER_CO 6 (523959) to ROLLHILLS 6 (524010) 230 kV line CKT 1, near POTTER_CO 6. a. Apply fault at the POTTER_CO 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
FLT9056-3PH	P1	3 phase fault on the POTTER_CO 6 (523959) to CHAN+TASCO 6 (523869) 230 kV line CKT 1, near POTTER_CO 6. a. Apply fault at the POTTER_CO 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.
FLT9057-3PH	P1	3 phase fault on the POTTER_CO 6 (523959) to MCDWL_CREEK6 (523323) 230 kV line CKT 1, near POTTER_CO 6. a. Apply fault at the POTTER_CO 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.
FLT9058-3PH	P1	3 phase fault on the POTTER_CO 6 (523959) to BUSHLAND 6 (524267) 230 kV line CKT 1, near POTTER_CO 6. a. Apply fault at the POTTER_CO 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.
FLT9059-3PH	P1	3 phase fault on the G17-218TAP (762174) to TOLK 6 (525531) 230 kV line CKT 1, near G17-218TAP. a. Apply fault at the G17-218TAP 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.
FLT9060-3PH	P1	3 phase fault on the G17-218TAP (762174) to GEN-2017-218 (762175) 230 kV line CKT 1, near G17-218TAP. a. Apply fault at the G17-218TAP 230 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. Trip generators on bus G17-218GEN1 (762178), G17-218GEN2 (762181), G17-218GEN3 (762184) 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.
FLT9061-3PH	P1	3 phase fault on the TOLK 6 (525531) to LAMB_CNTY 6 (525637) 230 kV line CKT 1, near TOLK 6. a. Apply fault at the TOLK 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.
FLT9062-3PH	P1	3 phase fault on the TOLK 6 (525531) to NEEDMORE 6 (525586) 230 kV line CKT 1, near TOLK 6. a. Apply fault at the TOLK 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.
FLT9063-3PH	P1	3 phase fault on the TOLK 6 (525531) to GEN-2017-158 (762132) 230 kV line CKT 1, near TOLK 6. a. Apply fault at the TOLK 6 230 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. Trip generator on bus G17-158GEN1 (762135), G17-158GEN2 (762138) 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.
FLT9064-3PH	P1	3 phase fault on the TOLK 230 kV (525531) /24 kV (525561) XFMR CKT 1, near TOLK 6 230 kV. a. Apply fault at the TOLK 6 230 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer. Trip generator on bus TOLK_1 1 (525561)
FLT9065-3PH	P1	3 phase fault on the TOLK 6 (525531) to ROOSEVELT 6 (524909) 230 kV line CKT 1, near TOLK 6. a. Apply fault at the TOLK 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.
FLT9066-3PH	P1	3 phase fault on the NEEDMORE 6 (525586) to YOAKUM 6 (526935) 230 kV line CKT 1, near NEEDMORE 6. a. Apply fault at the NEEDMORE 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
FLT9067-3PH	P1	3 phase fault on the NEEDMORE 6 (525586) to BLUECLDPOI 6 (525585) 230 kV line CKT Z1, near NEEDMORE 6. a. Apply fault at the NEEDMORE 6 230 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. Trip generator on bus BLUECLDGEN1 (525581) 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.
FLT9068-3PH	P1	3 phase fault on the TOLK 230 kV (525531) /345 kV (525549) /13.2 kV (525537) XFMR CKT 1, near TOLK 6 230 kV. a. Apply fault at the TOLK 6 230 kV bus. b. Clear fault after 7 cycles and trip the faulted transformer.
FLT9069-3PH	P1	3 phase fault on the POTTER_CO 7 (523961) to SPNSPUR WND7 (524296) 345 kV line CKT 1, near POTTER_CO 7. a. Apply fault at the POTTER_CO 7 345 kV bus. b. Clear fault after 6 cycles by tripping the faulted line. Trip generator on bus XXXX (524295) 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.
FLT9070-3PH	P1	3 phase fault on the POTTER_CO 7 (523961) to HITCHLAND 7 (523097) 345 kV line CKT 1, near POTTER_CO 7. a. Apply fault at the POTTER_CO 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.
FLT9071-3PH	P1	3 phase fault on the TOLK 7 (525549) to CROSSROADS 7 (527656) 345 kV line CKT 1, near TOLK 7. a. Apply fault at the TOLK 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	<b>Stuck Breaker at PLANT_X 6 (525481) 230 kV bus</b> a. Apply single phase fault at PLANT_X 6 bus. b. Clear fault after 16 cycles and trip the following elements c. Trip the Bus PLANT_X 6 (525481). Trip the generator on bus PLANT_X4 1 (525494)
FLT1002-SB	P4	<b>Stuck Breaker at PLANT_X 3 (525480) 115 kV bus</b> a. Apply single phase fault at PLANT_X 3 bus. b. Clear fault after 16 cycles and trip the following elements c. Trip the PLANT_X 3 (525480) to MULSHVLY_TP3 (525019) 115 kV line CKT 1. d. Trip the PLANT_X 3 (525480) to LAMB_CNTY 3 (525636) 115 kV line CKT 1.
FLT1003-SB	P4	<b>Stuck Breaker at PLANT_X 3 (525480) 115 kV bus</b> a. Apply single phase fault at PLANT_X 3 bus. b. Clear fault after 16 cycles and trip the following elements c. Trip the PLANT_X 3 (525480) to HALE_CNTY 3 (525454) 115 kV line CKT 1. d. Trip the PLANT_X 3 (525480) to LAMB_CNTY 3 (525636) 115 kV line CKT 1.
FLT1004-SB	P4	<b>Stuck Breaker at PLANT_X 3 (525480) 115 kV bus</b> a. Apply single phase fault at PLANT_X 3 bus. b. Clear fault after 16 cycles and trip the following elements c. Trip the PLANT_X 3 (525480) to HALE_CNTY 3 (525454) 115 kV line CKT 1. d. Trip the PLANT_X 3 (525480) to RKYFORD_TP 3 (525446) 115 kV line CKT 1.
FLT1005-SB	P4	<b>Stuck Breaker at PLANT_X 3 (525480) 115 kV bus</b> a. Apply single phase fault at PLANT_X 3 bus. b. Clear fault after 16 cycles and trip the following elements c. Trip the PLANT_X 3 (525480) to BC-EARTH 3 (525056) 115 kV line CKT 1. d. Trip the PLANT_X 3 (525480) to RKYFORD_TP 3 (525446) 115 kV line CKT 1.
FLT1006-SB	P4	<b>Stuck Breaker at PLANT_X 3 (525480) 115 kV bus</b> a. Apply single phase fault at PLANT_X 3 bus. b. Clear fault after 16 cycles and trip the following elements c. Trip the PLANT_X 3 (525480) to BC-EARTH 3 (525056) 115 kV line CKT 1. d. Trip the PLANT_X 115 kV (525480) /230 kV (525481) /13.2 kV (525479) XFMR CKT 1.

**Table 6 Continued**

Fault ID	Planning Event	Fault Descriptions
FLT1007-SB	P4	<b>Stuck Breaker at PLANT_X 3 (525480) 115 kV bus</b> a. Apply single phase fault at PLANT_X 3 bus. b. Clear fault after 16 cycles and trip the following elements c. Trip the PLANT_X 3 (525480) to BC-EARTH 3 (525056) 115 kV line CKT 1. d. Trip the PLANT_X G3 115 kV (525480) /13.8 kV (525493) XFMR CKT 1. Trip the generator on bus PLANT_X3 1 (525493)
FLT1008-SB	P4	<b>Stuck Breaker at PLANT_X 3 (525480) 115 kV bus</b> a. Apply single phase fault at PLANT_X 3 bus. b. Clear fault after 16 cycles and trip the following elements c. Trip the PLANT_X 3 (525480) to HALE_CNTY 3 (525454) 115 kV line CKT 1. d. Trip the PLANT_X 3 (525480) to G23-GR5 MPTH (923541) 115 kV line CKT 1. Trip the generator on bus G23-GR5 GEN1 (923543)
FLT1009-SB	P4	<b>Stuck Breaker at PLANT_X 3 (525480) 115 kV bus</b> a. Apply single phase fault at PLANT_X 3 bus. b. Clear fault after 16 cycles and trip the following elements c. Trip the PLANT_X G3 115 kV (525480) /13.8 kV (525493) XFMR CKT 1. d. Trip the PLANT_X 3 (525480) to G23-GR5 MPTH (923541) 115 kV line CKT 1. Trip the generator on bus PLANT_X3 1 (525493) Trip the generator on bus G23-GR5 GEN1 (923543)

## 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
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

**Table 7 Continued**

Fault ID	25SP			25WP		
	Voltage Violation	Voltage Recovery	Stable	Voltage Violation	Voltage Recovery	Stable
FLT9014-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9015-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9016-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9017-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9018-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9019-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9020-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9021-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9022-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9023-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9024-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9025-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9026-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9027-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9028-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9029-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9030-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9031-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9032-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9033-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9034-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9035-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9036-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9037-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9038-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9039-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9040-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9041-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9042-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9043-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9044-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9045-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9046-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9047-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT9048-3PH	Pass	Pass	Stable	Pass	Pass	Stable

**Table 7 Continued**

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

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-GR5 included.

These issues were not attributed to the GEN-2023-GR5 replacement request and are detailed in Appendix C.

There were no damping or voltage recovery violations attributed to the GEN-2023-GR5 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-GR5 as shown in Table 8.

**Table 8: Necessary Interconnection Facilities**

Upgrade Name	Upgrade Description
Plant X 115 kV GEN-2023-GR5 Interconnection (TOIF) (SPS)	Interconnection upgrades and cost estimates needed to interconnect the following Interconnection Customer facility, GEN-2023-GR5, into the POI at Plant X 115 kV.
Plant X 115 kV GEN-2023-GR5 Interconnection (Non-Shared NU) (SPS)	Interconnection upgrades and cost estimates needed to interconnect the following Interconnection Customer facility, GEN-2023-GR5, into the POI at Plant X 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

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## 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 from service of the EGF 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.